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Judith A. Hall, Mark L. Knapp (Eds.)

NONVERBAL COMMUNICATION

HANDBOOKS OF
COMMUNICATION SCIENCE

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Nonverbal Communication

Handbooks of Communication Science

Edited by
Peter J. Schulz and Paul Cobley

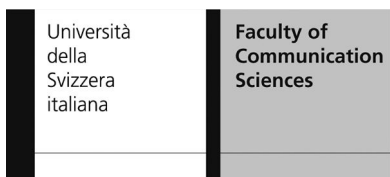
Volume 2

Nonverbal Communication



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Preface to *Handbooks of Communication Science* series

This volume is part of the series *Handbooks of Communication Science*, published from 2012 onwards by de Gruyter Mouton. When our generation of scholars was in their undergraduate years, and one happened to be studying communication, a series like this one was hard to imagine. There was, in fact, such a dearth of basic and reference literature that trying to make one's way in communication studies as our generation did would be unimaginable to today's undergraduates in the field. In truth, there was simply nothing much to turn to when you needed to cast a first glance at the key objects in the field of communication. The situation in the United States was slightly different; nevertheless, it is only within the last generation that the basic literature has really proliferated there.

What one did when looking for an overview or just a quick reference was to turn to social science books in general, or to the handbooks or textbooks from the neighbouring disciplines such as psychology, sociology, political science, linguistics, and probably other fields. That situation has changed dramatically. There are more textbooks available on some subjects than even the most industrious undergraduate can read. The representative key multi-volume *International Encyclopedia of Communication* has now been available for some years. Overviews of subfields of communication exist in abundance. There is no longer a dearth for the curious undergraduate, who might nevertheless overlook the abundance of printed material and Google whatever he or she wants to know, to find a suitable Wikipedia entry within seconds.

'Overview literature' in an academic discipline serves to draw a balance. There has been a demand and a necessity to draw that balance in the field of communication and it is an indicator of the maturing of the discipline. Our project of a multi-volume series of *Handbooks of Communication Science* is a part of this coming-of-age movement of the field. It is certainly one of the largest endeavours of its kind within communication sciences, with almost two dozen volumes already planned. But it is also unique in its combination of several things.

The series is a major publishing venture which aims to offer a portrait of the current state of the art in the study of communication. But it seeks to do more than just assemble our knowledge of communication structures and processes; it seeks to *integrate* this knowledge. It does so by offering comprehensive articles in all the volumes instead of small entries in the style of an encyclopedia. An extensive index in each *Handbook* in the series, serves the encyclopedic task of finding relevant specific pieces of information. There are already several handbooks in sub-disciplines of communication sciences such as political communication, methodology, organisational communication – but none so far has tried to comprehensively cover the discipline as a whole.

For all that it is maturing, communication as a discipline is still young and one of its benefits is that it derives its theories and methods from a great variety of work in other, and often older, disciplines. One consequence of this is that there is a variety of approaches and traditions in the field. For the *Handbooks* in this series, this has created two necessities: commitment to a pluralism of approaches, and a commitment to honour the scholarly traditions of current work and its intellectual roots in the knowledge in earlier times.

There is really no single object of communication sciences. However, if one were to posit one possible object it might be the human communicative act – often conceived as “someone communicates something to someone else.” This is the departure point for much study of communication and, in consonance with such study, it is also the departure point for this series of *Handbooks*. As such, the series does not attempt to adopt the untenable position of understanding communication sciences as the study of everything that can be conceived as communicating. Rather, while acknowledging that the study of communication must be multifaceted or fragmented, it also recognizes two very general approaches to communication which can be distinguished as: a) the semiotic or linguistic approach associated particularly with the humanities and developed especially where the Romance languages have been dominant and b) a quantitative approach associated with the hard and the social sciences and developed, especially, within an Anglo-German tradition. Although the relationship between these two approaches and between theory and research has not always been straightforward, the series does not privilege one above the other. In being committed to a plurality of approaches it assumes that different camps have something to tell each other. In this way, the *Handbooks* aspire to be relevant for all approaches to communication. The specific designation “communication science” for the *Handbooks* should be taken to indicate this commitment to plurality; like “the study of communication,” it merely designates the disciplined, methodologically informed, institutionalized study of (human) communication.

On an operational level, the series aims at meeting the needs of undergraduates, postgraduates, academics and researchers across the area of communication studies. Integrating knowledge of communication structures and processes, it is dedicated to cultural and epistemological diversity, covering work originating from around the globe and applying very different scholarly approaches. To this end, the series is divided into 6 sections: “Theories and Models of Communication”, “Messages, Codes and Channels”, “Mode of Address, Communicative Situations and Contexts”, “Methodologies”, “Application areas” and “Futures”. As readers will see, the first four sections are fixed; yet it is in the nature of our field that the “Application areas” will expand. It is inevitable that the futures for the field promise to be intriguing with their proximity to the key concerns of human existence on this planet (and even beyond), with the continuing prospect in communication sciences that that future is increasingly susceptible of prediction.

Note: administration on this series has been funded by the Università della Svizzera italiana – University of Lugano. Thanks go to the president of the university, Professor Piero Martinoli, as well as to the administration director, Albino Zgraggen.

Peter J. Schulz, Università della Svizzera italiana, Lugano
Paul Cobley, London Metropolitan University

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| Introduction

Judith A. Hall and Mark L. Knapp

1 Welcome to the *Handbook of Nonverbal Communication*

Nonverbal communication has always fascinated human beings. It is omnipresent and influential, but ineffable in many ways. Much of the time, it is hard to describe and hard to study. Nonverbal communication is often hard to be aware of in daily life, and sometimes we become aware only when it goes amiss. Yet, people have extensive and deeply shared implicit understandings of nonverbal communication. If this were not the case, daily life would be chaotic. Proof of these shared implicit understandings is the routine success of fiction writers in bringing their characters to life. This is possible because readers understand how descriptions of expressions, movements, and appearance map onto characters' personalities, emotions, and intentions. If the writer says that the private detective's eyes narrowed and his jaw tightened, readers "get it" – they know that this implies determination or anger. Similarly – in reverse – if the writer says that the heroine looked puzzled, readers can easily picture a constellation of facial cues that convey puzzlement. And this miracle of shared implicit understandings usually transcends time and culture; American readers "get it" just as much when reading a Russian novelist who wrote two centuries ago as when reading an American novelist's current best-seller.

Similarly, people can meet or even just glimpse strangers and glean a wealth of important and valid information about them – their feelings, thoughts, personality, sociodemographic characteristics, and much else – without any apparent effort. People are able to take turns smoothly in conversations – surely an amazing feat of implicitly understood coordination. And people have predictable implicit ideas about how their own nonverbal behavior influences other people. Sensible interpersonal interaction would simply not be possible if people did not share implicit understandings of what nonverbal cues are used for and what they mean.

What scholars seek to do is go beyond these implicit understandings to create a science of nonverbal communication – to describe it and understand its meanings, functions, origins, and impact using empirical methods. This difficult and exciting undertaking is what the present volume seeks to capture.

1 The nonverbal communication field today

The study of nonverbal communication is widely dispersed across many academic disciplines. In this volume, the contributors span the fields of communication and psychology. These distinguished scholars from Europe, Canada, and the United States bring their wide-ranging expertise and programs of research to bear on this

fast-expanding and exciting area of study. Though the authors represent the fields of communication and psychology, it is important to recognize that the topic is not defined by discipline. Indeed, it is a truly cross-disciplinary subject, with connections to theory and practice in adjacent fields including sociology, anthropology, ethology, education, computer science, political science, and medicine (as well as other clinical disciplines), and many subdisciplines within psychology (cognition, perception, developmental, abnormal, behavioral neuroscience, evolutionary psychology, social-personality and others).

Nonverbal communication is experiencing not only an explosion of interest but also a quickly rising stature in the scientific community. Many important journals, including *Human Communication Research* and the *Journal of Personality and Social Psychology*, routinely publish nonverbal communication research, and some journals devote all of their content to this topic (*Journal of Nonverbal Behavior*, *Gesture*). Many of the most popular topics in behavioral research today involve nonverbal behavior. Such topics include emotions, priming, mimicry, accuracy of interpersonal perception, power and dominance, and embodiment (and others). Some of the relevance and excitement over nonverbal communication comes from the resurgence of interest in nonconscious processes. Another source of renewed interest is psychology's transition from viewing humans as "cold" (rational, information-processing) to "hot" (motivated, emotional, not always rational) in their thought and behavior.

Another source of interest, worldwide and across many disciplines, is the willingness of researchers to break out of their disciplinary cocoons. New marriages of theory and methodology can produce entirely new fields of endeavor. Examples include psychology's discovery that hand gestures are closely bound up with language production, comprehension, and learning, and the discovery that what people think cannot be divorced from what their bodies are doing. Computer scientists and those in artificial intelligence turn to nonverbal communication experts for advice on avatar behavior. Psychologists and animal behavior researchers who are interested in what makes for intelligence in animals and humans have "theory of mind" as one of their central concepts; theory of mind is often measured in terms of nonverbal cues such as gazing and inference-making based on nonverbal cues. These are just examples of the many creative alliances that continue to develop between researchers in many fields and those in the nonverbal communication field.

There are numerous different ways that nonverbal behavior figures in the research designs employed by researchers. It can be the independent variable, experimentally manipulated using video stimuli or live confederates, with the goal of finding out how nonverbal cues causally influence other variables such as attitudes, emotion, interpersonal responses, or learning. Or, nonverbal behavior can be the dependent variable, with the goal of finding out how other factors (such as training, the behavior of a confederate, or social power) influence non-

verbal behavior. Some research looks at nonverbal behavior as the mediator in a causal process between two other variables, such as the study of how one person's racial attitudes might influence a target person's outcomes via the impact of the first person's nonverbal behavior. Also, of course, many studies do not, and often cannot, experimentally manipulate variables in the design, but rely instead on correlational (observational) methodologies, as when studying differences between preexisting groups defined in many ways (e.g., personality, mental health, gender, or social class). The fact that nonverbal communication can enrich understanding of many phenomena, using many different research approaches, is one reason why it is, and will remain, a vital element in the study of human behavior.

As a final reason for the present – and we predict future – strong growth in the nonverbal field, we can point to the disillusionment that has been spreading with research paradigms that rely on measuring not actual human behavior but on more easily measured self-reports and reaction times. Critics of publication trends point out an overreliance on measurements that do not capture actual (or at least, meaningful) behavior. There are many explanations for this overreliance, but the point we wish to make here is that dissatisfaction is growing and there will be more and more recognition that students of human behavior should study actual human behavior. As that happens, nonverbal communication researchers will be at the forefront. Because nonverbal behavior has not been over-studied, there are many important questions remaining to be answered, and furthermore nonverbal behavior is demonstrably interesting and relevant in the real world. Therefore, one should have strong expectations for the future of this field.

2 Nature of the present volume

As the editors of this volume we felt we had a good grasp of the field – having had many years of experience in the field ourselves – yet we were amazed and humbled by the wealth of scholarship contained in the volume's chapters as well as by the authors' awe-inspiring mastery of the research literature. These authors are a select group of world experts and rising stars in the field of nonverbal communication. Although it is impossible to treat in one volume all of the important and vibrant areas of research, the present volume covers a very wide range of basic and applied topics in depth, a feat made possible by the generous page allocations provided by the publisher. It offers balanced yet detailed overviews that summarize theory, findings, accumulated knowledge, and ideas at the cutting edge. Readers are able to learn the experts' current views on a field that is fast-moving and sometimes marked by debates. The authors thus address unresolved issues and future directions, not only the current state of knowledge.

2.1 Audience

The volume is designed to serve both newcomers and experts from any area of behavioral science. Even scholars within the nonverbal communication field will find much that is new, on their own and other topics. Specialized knowledge is not assumed, and readers may choose between focusing on the “big picture” including how the various themes and areas of research connect to each other, and delving deep by taking advantage of the rich bibliographic resources within each chapter.

2.2 Content

Nonverbal cues can be defined as all potentially informative behaviors that are not purely linguistic in content. Such a definition, though accurate, must be accompanied by recognition of the fact that nonverbal and linguistic information typically do not travel on separate paths. Instead, they work together in complex ways to convey meaning. This crucial point should be kept in mind when reading the chapters in the present volume. The chapters focus only on the nonverbal side of things, but the “whole story” is comprised of both kinds of information.

Visible nonverbal cues include facial expressions, head movements, posture, body and hand movements, self- and other-touching, leg positions and movements, interpersonal gaze, directness of interpersonal orientation, interpersonal distance, and synchrony or mimicry between people. Auditory nonverbal cues include discrete nonlinguistic vocal sounds (e.g., sighs) as well as qualities of the voice such as pitch and pitch variation, loudness, speed and speed variation, and tonal qualities. This list does not exhaust the many kinds of nonverbal communication that are present in the human behavioral repertoire.

The current volume emphasizes uses, purposes, origins, and consequences of nonverbal communication in the lives of individuals, dyads, and groups – in other words, the behavior of human beings. As such, it does not emphasize communication systems per se nor the impact on humans of the physical environment, whether built or natural. And, as alluded to above, some important topics had to be passed over, including olfactory nonverbal communication, clothing, and music. With a field as wide as this one, full coverage within one volume is impossible. Though still covering many different topics, the volume’s unity derives from its primary focus on the *persons* engaging in nonverbal communication and the communicative and psychological aspects of this behavior.

2.3 Structure

In designing the volume, we faced the perennial problem in this field of how to “carve up” the material. Do we treat each major communication modality in isola-

tion – e.g., the face, the voice, etc. – or do we organize by conceptual themes that cut across the different cue modalities? Different readers, depending on their goals, would prefer one or the other. We dealt with this dilemma by doing both, to the extent possible in a mere 28 chapters. As seen below, some chapters are modality specific while others are about large areas of function or domains of application. Hopefully, the extensive cross-referencing that is included will help readers to understand how their special interests may crop up in other parts of the book.

After the Introduction, the next five chapters (“Fundamental Perspectives”) are broad in scope and application. These chapters emphasize theoretical perspectives and integrate research traditions and findings across different kinds of nonverbal communication. Thus, in this opening section, broad themes are introduced that orient the reader to the discipline and equip the reader with basic terms, definitions, concepts, and a grasp of the evolution of the field. These chapters present a historical perspective on the field (Knapp); a methodological overview (Harrigan); the origins, adaptation, and functionality of nonverbal behavior (Fernández-Dols), and a developmental perspective (Halberstadt, Parker, and Castro). Many of the ideas brought forth in these chapters will reappear later in the volume.

The next section, “Modalities of Nonverbal Communication,” consists of six chapters on the classic modalities studied in this field. Each author provides an overview of research on that modality, with some attention given to measurement but most of the emphasis being on the main theories and evidence pertaining to purposes, meanings, impacts, and correlates of behavior within each tradition. These chapters focus on facial behavior (Kappas, Krumhuber, and Küster); vocal behavior (Patel and Scherer); gestures and body movement (Bull and Doody); eye behavior (Adams, Nelson, and Purring); face and body physiognomy (Zebrowitz, Montepare, and Strom); and proxemic and haptic interaction (Andersen, Gannon, and Kalchik).

From this point on, the distinction between form and substance yields to a focus on the contexts in which nonverbal communication occurs. In these chapters, the authors “slice the pie” differently from the Modalities section by focusing on substantive themes and thereby bringing in evidence from multiple cue modalities. These chapters reassemble cues and behaviors into a more integrated and complete picture of the behaving person.

The first of these sections, “Focus on the Individual,” covers feedback processes and physiological responding (Afifi and Denes); personality and self-presentation (Gifford); accuracy in nonverbal encoding and display (Buck and Powers); accuracy in interpreting nonverbal cues (Nowicki and Duke); and the role of nonverbal communication in detecting and telling lies (Frank and Svetieva). Of course, there is no such thing as “an individual” who has no social context, and indeed the very concept of nonverbal communication implies more than one person. Therefore, these chapters recognize that others are required for the phenomenon to occur. However, the main traditions described within each of these chapters involve the measurement of individuals.

The next section, “Focus on the Dyad,” includes topics for which interpersonal interaction, particularly that between two people, is central in both theory and method. These chapters describe a systems approach to nonverbal interaction (Patterson); behavioral mimicry and interpersonal synchrony (Lakin); intimacy (Guerero and Wiedmaier); and power, dominance, and persuasion (Schmid Mast and Cousin).

Moving into an even larger frame of reference, the next section is entitled “Focus on Group Membership.” These chapters ask how nonverbal communication may differ according to several standard sociodemographic variables: gender (Hall and Gunnery); race and ethnicity (Dovidio and LaFrance); and culture (Matsumoto and Hwang).

The final section, “Settings,” switches from the characteristics of the people engaging in nonverbal communication to the characteristics of the settings in which nonverbal communication takes place: media and computer mediation (Burgoon and Walther); education (Blincoe and Harris); the workplace (Kudesia and Elfenbein); and clinical interactions (Martin and DiMatteo).

The volume concludes with a chapter of summing up and future directions (Knapp and Hall).

Acknowledgments

Producing a handbook of these proportions depends on the cooperation and good will of many people. First and foremost are the authors, who now know all too well (if they did not already know) how difficult it is to write a comprehensive review in only 50 manuscript pages. Each author, furthermore, responded to our requirement that they write a truly comprehensive piece and not focus mainly on their own (inevitably narrower) area of expertise within the topic and their own theoretical leanings.

We also thank Peter Schulz and Paul Cogley, series editors, for inviting us to edit this volume in their *Handbooks of Communication Sciences* series. They gave us freedom to design it to suit our values and they honored us with the faith that we would produce a volume to be proud of. Finally, Barbara Karlson of de Gruyter Mouton was always patient and informative – and good humored – in responding to our *many* inquiries about the publisher’s policies and style requirements.

II Fundamental perspectives

Mark L. Knapp

2 Establishing a domain for the study of nonverbal phenomena: *e pluribus unum*

Abstract: The emergence of a domain for nonverbal studies grew rapidly following the confluence of several societal and academic factors during the 1950s and 1960s in America. The culture at that time encouraged creativity and change, greatly increased citizen exposure to visual images, adopted a focus on personal relationships, and established the importance of studying human communication. In this inviting climate, scholars from several different academic disciplines established research programs focused on identifying the structure and effects of nonverbal behavior in social interaction. With the help of the scholarship that preceded them and the contributions of their contemporaries, nine scholars seem to have had a particularly strong impact on the emergence of a domain for nonverbal studies during this period – namely, Michael Argyle, Ray Birdwhistell, Irenäus Eibl-Eibesfeldt, Paul Ekman, Edward T. Hall, Adam Kendon, Albert Mehrabian, Robert Rosenthal, and Albert E. Schefflen. With scholarly output and the general acceptance of the controversial term “nonverbal” to describe this diverse field of study, important first steps toward the institutionalization of a domain of nonverbal studies had occurred. The domain’s existence was reinforced with the publication of books on “body language” that appealed to the general public, the offering of college courses focused on nonverbal communication, and the establishment of an academic journal devoted to nonverbal research.

Keywords: history, nonverbal studies, pioneers, nonverbal domain

There have been efforts to document highlights of the multi-disciplinary history of nonverbal studies (DePaulo and Friedman 1998; Knapp 2006), but a comprehensive history would be book length. A more common and more manageable approach is to record the history of a particular area of nonverbal study. For example, Ekman (1982), Fridlund (1994), Zebrowitz (1997), and Gifford (2006) provide historical benchmarks for the study of facial expressions and facial features. Historical contributions to the modern study of gestures were put forward by Kendon (1982b; 2004) and Schmitt (1992). Laver (1981) addressed the study of vocal quality from an historical perspective. Bavelas and Chovil (2006) provided a brief history of scholarship that analyzed the coordination of some nonverbal behavior with words, prosody, and each other. Walther (2006) highlighted the relatively recent history of nonverbal signals mediated by various types of technology while Holoka (1992) and Lateiner (1992) showed how some nonverbal behaviors were treated in ancient Greek and Roman literature.

While the preceding historical accounts often describe important historical contributions prior to the twentieth century, the coalescing of these individual areas of study into what is now a domain of nonverbal studies didn't begin to flower until the mid-twentieth century. The factors that led to the establishment of this nonverbal community are the focus of this chapter. I will focus on the confluence of factors that brought together several different tributaries of knowledge. In doing so, I will highlight: 1) facilitating forces in American society and academia; 2) the efforts of a select group of scholars; and 3) events that contributed to the institutionalization of a domain for nonverbal studies.

1 Facilitating forces in society and academia

During the 1950s and 1960s the United States experienced widespread and dramatic social changes. At the same time there were new initiatives in the academy. Both helped create favorable conditions for the establishment of a new and multidisciplinary domain for the study of nonverbal phenomena.

1.1 A creative climate

The changes, innovations, and new ideas in post-World War II America were so widespread and frequent there seemed to be an implicit and omnipresent invitation to search for productive alternatives, no matter what one's endeavor. Public education changed dramatically when the U.S. Supreme Court declared segregation in public schools unconstitutional; artists like Jackson Pollock, Willem de Kooning, and Mark Rothko experimented with new forms of abstract art; new forms of design and architecture blossomed to meet a surge in consumerism; popular books like *The Lonely Crowd*, *The Man in the Gray Flannel Suit*, and *The Organization Man* argued for individuality and against conformity; the birth of rock and roll music was the teenager's call to break out of the mold of America's conservative middle class. Interdisciplinary courses and research had not yet become a familiar academic calling, but individual scholars were not afraid to seek out and collaborate with those from other disciplines (Sewell 1989). Scholars from anthropology, linguistics, psychiatry, sociology, and psychology who were interested in the organization and structure of human interaction in general and nonverbal phenomena in particular had several interdisciplinary conferences in the 1950s and 1960s (Kendon 1975: 6). Thus, on almost every cultural front change was beckoning.

1.2 A visual orientation

Whatever the extent of the culture's visual orientation, it was dramatically enhanced during this period. A professor of history and director of the Warburg

Institute at the University of London put it this way: “Ours is a visual age. We are bombarded with pictures from morning till night...No wonder it has been asserted that we are entering a historical epoch in which the image will take over from the written word” (Gombich 1972).

Television was booming worldwide, but during the decade of the 1950s the number of families owning TV sets in America went from 12% to 89% (Pierce 1972). This was the first generation of children raised on television. People were acting as eye witnesses to the behavior of more people doing more things and they often believed they were seeing natural behavior. Of course, many of these behaviors were nonverbal so the stage had been set for looking at them more closely, often in the privacy of one’s own living room.

1.3 A focus on personal relationships

Television and other forms of mass media were capable of mobilizing large numbers of people in a common pursuit, but an increasing number of misleading messages by public officials about social and political issues prompted widespread skepticism of the mass media during this period. The public’s belief in the manipulative, secretive, and deceitful nature of these messages probably reached its height during the Vietnam War. Many wanted a more “open” or transparent society. The impact of this distrust was twofold: 1) There was a yearning for a more “open” or transparent society and if verbal messages weren’t reliable, perhaps less direct (and by implication, less manipulated) sources of information were. 2) There was also more attention given to the role of personal relationships in improving the quality of life.

Discovering the meaning of nonverbal signals clearly met the need to obtain information from less direct sources. The subtle cues that revealed unspoken prejudice and power seemed especially relevant to those participating in two of the most active movements of the era – race relations and the women’s movement. Thus, learning how to “read” people’s behavior that they presumably had little or no control over seemed like a desirable skill to acquire. From this perspective, nonverbal channels were initially viewed by many as sources of more reliable information than verbal.

America in the 1960s is best known for activists who campaigned for political and social justice in the society at large, but it was also the beginning of a greater concern for individual well-being and the exploration of personal relationships. Davis (1971: 2) put it this way: “...the enormous public interest in nonverbal communications seems to be part of the spirit of the times, the need that many people feel to get back in touch with their own emotions—the search for the emotional truth that perhaps gets expressed nonverbally.” Self-development and personal awareness led to the proliferation of “consciousness-raising” and “sensitivity”

training groups based on the idea that the quality of one's life is shaped by the integrity of their personal relationships.

1.4 The advent of communication as a field of study

Just prior to the middle of the twentieth century, scholars from various academic disciplines had independently addressed issues of human communication, whether the subject was language in the form of general semantics (Hayakawa 1941), small group behavior (Hare, Borgatta, and Bales 1955), the emerging self in social interaction (Mead 1934), or the proposed connection between mental health and the nature of interpersonal communication (Ruesch and Bateson 1951; Sullivan 1954). With a history of propaganda analysis and public opinion research (Lasswell and Blumenstock 1939), mass communication was also putting down roots. Wilbur Schramm (1997), sometimes called the father of communication media studies, had established the Institute for Communication Research at the University of Illinois in 1947. But it was the works of Wiener (1948) in cybernetics and Shannon and Weaver (1949) in information theory that seemed to be the sparks that energized those with varied interests in communication to see what they had in common and that intellectually herded many of them together. In 1950 scholars from several different academic disciplines and practitioners came together to form the National Society for the Study of Communication, which later became the International Communication Association. Their interests included cybernetics, information theory, mass communication, speech, and interaction in health, government, voluntary, and business organizations. In 1951 they published the first issue of the *Journal of Communication*.

Initially, the study of interpersonal communication played a minor role in the newly organized field of communication because scholars interested in journalism and mass media research dominated the organization. Members of the National Society for the Study of Communication who were interested in interpersonal communication most often had a background in the field of speech. The field of speech had been dominated by the study of rhetoric so these budding interpersonal scholars borrowed heavily for the theory and research relevant to their interests from the scholarship in other disciplines, primarily the social psychology of the 1950s. Some works of scholarship in social psychology that exerted a powerful influence on these scholars were Heider's *The Psychology of Interpersonal Relations* (1958); Newcomb's (1953) coorientation model of interpersonal perception; the semantic differential to measure meaning (Osgood, Suci, and Tannenbaum 1957); and social exchange theories (Thibaut and Kelly 1959; Homans 1961). Even though forms of nonverbal communication occur within the context of the mass media, the study of nonverbal communication grew up almost exclusively within the interpersonal framework. Since those who pioneered the study of nonverbal communication

sought an understanding of social interaction in face-to-face encounters and frequently used two person encounters (e.g., psychiatric interviews) as the target of their observations, nonverbal studies seemed like a natural fit for those studying interpersonal communication and vice versa.

But the methods, goals, conceptualizations, and foci of study borrowed by scholars in interpersonal communication from social psychology were not always congruent with the ideas about face-to-face communication put forth by the scholars who pioneered nonverbal studies (Ruesch and Bateson 1951; Scheflen 1972, 1973) and later by communication scholars like Watzlawick, Beavin, and Jackson (1967). The preponderance of the scientific literature produced soon after a domain of nonverbal studies was established assumed the methodology of social psychology and typically did not focus on the structure of interaction, the mutual influence of both interactants, and the unique characteristics of dynamic, ongoing interaction. Descriptive, analytical, and ethological methods were far less common during this period than experimental designs, surveys, and individual self-reports with conclusions based on statistics.

1.5 Advances in recording behavior

During the first part of the twentieth century, anthropologists, child psychologists, and others used film to record human behavior. The ability to run the film in slow motion and stop the action had been used for filming skiing, boxing matches, movies, and animal behavior during this time as well. But during the 1950s and 1960s there were major advances in this technology which was so critical to visual analyses necessitated by many studies of nonverbal behavior. The repeated frame by frame analysis of Zapruder's film of President Kennedy's assassination in 1963 even made this type of analysis quite familiar to the general public in America. The first videotape recorder was invented in 1956 and a portable video recorder was available throughout the United States in 1969. Ekman, Friesen, and Taussig (1969) showed how film could be transferred to videotape and a computer could assist in data retrieval and analysis. Ethologist Eibl-Eibesfeldt reported the use of a camera with a mirror lens that filmed to the side instead of in the direction the camera was pointing. This was designed to offset any effects the camera might have had on people's behavior. "Even a learned activity changes markedly when it has an audience; this is even more true for emotional behavior," said Eibl-Eibesfeldt (1970: 459).

In addition to advances in visual technology, scholars in the 1960s were already looking for ways to computerize other methods of recording nonverbal behavior such as the manual coding systems for proxemics (Hall 1963) and facial expressions of emotion (Ekman, Friesen, and Tomkins 1971). Eventually computers also replaced basic mechanical systems like the interaction chronograph (Chapple

1949) that graphically recorded when, how often, and how long behaviors of both interactants occurred and the spectrograph (Potter, Kopp, and Green 1947) that graphically illustrated vocal acoustics of intensity, frequency, and duration.

1.6 Summary

The emergence of a domain for nonverbal studies occurred during the 1950s and 1960s. It was facilitated by a social and academic climate in the United States that was ready for change, a culture increasingly attuned to visual images, a society that had adopted a focus on personal relationships, and a segment of the academic community that banded together with the goal of studying human communication. The combined effect of these factors provided an inviting climate for scholars in several different disciplines to pursue the structure and effects of nonverbal behavior in social interaction.

2 Scholarly contributions

Although some may quarrel with my choices, I have selected nine scholars whose impact on the establishment of a domain of nonverbal studies seemed to be particularly significant. Their scholarship and ideas affected and often motivated scholars outside of their discipline; they focused on social interaction; they often impacted nonverbal studies in more than one way; and they had a substantial influence during the 1950s and 1960s. These scholars, representing psychology, psychiatry, anthropology, and ethology, are: Michael Argyle, Ray Birdwhistell, Irenäus Eibl-Eibesfeldt, Paul Ekman, Edward T. Hall, Adam Kendon, Albert Mehrabian, Robert Rosenthal, and Albert E. Schefflen.

Obviously, the domain of nonverbal studies was not solely the result of these nine scholars. They were often influenced by those who came before them – like Darwin's work ([1872] 1998) on facial expressions of emotion; the work of deJorio (1832) and Efron (1941) on gestures; the research of Allport and Vernon (1933) and German expression psychology of the 1930s (Asendorpf 1982; Wallbott 1982) that sought links between expressive behavior and movement patterns with personality; or the early twentieth century work of Ladygina-Kohts (2002), first published in 1935, that compared the expressive behaviors of humans and chimpanzees.

It is also important to note that the domain of nonverbal studies would have struggled to survive were it not for the efforts of the contemporaries to the nine scholars whom I have designated as playing an especially crucial role. Some of these scholars who formed a supporting cast established research programs that specialized in areas of nonverbal behavior; others made important contributions

to the nonverbal literature, but their professional reputation was rooted in another academic area; and still others mentored scholars who played a significant role in establishing the nonverbal domain.

2.1 The supporting cast

During the 1950s and 1960s a number of scholars had research programs that became part of the nonverbal domain. Like anthropologist Edward T. Hall, psychologist Robert Sommer examined the role of personal space in human interaction (Sommer [1969] 2008). He was also keenly aware of how the environment affects who people interact with, how long they interact, and what they say. Following up on the work of Humphrey Osmond, who had shown how environmental features can affect recovery in mental hospitals and who coined such terms as “psychedelic” and “sociopetal and sociofugal space,” Sommer also made important contributions to our understanding of the role environments play in human interaction (Sommer 1972, 1974). Psychiatrist George Mahl and psychologist Frieda Goldman-Eisler systematically studied the relationship of everyday speech disfluencies like uh, um, and pauses to anxiety (Mahl 1956; Mahl and Schulze 1964; Goldman-Eisler 1968). Howard Rosenfeld’s studies of nonverbal behavior associated with affiliation, approval-seeking, and approval avoidance (1966, 1967) foreshadowed Mehrabian’s (1972) widely studied concept of immediacy. Rosenfeld was also an early contributor to our understanding of nonverbal behavior as it functions in conversational control and the turn-exchange process.

At least two scholars during this period of the 1950s and 1960s serendipitously discovered and studied phenomena within the nonverbal domain. Eckard Hess had devoted most of his career to the study of imprinting among precocial birds when he accidentally discovered the pupil response in 1959. As he was looking at some beautiful pictures of animals, his wife observed how large his pupils were. This eventually led him to focus his research on a person’s pupil behavior while viewing attitudinally favorable or emotionally charged stimuli (Hess 1975). Ralph Exline was testing whether affiliation differences, rather than sex, explained accuracy in judging interpersonal attraction when he noticed that people high in affiliation, regardless of sex, tended to gaze at their partner significantly longer than those low in affiliation. This led to a series of studies on gaze and mutual gaze (Exline 1963).

Several scholars made an important contribution to the early nonverbal literature even though their primary reputation was achieved elsewhere. Lawrence Frank, who is best known for his work in child development and as a foundation executive, provided a rationale for the importance of touching behavior, particularly to the health and development of infants, and the directions future research in this area might take (Frank 1957). In 1959 Joel and Lois Davitz co-authored a

study showing how emotions can be communicated via “meaningless content” speech (saying the alphabet) – an approach to studying vocal cues that has been used in numerous studies. A few years later, Joel Davitz (1964) published a book on the vocal communication of emotional meaning, but the Davitzes’ professional career thereafter was primarily focused on why personal relationships succeed or fail. To linguists, George Trager is well known for his studies focused on American Indian languages. But it was his (1958) treatise on paralanguage that played a pivotal role in guiding many subsequent studies of vocal cues. While there is little doubt that Trager’s explication of paralanguage had a profound influence on nonverbal studies, Key (1975) noted that the term paralanguage had been introduced by linguist Archibald Hill many years before. Psychologist Abraham Maslow, a pioneer in the humanistic psychology movement, focused most of his work on mental health and human potential. He is most likely to be associated with his hierarchy of needs. But in 1956, along with a colleague, Norbett Mintz, he co-authored a well-known study that highlighted the importance of the communication environment to human perceptions and serves as an early anchor for later studies that conceptualize the environment as an influential part of the nonverbal domain.

Linguist Kenneth Pike believed that the same types of rules and structure found in phonology applied not only to language, but to all forms of human behavior. This system, called *tagmemics*, was put forth in 1954 and later published in book form (Pike 1967). Even though many linguists were skeptical of this theory, Pike’s ideas did influence the thinking of some scholars who made important contributions to the establishment of a nonverbal domain, including Birdwhistell, Trager, and E. T. Hall. The idea that human behavior involves overlapping hierarchies and that in any analysis, context plays a crucial role were appealing to them. Psychologist Silvan Tomkins was also a mentor. He is known to many as the founder of modern affect theory. Thus, his work was important to anyone studying nonverbal signals and emotion, but his influence on Ekman (1982) and Izard (1971) was especially strong. He was a close and accurate observer of emotion behavior and believed the structure of certain facial expressions of emotion were innate and recognizable across cultures (Tomkins 1962–1963).

Like other pioneers who helped establish the nonverbal domain, sociologist Erving Goffman was interested in the total interaction process, the “syntactical relations” between people, not just the nonverbal aspects of this process. So even though he shared an interest in close observation, the importance of context, and the need to understand the structure of interaction like Birdwhistell, Kendon, Schefflen, and E.T. Hall, he did not emphasize nonverbal behavior in his work to the extent that they did. Thus, his legacy to those whose interest lies in the broader field of interpersonal communication is probably stronger than that of his legacy to those who focus on nonverbal studies – despite the fact that his detailed observations of phenomena like spatial organization, gaze, turn exchanges, and

impression formation led other nonverbal scholars to conduct related studies. Goffman was also keenly aware of how the environment and physical setting were a part of the interaction structure. He had a special talent for noting aspects involved in the interplay of interaction that others only remembered noticing after reading about them in his works. Thus, his work is often called micro-sociology. His books are on a “must read” list for anyone interested in learning about the ways human beings organize their encounters (Goffman 1959, 1963, 1967, 1971).

2.2 The featured cast

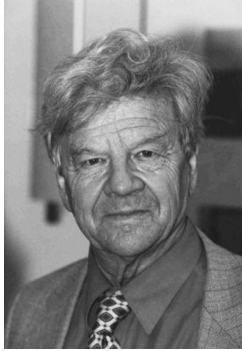


Michael Argyle was one of the best known English social psychologists of the twentieth century. His scholarship covered a variety of topics, but his contributions to the early study of nonverbal communication were extensive and influential. With Janet Dean, Argyle published an article about affiliative-conflict theory that was to become one of the most frequently cited articles in social psychology (Argyle and Dean 1965). Their study posited that interactants try to maintain an equilibrium of intimacy by modifying the content of their speech, the frequency of their smiles, their proximity

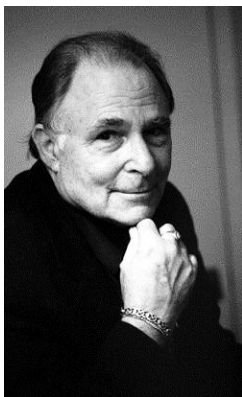
to the other, the frequency and duration of their eye gaze, and other intimacy-modifying behaviors. Greater intimacy could be achieved by reciprocating intimacy behaviors of the other interactant and uncomfortable levels of intimacy could be offset with compensatory verbal and nonverbal behaviors. Their initial study focused only on eye gaze and proximity, but it stimulated a great deal of subsequent research (Patterson 2006). Although Argyle co-authored a specialized volume on eye gaze with Mark Cook in 1975, it was his publication of *The Psychology of Interpersonal Behaviour* in 1967 followed by *Social Interaction* in 1969 that set forth what was known at that time about the interplay of gaze, touch, facial expressions, posture, proximity, gesture, and verbal behavior in social interaction. He drew on the literature of anthropology, psychiatry, ethology, linguistics, and developmental, organizational, and social psychology. In these books Argyle also discussed the biological roots of behavior, a premise that was not widely accepted in social science at the time. He treated the dyad as a social system and discussed how nonverbal behavior functions to express emotions and attitudes, assist verbal behavior, perform rituals, and facilitate self-presentation. These books were a primer on what were to become the areas comprising the nonverbal domain. During the 1960s Argyle was also aware of the need for nonverbal skills and proposed a social skills model.



Anthropologist **Ray Birdwhistell** did not produce many publications, had no advisees who followed up on his work, and the concepts he espoused were sometimes misunderstood. But as Kendon (1982a: 456) pointed out: “Despite this, however, Birdwhistell has been very influential. His work has been highly effective in focusing attention upon the fact that people, in their body movements, do make use of repertoires of movement patterns that are shared culturally and cannot be accounted for by considering their significance for expression alone...[and that it is] possible to examine this behavior as if it is structured by those who use it into a code analogous to language.” A collection of his works was published in 1970 (Birdwhistell 1970). Birdwhistell’s work greatly influenced other scholars who adopted a structural approach to understanding social interaction (Duncan and Fiske 1977; Kendon 1977; Schefflen 1973). When Erving Goffman was an undergraduate college student at the University of Toronto he took a course from Birdwhistell and was impressed with his ideas about how behavioral structure and organization illumine the way humans interact. His ideas also influenced the famous folklorist and ethnomusicologist Alan Lomax, who incorporated some of Birdwhistell’s ideas into his own thinking about music and dance. Birdwhistell coined the term “kinesics,” to designate the study of human movement as culturally patterned visual communication. Like others whose focus was on the nature of interpersonal communication in the 1950s, Birdwhistell was concerned with the structure and relationships among all ongoing behaviors, but his primary focus was that of body movement, recognizing it was only part of the total interaction process. As Kendon (1977: 218) noted, “The idea that we can talk of elements of body motion that occur in different combinations, combinations which themselves behave like elements in *other* combinations, is one of the most central ideas in Birdwhistell’s conception of kinesics.” Methodologically, he took on the approaches used in descriptive linguistics which he viewed as rigorous. Because he chose terms to describe kinesic behavior that were similar to those used in linguistics and because he often used analogies to linguistic behavior, it wasn’t always clear to what extent Birdwhistell believed nonverbal behavior (or parts of it) were a language or just subject to being coded like a language. And from a communication perspective, his descriptions of coordinated behaviors between interactants weren’t always as strong as the coordinated behavioral activity manifested by a single communicator. Nevertheless, his pioneering efforts to describe the relationships among behaviors and patterns of behavior made a noteworthy contribution on the work of other scholars and to the establishment of a domain of nonverbal studies.

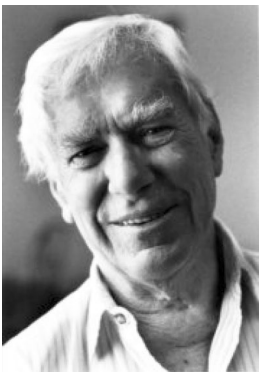


Austrian born zoologist **Irenäus Eibl-Eibesfeldt** applied the methods of ethology used by Conrad Lorenz and Nikolaas Tinbergen to human behavior and is credited with being the founder of the field of human ethology. Human ethology, like ethology, is the study of behavior from a biological perspective. It borrows and integrates literature from physiology, psychology, sociobiology, social anthropology, psychiatry, and many other areas. In many ways the structural approach of Birdwhistell, Schefflen, and others has much in common with ethology. They both rely on precise observation and recording of naturally occurring behavior and the description of action patterns. Goffman (1971) even proposed “interaction ethology” as a descriptor for his preferred methodology. But human ethology is incompatible with the structuralist approach (see Birdwhistell 1970: 13–14) and Goffman’s interaction ethology because it looks at how behavior (communication included) might be adaptive from an evolutionary perspective. Human ethology deals with inherited as well as culturally acquired behavior. The fixed-action pattern (inherited movement coordination) is a fundamental ethological concept. But social influence can be an important part of how genetically predisposed behaviors are manifested. Eibl-Eibesfeldt’s contributions to nonverbal studies are many. He gave social scientists a new lens with which to examine social interaction at a time when little attention was being given to this area. His comparative studies of similar behavior in human and nonhuman primates, similar expressive behavior among children born hearing and sighted with those born deaf and blind, and his research that suggested the possibility that entire sequences of behavior, like greetings and refusals, may have a biological basis to them made a substantial contribution to the establishment of the nonverbal domain (Eibl-Eibesfeldt 1970).



Psychologist **Paul Ekman** made numerous contributions that facilitated the establishment of the nonverbal domain. In many respects, his co-authored article detailing the categories, origins, usage, and coding of nonverbal behavior was a lynchpin for nonverbal studies, and the concepts explicated in that article remain influential today (Ekman and Friesen 1969). In 1957 Ekman proposed a technique for coding and recording nonverbal behavior based on his master’s thesis that focused on group interaction. Subsequently, he studied how variations in body position, facial expression, and verbal behavior were perceived (Ekman 1964). Gestures were the focus for several of his published studies (e.g., Ekman and Friesen 1972; Ekman 1976; Johnson, Ekman, and Friesen 1975) but Ekman is probably best known for his research on facial expressions of emo-

tion. His first study documenting the pan-cultural nature of certain facial expressions of emotion was published in 1969 (Ekman, Sorenson, and Friesen 1969). A book showing how muscles move each part of the face during expressions of emotion followed (Ekman and Friesen 1975) and a compilation of studies using Ekman's Facial Affect Coding System (FACS) appeared in 1997 (Ekman and Rosenberg 1997). He was also interested in the role of nonverbal and verbal behavior during acts of deception and the extent to which such behaviors could be used to accurately detect deception. After focusing on the subject for twenty years, he published *Telling Lies* in 2001. He was named by the American Psychological Association as one of the most influential psychologists of the twentieth century on the basis of publications, citations, and awards.



Anthropologist **Edward T. Hall** has the rare distinction of being referred to as the *father* of two academic areas – intercultural communication and proxemics. His book *The Silent Language* (1959) was one of many practical and academic publications Hall wrote on intercultural communication, but it is by far the most well-known. He had experienced the reality of communicating with different cultures when he worked with the Hopi and Navajo Indians and commanded a regiment of African Americans in World War II, but *The Silent Language* was primarily stimulated by his work as director of the Foreign Service Institute in

the U.S. Department of State where he worked with linguist George Trager and was charged with improving the sensitivities, knowledge, and communication skills of Americans who visited and worked in countries around the world. It is a book that emphasizes cultural practices and patterns that are largely out of awareness and inevitably involve nonverbal behavior. Freud's notion of the unconscious was also of interest to Hall since he believed there was a lack of awareness of many cultural patterns. He is credited with the concept of high and low context cultures, with high context cultures communicating information in more implicit, indirect messages, valuing nonverbal messages, and relying primarily on a knowledge of context for meaning. Although Hall's formal schooling was in cultural anthropology, he acknowledged the influence of Trager and other linguists on his ideas. He did not, however, intend for the word "language" in the title of his book to suggest a language structure similar to verbal behavior. His paternity associated with proxemics is largely due to his explication of personal, social, architectural, and urban space in *The Hidden Dimension*. He coined the term proxemics to refer to the ways human beings use space within a cultural context. According to Hall, communication via personal, social/consultative, and public space can be influenced by kinesthetic, olfactory, auditory, thermal, postural, orientational, and tactile factors. A sound, stare, movement, or scent can influence human spatial positioning. Hall's ideas on

proxemics spawned a huge interdisciplinary literature comprised of studies from nursing, sociology, communication, anthropology, geography, counseling, social and developmental psychology, and psychiatry.



Before **Adam Kendon** became what many consider the world's foremost authority on gesture (Kendon 2004), he worked with, learned from, and was influenced by other scholars who were instrumental in creating the domain of nonverbal studies. He studied the temporal organization of social interaction with Eliot Chapple; he learned from William Condon's microkinesic studies of self-synchrony and interactional synchrony by analyzing frames of slow motion film; he was on a social skills research group co-

directed by Michael Argyle at Oxford; and he developed a perspective for analyzing the structure and organization of social interaction by working and consulting with Albert Schefflen, Ray Birdwhistell, and Erving Goffman. Kendon has gratefully contributed to the history of nonverbal studies by recounting his experiences and knowledge of these pioneers in a number of his publications.

Kendon brings a tremendous breadth and depth of knowledge to his work. His formal schooling included biology, psychology, and experimental methods. Guided by scholars like Schefflen, Birdwhistell, and Goffman, Kendon later developed his own style of studying the structure and organization of social interaction that involved natural observation, fine-grained and rigorous analyses of multiple signals, and clear conclusions. Some liken it to the approach used by ethologists. Of his many contributions, the following are but a few. His work on the functions of eye gaze continues to inform current learning and is considered a classic (Kendon 1967); his micro-analyses have demonstrated not only how speech and bodily action are coordinated within a single speaker but interactionally as well (1970); he illuminated "transaction space" with his work on the F-formation (1977); his several explications of the linkage between gesture and speech have been groundbreaking (1983) as were his studies of the natural sign language of Australian aborigines (1988) and deaf mutes in Papau New Guinea (1980).



Albert Mehrabian's PhD was in psychology but his bachelor's and master's degrees were from M.I.T. in engineering. His research was based on experimental methods and his contributions to the early nonverbal literature were significant. He proposed three categories of meaning associated with nonverbal behavior – immediacy (like/dislike); status (powerful/powerless); and

responsiveness (active/passive) (Mehrabian 1970). Others have found similar categories as responses to a variety of stimuli in our environment. He was also the author of one of the first textbooks for college courses in nonverbal communication (Mehrabian 1971b). Mehrabian conducted a number of studies in the late 1960s which he later incorporated with related nonverbal literature in book form (Mehrabian 1972). Two lines of research he pursued during this period had an enduring influence. His studies of immediacy (e.g., Mehrabian 1968) showed how a cluster of nonverbal behaviors can signal liking and disliking in initial interaction with strangers, but the immediacy construct has led to scores of studies in teacher-student interaction, personal relationships, politeness routines, and supportive behavior. In two studies, Mehrabian and his colleagues developed a formula for the relative influence of verbal (7%), vocal (38%), and facial (55%) cues (Mehrabian and Ferris 1967; Mehrabian and Weiner 1967). The formula was limited to the studies that used one word stimuli, made vocal tone inconsistent with the word meaning, and focused on perceived feelings. But many consultants, trainers, media reporters, and teachers used the formula as if it applied to everyday interaction and illustrated the power of nonverbal signals. Their interpretation of Mehrabian's research was incorrect, but their promotion of the potential influence nonverbal signals might have greatly increased the public's awareness of nonverbal behavior and attention to research in this area.

Mehrabian's research also addressed how we react to environmental stimuli (Mehrabian 1976) and the role of negativity in responses to messages with discrepant verbal and nonverbal information (Beakel and Mehrabian 1969). Some of his research addressed skill in encoding and decoding nonverbal behavior (e.g., Zaidel and Mehrabian 1969) and he was an early contributor to the study of deception, pointing out the negative affect that may accompany deceptive behavior (Mehrabian 1971a).



In the mid-1950s, psychologist **Robert Rosenthal** felt that he had unwittingly directed participants in his doctoral dissertation to behave in accord with his hypotheses, which led to a set of questions that guided much of his career. His documentation of the self-fulfilling effects of these expectancies in teacher-student relationships was widely publicized and discussed (Rosenthal and Jacobson 1968), but he also found expectancies affected the way research is conducted, the way clinicians and physicians interact with their patients, the manner in which judges communicate with juries, and the way managers supervise employees (Rosenthal 2002). Through his laboratory and field studies, he found that it was often the subtle (out of awareness) nonverbal signals that were exhibited by those with the expectancies and the read-

ing of those signals by the source of the expectancies that resulted in the prophecy being fulfilled (Rosenthal 1985). Knowing the importance of nonverbal behavior to expectancy effects led him to examine individual differences in encoding and decoding nonverbal skills (Rosenthal 1979). With his students he developed a multi-channel test to measure nonverbal decoding ability called the Profile of Nonverbal Sensitivity or the PONS test. It has been administered to people in twenty nations (Rosenthal et al. 1979). He and his students also found that “thin slices” of behavior (silent videos or vocal cues of 2 to 300 seconds) may be representative of perceptions of much longer streams of behavior and even predictive of outcomes (Ambady and Rosenthal 1992). Among other contributions to the nonverbal literature, he further illuminated interaction synchrony and the extent to which it represents rapport between the interactants (Bernieri and Rosenthal 1992). Unlike other outstanding scholars who helped establish the nonverbal domain, at least eleven of his students have also made important contributions to the nonverbal literature – four of whom are authors in this volume.



Psychiatrist **Albert E. Scheflen** worked with and shared ideas with contemporaries like Birdwhistell, Kendon, Bateson, and Goffman. And, like them, he was driven to understand all aspects of human communication behavior in a particular context. As a trained physician and practicing psychotherapist he valued psychological approaches to communication study, but starting in 1957 his approach to culture and social organization was based on a

structural approach. Because the subtle nonverbal cues involved in the total communication process had often been neglected, this was a common focus in his published work. So, like some other scholars who were primarily interested in a holistic view of interpersonal communication during this period, he has become known for his contributions to the study of nonverbal behavior because those were the aspects of the process he often highlighted (Scheflen 1972). His observations and analyses contributed to our understanding of how people collaborate behaviorally in creating and sustaining a postural configuration and how changes in this configuration are also mutually coordinated (Scheflen 1964); the interdependence of micro and macro territories used by communicators (Scheflen and Ashcraft 1976); the value of multi-channel analyses to illustrate that the meaning of an act is only determined by its relation to other acts that help to identify the context for interpretation (Scheflen 1963); and the multi-meaning capacity of a cluster of signals he called quasi-courtship. These signals, depending on context, could communicate a friendly, flirting, or seductive message (Scheflen 1965).

Probably as much as any of the scholars who adopted a structural approach, Scheflen tried to elucidate the method and his particular version that he called

context analysis (Schefflen 1973). He argued for the importance of recording “all” behavior, analyzing recurring actions and patterns, and viewing behaviors within a hierarchy, with “lower” levels framed or encapsulated within “higher” ones. Schefflen and Ashcraft (1976) applied these same principles to their analysis of how humans use space and territory. But as Kendon (1982a: 462) said, “Much is left to the analyst’s intuitive grasp of the behavior being examined and his or her ability to perceive the configurational structure of behavior.”

3 Institutionalizing the domain

In addition to a receptive academic and social climate and the efforts of scholars who studied nonverbal behavior, certain events were necessary to institutionalize the domain of nonverbal studies.

The domain had to have a name that would serve as a rallying point for a community of scholars with related but diverse interests. The eventual selection of the term *nonverbal* was due more to its frequent use than to its adequacy in describing the phenomena studied. Psychiatrist Jurgen Ruesch used the term *nonverbal* to describe what he called “silent actions” in several journal publications (Ruesch 1953, 1955) and he later used it in the title of his popular co-authored book, *Nonverbal Communication: Notes on the Visual Perception of Human Relations* (Ruesch and Kees 1956). It was hard to ignore the obvious flaws in the term. Aside from defining by negation, it designated an area of study that presumably excluded verbal behavior. This was not only incompatible with the study of gestures intimately linked to speech, but also with the broader communication perspective maintained by most of the early pioneers who were identified with nonverbal studies. They saw the flow of speech as closely woven into body movements. In addition, *nonverbal* was also a term that other scholars applied to children with language pathologies (Adler 1970). As a result, alternative terms were proffered. Wescott (1966) suggested *coenetics*, which he said encompassed paralanguage, proxemics, posture, facial expressions, body movements, intonation, and interactional events, but the term was never widely used. Some felt *kinesics* was the appropriate term, but others felt it was too limiting and tied to Birdwhistell and his methods. Since the areas of study were not limited to the body nor were all units comparable to the organization of a language, the term *body language* was generally avoided by academicians but it was widely used by the general public. Despite its shortcomings, the term *nonverbal* was widely used among academicians by the late 1960s. Literature reviews (Duncan 1969), edited books (Hinde 1972), special journal issues (*Journal of Communication* 22: 1972), textbooks (Mehrabian 1971b), and academic books reporting a program of research (Mehrabian 1972) used the term Ruesch had put forth in 1953.

Given the inclusion of everything other than verbal behavior that the term *nonverbal* implied, the scope of the domain was open for interpretation. Did the domain of nonverbal studies include music, dance, Nazi arm bands worn by protesters, features of the built environment, literature, art, odor, sign language, climate, geography, time, clothes, artifacts, physical appearance, graphic and pictorial signs, and animal behavior? Part of the answer came from the related literature cited and studied by those who saw their own work as part of the nonverbal domain and part from articles that addressed the nature of the field (Ekman and Friesen 1969; Wiener et al. 1972). Duncan (1969) also acknowledged that the nonverbal literature was derived from two different approaches to the study of nonverbal communication – the structural and the external variable. Most of the research that emerged within the nonverbal domain has been focused on the face, eyes, voice, space, appearance, gesture, posture, touch, and functions or outcomes like skills, identity, intimacy, dominance/status, interaction management, and deception. The covering label for the domain is not unimportant because it provides a gathering point for diverse interests, but all of the scholars who work under that umbrella have more refined and specific areas of focus that are more influential in defining their work.

The institutionalization of the domain of nonverbal studies was further cemented with the offering of college courses, the establishment of special interest groups within professional associations, the establishment of the *Journal of Environmental Psychology and Nonverbal Behavior* which later became the *Journal of Nonverbal Behavior*, and the widespread public interest in popular books like Fast's *Body Language* (1970), Montagu's *Touching* (1971), and Morris' *Manwatching* (1977).

4 Coda

I was not trained as an historian but I'm fully aware that historical accounts aren't always viewed the same way by everyone. There is often more than one version of the past "as it actually happened." As Santayana ([1905/06]1998: 397) put it, "History is always written wrong, and so always needs to be rewritten." With this in mind, I will not be surprised if there are readers who feel the need to edit my portrayal of establishing a domain for nonverbal studies. My account is surely affected by my own personal and professional involvement. I was not professionally present during the infancy of nonverbal studies in the 1950s, but from the late 1960s until now I feel like I was a part of its childhood, adolescence, and adulthood.

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Jinni A. Harrigan

3 Methodology: coding and studying nonverbal behavior

Abstract: This chapter presents material on methodological issues in the study of nonverbal behavior. Areas included are: facial and vocal behavior, kinesics, proxemics, and gaze behavior. The focus within these dimensions of nonverbal behavior is on strategies used for coding, counting, and recording the various units of analysis. Thorough treatments of specific methodological practices can be found elsewhere, especially for facial and vocal behavior. The complex conceptual issues in cataloguing nonverbal behavioral units for analysis cannot be overlooked and this chapter elucidates some of these issues particularly for kinesics, proxemics, and gaze behavior. Future researchers will enhance the research gleaned on nonverbal behavior by further development of coding and recording methods, particularly for kinesics, proxemics, and gaze behavior.

Keywords: nonverbal behavior methodology, coding methods, facial, vocal, gaze, kinesics, proxemics

1 Introduction

The methodology for studying nonverbal behavior is as broad and dense as the field itself. A comprehensive description of these methods is not within the scope of this chapter; rather the focus is on the coding methods used for nonverbal behaviors, as the coding methods themselves are essential for both studies where behaviors are quantified (e.g., frequency of head nods) or manipulated (e.g., types of gestures). Gray and Ambady (2006) outlined strategies for studying nonverbal behaviors as independent or dependent variables, but the focus here is on accepted coding practices for recording face and body actions and vocal content, as these methods are essential for replicability and comparison of behaviors across studies.

Advances have been made in nonverbal domains where the behavioral codes have been systematically developed and tested, and are used by researchers from different laboratories to denote the same behaviors. A coding system requires conceptualization, segmentation, and classification of behaviors as mutually exclusive units. Segmentation involves decisions for separating and identifying a behavioral unit from the stream of behavior, and is based on conceptual distinctions (i.e., a head nod versus head shake) and temporal parameters (i.e., beginning and end points); symbols are often used to represent the resulting behavioral units (e.g., Facial Action Unit 12). Both micro and macro levels of coding are used (Burgoon

and Baseler 1991). A micro level may be used to code minute movements of the head, eyes, and fingers in speaker turn-switching studies, whereas a macro level may be used in studies of affiliation where smiles, head nods, and distance are coded.

The present chapter is divided into the five, historically distinguished, nonverbal domains: facial actions, vocal cues, proxemics (use and perception of space), gaze, and kinesics (head, body, arm, and leg movement). Coding techniques and sample research methodologies are discussed for each. The notion of separate domains is a handy tool for research, but should not obscure the importance of the congruency that exists across nonverbal, vocal, and verbal behaviors in social interaction. (Additional methodological information on these five domains is available in Chapters 6–11 of the present volume.)

Research on the face and voice has evolved considerably over the last 50 years, due in large part to sound conceptual and theoretical perspectives that resulted in distinct coding methods based on anatomy, evolution, and social function. Research in these two research areas was pursued meticulously by investigators who worked consistently to develop and hone reliable and valid coding techniques which are used by other researchers, permitting comparison across laboratories, and ultimately, accelerating our understanding of facial and vocal behavior. With the exception of some technical innovations, strategies for coding proxemics and gaze have changed little since the 1980s, and systematic research on kinesics, begun more than a half century ago, is even less advanced. Investigations in the latter three domains have received less unified attention, and include a range of foci and individual coding methods by researchers from a variety of disciplines. This state of disjointedness in the development of coding systems for proxemics, gaze, and kinesics has hampered the elucidation of theoretical constructs and research methodologies in these areas, and for this reason a wider discussion is provided for these three to outline present coding frameworks which can be further developed in future research.

Several issues are relevant for coding nonverbal behavior. First, although artfully suggested by pop-psychology writers (Fast 1970), the great majority of nonverbal behaviors do not convey unambiguous meaning as verbal behavior generally does. A word itself usually has no direct relationship to its referent, other than the defined meaning attributed to it by those who use it. The primary carriers of affect, the face and voice, are the closest to being able to represent specific meaning (e.g., eye and mouth configuration and vocal contour in sadness). There are a few body actions (e.g., insulting hand movements, head nodding) that can be interpreted like language by those within or between cultures, but even these do not reveal the same meaning each time they are displayed (e.g., head nod to signal Yes, or as listener response acknowledging speaker's comments). Ekman and Friesen (1969) provided a thorough articulation of the differences between idiosyncratic and shared meanings, and informative and communicative behaviors; see also Rosen-

feld (1987). Secondly, while a verbalization may be disjointed or blurted out, it implies an intention to send a message. Intention is far less discernible with nonverbal behaviors (Dittmann 1987; Ekman and Friesen 1969). Compare the utterance, “I don’t agree,” with a silent person who simultaneously purses the lips, and looks and turns away from the speaker. In both cases information is revealed, and in the latter, an attitude or feeling may be surmised, but was it intentional or a spontaneous reaction? The encoded (i.e., displayed) nonverbal behaviors may range from conscious and deliberate to automatic and unintended. Lastly, the terminology for coded behaviors needs to be descriptive, rather than inferential, to avoid bias resulting from inferred meanings, i.e., reporting positive relationships between personality variables (e.g., agreeableness and extraversion) and body positions characterized as “open,” without defining “open.”

Investigations may be focused on behaviors within a domain (e.g., gaze patterns in teacher-student interactions) or from several domains (i.e., gaze, kinesics, face). The latter are referred to as channel studies and are ideal for obtaining a wealth of information about a construct (e.g., listener feedback), or for examining the interactions of behaviors from different domains. Channel studies are plentiful (Bugental, Kaswan, and Love 1970; Gallois and Callan 1986). For example, a meta-analysis showed the influence of channel on ratings of state and trait anxiety (Harrigan, Wilson, and Rosenthal 2004). While coding nonverbal behaviors may seem an ideal method to determine the relationship between specific actions and a particular concept (e.g., gaze and dominance), a less time consuming method is using adjective ratings (e.g., warmth, dominance) of the behaviors of interest. For example, global assessments of overall behavior with respect to arousal (i.e., calm, reticent, attentive) were shown to be highly correlated in the psychotherapy context (Burgoon et al. 1992).

2 Facial behavior

2.1 Anatomical coding of facial behavior

Of the five broad channels of nonverbal behavior identified above, the face has received the most research attention, and a great deal of appreciation in literature and the media as an important vehicle for conveying emotion. For example, reading “he sneered” in a novel connotes a very different impression than “he smiled”; this is even more powerfully conveyed when we see an actor sneer or smile in a movie. When we see these displays we have an idea what they might indicate, but the research question might be what muscles move to provide this information. These simple examples of facial expressions belie the difficulty in measuring such complex, rapid, and sometimes confusing movements. More than 80 years have passed since the earliest attempts to systematically measure facial actions. Tech-

niques for measuring facial actions are presented here but more thorough treatments exist (Cohn and Ekman 2005). One of the oldest research questions regarding facial cues, cultural specificity in emotion recognition, has been elucidated in Elfenbein and Ambady's (2002) thorough meta-analysis on studies of the universality of emotion recognition.

The oldest, most developed, and most used method for enumerating facial actions is manual coding which involves a trained coder counting specific facial movements based on a systematic inventory of facial muscle movements. Thorough inventories of facial actions are anatomically based (Ekman, Friesen, and Hager 2002; Ermiane and Gergerian 1978), but other perspectives include linguistic (Bird-whistell 1970) or ethological (Blurton Jones 1971) approaches. The extensive and comprehensive work of Ekman and colleagues has resulted in a detailed and specific system (Facial Affect Coding System or FACS; Ekman et al. 2002) presently used by many researchers (Ekman and Rosenberg 1997; 2005). Like Ermiane and Gergerian (1978), the FACS describes actions of all the facial anatomy, and includes details regarding intensity and timing. For example, the intensity of the contraction of the zygomatic major which pulls the mouth corners upward was correlated with self-reported happiness (Ekman, Friesen, and Ancoli 1980). The timing of various "...actions that compose a facial expression do not all start, reach an apex, and stop simultaneously" (Cohn and Ekman 2005: 23). Both factors are crucial for determining the exact facial configuration and thus expression. Facial affect typically involves more than one muscle movement, and coding systems need to account for changes with respect to speaking, eye movement, and developmental variations (e.g., infants, children, elders). The FACS was developed methodically and rigorously over more than a decade of research (Ekman and Friesen 1978; Ekman et al. 2002), by carefully determining which muscles contracted in various facially-displayed emotions and labeling these individual muscle movements (Action Units or AUs) by number rather than inference (i.e., AUs 9+12 versus "sneer") to avoid bias associated with terminology. In addition to studying which facial muscles were contracted in each emotion, electromyography was used to stimulate facial muscle contraction to determine specific actions (Ekman, Schwartz, and Friesen 1978). Finally, observers were able to accurately differentiate the facial action units, i.e., visible changes in different facial muscles (Ekman and Friesen 1978). The EMFACS, which is based on the FACS, is used to score only those movements related to the seven universal facial expressions (i.e., happiness, sadness, anger, fear, disgust, contempt, and surprise) delineated by Ekman and Friesen (1971); Izard (1971). The EMFACS (Friesen and Ekman 1984) was developed to reduce the time and cost involved in scoring facial data using the FACS which can be time consuming because all visible movements are scored, and the quantity or compactness (i.e., density of muscle movements) of the data may require many hours of coding.

Not all facial coding systems that have been developed considered all muscle movements (Frois-Wittmann 1930; Landis 1924); some included only those related

to emotion (Izard 1983). Based on the Differential Emotions Theory, Izard (1971) developed the Maximally Discriminative Facial Movement Coding System or MAX (Izard 1979, 1983) for scoring infant facial expressiveness, and later, a system for identifying affect expressions by holistic judgments, AFFEX (Izard and Dougherty 1980). Disadvantages of the MAX are that it does not include all possible facial muscle movement, it is based on posed, prototypical adult facial expressions (Oster, Hegley, and Nagel 1992), and it cannot “distinguish among facial actions that have different anatomical bases” (Cohn and Ekman 2005: 17).

2.1.1 Reliability and validity of anatomical coding of facial movements

Most of the coding techniques cited above either did not report reliability data or reported it only for selected facial actions, and did not include reliabilities for different age groups, spontaneous and posed facial actions, or with respect to intensity and timing, or coder experience differences (Cohn and Ekman 2005). An index of agreement can be used to show which actions are more reliably coded than others; and particularly for small actions, it can help to establish a minimum threshold for an action to be coded (Cohn and Ekman 2005). Reliabilities (e.g., percent agreement) reported for FACS and MAX are very good. Coders must achieve a reliability of .83 to be considered a valid FACS coder, and mean ratios of agreement for a sample of action units was .82 (Ekman et al. 2002: 18).

Very little information is available regarding the validity of the various coding strategies. While some other coding techniques purport to predict developmental changes (Frois-Whittman 1930), severity of mental illness, and individual differences (Landis 1924), little data was provided. An exception is the work of Ekman and colleagues who demonstrated validity for the FACS codes and muscle movement: a) requested performances of various facial actions by trained individuals (Ekman and Friesen 1978), and b) electrical stimulation of facial muscles (Ekman et al. 1978). The bulk of studies on facial movement have been directed toward recognition of emotion in others, and facial EMG studies showed associations between FACS codes and the muscles displayed during an emotional experience: (a) autonomic nervous system responses associated with the experience of spontaneous emotions (Ancoli 1979), and (b) subjects' retrospective reports of experienced emotion (Ekman et al. 1980). Izard found that MAX coders could reliably identify infant facial actions which corresponded to posed adult emotions, and infant vocalization and movement patterns (Izard 1983).

2.2 Other facial movement measurement strategies

Facial electromyography (EMG) is a technique to measure the electrical activity of facial muscles by detecting the electrical impulses within the muscle during

contraction that are not visible to the naked eye. Measures of facial muscle activity using EMG have become more sensitive and precise over time. Two methods can be used: electrodes placed over the surface of the face, or fine wires inserted into the muscle (Cacioppo, Gardner, and Berntson 1999); for detailed descriptions see Cacioppo et al. (2000). While there are some difficulties with facial EMG (i.e., anatomical alignment of muscles over one another, restricted head movement, asymmetry of facial musculature, training of researchers), it was used in the development of the FACS and to establish the reliability of FACS (Cohn et al. 1999; Ekman and Friesen 1978). Reliability for facial EMG has improved since guidelines were developed (Fridlund and Cacioppo 1986), and FACS codes and EMG recordings were shown to be highly correlated ($r = .85$) (Ekman et al. 1978). Typically, EMG is not used to study specific emotions, but which muscles contract during facial displays of positive or negative affect (Cacioppo et al. 2000). However, EMG recordings have been correlated with self and observer reported emotion (Dimberg, Thunberg, and Grunedal 2002), and the prediction of treatment outcome in depression (Carney et al. 1981).

An emerging method of representing facial configurations is the current development of automatic image analysis for facial expressions using computer vision. The result of such analysis is recognized arrangements of facial actions from digitized images; this culminates in the extraction of relevant patterns representing various emotions (Cohn 2010; Cohn and Ekman 2005). Face recognition is an example of automated facial image analysis, and commercial applications are available, however this technique is complex and requires significant expertise and equipment for use (Cohn and Kanade 2007). Use of this technique for facial expression research is described in detail by Cohn and Ekman (2005).

3 Vocal behavior

The domain of vocal behavior, also referred to as ‘paralanguage’ (Street 1990; Trager 1958), includes acoustic features of the voice (e.g., pitch), and speech disruptions and nonlinguistic sounds (e.g., stutters). Phonation characteristics of the voice (e.g., movement of the vocal folds; tongue position) are analyzed in relation to the speech process, but have not yet been examined in social interaction studies. Acoustic features most commonly extracted are pitch (i.e., fundamental frequency), tempo (i.e., speech rate), and loudness (i.e., amplitude or intensity), but other measures are lip and articulation control, rhythm, breathiness, nasality, and resonance (Poyatos 1993; K.R. Scherer 1979). Several voice features that describe phonation changes (i.e., tension, perturbation) recently have been analyzed (Patel et al. 2011); see also <http://www.ncvs.org/ncvs/tutorials/voiceprod/tutorial/quality.html>. Speech disruptions include stutters, repetitions, sentence changes and incompleteness, filled and unfilled pauses, word omissions, and nonlinguistic sounds such

as sighing or clearing the throat (Poyatos 1993; Siegman 1979). While verbalizations are generally intentional and deliberate with regard to communication, nonlinguistic sounds are less specific and less premeditated, but offer important cues regarding the speaker's identity, personality, emotion, and conversational turn intentions. For example, vocal stress, a nonlinguistic characteristic helps untangle the meaning of an utterance (Chomsky 1965), or the recognition of sarcasm (Rockwell 2006). Like facial actions, vocal behavior has a long history of study, and has been focused on: personal characteristics, conversational cues, and affect communication. Both acoustic cues and speech disruptions have been considered in these areas.

3.1 Vocal behavior methodologies

Speech samples are typically audio- or videotaped, but unlike facial actions which are immediately apparent and capable of being analyzed in a still state (e.g., paused videotape), vocalizations are dynamic. A still state cannot capture vocal characteristics as they transpire over time and are additive, i.e., "each cue is neither necessary nor sufficient, but the larger the number of cues used, the more reliable the communication" (Juslin and Scherer 2005: 84). The collection of speech samples poses several potential problems. Speech samples necessarily involve verbal behavior and reducing its impact can be accomplished in several ways: using standard content (e.g., alphabet, stock passages, or pseudolanguage), or masking techniques such as low-pass filtering (content-filtering; Rogers, Scherer, and Rosenthal 1971) or randomized splicing (K.R. Scherer 1971) remove content and voice quality cues and have been used in many studies (Rosenthal et al. 1979; K.R. Scherer and Wallbott 1985). Still other masking techniques are used where acoustic as well as linguistic cues are masked using "sinewave replication" to filter out voice quality and intonation (Remez, Fellowes, and Rubin 1997; Schiller and Koster 1998); also phonetic cues in voice segments have been distorted by playing them forwards and backwards (van Lacker, Kreiman, and Emmorty 1985). Examples of successful masking using content-filtered speech showed that physicians' voices correlated with their success at referring alcoholic patients to treatment programs (Milmoie et al. 1967), with patients' satisfaction (J.A Hall, Roter, and Rand 1981), and with physicians' malpractice history (Ambady et al. 2002).

In addition to concerns regarding verbal content, other issues to address relate to the sound quality and analysis of acoustic cues. Attention to sound quality at the time of recording and playback is critical. Research conducted on acoustic cues requires knowledge about speech acoustics and vocal parameters. Coding procedures have evolved for analyzing vocal expression, with commercially available computer software designed to measure acoustic cues. Commercial products are available via the internet (e.g., Audacity), and these are described by Juslin

and Scherer (2005) who recommend PRAAT, available for download at <http://www.fon.hum.uva.nl/praat/>. There are a number of technical devices which may be of service for recording vocal cues: spectrogram (i.e., visual picture of a speech sample similar to a sonogram), EMG (electromyographic measure of muscle actions during speech with surface or needle electrodes), and thermistors to measure air temperature variations during inhalation and exhalation (Juslin and Scherer 2005).

Speech disturbances traditionally have been coded by trained coders who tally disturbances from meticulously transcribed speech including all nonlinguistic sounds and incomplete speech (Kasl and Mahl, 1965; Rosenfeld 1987). Speech rate can be determined by word or syllable counts (Buller 2005). Pauses (i.e., silent and filled) in the speech stream have been measured using a stopwatch (Goldman-Eisler 1968; Matarazzo and Wiens 1977), but more elaborate software exists to objectively and automatically assess pausing and speech disruptions (Patel and Shrivastav 2007). There are many applications for measuring speech characteristics, and some of these show potential diagnostic benefit. For example, researchers aim to model the vocal quality of dysphonic voices (i.e., involuntary movements of muscles of larynx) during speech to serve as a diagnostic tool in clinical settings (Shrivastav et al. 2011), and efforts to infer personality characteristics from normal speakers has the potential to be used with populations suffering psychological disorders (Mohammadi, Vinciarelli, and Mortillaro 2010).

3.2. Research considerations

As with other areas in nonverbal behavioral research, crucial questions regarding vocal behavior depend on the research focus: on the encoder (individuals emitting vocal behavior) or on the decoder (individuals evaluating vocal behavior). Several methodological decisions are necessary to consider: 1) determining the type of speech samples (e.g., portrayals, natural or induced expressions) and how these will be recorded; 2) deciding how to segment speech samples (i.e., establishing boundaries between units of analysis in the speech stream); 3) selecting vocal behaviors (e.g., acoustic parameters, speech disruptions); 4) and determining number of participants. Judgment studies require decisions regarding the choice of judges, rating methods, the format for and type of ratings, and establishing reliabilities among judges and ratings. Suggestions for overcoming methodological difficulties are discussed in detail by Juslin and Scherer (2005) and Tusing (2005).

4 Proxemics

The field of proxemics encompasses the perception, use, and framing of space. Contexts include conversations among intimates or strangers, employee interface

in business settings, teacher-student collaborations, and approach or crowding by others. Researchers are from many disciplines with differing perspectives: naturalistic, observational studies to empirical manipulations of proxemic cues.

Historically, E.T. Hall (1963, 1966, 1973) and Sommer (1959, 1961) were the first to study proxemics (E.T. Hall) and personal space (Sommer), and their ideas reflect their theoretical backgrounds. An anthropologist, E.T. Hall primarily emphasized features of our mammalian sensory equipment (i.e., thermal receptors, vision, olfaction, touch, kinesthesia [head, body, limbs]) in relation to others; kinesthesia refers to an awareness of body position and movement by proprioceptors in muscles and joints. For example, intimates (mothers and babies; lovers) often inhabit the close phase of E.T. Hall's intimate distance, zero to 18 inches, where touch, smell, body heat, and even faint sounds are perceived, but vision is distorted. Watson and Graves (1966) operationalized E.T. Hall's dimensional codes: e.g., holding and caressing touch through spot touching to no physical contact. E.T. Hall (1974) also discussed environmental and cultural effects on our use of space: sociopetal (to encourage communication) and sociofugal (for solitariness). Sommer, a psychologist, observed individuals' alignments in "semi-fixed" space (around tables, chairs), and how these reflected and were affected by affiliation, status, leadership, and productivity (1967, 1969). He found intriguing results on intrusions into another's personal space (Sommer 2002; Sommer and Becker 1969). Both E.T. Hall's and Sommer's findings (e.g., have been corroborated by others; Altman and Visel 1977). Research also has been focused on concepts of territoriality, defense, crowding, boundary markers, and maneuvers for maintaining personal space in public settings (Goffman 1971). While these proxemic content issues are of great interest, the methodology for coding these variables often is not clearly defined, and conceptual categories have been shown to be considerably complex. For example, crowding, a psychological experience, involves not just population density, but time spent in the encounter, attention paid to oneself or others (Zlutnick and Altman 1972), social stimulation (Desor 1972), and room size (Ross et al. 1973).

Altman made significant contributions in research on crowding, territoriality, and interpersonal relations (Altman 1975). He described primary (i.e., owner's domain; home, bedroom), secondary (i.e., not exclusive to owner; neighborhood sites), and public (i.e., available to anyone; parks, public transportation seats) territories, and discussed how privacy is upheld through physical barriers, place markers, and verbal and nonverbal adjustments to discourage interaction (Altman 1975). Lyman and Scott (1967) developed a classification system based on the degree of personal autonomy in various settings, and delineated types of territorial incursion (i.e., violation, invasion, and contamination). Attempts to apply the defining features of these territories to real life settings are not clear-cut. Lines defining interactional, public, and secondary territories are often fuzzy, with considerable overlap on critical variables such as density, use of boundary markers, status, degree of acquaintanceship, and other relevant factors. Sommer's studies

reveal the impact of markers (e.g., coat over a chair) to defend personal space in public, and reduce incursion by others while the owner was absent (Sommer and Becker 1969).

An additional area of inquiry that has received extensive study is approach distance, i.e., approach toward or being approached by another person (Hayduk 1981a). Aiello (1987) reviewed more than 100 studies that have used the popular, “stop-distance procedure” in which a participant signals “stop” to show his/her level of discomfort with regard to an approaching individual or when approaching another (Hayduk 1983). The space between interactants after “stop” is presumably measured specifically, but reference is made to an estimate, i.e., an “arm’s length” (Aiello 1987). Hayduk (1981b) altered frontal body angle of approach, and conducted the most elaborate study of reactions to intrusions. Bailenson et al. (2003) showed that participants approached by a virtual human in a virtual room behaved in a manner similar to human-to-human approach. An interesting study of approach distance shows the interface between neurology and proxemics when a patient with bilateral damage to the amygdala (which plays a key role in social cognition) displayed an absence of personal space boundaries (Kennedy et al. 2009).

4.1 Proxemic variables

The primary proxemic variable has been distance between interactants, and it has garnered the most investigative attention despite being a crude and limited measure. Other proxemic variables add to measurement precision: frontal orientation, posture, and sensory input (e.g., vision, olfaction, touch). Distance would appear to be an unequivocal measure to establish, but the actual physical measurement (i.e., inches or cm) of distance between interactants rarely has been used as it is highly intrusive. Most often distance is estimated between interactants’ foreheads, noses, chins, knees, chests, feet, or chair edges. In some studies the number of floor tiles separating individuals has been used, though its accuracy is ambiguous. Barnard and Bell (1982) developed the Interpersonal Distance Mat where tension on embedded wires within the carpet mat measures pressure from a person walking or standing which is illuminated as a LED device.

Trained coders have estimated distances between participants in field settings such as playgrounds (Aiello and Jones 1971) or physicians’ offices (Noesjirwan 1977) using E.T. Hall’s proxemic scales. Videotaped records permit greater accuracy in measuring distance using predetermined calculations, e.g., the distance between participants’ heads and torsos was estimated in three-inch intervals from field recorded videotapes (Remland, Jones, and Brinkman 1995). Calibrated grids have been used in several studies to guide trained coders in establishing distance (Madden 1999). Similarly, photographs made in field settings (i.e., shopping malls, sidewalks) were projected onto a calibrated grid to estimate distance (Burgess 1983).

Jones and Aiello (1973) developed a coding system to adjust for participant height variations, and Shuter (1976) designed a method for coding frontal body orientation.

4.2 Methodologies for proxemic studies

Studies have employed projective and experimental techniques, and field investigations in public spaces or observations in labs, classrooms, or elevators. Projective techniques ask participants to indicate their comfortable standing or seating distance from another person by manipulating felt figures, dolls, or silhouettes (Aronow, Reznikoff, and Troyon 1975; Strayer and Roberts 1997), or marking photographs (Meisels and Guardo 1969), drawings (Ashton and Shaw 1980), or a questionnaire depicting various scenarios (Hogh-Olesen 2008; Pederson 1973). Duke and Nowicki (1972) designed the Comfort Interpersonal Distance Scale that has been used frequently, as have Kuethe's (1962) felt figures. Holmes (1992) adopted a unique approach with children whereby they drew a picture of themselves with a stranger and with a friend, and distances between each were measured. Hayduk (1983) and Aiello (1987) contended that projective techniques are a poor measure of personal space because they do not parallel life-size differences, and correlations are very low between projective and real-life studies; such problems are especially true in studies of approach distance.

Experimental strategies require subjects to choose a seat with confederates or other participants (Latta 1978). Beaulieu (2004) allowed participants to position their chair, and used taped floor measures to estimate distance. In other studies, the participant's chair was in the same position for all participants and it could not be moved (Patterson, Roth, and Schenk 1979), or the distance between a participant and interviewer was manipulated (Sundstrom 1975). Participants' attitudes (Marshall and Heslin 1975) or physiological responses (McBride, King, and James 1965) were assessed in relation to room density or distance from the experimenter.

Field investigations are many, and include a variety of public settings: transportation terminals (Remland et al. 1995), outdoor benches (Leibman 1970), playgrounds (S.E. Scherer 1974), sidewalks (Sobel and Lillith 1975), movie and bank lines (Kaya and Erkip 1999), and shopping malls (Brown 1981). Spatial organization with respect to walking in public spaces also has been considered (Costa 2010). In public settings, unobtrusive observations were conducted by trained coders (Greenbaum and Rosenfeld 1980), or photographs and videotapes were made using unseen or disguised cameras (Gilmour and Walkey 1981). While video recordings with slow motion and digital counters offer more precise distance estimates than paper and pencil tallies in the field, other problems can occur (e.g., angle of participants to the camera). S.E. Scherer (1974) developed photogrammetry, a mathematical formula to account for errors in coding distance resulting from participants' angle to the camera. Recently, proxemic studies have been conducted with

robots (Mumm and Mutlu 2011; Van Oosterhout and Visser 2008), and in virtual environments (Llobera et al. 2010). For example, customers interacted with a financial advisor at either a close or far distance using a video mediated device (Grayson and Coventry 1998).

4.3 Research considerations

In general, there are no universally adopted methods for precisely measuring proxemic variables, and few improvements have been made since E.T. Hall's notation system (1973). Researchers have developed their own procedures, but without procedural specifics methodological implementation and comparisons across studies are difficult. Hayduk's (1983) and Aiello's (1987) thoughtful and comprehensive reviews of more than 700 studies will benefit proxemic researchers. They discussed measures and methodological issues, theoretical interpretations, problem areas, and detailed findings on spatial behavior. Future research will benefit from continued development and precise description of methods and measurement techniques.

A few coding suggestions can be proposed. The research question will direct decisions about which proxemic variables to include. In studies targeting how one uses space (e.g., finding solitariness in a public setting) and other variables of interest (e.g., age, gender), it would be useful to employ E.T. Hall's measures with modifications by Watson and Graves (1966): posture, distance, orientation, touch, vision, audition, olfaction, and thermal detection. Each of these needs to be operationalized. For example, the relationships between children's age and culture in relation to approach by peers, strangers, or authority figures will require the specifics of distance, posture, orientation, touch, and vision. Body positional cues (i.e., trunk lean, arm/leg/head positions) impact proxemics: for example leaning forward reduces the distance between participants and makes touching, olfaction, and thermal detection possible. When proxemic cues are secondary to the research question (e.g., encounter between bank teller and customer), distance and orientation may be sufficient, while other variables such as facial expression and eye contact may be more important. Grahe and Bernieri (1999) rated the degree of mutual eye contact, in addition to proximity and orientation. Proxemic cues are a significant part of the Intimacy Equilibrium Model (Argyle and Dean, 1965; Argyle and Cook, 1976) and show the importance of studying co-occurring cues rather than isolated ones; this mode is discussed in the section on gaze.

5 Gaze behavior

Gaze is unique among nonverbal channels in that it is used to both receive and send information. Receiving visual information refers to the "monitoring" function

described by Kendon (1967), a pioneer in gaze studies. We gather information about our environment and others by looking to determine others' motivations and intentions. Von Cranach (1971) described gaze as one component of "orienting behavior" which humans share with other animals. The send function is exercised in both "regulating" speaker-listener turn switches in conversation, and in "expressing" or revealing interest, emotion, and attitude (Kendon, 1967).

Preliminary research decisions depend on which function will provide answers sought in the research question, and these decisions in turn dictate where and how the study will be conducted. Monitoring functions involve studies on gaze fixation with precise measurement of pupil direction and movement over stimuli, or studies examining the information gleaned by the observer through looking (Faraday and Sutcliffe 1998). Substantial research exists on the role of gaze in coordinating speaking turns, and indicating listener responsiveness (Duncan and Fiske 1977). Visual behavior is an element in expressing emotion, information, or attitude. Norms for appropriate gaze have been delineated, e.g., "civil inattention" (i.e., not gazing at strangers in public) or "cutting" (i.e., visually ignoring another) (Goffman 1963).

5.1 Gaze variables

Gaze behaviors include: eye direction (left/right, up/down); eye contact or mutual gaze between interactants; "one-sided gaze" (one person looks at another who does not return gaze); glancing (brief looks toward and away from another person or object); staring (continual gaze at another); and gaze aversion (looking away from another person) (Kleinke 1986; Noller 2005). Gaze variables are recorded as frequencies or durations, and the most commonly studied are: mutual gaze, glance frequency, gaze duration at partner, and proportion of looking during a specified activity (e.g., listening, speaking); many of these are intercorrelated (Duncan and Fiske 1977).

The difficulties encountered in precise measurement have given way to recording "face gaze" (looking toward another's face) versus "eye gaze" (looking into another's eyes). Typically, one moves the head when redirecting gaze, and interactants tend to look at each other or well away (Exline 1972; Kendon 1967). Von Cranach (1971) and others (Exline and Fehr 1982; Guerrero 2005) have suggested that the precise determination of eye-to-eye contact may be less critical than the direction of one's head in relation to another person. It may be more useful to record the extent to which interactants direct their face toward one another, rather than suffer cumbersome intrusions with eye-tracking devices. In their seminal work on speaker-listener turn switching, Duncan and Fiske (1977: 43), recorded gaze based "largely from the movement and orientation of the actor's head." The Intimacy Equilibrium Model (Argyle and Cook 1976) suggests that approach-avoid-

ance forces underlie eye contact and are held in check by components of intimacy (i.e., degree of eye contact, physical distance, topic intimacy, body orientation, smiling, etc.); see Julien (2005) and Patterson (1991).

Eye direction when answering thought-provoking questions is purported to reflect brain hemisphere involvement during cognitive processing. Looking left indicates retrieval of emotion or spatial information from the right hemisphere, whereas looking right evinces left hemisphere linguistic and analytic thinking (Weisz and Adam 1993). Finally, while not directly related to gaze, other parts of the eye, the eyebrows and eyelids, are important in studies of emotion: e.g., raised brows in surprise, lowered drawn brows in anger (Ekman and Friesen 1977); blinking in anxiety (Harrigan and O'Connell 1996), and decreased gaze in embarrassment (Edlemann and Hampson 1979). One distinguishing feature among smile types is eye muscle involvement (Ekman and Friesen 1982). Facial affect processing is greatly influenced by direct versus averted gaze (Adams and Kleck 2003).

5.2 Methodologies for gaze studies

After determining the variables that will provide the desired data, a question is where to conduct the study. Field studies elucidate naturally occurring gaze in public settings, while laboratory experiments are designed for greater precision of measurement and manipulation of relevant variables by the experimenter. Determining gaze in the field (e.g., in cars, at airports) is imprecise compared with measures using technical equipment in laboratories such as videotaping equipment. These difficulties have encouraged researchers to choose manipulation of gaze patterns in the field rather than measuring spontaneous gaze in the field. Such manipulation studies include participants' helping a victim (Ellsworth and Langer 1976), giving money (Kleinke 1977), or complying with a request (Snyder, Grather, and Keller 1974).

Field studies may offer better external validity than laboratory studies, but several difficulties must be overcome. LaFrance and Mayo (1976) had observers position themselves in public settings so that they could clearly tally gaze data from both dyad members. While inter-observer reliabilities may be sufficient using such crude measures, the introduction of recording equipment has enhanced reliability considerably. As in studies of other nonverbal behaviors, camera obtrusiveness can significantly alter gaze (Exline and Fehr 1982), but its effect can be partially remedied by creatively placed cameras or deceptively directed camera apertures (Eibl-Eibesfeldt 1989). The limited scope of observation can be partially compensated for by a wide angle lens, and a telephoto can help resolve distance issues. A telephoto record of the image provides more detail in the region of interest; zooming in on an image (taken with a standard lens) on the computer compromises clarity as there are fewer pixels of the desired image. Other potential prob-

lems need attention: visual acuity, illumination, subject movement out of camera range, and blocking of subject by other individuals or objects. Laboratory studies reduce many disadvantages of field studies. In early investigations, gaze was coded by an observer who sat behind a one-way mirror directly behind the participant's interlocutor (Argyle and Cook 1976). This "over the shoulder" approach permitted direct visualization of the participant's gaze (Exline 1972). Gaze variables were tallied on paper, or with event recorders (Dovidio et al. 1988). While coder reaction time may affect measurement error, reliabilities were quite substantial (Exline and Fehr 1982).

Another important consideration is the number of participants. Most often, research has been conducted with dyads, but there are studies with three or more (Harrigan and Steffen 1983). A separate coder is assigned to each participant in live interactions (Guerrero 2005), or videotaped recordings were made of each participant (Duncan and Fiske 1977) with split-screen technology to precisely synchronize gaze and speech (Argyle and Cook 1976). As in studies of other nonverbal behaviors, confederates have been used to present the same demeanor and visual patterns to each participant, and can be trained to control their gaze with remarkable precision (Exline 1972), or can be cued with unseen, slight shocks to the hand (Ellyson et al. 1980). Employing a confederate introduces the possibility that other confederate behaviors (e.g., smiling, nodding) can systematically bias the results (Guerrero and Le Poire 2005), and confederates have reported "affective reactions" when altering normal gaze, by modifying head nods, gestures, and orientation (Exline and Fehr 1982). Monitoring can help reduce the potential effects of confederate discomfort, and the attendant arousal experienced by looking at or being looked at by another (Exline and Fehr 1982). Using confederates permits greater control, but reduces spontaneity and introduces artificiality, distinct disadvantages for some research questions.

5.3 Reliability and validity of gaze measurement

Reliability estimates for gaze variables are often quite high for live interactions and videotaped records (Argyle and Cook 1976; Exline and Fehr 1982). High reliability estimates are more likely when coding is based on videotape than live encounters because of advantages of re-play, slow motion viewing, and resolution of measurement errors. Validity is more difficult to establish as people do not typically fixate on one part of the face (Yarbus 1967). "Humans are not as accurate as desired in determining when others look them *directly* (italics added) in the eye(s)" (Exline and Fehr 1982:122). Validity estimates for eye-directed gaze are considerably worse than for face-directed gaze (Exline and Fehr 1982). Judgment errors increase as the head deviates from a straight-on position, as distance between interactants increases, or as gaze duration decreases (Argyle and Cook 1976). There seems to

be a wide margin to the left and right of one's face ("off-the-face-gazes") that is interpreted as gaze from another person. The issue of validity in determining eye-to-eye contact by a participant may be of little importance as (Kendon 1970) and others (Argyle 1970) have strongly suggested that participants tend to look at each other's faces in an interaction or clearly look away. The meaning attributed to another's gaze can be assessed by ratings or questionnaires by interacting confederates or other observers (Kleinke, Meeker, and La Fong 1974). Researchers are encouraged to peruse the stellar review of gaze methodology by Fehr and Exline (1987).

5.4 Technology in gaze measurement

When precise measurement of gaze is required, the setting likely will be in a laboratory where devices can be implemented to accurately pinpoint gaze. Eye tracking devices shine an infrared light from an infrared sensitive camera into the participant's eye which reflects lens and cornea boundaries. The reflection off the retina pinpoints the position of the pupil which can be videotaped; "bright pupil" reflection provides the highest accuracy. Since head movement tends to occur when people change their gaze, a stable head position is necessary using a chin rest and forehead lean bar to prevent movement. Pupil reflection is recorded by either a headset with tiny cameras (Moukheiber et al. 2010) or a table mounted camera system (Talmi and Liu 1999). Fortunately, newer headset models are less restrictive, permitting a full range of motion (Nadig et al. 2010), and pupil tracking algorithms calibrate eye orientation when head movement is unrestricted (Ronsee, White, & Lefevre 2007). Many eye tracking studies recorded the gaze of one participant as he/she viewed a specific target. Eizenman and colleagues (2003) developed instrumentation and software analyses which showed remarkable specificity in fixations and glance durations using a high resolution eye tracker, placed behind a participant who receives the gaze of another participant. Nadig and colleagues (2010) measured gaze between autistic children and an interacting adult, and Vertegaal et al. (2001) measured gaze in groups of three to four participants using calibrated circles around interactants' videotaped faces. An interactive computer system is needed to synchronize coordinated gaze and speech cues (Richardson and Dale 2005). Elaborate devices may be superfluous, however, in light of earlier reports that in natural settings, interactants look at another's face or well away; "where the receiver thinks the sender looks is more important than where the sender does precisely focus" (Exline 1972: 204). Strongman and Champness (1968) developed a "chance model" to predict the degree of mutual gaze using a probabilistic formula based on individual gaze patterns. While these predictions have been substantiated (Rutter et al. 1977), Exline and Fehr (1982: 115) comment that "another human is a socially significant event that captures far more of our attention...than a truly

chance model would predict,” and thus, the degree of mutual gaze is greater than one would predict by random confluence.

6 Kinesics

Body movement research methodology suffers from a lack of a well defined, organized coding method that fits a conceptual and theoretical framework. A few coding systems have been proposed. Labanotation (Laban 1975) is a movement notation system designed specifically for dance but has been used to record body actions over time. Birdwhistell (1970), a pioneer in the study of body movement, patterned his coding system on linguistic principles where “kinemes,” the most elementary units (like phonemes), are combined into “kinemorphs” (analogous to morphemes), and then “kinemorphic constructions” (analogous to sentences). One coding system that has received further development since its inception is the Bernese system (Frey and Pool 1976) which uses the Cartesian axes of horizontal, vertical, and depth as spatial parameters to code movement from moment to moment. It purports to cover all possible movements by assigning a numerical code for each movement or “deviation from normal”; for example, a head tilt to the left and down is coded as the deviation from head upright and facing forward (i.e., “normal”). Of these three coding strategies, the Bernese system shows the best reliability, but each suffers considerable coding challenges: large number of arbitrary non-intuitive symbols, time-consuming nature of the coding process, and isolation of body movements which may be considered as a unit (e.g., crossed arms, lean away, and less direct frontal orientation to connote “rejection”).

Reasons for the failure to develop an adequate coding strategy for head and body movement may be the intimidating fact that humans display a rich mosaic of body movements in a rather constant state of change. In addition to the sheer number of possible body actions and postures, there are factors of versatility, subtlety, and speed of movement; and the interactive quality of various actions and positions. Coding is manageable, however, because of three key features of body movement. The “body tableau” is composed of a modest number of moveable parts. Legs, arms, and trunk are primarily involved in body positioning and may reflect affect or attitude, actions of the shoulder or elbow may be relevant more specifically, in the display of affect: i.e., shoulder shrugging; elbow jabbing toward another person. The head and hands are responsible for the most movement, and have received the most research attention. A second feature that helps make coding manageable is that while many possible actions and positions can be performed anatomically speaking, some rarely, if ever, occur (e.g., conversing with others from an extreme backward trunk lean). Social conventions, “display rules,” guide our behavior by the exercise of culturally learned rules that govern “...when it is appropriate to express an emotion and to whom one can reveal one’s feelings”

(Ekman and Rosenberg 1997: 10). This maxim applies to body movements as atypical actions and positions have been regarded as diagnostic with respect to mental stability (e.g., catatonic positioning in schizophrenia) or level of intellectual functioning (e.g., body rocking in mental retardation) (APA 2000; Goffman 1963).

A final feature that modifies coding intricacy is that body movements often occur simultaneously or in sequence, and many co-occur with facial and vocal behaviors. Movements with such a temporal relationship are more visible than single movements, thus reducing omission errors (i.e., not coding a behavior that occurred), and provide information on the function of movement patterns.

6.1 Kinesic variables

Body movements can be distinguished as actions and positions (Harrigan 2005). Coding strategies have been focused primarily on action behaviors with a relatively distinct onset (i.e., beginning) and offset (i.e., end). Actions involve the head, hands, shoulders, and feet (e.g., nodding, gesturing, kicking) and often are considered expressive of affect, attitude, or intention. Positions are associated with aligning the body and are recorded as a beginning position and whenever a change in configuration occurs; one's body is always in a position with torso, arms, and legs arranged. Positions are larger units, change less frequently, can be more easily codified, and usually are described with reference to an interactant. Individual position changes tend not to occur in isolation, and often can be considered as a unit. For example, a shift in trunk lean usually affects arm, and sometimes leg, positions. Self-synchrony assumes the coordinated interaction of an individual's body movements, and interactional synchrony describes coincident movements between interactants. Considerable research exists on both types of synchrony (Bernieri, Reznick, and Rosenthal 1988; Condon and Sander 1974). For a more thorough explication of synchrony measurements see also Chapter 18 (Lakin, this volume). Positions provide information regarding attention, interest, and attitude. They may reflect the degree of tension an individual is experiencing and something about emotion intensity, but carry little information about specific affect (Ekman and Friesen 1974).

6.1.1 Body actions

Ekman and Friesen (1969) described several categories of nonverbal behavior based on a theoretical framework; these have been widely adapted by researchers. The first category is emblems, a term adopted from Efron's (1941) impressive study of hand actions. Emblems are symbolic actions with a "specific verbal translation known to most members of a subculture, and [are] typically intended to send a message" (Ekman and Friesen 1977: 38). They include head nods and hand movements like pointing, waving, "OK" and other signs, and shoulder shrugs.

A second category is illustrators, “movements directly tied to speech, serving to illustrate what is being said verbally” (Ekman and Friesen, 1969: 68). These hand actions accent or emphasize a word or phrase (batons), draw the shape of the referent (pictographs), sketch a path or direction of thought (ideographs), depict a bodily action (kinetographs), point to objects (deictics), or show a spatial (spatials) relationship. Illustrators are displayed with little direct awareness or intention, and generally have negligible meaning separate from speech (Krauss, Morrel-Samuels, and Colasante 1991). Much research has been focused on the function of illustrators in speech where they are most often exhibited by speakers to aid listener comprehension (Cohen; 1977; Kendon 1994), but this notion is far from clear (Rimé and Schiaratura 1991). Interestingly, illustrators were exhibited spontaneously by congenitally blind individuals while speaking (Blass, Freedman, and Steingart 1974). Krauss and colleagues have conducted extensive studies on these movements in relation to semantic representations, word retrieval, and hesitation phenomena (Hadar et al. 1998; Krauss, Chen, and Chawla 1996). Bavelas and colleagues (Bavelas and Gerwing 2007) offer an intriguing model of the function of gestures which emphasizes the role of the addressee in effecting the form of the speaker’s gesture: e.g., degree of shared information (Gerwing and Bavelas 2004), or redundancy in linguistic content (Bavelas et al. 2011). Finally, illustrators affect observers’ impressions of the encoder, and their frequency is related to psychopathology, deception, and personality ratings (Ekman and Friesen 1977).

The third category is self-adaptors where one part of the body has contact with another body part such as when grooming, scratching one’s head, or hand-to-hand rubbing (Ekman 1977). The function of self-adaptors is considered an affective one: an attempt to cope with feelings, relieve self or bodily needs, or comfort, irritate, or release emotional arousal (Ekman and Friesen 1969). These are usually displayed “with little awareness, without the deliberate intent to communicate a message” (Ekman and Friesen 1977: 39), and are thought to convey some diffuse information about the encoder’s emotional state, pathology, deceptiveness, and general personality traits (Ekman and Friesen 1977). Self-adaptors reveal unintended “emotional leakage” betraying aroused affect, and have been associated with anxiety, guilt, hostility, and suspiciousness (Ekman and Friesen 1974). However, those who display self-adaptors also have been rated very positively (Harrigan et al. 1987). A critical point regarding self-adaptors is the importance of the location, temporal patterning, and type of self-adaptor (Goldberg and Rosenthal 1986). For instance, hand-to-hand rubbing by job interviewees and patients was judged as more appropriate than by friends or strangers (Harrigan et al. 1991). Freedman and colleagues (Barroso et al. 1978) developed a compelling cognitive processing theoretical view for both illustrators and self-adaptors: illustrators help “buttress the clarity of the image” connecting the image and word, while self-adaptors help maintain the focus of attention and organization of thought (Freedman 1977).

The final category, regulators, includes actions with no explicit meaning in themselves, but help “maintain and regulate the back-and-forth” flow of conversa-

tion between speakers and listeners (Ekman and Friesen, 1969: 82). Regulators include listener responses such as head nods, eye contact, postural shifts, eyebrow movements, and hand movements as “floor holders” (Ekman 2004). Conversational exchange behaviors have received much study; see Feldstein and Welkowitz (1987) and Rosenfeld (1987) for reviews, as well as Chapter 16, Patterson, this volume. While work by Bavelas and colleagues has contributed much to our knowledge of illustrators and their interaction with speech and facial actions, the area of hand movements in general has evolved slowly and much remains rudimentary with respect to description, coding systems, specific methodology, function, and conceptualization.

Another important type of body action, in addition to those mentioned above, involves touching, where one person touches another. Research studies on touch are many and include greetings and farewells, intimate encounters, providing comfort or service, or aggressive conflicts (Knapp and Hall 2010; Jones 1994). Touch studies include gender (J.A. Hall and Veccia 1990) and cultural differences (Nail, Harton, and Decker 2003); and therapeutic contact (Stenzel and Rupert 2004). For example, increased touch to premature infants resulted in profound changes in weight gain and developmental advances (Field 2001). Andersen and Guerrero (2005) created the Body Chart for recording touch in natural and lab settings. For touch studies, several factors need be considered: types of touching (Argyle 1975; Heslin and Alper 1983); location of touch (Morris 1977); meanings of touch and characteristics of the toucher and touchee (Knapp and Hall 2010).

6.1.2 Body positions

Unfortunately, most studies on body position offer incomplete descriptions of the coded behavior, and much work remains on specifying body positions. These include: overall posture (i.e., sitting, standing, lying), trunk or frontal orientation (i.e., facing, turned away), trunk lean (i.e., forward, straight, backward, sideways), and arm, leg, and foot positions (e.g., folded arms, uncrossed legs, feet under chair). Trunk lean refers to the angle of the trunk with respect to the hips; most often based on a seated posture, although “upper body lean” has been noted for standing postures (Mehrabian 1968). Trunk lean is referenced with respect to an interactant, and can be upright or erect (i.e., head and shoulders in a vertical line over the hips), forward lean (i.e., head and shoulders forward of upright relative to the hips), or backward lean (i.e., head and shoulders backward of upright relative to the hips). Lean has been further defined using a range from five to a 45 degree angle from upright (Fairbanks, McGuire, and Harris 1982). Researchers included sideways turn of the trunk where the shoulders are turned to the left or right (Vrij 1994). Trunk orientation is most often coded as a range where the encoder is directly facing (i.e., zero degrees) or facing away (i.e., turned at a right angle, 90 degrees) from another person (Cappella and Green 1984). Orientation

also has been based on the shoulders' alignment with the plane of the encoder's seat edge, or the plane of the interactant's shoulders (Bernieri and Gillis 1995).

In many studies the lack of definition for arm and leg positions is typical. Coding the arms, legs, and feet is focused on movement frequencies or noting arm and leg positions as open, symmetrical, or relaxed without defining these terms. Some researchers coded specific types of arm positions such as arms akimbo or folded arms; Mabry (1989) defined five specific arm positions. Bente (1989) described arm movements with respect to horizontal, vertical, and forward or backward axes. Harrigan and Carney (2005) coded arm and leg positions with symbols representing the configuration, e.g., arms folded, hands resting together in lap, legs crossed ankle on knee, feet beneath the chair, etc. Frequencies of postural shifts also have been reported, but definition specificity was lacking; these are sometimes defined as any change in posture, or only leg movements (Vrij 1994). Distinct posture definitions are represented by Hewes (1957), who exhaustively described the world distribution of postures for sitting and standing.

6.1.3 Head movements

Not surprisingly, the most typical action counted when coding head movement is nodding, but others are shaking, tilting (i.e., head drawn toward shoulder), and turning movements associated with gaze changes or the slight movements which occur when speaking or listening (Kendon 1970). Still other behaviors have been counted, though ambiguously defined: dipping, bobbing, tossing, thrusting, and dropping. Researchers define nodding based on the type and direction of movement: cyclical or continuous, up/downward or forward/backward motions on the vertical or sagittal plane (Noller 2005). Definitional reference points for nods, shakes, and tilts can be based on imaginary lines drawn horizontally across the tip of the nose, and vertically from the top of the face to the chin bisecting the nose; a nod is coded when the nose crosses the horizontal line and a shake when the nose crosses the vertical line (Harrigan and Carney 2005). A head tilt draws the head toward the shoulder, a head dip draws the chin toward the chest without an upward lift (like a nod), and a head toss is an abrupt upward lift of the chin without a subsequent movement downward (like a nod). All of these actions vary in intensity, breadth, and frequency, and range from fast, vigorous, long head nods to slow, subtle, narrow head shakes. Counting only the frequency of these behaviors may not capture the qualitative variations which may provide valuable information about the function, meaning, or intent of the behavior.

While a review of the functions of head movements is not within the scope of this chapter, a few highlighted studies may show the range of research questions that have addressed head movements. A substantial literature demonstrates the powerful reinforcing relationship between interviewer head nodding and information provided by clients (Matarazzo et al. 1964). Nodding has been displayed in

both giving and seeking approval, and in persuasion (Rosenfeld 1987). Head shaking was related to memory for negatively valenced words (Förster and Strack 1996), and produced prosocial feelings toward an individual who described a negative event (Tamir et al. 2004). Rhythmic head movements improved speech perception (Munhall et al. 2004), and were linked to suprasegmental features of speech (e.g., stress, amplitude) (Hadar et al. 1983). Studies on head tilting are rare (Noller and Callan 1989).

6.2 Training coders and determining reliability

The most common method of coding body movements is using trained human observers. The researcher begins with clear definitions and parameters of each of behavior to be coded, and trains coders to recognize the behaviors and code their occurrence. Coders view samples of the participants' behavior, and record the designated behaviors as frequencies or durations, or based on the time of occurrence, or in relation to another feature of the interaction (e.g., speaking turn, greeting, etc.). Most often behavior is coded from videotaped interactions which permit the viewing and reviewing that is necessary to establish a high level of accuracy and confidence in the coded behaviors. After initial training and practice, the coders' data is checked for reliability, and if necessary, clarification and re-training is instituted. When acceptable reliabilities are established, each coder is dispatched to complete the coding independently. Continued reliability checks throughout the coding are encouraged to maintain a high level of accuracy. Acceptable reliability thresholds are often set at .80 or better using interrater, rho, or percent agreement, or Pearson or kappa coefficients (Baesler and Burgoon 1987). In some studies two or more coders recorded all behaviors for all participants, but typically only 10 to 25% of the sample is coded by the same two coders (Duncan and Fiske 1977). Reliability can be ascertained in several ways: percent agreement, Spearman's *rho*, Pearson's *r*, Ebel's or Winer's interrater analysis using intraclass correlation, and Rosenthal's (1987) application of the Spearman-Brown formula. Cohen's *kappa* corrects for chance agreement and is preferred over percent agreement (Bakeman 2005). Baesler and Burgoon (1987) conducted a thorough evaluation of reliability measures for nonverbal behavior and found very high median reliabilities for all categories of movement. Important considerations regarding reliability are thoroughly discussed in Rosenthal (2005), and are relevant for all the categories of nonverbal behavior.

6.3 Technology for kinesics

Frey and Pool (1976) inserted a cross-hair device onto a videotape recording for coders to locate various movements with reference to vertical and horizontal lines.

The Bernese system has been adapted for computer application, and by using it trained coders could draw 3-D characters based on data protocols of models' body movement coded from the original videotaped interactions using the Bernese system (Bente et al. 2001). Transducers (i.e., small ultrasonic devices), attached to parts of the body, can show receiver-transducer distances and plot three-dimensional positions or movement (Altofer et al. 2000). Blascovich et al. (2002) and others (Guye-Vuilleme et al. 1999), studied behavior using computer generated "immersive virtual environments" (IVEs). Technology for coding head movements also is available. Hadar et al. (1985) used a polarized light goniometer (i.e., measures relationships among moving body parts) to systematically record up/down and left/right cycles in head nodding and shaking and related these to conversational behaviors (i.e., listener responses, speaker-turn attempts, speech stress). Older methods for synchronizing speech, body movement, and acoustic data required aligning videotaped information and speech transcripts together with a superimposed time clock. Almost unimaginably, with reel-to-reel videotapes a researcher had to turn the reels slowly back and forth to see the exact movement onset and offset. Stopwatches had been used to record the length of a movement or utterance (Duncan and Fiske 1977). A great boon to coding nonverbal behavior and speech is Kipp's (2003) ANVIL, a software framework for digitized audiovisual data, which uses time-anchored embedded slots for the coded data (e.g., linguistic, acoustic, gestures) and which can be subsequently analyzed across channels (i.e., vocal, kinesic, verbal). This system permits ease in transcribing human behavior in temporal alignment with speech and other audio cues. Current computer software allows researchers to build a coding scheme with defined behaviors, collected from video recordings, and synchronized with other data (e.g., verbalizations, physiological measures) which can then be analyzed (e.g., Noldus Information Technology 2010; http://www.noldus.com/files/actions/2010_observer/observer_xt_hu.html).

6.4 Research considerations

The usual encounter for coding body movements is a dyad, but there are studies involving a group (Altofer et al. 1992). Settings have included therapy interactions, employment interviews, or conversations between friends or strangers in a lab, educational, or public environment. A critical determinant for what movements are manipulated or quantified is the research query. Whether intentional or not, many body actions are expressive, and can reveal personal attributes (e.g., warm, impulsive) and motivations (e.g., interest, competitiveness). Body positions offer information about attitude, status, and degree of affiliation based on position in relation to another person: e.g., leaning forward versus sitting turned away. One category of movement may be more important than another: e.g., turn-taking stud-

ies include head and hand actions, while those concerned with cultural similarity may involve emblems of the hands and head. A guide for the selection of actions and positions is suggested: 1) when research questions are focused on the more enduring qualities of the interaction (e.g., status), positions provide initial impressions, and 2) for questions regarding characteristics that change from moment to moment (e.g., dynamic), expressive hand and head actions may be most evocative of affect, attitude, attention, and other social interactive behaviors. The critical determination is how the specific research question is reflected in movement. Positions can be coded individually, but may contribute more information when treated as a unit (e.g., change in trunk lean and repositioning of arms and legs) as positions and actions often work together (Costa et al. 2001).

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4 Nonverbal communication: origins, adaptation, and functionality

Abstract: This chapter deals with the origins and functions of two ways of human communication beyond language: nonverbal communication and animal communication. Nonverbal communication includes all those kinds of human behavior that are not strictly linguistic but convey meaning, i.e., a set of behaviors (e.g., gestures) with a specific referential value and a function. Animal communication are processes of mutual interactive influence between two or more individuals in which some key ingredients of human communication (shared code, attribution of mental states, and meaning) are missing. Exploring vestigial forms of animal communication (e.g. laughter) in contemporary humans can provide psychological sciences with some keys to the understanding of the origins and functions of verbal and nonverbal communication. The take-home message of this chapter is that the co-existence of animal communication and nonverbal communication in humans constitutes an amazing evolutionary phenomenon with two important features: (a) the meaning of nonverbal communication is language-dependent, and the meaning of animal communication is context-dependent. (b) Pure animal communication is probably impossible in humans, as the complex interconnections between all the brain regions make it extremely difficult to conceive of any encapsulated module totally isolated from the neural circuits that give rise to language.

Keywords: nonverbal behavior, animal communication, adaptation, adaptive, language, brain evolution

1 Definitions and delimitations

This chapter deals with a rather abstract subject: the origins and functions of nonverbal communication. It introduces a conceptual discussion that is probably unnecessary for carrying out empirical research on an everyday basis, but which may help make sense of this field and its promises, accomplishments, and limitations.

The label “nonverbal communication” has proved extremely successful in popular psychology. Its power of suggestion derives from the implicit promise that our body has its own language which we can read, revealing senders’ hidden secrets. Most popular books in this field have exploited such expectations, with books such as *Louder than Words: Take your Career from Average to Exceptional with the Hidden Power of Nonverbal Intelligence* (Navarro and Poynter 2010) or *Emotions Revealed:*

Recognizing Faces and Feelings to Improve Communication and Emotional Life (Ekman 2003). But “nonverbal communication” is not only an attractive label. It is also an extremely complex concept; merely defining it is a challenge in itself.

Tradition has kept the borders between “nonverbal communication” and other terms such as “nonverbal behavior” and “nonverbal information.” Unfortunately, the use of such terms has given rise to a considerable number of conceptual misunderstandings which, in some cases, have led to bias in research in the field.

1.1 Nonverbal behavior

The term “nonverbal behavior” is an extremely broad term which, in its strict sense, means nothing and everything. It means nothing insofar as all behaviors we know are actually verbal because we cannot avoid perceiving, representing, and describing them through language; for this reason we can assume that there is no behavior which is not mediated by the actor’s and the observer’s language. On the other hand, though, the term means everything, in the sense that all human behavior, including verbal behavior, can be approached as mere physical, observable movements. Two alternative ways of getting around this epistemic paradox would be either (a) to de-emphasize the “nonverbal” qualification, confining the study of “nonverbal behavior” to behavioral experiments on psychological processes (as opposed to paper-and-pencil experiments; see Patterson, Giles, and Teske 2011), or (b) to make “nonverbal behavior” a synonym of “nonverbal communication.” In this chapter we shall not discuss the first option, which is a legitimate and fruitful field but mostly focused on proximal, psychological causes and consequences of behavior rather than on its origins (see Patterson 2003). Instead, we shall assimilate “nonverbal behavior” into nonverbal communication.

1.2 Nonverbal information

The term “nonverbal information” is inspired by Shannon’s mathematical information theory (1948). According to Shannon, A is a signal if its states covary with the states of a source, B. A nonverbal-information research program should consist in seeking specific covariations between the states of source and signal. In Shannon’s theory, an informational link between two observable behaviors or environmental changes is a mere correlation. In Shannon’s sense, when a variable (e.g., observed states of a behavior) correlates with a second variable (e.g., an environmental change), we can say that the signal carries information about the source. A signal, in Shannon’s sense, is informative if the state of the signal helps to predict the state of the source.

Information is contingency and correlation, but it is not causal explanation nor, most importantly, meaning. If human behavior is approached as information,

the study of nonverbal information is restricted to the findings of consistent correlations between some observable range of states from the source and some observable states of signals such as bodily postures and movements. This quantitative, probabilistic approach could be useful as a tool for predicting well defined patterns of behavior, but it does not indicate the functions and causes of such behavior. Signals do not provide, by themselves, a causal or a functional explanation of an event, just as smoke is a signal of fire but does not explain combustion.

In a strict translation of Shannon's ideas, uncertainty reduction is a statistical estimate that requires knowing the range of potential states of source and signal. Given that the precise specification of such states is not usually accessible in behavioral sciences, psychologists and ethologists have adopted a broader and vaguer approach to "nonverbal information" in which there is a material signal emitted by the sender and decoded by the receiver. In this framework, "nonverbal information" becomes an imperfect form of communication in which the receiver can "read" a signal through a code unconsciously active in the sender (see Rendall, Owren, and Ryan 2009).

Again, as was the case with the term "nonverbal behavior" this softer version of Shannon's information theory is somewhat problematic, theoretically and empirically, because it means nothing or it means too much. It can be trivial insofar as any behavior is information in a broad sense: we "read" any behavior we are aware of, through a large repertory of social cognitive mechanisms (attribution, person perception, categorization, and so on). Calling any target of our cognitive mechanisms "information" is an unnecessary qualification. On the other hand, it is too broad a concept because the approach to information as a carrier of meaning betrays the technical concept of information and shifts the focus onto forms of interaction that can be labeled communication. Again, the ways of circumventing this second paradox would be either (a) to assimilate the term "nonverbal information" to "nonverbal communication," or (b) to adopt a restricted approach to nonverbal information as a form of social interaction in which the behavior of a sender influences the behavior of the receiver with no transmission of meaning for either sender or receiver. This second option is coherent with the definition of what is called, in contemporary ethology, "animal communication" (see Rendall, Owren, and Ryan 2009).

2 Animal communication and nonverbal communication

In this chapter I shall discuss the two most feasible alternative ways of talking about the origins and functions of human communication beyond language. A first, obvious option involves talking about nonverbal communication. Nonverbal communication would include all those kinds of human behavior that are not

strictly linguistic but convey meaning, i.e., a set of behaviors with a specific referential value and a function. The take-home message concerning nonverbal communication will be that it is the dialectic, inseparable antithesis of verbal communication, and that the two of them constitute human communication.

A second, less obvious option would involve those forms of communication in which language is excluded. Pure a-linguistic communication is probably impossible in humans, as the complex interconnections between all the brain regions make it extremely difficult to conceive of an encapsulated module totally isolated from the neural circuits that give rise to language. But some sort of mutual social influence does occur in animals, and we can assume that this kind of interaction was also present in our remote evolutionary ancestors before the appearance of a protolanguage around two million years ago. This mutual influence is called “animal communication.” From a coherent evolutionary point of view, the study of animal communication can provide psychological sciences with some keys to the understanding of the origins and functions of verbal and nonverbal communication. Furthermore, researchers can explore vestigial forms of animal communication in contemporary humans.

In any case, as we shall see in the next paragraph, the term “animal communication” is tricky because of its counterintuitive nature. “Animal communication” means simply a process of mutual interactive influence between two or more individuals in which some of the key ingredients of human communication (e.g., a shared code, attribution of mental states, and meaning) are missing.

In summary, this chapter will consider two kinds of “nonverbal communication”: nonverbal communication and animal communication. We shall see how “nonverbal” is practically synonymous with “human.” On the other hand, “animal communication” can be applied to some sorts of either animal or human interactive behaviors, but it does not include “communication” in the strict, human sense.

2.1 Animal communication

What ethologists mean by animal communication (see, for example, Seyfarth and Cheney 2003) is a sender’s way of influencing a receiver’s behavior. Such an influence process lacks a fundamental feature of verbal communication: animals who send a signal – with the possible exception of chimpanzees in very rare cases – do not recognize the mental state of the receivers, and receivers obtain information that senders do not intend to emit.

Signals are typically produced in the presence of an audience, but the meaning and function of these signals are not the same for sender and receiver. Animal signals can be aversive, if produced in agonistic encounters, or beneficial, if produced in cooperative encounters. The informative value of such signals depends on their referential specificity, which in turn depends on the range of elicitors that

produce the signals, on their visual or acoustic distinctiveness, and on the context in which the receiver perceives the signal. For example, primates' alarm calls vary depending on the status and kinship of the audience or the presence of potential risks derived from the salience of the signal (see Owren, Amoss, and Rendall 2011). However, such signals lack a key feature of human communication: the sender cannot have a cognitive representation (theory of mind) of the receiver's mental state and the ways in which the message will change such a state and consequently the receiver's behavior. Animal communication can change the receiver's behavior to the sender's benefit, but with no sender's representation of the receiver's mind. Chimpanzees are probably the only non-humans in which researchers have hypothesized some rudimentary representation of others' perceptions when, for example, they teach them to use tools or they infer what another chimpanzee can or cannot see. But even chimpanzees have no cognitive representation of their conspecifics' ignorance or need (see Tomasello and Call 2007).

This relative advantage for chimpanzees over other animals (see, however, Sayers and Lovejoy 2008) and their relative closeness to humans on the evolutionary tree have meant these primates have become a source of hypotheses about hominins' (i.e., humans and their immediate ancestors') behavior prior to 2.5 million years ago. These hypotheses assume that chimpanzees and humans share some forms of animal communication through behaviors such as facial displays. In more technical terms, what these hypotheses say is that such behaviors are homologous, i.e., that they are anatomically and functionally similar because they have a common evolutionary origin, six million years ago, when humans' and chimpanzees' evolutionary paths divided.

For example, research using a careful observational description of muscular movements (Vick et al. 2007) has found anatomical similarities between typical facial displays in chimpanzees and humans (bare-teeth display and smile, chimpanzees' and humans' screams, bulging lip face to human "anger," and play face and laughter). But functional similarity is a complex issue, and researchers have claimed potential homology for just two of the chimpanzees' facial displays described (bare-teeth and smile, and play face and laughter; see Parr and Waller 2006). Even in these cases, the homological equivalence is based on a very broad, vague functional similarity. The chimpanzee's bare teeth seem to be displayed as a signal of appeasement or benign intent (Preuschoft and van Hooff 1997), which involves a very broad referential value and affective content. Some anecdotal evidence shows how broad and context-dependent the bare-teeth display's referential value can be: one of the pioneers of the study of chimpanzees reared in a human setting (Ladygina-Kohts [1935] 2002) interpreted such displays as fearful, and it seems in fact that chimpanzees' "smiles" were induced in Hollywood movies by the application of aversive stimuli (Reynolds 1981).

Through the study of animal communication it is possible to apply the findings of ethologists and primatologists to the study of human behavior. We can assume

that some forms of animal communication in primates are homologous to human behavior (or at least analogous: similar behaviors in response to similar selection pressures but with no common evolutionary origin), and for this reason they share a referential non-specificity strongly dependent on the context of the message. But psychologists should bear in mind that a theoretically coherent approach to human behavior as animal communication should not, for example, look for a specific referential value for such human behavior presumably homologous to animal communicative signals. From this point of view, facial behavior (e.g., smiles) would be, as in chimpanzees and other primates, signals with a highly variable affective content, depending on the context of sender and receiver. In fact, this approach is coherent with the findings of naturalistic studies about human facial behavior in general.

For example, researchers have found that smiles convey different referential and affective messages depending on the context. Mehu, Grammer, and Dunbar (2007) reported a significant relationship between the frequency of smiles and the sharing of resources, and senders' smiles predicted receivers' but not senders' reports of happiness. Eibl-Eibesfeldt (1989) found that social invitations are typically linked, across cultures, to fast eyebrow-raising and to smiling. This broad referential value has been corroborated by experimental psychologists who have isolated dynamic aspects of facial behavior (e.g., Krumhuber et al. 2007) and voice (e.g., Owren, Rendall, and Bachorowski 2005) that influence receivers' affective and motivational states – e.g., decisions to cooperate – without a conscious cognitive representation of such dynamic aspects and their detection.

The human-behavior-as-animal-communication approach means that humans retain some vestiges of an ancestral system of mutual influence. This animal interactive system, hypothetically shared with some great apes, would require a degree of sensitivity to others' intentional action and perception (e.g., being sensitive to others' gaze direction), but not senders' sharing of psychological states such as receivers' intentions, perceptions, or focus of attention (e.g., discriminating between those potential receivers of an alarm call who are probably aware of the danger and those who are not) (see Tomasello and Carpenter 2005).

The inclusion of specific semantic categories in this process (e.g., assuming that the messages conveyed by a smile can, on evolutionary bases, be translated into a task of semantic recognition) would mean betraying the conceptual bases of this hypothesis. A specific, semantic, referential value is not compatible with the hypothesis of human animal communication because such referential specificity requires the enormous step forward in senders' and receivers' cognitive capacities that makes human language possible. I shall return to this point in the conclusions of this chapter.

In summary, the study of animal communication is an important avenue for the understanding of certain kinds of human behavior. According to this hypothesis, some forms of human behavior have an unspecific, context-dependent refer-

ential value which is independent of their emotional content, and do not require an active process of mind-reading in the sender. Their functions would be equally flexible and context-dependent, encompassing a fuzzy set of events not always transparent to common-sense categorizations based on everyday language. Some recent research explores signals that seem to have these features. For example, Fernández-Dols, Carrera, and Crivelli (2011) have found that facial behavior during sexual intercourse (a highly relevant behavior from an adaptive point of view) is strikingly similar to the facial behavior documented for pain (Prkachin 1992). A potential way of interpreting this lack of referential specificity is that such important facial behaviors have one function (e.g., to focus the attention of our partners, see Williams 2002) but can convey multiple messages that are extremely dependent on context, with no specific referential or affective fixed value. Another example is crying, which might have specific adaptive functions – for example, eliciting care from others, given its early appearance in humans and its prevalence (see Soltis 2004) – but has widely differing affective and referential meanings depending on its context: happiness, pain, anger, empathy, and so on (see Miceli and Castelfranchi 2003).

3 Adaptation vs. adaptive

Approaching human behavior as animal communication means that such behavior is functional for senders and also, in many cases, for receivers. However, this basic agreement conceals some important divergences in explanations of the origins of such functionality.

Some researchers approach human animal-communication as an adaptation. This assumption implies that codes are functional on evolutionary bases because they are contained in the genes, transmitted from parents to offspring, and run as innate programs. Other researchers stress that animal-communication human behaviors are adaptive in their current form, but are not necessarily the result of domain-specific programs carried by our genes. From this point of view, any functionality of human behavior depends on the context because in humans functionality is all about flexibility.

The evolutionary accounts of human behavior underlying the terms “adaptation” and “adaptability” or “adaptive behavior” are significantly different. A behavioral adaptation is the outcome of a process of natural selection because of its functional value in a specific environment of the human evolutionary past. The concept of adaptation emphasizes a static approach to the evolutionary adaptedness of human behaviors. A particular environment in the remote human past (typically the Pleistocene, i.e., between approximately 2.5 million and 10,000 years ago) would prompt a modular organization of the future human brain with a number of domain-specific regions aimed at solving specific problems of survival and

reproduction. Such adaptations would “carve the mind” at its natural, innate “joints” (see, for example, Buss 1999), and would produce universal psychological processes that were functional in the Pleistocene but not necessarily in our contemporary society.

3.1 Adaptation

Defenders of these views are generally called “evolutionary psychologists.” Their work consists in applying these theoretical assumptions to different problems, such as interpersonal trust, mate choice, or aggression. Tomkins’ (1962, 1963) influential ideas about “Affect Systems” and their subsequent application to the study of facial behavior – more specifically a subset of facial behaviors called “facial expressions of basic emotion” – have played a decisive role in the development of an evolutionary psychology of affect communication. Affect systems or basic emotions would be located in brain modules. In this way, facial behavior becomes modular, universal, and primitive, which at the same time means based on “old structures of the brain” (basal ganglia and limbic system) and homologous to the facial behavior of other primates that diverged from the genus *Homo* six million years ago. From this perspective, communication of emotion through facial behavior is a legacy from our evolutionary ancestors that we share with other primates, such as chimpanzees and bonobos.

Unfortunately, not much is known about the specific circumstances that could lead to the hypothesized adaptations predicted by evolutionary psychology. For example, a common assumption about human adaptations is that bipedalism and facial communication were the consequence of our ancestors’ adaptation to their environment. Propensity to a standing posture would allow humans to detect potential predators on the plains of the African savanna and study others’ facial behaviors. But such a commonsense and widespread hypothesis is debatable. Chimpanzees and other animals can adopt an upright posture frequently and without much effort (see Sayers and Lovejoy 2008), and it is not at all clear that the human environment of the Pleistocene was similar to the contemporary African savanna (i.e., grassy open plains without thick forest). New evidence in fact suggests that early hominins lived in forests rather than in the savanna (Gibbons 2002).

Furthermore, establishing what processes are subjected to natural selection is plagued with serious problems. A behavior can be a consequence of developmental constraints which, with an attractive label, can be convincingly portrayed as selected for a particular function. In the case of communication, the assumption that any relevant behavioral propensity has a function because of a history of natural selection leads to a potentially circular explanation in which those behaviors that seem commonsensically significant must have a pre-programmed adapta-

tion. Scholars have put forward convincing arguments about the obvious adaptive advantage of a number of behaviors, badges, or physical appearances, but the persuasiveness of such functional *a priori* explanations does not preclude debatable inferences. An example of such inferences is Sell, Tooby, and Cosmides' (2007) concept of "formidability." According to these authors, anger is an innate neurocognitive program created by natural selection to help people win conflicts, and for this reason those individuals with better physical resources for winning conflicts are programmed to be more prone to anger. This would apply to males who would typically win their conflicts by inflicting pain (males with greater body size) or to females who would typically win their conflicts by providing pleasure (more physically attractive women). Sell, Tooby, and Cosmides found that bigger men and more attractive women reported being more prone to anger and having more favorable attitudes to aggression, which seemed to confirm their evolutionary hypothesis. Unfortunately, there is no plausible explanation for why attractiveness (which, by the way, also predicted anger in men) predicted favorable attitudes to aggression in women, why women's strength was not correlated with anger, and how natural selection was able to develop in the Pleistocene an encapsulated program through which we are still capable of discriminating relative concepts such as "big" or "attractive" in a particular historical and geographical location. Finally, if anger helps to solve conflicts, an additional question is why nature has not adopted the opposite strategy, helping relatively smaller – women, for example – or more intelligent – again, for example women – individuals with extra compensatory proneness to feel anger when in a conflict. An appearance of irrational anger can be a powerful deterrent in confrontations with stronger opponents (Schelling 1980).

3.2 Adaptive

An alternative strategy in considering human behavior consists in focusing on adaptive behavior rather than on adaptation. When a behavior is defined as adaptive, the assumptions are not about its evolutionary history, but about its contemporary efficiency for increasing reproductive success. The focus is individuals' capacity for ensuring the transmission of genes to further generations, which means as many and as healthy offspring as possible, given the environmental circumstances.

Advocates of this view are generally called "behavioral ecologists." This approach is less popular in psychology than in anthropology or ethology, and this probably explains why hypotheses about nonverbal communication from a behavioral-ecology point of view are less well known in psychology than those inspired by evolutionary psychology (Laland and Brown 2002).

If Tomkins and his followers represent the prototypical example of the approach to facial behavior as adaptation, Fridlund (1994) provides the best exam-

ple of an approach to facial behavior as adaptive. For Fridlund, facial behavior cannot express emotion because there is no plausible fitness maximization for being transparent about our emotions. Quite the contrary: a nature-driven tendency to “honest” displays of emotion would make the sender more vulnerable to abuse or manipulation by conspecifics and to attacks by predators. From this view, facial behavior is a trade-off between sender and receiver, and the key question is how environmental factors influence the costs and benefits of such a trade-off. In other words, the meaning of the facial display depends on the context in which it is produced, and this can be summarized in Smith’s (1965) formula of animal communication: message plus context equals meaning. Such meaning is particularly relevant for producing effects in the receiver that are beneficial for the sender, rather than for expressing an inner state in the sender. For this reason, Fridlund maintains that sociality is a necessary elicitor of facial behavior, and that facial behavior – popularly known as “facial expression” – is an individual’s behavioral tool for achieving certain goals. People cry seeking help or succor, smile for transmitting sociality, frown for rebuking others, and so on. Some textbooks and reviews have misinterpreted Fridlund’s view, concluding that he claims facial behavior to be exclusively learned or to express sociality rather than emotion.

From an ecological-behavioral view, the most important outcomes of human evolution are not specific adaptations but a more generic and powerful adaptation: adaptability. Human behavior results not from domain-specific mechanisms but from flexible cognitive and motivational resources that can take multiple forms in different contexts, and involve different strategies with respect to potential social or environmental constraints. Thus, the most important and misunderstood of Fridlund’s points are (a) that facial behavior is not necessarily learned, and (b) that it expresses nothing because it is a behavioral strategy driven by the sender’s motives or needs.

The emphasis on adaptiveness is not without its criticism, and there has been lengthy debate on the feasibility of such an approach (e.g., Symons 1989). As was the case with evolutionary psychology, behavioral ecology hypotheses are extremely difficult to test on empirical grounds, especially with respect to their long-term consequences for individuals’ reproductive success. But the most substantial discrepancies between evolutionary psychologists and behavioral ecologists probably concern the contemporary functionality of an observed behavior. A radical behavioral-ecology approach would deny the existence of shared dysfunctional behaviors (e.g., a widespread, massive investment of the material resources in tobacco or alcohol, see Symons, 1990), which is rather implausible. On the other hand evolutionary psychologists sustain that most human behavior is a consequence of a functional phenotypic design of the human brain in a remote past (environment of evolutionary adaptedness) even if sometimes it is not adaptive in the contemporary human environment (e.g., the unhealthy human taste for industrially produced sugar can be a past adaptation from an ancestral environment in which natural sugars were very rare).

As is probably true for any debate in psychology, the right approach to the choice between adaptation and adaptive would consist in conciliating these two views by softening their most radical assumptions. Humans may have some psychological mechanisms that are not necessarily adaptive and come from our remote evolutionary past, but we are the only species capable of construing our own ecological niche. The extreme variability and flexibility of human ecological niches allow the combination into a behavioral set of some adaptations that remain adaptive in contemporary humans, of exaptations (behaviors that are not the outcome of a remote process of natural selection but have become adaptive now), and of a number of adaptations that are no longer adaptive but were probably adaptive in a remote selective environment.

Human behavior is complex enough to constitute a large “toolbox” that includes current adaptations, past adaptations, exaptations, and even dysfunctional behaviors that are neither past adaptations nor currently adaptive. A key question in this chapter concerns how much weight such animal-communication tools have in human communication. The next paragraph sets out to answer this question while discussing the origins of the main definitional referent of nonverbal communication: verbal communication.

4 Verbal versus nonverbal

“Nonverbal communication” includes a positive proposition (there is fully-fledged communication) and an implicit negative proposition (that it is not verbal). If animal communication is a functional interactive resource, verbal and nonverbal communications constitute an extremely functional system that can be called “human communication.” Human communication implies a shared code, which includes the capacity on both sides – sender and receiver – for sharing others’ psychological states.

Understanding the concept of “nonverbal” requires the previous discussion of its positive counterpart, “verbal.” “Verbal” means “expressed with words” or, more specifically, expressed with spoken words. In principle, this definition seems intuitive and commonsensical, but it poses a number of interesting problems when we try to produce companion definitions for “verbal” and “nonverbal.” A verbal message is the utterance of words, and words are symbols, i.e., arbitrary selected vocalizations that have one or several meanings and are produced in sentences governed by non-arbitrary syntaxes.

There is an almost perennial controversy about to the extent to which the main function of language is cognition or communication. Some authors (e.g., Hauser, Chomsky, and Fitch 2002) argue that the main feature of language is its recursivity, and that language is a system for expressing thought (Chomsky 2000). On the other hand, other authors emphasize communication as the main function of language.

Verbal communication is language, i.e., thought and communication, but it is also the most primitive and universal manifestation of language: human talk. “Spoken words” – i.e., verbal behavior – are inextricably and substantially embedded in behaviors that are nonverbal, e.g. vocal sounds. The universal production of such utterances strongly suggests a history of evolutionary adaptations that seem nonverbal but are nevertheless necessary for the existence of verbalizations. For example, the lower location of the human larynx is probably a basic adaptation for the voluntary production of vocalizations by controlling the supralaryngeal vocal tract (see Corballis 2003). The costs of this unusual (albeit not exclusive to humans, see Fitch and Reby 2001) morphology of the vocal tract hints at the importance of some nonverbal tools for verbal communication (e.g., the production of acoustic signals). A lower larynx makes breathing and swallowing incompatible, a very rare and dangerous innovation in mammals’ anatomy that makes humans extremely vulnerable to choking.

Verbal communication requires the existence of a broad set of complex movements of lips, velum, larynx, and tongue in all languages, irrespective of whether such behaviors were originally adapted for verbal communication or not. Should we consider these behaviors as nonverbal or verbal communication? On the one hand such behaviors – as well, probably, as other body movements apparently unrelated to spoken language, such as the voluntary control of breathing – are as necessary for the actual production of human verbal behavior as some human cognitive processes (e.g., recursivity). On the other hand, such behaviors lack any meaning by themselves: the sounds that constitute speech are combined in phonemes (the smallest phonetic unit that can convey linguistic meaning), but are also combined in a broad variety of nonverbal acoustic utterances (shouts, cries, gurgles, and so on) that are not, strictly speaking, verbal.

This dialectical combination of necessary behaviors and necessary cognitive features (e.g., the capacity of language for producing infinite combinations of words) has fascinated those researchers who have tried to explain the evolutionary origins of language. How can language combine such antithetical features? And how were such antithetical features coordinated into a universal human behavior called verbal language? Why does such universal adaptation have so many cultural variations? In attempting to answer these questions, scholars have come up with a range of solutions. Some emphasize the cognitive constituents of verbal messages, making of the nonverbal component a secondary, even accidental feature. Others emphasize the behavioral side of verbal language, paying relatively little attention to the cognitive features.

For example, Hauser, Chomsky, and Fitch (2002) distinguish between a “narrow language faculty” and a “broad language faculty.” The broad language faculty would include a number of cognitive and perceptual mechanisms such as discrimination of phonemes and sentences and the categorical perception of conceptual representations. The narrow language faculty would include an abstract computa-

tion that generates internal representations and translates them into a specific phonological system and its corresponding semantic system. The central feature of this narrow faculty would be recursion (the capacity for repetition in infinite variations, embedding phrases within phrases of the same type).

On the other hand, other authors (e.g. Arbib 2005; Falk 2004) attribute an instrumental role to gestures or vocalizations either in the origins or in the definition of current language. For example, Arbib's hypothesis is that language evolved as a manual, facial and acoustic system that scaffolded a vocal protolanguage. Imitation of motor actions such as grasping could have given rise to a manual-based communication system. Such pantomime already requires a sender's intentional interaction that assumes some kind of inferences in the receiver, i.e., communication. This protoverbal communication would have caused the neural improvements which, in turn, allowed language, i.e., verbal communication. The need to disambiguate such pantomime representations would require new sorts of gestures that would pave the way to conventional manual protosigns and, over millions of years, a fully-fledged language.

These two opposing hypotheses about the origins of language have provoked a number of typical, expectable criticisms. Those who approach the origins of language as the side-effect of some new cognitive and perceptual capacities are taken to task for not paying attention to how the appearance of verbal communication needs complex phonological skills and specialized cognitive capacities – mostly related to speech perception and speech production. Such skills and capacities could not be ready to support the first forms of fully-fledged language without some proto-development of a communicative interaction parallel to the proto-development of sophisticated cognitive representations (see Pinker and Jackendoff 2005).

Those who support hypotheses which choose to approach the origins of language as a consequence of communicative, intentional interactions – based on relatively simple mechanisms such as mirror-neuron-based imitations – are taken to task for their inattention to the necessary cognitive representational capacities that support syntax and semantics. Such complex representational capacities seem to need a cognitive evolution that is scarcely explained by the mere repetition of some simple interactive signals (see Bickerton 2004).

As Bickerton (2007) concludes, only a few points are uncontroversial after decades of research on the origins and evolution of language: (a) that Australopithecines probably had no language, but *Homo sapiens* had language around 50,000 years ago, (b) that around 2 million years earlier there was a protolanguage, and (c) that the evolution of protolanguage into language was somehow connected to the evolution of cognition. The nature of the connections between protolanguage and cognition, the features of such protolanguage, and the selective pressures that caused protolanguage to appear remain unknown. For example, there are unsolved controversies around preliminary questions such as why language did not evolve

towards a gestural sign-language – similar to sign languages for the deaf – instead of towards a vocal one, or why humans are the only verbal primates, given what we know today about the advanced social intelligence of other primates and other animals.

In any case, and this is the essential message of this discussion, it is clear that the origins of nonverbal communication are part of the origins of verbal language. If the cognitive representational capacities had the primary role, nonverbal communication was a key tool in the development of verbal communication as speech. If the interactive capacities had the primary role, protolanguage was nonverbal communication. In other words, whatever the scenario, the origins of nonverbal communication are the origins of verbal communication. Verbal and nonverbal communication are not independent, isolated domains, but rather different views on the same reality. To explain the origins of verbal communication is to explain the origins of nonverbal communication. What were the roles of pantomime, posture, and facial behavior in social exchanges? How did the transition from inarticulate sounds to speech take place? And why did vocal utterances take over from gestures in humans? And so on.

An additional body of evidence that reinforces the approach to verbal and nonverbal communication as a unitary phenomenon comes from the study of brain evolution. The acquisition of verbal communication, according to the paleontological and archeological evidence, had an intriguing trajectory. Early hominins speciated from other primitive primates around 6–7 million years ago (when “we” diverged from chimpanzees), and gave rise to the genus *Homo* 2–3 million years ago. This mind-numbingly long period of evolution was followed by an amazingly short period of rapid and gigantic changes. Human language based on a presumably universal deep grammar only appeared between 140,000 and 90,000 years ago, and it finally became evident around 50,000 years ago, with a massive production of symbolic artifacts that led, in a few “seconds” of evolution, to current human culture and a linguistic landscape very similar to that of our contemporary civilizations. The key causal factor of this dramatic appearance of language was a parallel and even more dramatic “bang” in the evolution of the human brain, which was clearly reflected by its growth in size.

Current approaches to the study of brain evolution have helped to discard the popular theory of an additive growth of human brain. According to that theory (MacLean 1990) human brain evolution consisted in the mere addition of neocortex to a primitive reptilian brain. Instead, current research supports a more complex brain evolution with important systemic changes. The contemporary human brain is characterized by a massive neocortex, and its relatively sudden appearance forced deep transformations in the organization and functions of this organ. For example, a key feature of the neocortex is the laminar organization of its neurons (in spatially differentiated layers), which increases the efficiency and selectivity of synapses. Primitive as well as new brain regions – and their interconnecting cir-

cuity— underwent important changes, and information from the basal ganglia and the limbic system were re-routed through the neocortex. These systemic changes are illustrated by the finding that hominins' brains, once they diverged from apes around six million years ago, increased their size in two main “bangs.” The first bang involved an increase from approximately 400 cm³ to 800 cm³, and is associated with the origin of the genus *Homo*, between 2 and 1.5 million years ago. The second bang occurred around 100,000 years ago, and increased the size of our brains to their current volume (between 1,200 and 1,800 cm³). As mentioned above, this increase is connected to the emergence of *Homo sapiens*' language and human civilization (see Striedter 2005).

Furthermore, and most importantly for an understanding of the origins of nonverbal communication, the hypothetical gestures and expressions inherited from primates and hominins also underwent important changes. The huge expansion of neocortical projections allowed a previously unseen coordination not only of the respiratory, vocal, and oral muscles involved in language, but also of limbs, facial muscles, and eyes, i.e., of the basic tools for nonverbal communication. Verbal and nonverbal communication became a behavior that is not regulated by specific locations in the brain but by neural circuits networking multiple processes in cortical and subcortical structures (see Lieberman 2002).

Whereas the joint evolution and tight interconnections between gesture and language are a highly plausible explanation for those gestures that accompany speech, the most popular approaches to other forms of nonverbal communication, such as facial behavior (for a review on facial expression from an evolutionary perspective see Schmidt and Cohn 2001), have been mostly inspired by locationist approaches, such as McLean's additive view of human brain. In this view, the brain is organized in independent, modular sets, and basal ganglia and some key structures of the limbic system retain old functions and still fire the behaviors of our remote ancestors. This hypothesis has given rise to some questionable views about the structure and function of some brain regions involved in the production of nonverbal communication.

A conspicuous case, given the interest it had aroused in psychological sciences over the last 15 years (LeDoux 1996) is the function of the amygdala in the communication and experience of emotions through facial expression. In primates, the amygdala is characterized by its massive connections with other brain regions, organized in a direct subcortical pathway, and an indirect cortical pathway. According to a popular view of the amygdala's functions, the direct subcortical pathway is a legacy of the modular brain structures already functioning 6 million years ago. It would allow primates, including humans, to perform an automatic detection of specific visual emotional (fearful) stimuli. This module would be a domain-specific structure, a “fear module” designed by evolution as an adaptive tool for prototypical situations faced by primates and early hominins (e.g., the sudden appearance of a snake). One of the functions of this fear module would be

the recognition of expressions of fear, also designed by evolution even before the appearance of hominins.

This approach to the role of amygdala seemed to confirm the expectations of mainstream views on facial expression of emotion – which claim the existence of innate basic-emotion modules with specific, coherent sets of physiology, action tendencies, experience, and expression. Nevertheless this approach did not take into account the above-mentioned enormous interconnectivity between the neocortex and the older regions of the brain produced in the above-mentioned “bangs” that increased brain size and complexity. Further research has found that the amygdala is not a module, and nor is it specialized for fear. Whalen et al. (2001) found that the amygdala is more activated by expressions of anger than by expressions of fear, and subsequent studies have concluded that the amygdala is also activated by both positive and negative emotions (e.g., Yang et al. 2002). Thus, current approaches to the amygdala (see Sander, Grafman, and Zalla 2003) portray this complex brain region as a flexible processor aimed at the detection of uncertain events and objects – not just facial expressions – in which the subcortical and the cortical pathways play a joint role in the processing of events. Understanding the communication of emotional messages in facial behavior requires a broader, neural-circuits approach to the dynamics and functions of different brain regions (Kagan 2007).

In conclusion, when talking about nonverbal communication “*sensu stricto*,” we cannot understand, even define, “nonverbal” unless we bear in mind that (a) such a concept lacks any specific content without its counterpart (“verbal”), and (b) that the previous remark is based not merely on a play on words. The evolution of our body movements, and particularly the evolution of our hand and face movements, is inextricably linked – for some authors in a causal way – to the evolution of language. Even if the evolution of social intelligence was not the direct cause of language, the emergence of verbal communication was parallel to dramatic changes in our body movements. In other words, current evidence does not suggest that nonverbal communication is caused by some kind of brain time-capsules, modular structures that reside in our reptilian brain or our limbic system.

Nonverbal communication probably derives from much more recent neural-circuit systems that involve complex interrelations between different brain regions and multiple projections into their corresponding sensorimotor maps. Like language, human nonverbal communication is a key human tool in the construction of human culture, not a mere relic of our phylogenetic relatives, primates, and hominins. Evidence supports a co-evolution of verbal and nonverbal communication. If this conclusion is correct, we can return to the question that closed the previous paragraph on adaptation versus adaptive. What is the role of past adaptations, current adaptations, and exaptations in human nonverbal communication? A plausible answer is that nonverbal communication has been mainly shaped by the cultural and environmental factors that boosted language over the last

50,000 years, secondarily shaped by the plausible role of gestures in the development of a protolanguage (since 2.5 million years ago), and only indirectly influenced by our phylogenetic past prior to that landmark.

In other words, psychologists should restrict the term nonverbal communication and, most importantly, the assumptions behind such a concept, to those kinds of behavior that have a *functional similarity* with verbal communication. Nonverbal communication and verbal communication are the dialectical constituents of the same phenomenon – human communication – and they share neural causes and evolutionary origins (McNeill 2005).

5 Conclusion: Animal communication and nonverbal communication in perspective

Up to this point, I have described two functional forms of social influence available to human beings. Animal communication is a set of behaviors with an unspecific, flexible referential value, whereas nonverbal communication is a set of behaviors and processes with a specific referential value (meaning). The two systems can coexist in human beings, but the influence of each system and their interfaces are important matters for research. Coming up with empirical answers to these questions requires being aware of the important differences between the conceptual consequences of approaching human behavior as animal communication or as nonverbal communication. Besides nonverbal communication and animal communication, there are also an important number of studies that have been traditionally labeled as nonverbal communication and are worth pursuing (e.g., studies about the pattern of body movements that influence person perception) but, as I have discussed in a preliminary section, they should be properly labeled as behavioral experiments (as opposed to paper and pencil studies).

Most, if not all, of the field of nonverbal communication can be reconsidered from the minimalist approach of animal communication, but this approach – showing clear epistemic parallelisms with behaviorism – was not widespread among the authors who from the late 1950s to the early 1970s made nonverbal communication popular. A substantial portion of the early research on nonverbal communication was carried out in the framework of clinical studies of psychoanalytical inspiration, which opened the way to a more ambitious view about human behavior as nonverbal communication. Methodological decisions were probably made on intuitive, common-sense bases, without much thought for their theoretical consequences (see, however Wiener et al. 1972).

When psychologists approached a particular behavior as nonverbal communication, there were a number of implicit assumptions that shaped the field. A first conceptual change was the assumption of a nature-given causal link between

source (psychological process) and signal (behavior). The source commands a meaningful behavior for functional reasons. In other words the source *expresses* a meaning through such a signal, which accomplishes a particular function. Behavior exists because it has a meaning, and it has a meaning because that meaning has an adaptive function for its sender. In this way, behavior becomes nonverbal communication because it has a strong semantic and functional dimension. If a psychological process (e.g., emotion) expresses itself through meaningful signals (e.g., facial expressions of basic emotion), such signals have a prescriptive, imperative content. “Prescriptive” means, as in linguistics, the existence of certain norms that prescribe which signal is “correct” (true, honest, spontaneous) for being functional. By “imperative” I mean that nature commands a compulsive, unavoidable (even though concealable) causation of the signal by the source. As in some approaches to genetic information, expressions are specific semantic messages with a functional mandate. Researchers and the public assume this view when, for example, they use “smile” and “happiness” as semantically interchangeable. Borrowing a term from the philosophy of biology (see Godfrey-Smith and Sterelny 2008), I call this view “teleosemantic.”

The second conceptual change was that this teleosemantic approach to information – in which the psychological process “talks” and “operates” the world through our body– became the basis for the prevalent and most important relationship between source and signal. Environment was downplayed and became a mere circumstantial obstacle for the expression of the process. The relationship between expression and context was implicitly framed as the relationship between an independent, necessary process (the process that causes expression) and an incidental, random framework (context) (see Fernández-Dols and Carroll 1997).

Influential researchers adopted the above-described teleosemantic approach to nonverbal communication by assuming that the brain or specific regions of the brain literally “express” themselves, like inner homunculi, through signals aimed at “talking” to others and fulfilling a current or past adaptive function. For example, Silvan Tomkins (e.g., Tomkins 1975) concluded that facial behavior had the function of expressing emotion, or indeed, that emotion was literally in the face. In this view, some particular facial configurations are innate and specific expressions of certain affect programs or basic emotions located in specific subcortical brain regions. The affect program command of the expression is so close that the expression constitutes an icon of the affect program. The expression is the image of the cerebral process that “talks” to the receiver through the sender’s face. And these expressions are said to be justified on a particular reading of Darwin’s concept of natural selection.

Much less popular has been the assumption that the meaning of the nonverbal signal is produced not by a hidden homunculus who lives “north of the neck,” but by the interaction between sender, receiver, and environment. Such assumption does not imply any of the two conceptual changes of the nonverbal-communication

approach: there are no expressions with a prescriptive, imperative meaning, but rather strategies of influence that are flexible for being adaptive. Furthermore, the context plays a central role in the final determination of the consequences of the signal for sender and receiver. In this framework “false” or “true” behavior (e.g., a “false” or “true” smile) makes no more sense than “false” or “true” digestion.

This option is consistent with the above-described contemporary approach to human behavior as animal communication but also has old roots in psychology. George Herbert Mead’s ([1934] 1967) views on the expression of emotion provide a venerable example of this approach. For Mead, facial behavior does not have the function of expressing emotion (i.e., of being a signal of emotion). Facial behaviors are rather parts of complex acts which, all in all, include the sender’s acts themselves and the receivers’ responses. An angry sender can consciously choose to display a conventional verbal non-vocal signal of anger (e.g., by consciously choosing to shake his fist in the receiver’s face), but his nonverbal “angry” displays are behaviors without specific denotation that are a stimulus for the receiver, who also changes posture and facial display, leading to new behaviors in the sender, in an ongoing “conversation of gestures.” The expression of emotion is, in Mead’s view, a series of sender’s and receiver’s behaviors that “call out” appropriate behaviors, in a global episode that has an emotional meaning for an observer. In other words, nonverbal communication alludes to the secondary role of each individual behavior in the primary meaning of the global set of actions that constitute a particular emotional episode.

These two perspectives – animal communication versus nonverbal communication– can coexist in the study of human behavior. In some cases, a particular behavior seems to be clearly included in the realm of nonverbal communication or animal communication. The study of gesture, i.e. behavior of limbs and body that accompanies speech, probably provides the most relevant examples of nonverbal communication (but see, for example, Blute 2006 for an approach to gestures as animal communication). The most well-founded and potentially most fruitful theories in nonverbal communication are those that emphasize this tight dialectical relationship between verbal and nonverbal communication. For example, McNeill’s (2005; see also Kendon 2004) theory states that gestures and language are a bodily expression of meaning. Gestures are not just images, but concepts; speech and gestures co-express meaning in two parallel, synchronic modes that are simultaneously active in the speaker’s mind. For McNeill, hand and arm movements have specific adaptive and communicative value, and played a key role in the evolutionary genesis of language. Empirical research seems to support these claims, particularly for children and for gestures about spatial and motor topics (see Hostetter 2011).

On the other hand, studies of vocal elemental behaviors, such as crying or laughter, provide examples of animal communication still relatively prevalent in humans. For example, Owren, Amoss, and Rendall’s (2011) model on vocal produc-

tion describes two systems of vocal production. In the first system (called Production First), experience and practice would play minor roles, generating a restricted range of signals, whereas in the second system (called Reception First), experience and cognitive control would generate a more extensive repertory of flexible signals. Both systems are animal communication, and they would be interrelated, particularly in humans, where the Reception First system is prevalent due to the evolutionary explosion of connections between cortex and midbrain. But some kinds of human behavior, such as certain forms of laughter (e.g., babies' laughter), would be essentially Production First utterances, whereas others (e.g., a lecture on mathematics) would be essentially Reception First products.

Owren, Amoss, and Rendall's (2011) approach is an excellent example of the way in which vestigial animal communication and nonverbal communication should be studied in the psychological sciences. The focus of their theory is not only the existence of two kinds of vocal production, but also of the complex and important interactions between the two systems, particularly in humans. In this view, animal communication gives rise, on an evolutionary continuum, to two systems of vocalization. The existence of two systems of animal and human communication is the main research problem, rather than the final solution for the understanding of nonverbal communication.

Of course, alternative theories and hypotheses can also compete in this framework (e.g., a theory emphasizing a qualitative discontinuity between the animal Production First system and human language) or consider other targets of research (e.g., facial behavior or gestures). The take-home message of this chapter is that such theories should bear in mind that the co-existence of animal communication and nonverbal communication in humans is summarized in two relevant aspects: strong internal interaction between the neural circuits involved in these processes, and a strong social interaction between sender, context, and receiver – two forms of interaction that constitute a single manifestation of the unique, amazing phenomenon of human evolution.

Unfortunately, some of the most influential fields in the study of nonverbal communication have mixed the conceptual assumptions of human communication and animal communication into an apparently monolithic system, resulting in a series of unfortunate misunderstandings. These basic misapprehensions about the natural history of nonverbal communication have led to the myth of an "animal language," millions of years old. The most popular books on nonverbal communication (e.g., Desmond Morris' *The Naked Ape*, published in 1967, which sold millions of copies all over the world) were based on simplistic evolutionary arguments that have become part of contemporary popular culture. This mythical teleosemantic evolutionary approach to nonverbal communication was, in fact, also promoted by Darwin himself when he wrote for a popular audience *The Expression of the Emotions in Man and Animals* ([1872] 1965). Popular evolutionism has promoted an attractive and commonsensical approach to nonverbal communication whose most conspicuous case is the aforementioned study of the facial expression of emotions.

The most important and influential example of this popular teleosemantic evolutionary view is provided by those followers of Tomkins who simultaneously support two reasonable but incompatible hypotheses. The first hypothesis is that a set of human facial expressions are homologous to those produced by our remote evolutionary ancestors about 6 million years ago, and shared with other primates. The second hypothesis, based on some anecdotal remarks by Darwin, is that such expressions have a specific semantic referent that allows people to “recognize” a facial expression through language. Such recognition implies two very different assumptions: that some facial behaviors are perceived as discrete categories of a physical stimulus (the face) but also that such categories are discrete signals of emotional meaning. Whereas categorical perception has been observed in animals and humans, the second assumption – that expressions convey emotional meaning without linguistic mediation – not only has not been confirmed but is extremely debatable (see Barrett, Lindquist, and Gendron 2007). Recognition studies (for a review see Russell 1994) are the most important source of evidence for the claim that there are some universal facial expressions of basic emotion. Mixing ancestral propensities and words runs the serious risk of a sort of evolutionary hindsight bias: that nature, 6 million years ago, “knew” the future course of hominids’ evolution, and was already “speaking” human language, in such a way that provided hominins’ pre-linguistic brains with a precise, discrete categorization of hominids’ facial behavior in terms of *Homo sapiens*’ emotions. On a logical basis, this inconsistency can be resolved in two ways: either by assuming that human facial behaviors homologous to other primates’ displays are a product of ancestral evolution with a flexible, context-dependent meaning and no specific linguistic reference (which would render evidence from recognition studies irrelevant from an evolutionary point of view), or by assuming that human animal communication through facial behavior underwent a process of coevolution with proto-linguistic and linguistic signals. In this case, categorical recognition of emotion would be the outcome of a complex process of evolution in which culture and language played a key role.

Psychologists have an ambivalent or clearly positive attitude toward the mythical evolutionary approach because it has made nonverbal communication one of the most popular fields in psychology. People characterize nonverbal communication as a primitive “revelatory” language, i.e., as a secret code that allows us to perceive senders’ hidden traits or states. This feature is what probably makes some claims about nonverbal communication so popular and commercially profitable: people and key institutions – such as the police – are willing to pay to learn how to “read” such secret states or traits in others’ behavior (for a review, see Vrij, Granhag, and Porter 2010). But perhaps it is time to leave the myth behind us and to focus on the subtle and complex interactions between an open, remote, and relatively opaque-to-language human animal communication system and a much more recent system of nonverbal communication in a dialectical relationship with

language. New evolutionary lines of thought in psychology, such as epigenetic, developmental-dynamics approaches to human behavior (see Bouissac 2006 and Lickliter and Honeycutt 2003) can be instrumental in this endeavor.

We should render unto Nature what belongs to Nature, and render unto Culture what belongs to Culture, but all the time bearing in mind that Nature and Culture are irreversibly melded in human behavior.

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5 Nonverbal communication: developmental perspectives

Abstract: This review examines how nonverbal communication develops throughout the lifespan. The Affective Social Competence (ASC) model guides our review of research investigating how the abilities to receive and send both spontaneous and posed nonverbal messages develop throughout the lifespan, and across multiple channels. As part of this review, we attempt to illustrate how development of such skills from infancy to older adulthood is complex, multidynamic, contextual, and occasionally dependent upon other social cognitive milestones and motivations. Receiving and sending appear to be lifespan projects, with skills and styles developing well into adulthood, and few deficits occurring in later adulthood. Receiving and sending and their developmental processes appear to be related to temperament, gender, family socialization, and cultural values and norms. They also vary substantially by context and relationship, and predict a number of important socio-emotional outcomes. In addition to summarizing findings in the literature, we highlight gaps in our knowledge and generate areas for future research throughout the chapter.

Keywords: nonverbal communication, decoding, spontaneous expression, encoding, lifespan development, infancy, adulthood, aging, family expressiveness, culture

1 Introduction

1.1 Guiding beliefs

Research on nonverbal communication has been largely conducted “within” age groups, yet putting the studies together in age-related order, as in this review, allows us to better connect the dots. In this chapter, three guiding principles in development influence our thinking and recommendations for future research. First, we recognize nonverbal communications as processes which themselves are embedded in the process of development. Second, individuals themselves are complex, multidynamic systems, and their developing cognitive, physical, social, and emotion regulatory skills are likely intertwined with the development of their nonverbal abilities. Third, individuals reside within many social contexts, including family, neighborhood, and cultural contexts, and these contexts impact how individuals interpret others and create their own behaviors within these various lenses.

Although space constraints preclude further discussion of these beliefs, we attempt to interweave these ideas in our review of the literature.

1.2 Theoretical framework

The theoretical framework for this chapter is the Affective Social Competence (ASC) model (Halberstadt, Denham, and Dunsmore 2001). The ASC model proposes that children develop skills in three broad domains: *sending*, “efficacious communication of one’s own affect”; *receiving*, “successful interpretation and response to others’ affective communications”; and *experiencing*, “awareness, acceptance, and management of one’s own affect.” Within each broad area, there are related skills which children develop with age and experience (Halberstadt, Denham, and Dunsmore 2001). Communicating effectively with others includes becoming aware of some kind of communication or message, identifying the message, understanding the meaning of the message within the context of display rules, and managing the delivery or receipt of that message. In this chapter we explore how these sending and receiving skills develop across the lifespan.

1.3 Domains

We discuss receiving first. The first step in receiving communication from others is noticing that a message is being sent; once that message is perceived, the message must be identified and interpreted correctly (Halberstadt, Denham, and Dunsmore 2001). Individuals must be able to do all this while also becoming aware of and negotiating their own feelings about and goals regarding the social interaction, and accurately communicating their own feelings and goals as well. Receiving messages from others (e.g., a frown from a teacher) gives direct feedback about one’s own conduct (e.g., student talking loudly to a classmate), as well as the other person’s objectives (e.g., teacher nonverbally telling the student to stop talking in class). In the language of nonverbal communication, receiving and decoding are synonymous.

We then turn to research on sending, which includes two domains: spontaneous expressiveness and encoding; these are discussed in that order. Spontaneous expressiveness refers to the expressions that people engage in naturally as they go about their daily lives. Such expressions are considered spontaneous in that they are not planned, posed, inhibited, or hidden. An example of spontaneous expressiveness might be a child bursting into tears or shouting angrily when teased on the playground. Encoding includes several skill sets, including but not restricted to posed sending, inhibition or suppression of information, and masking; our review focuses primarily on posed sending and masking studies. Posed sending is the

intentional expression of nonverbal messages. An example is when a child practices with her teacher what she plans to do when being teased on the playground. Inhibition or suppression (we use these terms interchangeably) is the restraint of communication; in the example just above, the child might show a poker-face to the person teasing her, even though she actually feels sad, angry, or scared. Masking is the replacement of felt emotions with expressions that might be perceived as more socially appropriate, for example, the child might smile or laugh back as if the teasing was amusing, even though she does not feel that way at all.

1.4 Channels

The channels we review include facial expressions, vocalizations, gestures, body postures, and body movements. Most studies focus on identifying nonverbal communications within single channels, although it is possible to obtain dynamic, multimodal measures. We included both kinds of studies in our review.

Expressions of the face have traditionally received the greatest attention. In fact, it has been argued that expressions of the body, including gestures, postures, and movements, serve only to enhance information presented in the face (Ekman 1965; Ekman and Friesen 1969) or verbally (McNeill 1985). However, Rosenthal et al. (1979), and, more recently, Pollak (2009) have proposed that while researchers privilege the face; nonverbal communication, with children at least, is likely to be vocal as often as facial. Thus, in this chapter we include research emphasizing nonverbal expressions of face and voice, as well as the growing literature examining nonverbal communication in other modalities, including communicative gestures and body movements.

2 Decoding

2.1 When does the ability to decode messages begin?

The ability to receive messages from others via faces, gestures, and vocalizations begins the first year of life. Infants begin to notice and perceive facial features (e.g., eyes) as early as one month of age (Maurer 1985) and this recognition depends on the specific configuration of features that are unique to faces (e.g., a nose above the mouth; Maurer, Le Grand, and Mondloch 2002). In these early months, infants also develop the ability to recognize and discriminate among faces with different expressions (McClure 2000). At three months of age, infants can discriminate among smiling and frowning expressions, particularly of mothers (Barrera and Maurer 1981), and also among happy, sad, and surprise facial expressions (Young-Browne, Rosenfeld, and Horowitz 1977). By seven months and sometimes earlier,

infants perceive happy and fearful expressions as distinct, with infants looking longer at the fear face (Bornstein and Arterberry 2003; Nelson and Dolgin 1985); by this age infants can also discriminate between fear and anger but not fear and surprise (Serrano, Iglesias, and Loeches 1992). Children and adults also experience difficulty in differentiating between facial expressions of fear and surprise (e.g., Ekman, Sorenson, and Friesen 1969; Gagnon et al. 2010).

Perception of vocal, in addition to facial, expressions is also important in facilitating communication with others. Infants as young as five months old can identify changes in vocal expressions of happy and sad when matching facial expressions are present (Walker-Andrews and Lennon 1991; Walker-Andrews 1997). In naturalistic environments, 2-month olds are able to perceive emotion expressions when communicated by their mothers' faces and voices (Haviland and Lelwica 1987).

Once infants have appraised that there is a message, which is the first step in the ASC model, the next step is to interpret the message; this may involve looking for and extracting relevant information from the expressions of others. For example, 7- to 9-month old infants looked longer at ambiguous than unambiguous faces, particularly when the actor's expression was neutral, perhaps as a means of acquiring more information in order to interpret the actor's actions (Striano and Vaish 2006). Engaging in what is known as social referencing, 12- to 14-month old infants and toddlers tend to look toward their caregivers during uncertain situations to gain information from their caregivers' expressions (Walden and Ogan 1988). In a study focused more specifically on infant reception of nonverbal signals, 12-month old infants responded to mothers' vocal expressions of fear by looking longer at their mothers, as well as reducing interest in the toy and expressing negative affect (Mumme, Fernald, and Herrera 1996). In that study, female, but not male, infants also responded to mothers' fear facial expressions by looking longer at their mothers. The ability to recognize and respond meaningfully to the emotion expressions of others continues to develop and improve throughout infancy (Walker-Andrews 1997).

In addition to perceiving messages from caregivers' faces or voices, infants engage in joint attention. Eye contact between adult and infant is a key feature of joint attention (e.g., looking at each other, directing one's attention, or showing an item to another; Scaife and Bruner 1975). Throughout the first year of life, infants develop an increasing ability to respond to shifts in eye gaze direction of adults, eventually locating the correct object (e.g., Hood, Willen, and Driver 1998; Thoermer and Sodian 2001). By 18 months of age, infants progress further in their ability to recognize and respond to communicative gestures (e.g., Ross and Lollis 1987).

Little is known about infants' ability to respond to body cues; however, an event-related potential (ERP) study demonstrated that 3-month old infants can recognize the configuration of bodies in addition to faces (Gliga and Dehaene-Lambertz 2005). This is possible because bodies share similarities with faces (e.g.,

both faces and body positions convey social and emotional information) and can be recognized quickly in the upright position and processed by the configuration of their parts (Reed et al. 2003). Although infants are aware of changes in face, voice, body and gestural cues, we still do not yet know much about how infants interpret these cues, particularly vocal and body cues; more dynamic studies observing infants' reactions to these nonverbal cues will facilitate our knowledge.

2.2 What do we know about change in decoding ability across the lifespan?

Although some 2-year olds can identify happy, sad, angry, and scared facial expressions (Denham 1986; Wellman et al. 1995), most preschool children are able to correctly identify happiness or joy, but have more difficulty differentiating between negative emotions such as anger, fear, or disgust (e.g., Maxim and Nowicki 2003; Widen and Russell 2003). Throughout preschool and elementary school, children become increasingly skilled at recognizing both basic and complex emotions, such as pride, shame, and guilt, and communications that vary by valence and dominance (Bosacki and Moore 2004; Olthof et al. 2000; Rosenthal et al. 1979; Tracy, Robbins, and Laguttuta 2005; Widen and Russell 2003). Nonverbal decoding skill, particularly for faces, appears to increase linearly through the first two decades (Rosenthal et al. 1979). These linear increases are also supported in a neurodevelopmental examination of children and adolescents' facial emotion processing (Batty and Taylor 2006).

Middle-aged adults tend to more accurately and sensitively recognize and discriminate among nonverbal information from faces than children and adolescents (Ekman 1992; Etcoff and Magee 1992). For example, adults were more sensitive to and cognizant of change in morphed fear and anger expressions, compared to children and adolescents (Thomas et al. 2007). Young and middle-aged adults were also quicker than elementary school children at identifying positive and negative emotions (De Sonnevile et al. 2002). This may be because of their strategies; older adults spend more time than younger adults examining features of the face (e.g., mouth) in order to accurately decode the emotion expressions (Sullivan, Ruffman, and Hutton 2007).

This advantage may dissipate by late adulthood, as older adults are less accurate on many emotion recognition tasks compared to younger adults (e.g., Ebner and Johnson 2009; Isaacowitz et al. 2007), and across multiple modalities: face, body, and tone of voice (e.g., Ruffman et al. 2008; Ryan, Murray, and Ruffman 2010). This decline may be emotion dependent, with greater age-related decline for perception of negative compared to neutral or positive emotions (Mill et al. 2008; Ruffman et al. 2008). There is also a reversal from the pattern, with age-related *benefits*, for distinguishing between posed and spontaneous smiles (Mur-

phy, Lehrfeld, and Isaacowitz 2010). Further, age deficits may be partially due to measurement artifact, as most studies showing age-related deficit use static images (photographs), and the few studies employing dynamic images (videoclips) find no deficit or even an advantage by age (Krendl and Ambady 2010; Murphy et al. 2010). These results fit with the motivational goals of older adults to attend to and enjoy positive emotions, and not focus as much on the negative (e.g., Carstensen, Isaacowitz, and Charles 1999). In addition, age-related differences in emotional understanding and experience may depend on the relevance of stimuli as appropriately motivating for both older and younger adults (Kunzmann and Grünh 2005). Future work may want to examine motivational versus skill types of explanations for this apparent deficit.

Skill in recognizing body poses also develops throughout the lifespan. Four- and five-year old children recognized emotions in same-aged peers' bodily expressions (Parker, Kupersmidt, and Mathis in press). Five-year olds are also able to accurately decode happiness, sadness, and fear expressed through dance; 8-year olds were even better at this task and comparable to adults (Boone and Cunningham 1998). And, a study with 9-year-olds found that an interviewer's nonverbal body language (e.g., arms crossed, fidgeting) influenced children's ability to recall an event (Almerigogna et al. 2008). Adults easily identify happiness, anger, and sadness from bodily poses but experienced some difficulty with recognizing fear (Coulson 2004; Pitterman and Nowicki 2004; Van den Stock, Righart, and de Gelder 2007). Older adults are less accurate than younger adults in decoding emotions from bodily expressions in comparison to younger adults (Ruffman, Sullivan, and Dittrich 2009; Ruffman et al. 2008), following a similar developmental trajectory as for facial expressions. We do not know whether or not the ability to identify body postures changes throughout adolescence nor whether that skill becomes attenuated or improved during the latter part of the lifespan.

Evidence from multiple studies reveals that emotion recognition accuracy in voices improves with age from preschool to adulthood (e.g., Rothman and Nowicki 2004). Older adults appear to be less accurate in decoding emotion from vocalizations in comparison to younger adults (e.g., Brosgole and Weisman 1995; Laukka and Juslin 2007; Paulmann, Pell, and Kotz 2008; Ruffman et al. 2008; Ryan et al. 2010), and, as predicted by socioemotional selectivity theory (Carstensen et al. 1999), such decline is especially evident for negative emotions (Laukka and Juslin 2007). (Readers may also consult Chapter 15, Nowicki and Duke, this volume, for more discussion of accuracy in interpersonal perception.)

2.3 How do individuals decode mixed messages across the lifespan?

Another important process involved in receiving emotional messages, as described in the ASC model, is managing the receipt of multiple affective messages (Halber-

stadt, Denham, and Dunsmore 2001). In some instances, the presence of congruent information across multiple channels can be helpful in understanding a message. For example, accuracy in the identification of an emotion in a facial expression is enhanced by congruent emotion expressions from the body or tone of voice and is slowed by incongruent expressions, and this effect has been found from infancy through older adulthood (de Gelder and Vroomen 2000; Meeren, van Heijnsbergen, and de Gelder 2005; Walker-Andrews 1997). Older adults, however, may be most affected by incongruency (Hunter, Phillips, and MacPherson 2010). When comparing across modalities, infants and young children tend to be more influenced by vocal expression during recognition tasks and in vivo situations (e.g., Bugental, Love, and Gianetto 1971; Caron, Caron, and MacLean 1988), although elementary school children are not (Shackman and Pollack 2005). Future research might assess the development of the cross-modal effect longitudinally to determine when and if changes in modality preference take place.

Within the same channel, multiple messages may also be sent, and children develop increasing skill at this with age. Recognition that two emotion messages are being sent begins in late childhood (Harris 1989; Kestenbaum and Gelman 1995). Preschool-aged children possess the ability to identify when people should express and are genuinely expressing their inner feelings versus masking their true feelings (Harris et al. 1986; Misailidi 2006). In elementary school, most children are aware of display rules and can articulate goals to support the use of display rules (Cole 1986; von Salisch 2001). Around 10 years of age, children understand that individuals can experience mixed messages of emotions and can accurately perceive these mixed emotions in others (van Beek and Dubas 2008; Zeman and Shipman 1997). Larsen, To, and Fireman (2007) found that 11–12-year olds were better than younger children at identifying mixed emotions in a animated scene with a character displaying both happiness and sadness.

Children, adolescents, and young adults all seem to be able to discriminate truth from deception based on vocalizations to at least some degree (DePaulo et al. 1982). By elementary school, children become skilled at understanding verbal display rules, followed by facial display rules (Gnepp and Hess 1986). In adulthood, understanding display rules extends into the workplace (e.g., expressing positive emotions; controlling negative emotions) and this ability is related to job satisfaction (Diefendorff and Richard 2003).

2.4 What factors influence decoding abilities and how does this change over the lifespan?

Only a few studies have examined the relationship between children's temperament and decoding abilities. In the preschool years, an "easy" temperament in preschool predicted the ability to accurately identify emotion in vocal cues in mid-

dle adulthood (Hodgins and Koestner 1993). And in elementary school children, temperamental inhibition was associated with less facial emotion recognition ability (Izard et al. 1999).

Gender is a broad social construction which intersects with socialization of emotion in many but not all American subcultures (Brown, Craig, and Halberstadt 2012). Meta-analyses exploring gender differences in nonverbal accuracy demonstrate that females are more skilled at identifying nonverbal cues than males, and specifically at emotion discrimination, recognition, and identification in faces (Hall 1978; McClure 2000; see also Chapter 21, Hall and Gunnery, this volume). These effects appear to be consistent across the life span. In terms of specific channels and emotions, girls are more skilled than boys at decoding facial and body expressions and understanding complex emotions; girls' advantage wanes when decoding vocal messages, and anger or negative-dominance (Maxim and Nowicki 2003; Rosenthal et al 1979; Schultz, Izard, and Ackerman 2000). Females also appear to need less information to accurately identify an emotion than males (Hall and Matsumoto 2004; Montagne et al. 2005). It is important to note that some studies detect only small (e.g., for anger or disgust only) or no differences in recognition of emotion in faces and bodies among children (Babu and Rath 2007; Montirosso et al. 2009; Parker et al. 2012), which may be the result of different stimuli and measurement. Future research might continue to examine why gender differences exist and under what circumstances in the development of nonverbal sensitivity.

Parents model for children which emotions are acceptable to express in the family and in certain situations. Children derive schemas from their parents' expressiveness styles that help them to understand peers' and other adults' expressiveness; these may provide the working hypotheses that help label what others are feeling and to understand the degree to which display rules might be followed by peers and adults (Dunsmore and Halberstadt 1997). A child from a low expressive family may need to develop strong decoding skills in order to perceive that someone is feeling an emotion, whereas a child from a highly expressive family may not need to work hard at understanding because multiple emotional messages may be sent and across multiple channels, thereby facilitating easy identification of the emotion (Dunsmore and Halberstadt 1997; Halberstadt 1986). Children from positively expressive homes are more accurate in recognizing emotion expressions in others (e.g., Dunsmore and Smallen 2001). The relationship between family expressiveness and children's emotion decoding abilities may vary depending on the clarity of communication (Boyum and Parke 1995). For example, in a study of 9- and 10-year olds' ability to recognize emotion in their parents, only fathers' clarity of expressiveness was associated with children's accuracy (Dunsmore et al. 2009). Other studies suggest a curvilinear relationship between parents' expressiveness and children's decoding skill. Summarized in Halberstadt and Eaton (2002), these studies show initially a positive relationship between parents' expressiveness and decoding skill during the preschool years, a shift at the onset of school, and

a *negative* relationship between parents' expressiveness and decoding skill during adolescence. The negative relationship between family expressiveness and decoding skill persists through adulthood (Halberstadt, Dennis, and Hess 2011; Halberstadt and Eaton 2002).

Culture is likely to play a role in recognition of emotion; however, findings regarding cultural variations in these skills seem to be inconsistent. Some have argued that recognition of emotion expression in faces is universal (e.g., Izard 1971), but, or in addition to universality, a large meta-analysis demonstrates an in-group advantage, such that members of a cultural group are more accurate in identifying facial emotion expressions of their own cultural group than from another cultural group (Elfenbein and Ambady 2002). For example, in a study of young children's ability to identify facial expressions in a situation discrimination task, both Chinese and Australian children accurately recognized emotions expressed by both Chinese and Caucasians; however, the Chinese children tended to do better with Chinese faces (Markham and Wang 1996). Similarly, another study found that African American and European American adolescents more accurately interpreted the facial emotion expressions of their own racial group than another group (Weathers, Frank, and Spell 2002).

However, not all studies provide evidence for this cultural advantage model. Nowicki and colleagues examined elementary school-aged children's ability to recognize emotion in the faces of their own and other racial groups. In two studies, African American and European American children did not differ in their ability to recognize emotion from the facial expressions of either racial group (Collins and Nowicki 2001; Glanville and Nowicki 2002). In a study examining young adults' accuracy in detecting the valence of emotions while watching a videotaped interaction, no differences emerged across the four cultural groups: European American, Chinese American, African American, and Mexican American (Soto and Levenson 2009). Future work may need to assess the degree to which children and adults are familiar with the other cultures; it may be that the in-group and out-group effects are partially created by a lack of experience with the out-groups.

2.5 What types of social contexts influence decoding abilities?

Another important question embedded within the ASC model is whether individuals can appropriately decode messages, while recognizing the additional meanings and goals of their social context. These social contexts may include relationships with parents and family members, peers, romantic partners or spouses, strangers, or authority figures, and/or different social settings, such as home versus neighborhood, school, religious settings, or work setting. Early in life, infants are better able to recognize and respond to their mothers' facial and vocal expressions (Kahana-Kalman and Walker-Andrews 2001). Harsh social environments may also

influence children's decoding abilities for cues that are highly relevant for their safety. For example, growing up in a physically abusive environment is associated with children's increased ability to detect negative emotion quickly from facial expressions as they take form (Pollak and Sinha 2002; Pollak et al. 2009). The ability to recognize emotion from emergent faces may be beneficial for children in making inferences about how others may be feeling.

Who is being decoded affects decoding ability. Although preschoolers decoded emotion on parents' and strangers' faces equally well (Dunsmore and Smallen 2001), children in early elementary school recognized their mothers' voices with greater accuracy than they did an unfamiliar adult (Shackman and Pollak 2005). Among friends, adult participants are more accurate when judging stories told by friends than by strangers, or decoding emotion from facial expressions of close friends than acquaintances (Sternglanz and DePaulo 2004; Zhang and Parmley 2011). In adult romantic relationships, couples are more accurate than objective judges at receiving cues expressed by their partners (Sabatelli, Buck, and Dreyer 1982). This ability appears to increase within couples over time, suggesting that experience with receiving a partner's cues may result in an increased sensitivity to these cues (Noller and Feeney 1994).

Further, marriage may be positively influenced by the ability to accurately receive a partner's nonverbal cues, as decoding ability relates to partner's self-reported marital adjustment and satisfaction (Koerner and Fitzpatrick 2002; Noller 1980). Finally, within parent-child relationships, mothers are more sensitive than strangers in decoding their children's expressions of happiness, but not sadness, fear, and anger (Feinman and Feldman 1982). Increased exposure to a loved one may enhance our ability to decode his or her nonverbal cues.

2.6 What are the consequences of decoding abilities?

Individuals who can decode the expressions of others are likely to experience success in social interactions, perhaps because those who miss messages from others are then less able to adjust their own sending accordingly (Halberstadt, Denham, and Dunsmore 2001). Preschool children who can accurately match emotional expressions to social situations or emotion labels have better peer relations, social skills, and academic success (e.g., Boyatzis and Satyaprasad 1994; Dunsmore et al. 2008; Goodfellow and Nowicki 2009). Further, young children lacking skill in understanding emotional expressive cues in various situations are thought to be at risk for concurrent and future behavioral and academic problems (e.g., Denham and Couchoud 1990; Izard et al. 2001). For example, children who exhibited low emotion knowledge in preschool displayed increased levels of aggression in early elementary school (Denham et al. 2002). And, elementary school-aged children who are better at decoding emotion from various channels (e.g., face, tone of voice)

are also more popular with peers, and perform better academically than those who are not skilled at decoding (Halberstadt and Hall 1980; Nowicki and Duke 1992; 1994). Late elementary school-aged girls who are more socially competent are more accurate in decoding emotions than girls who are not socially competent, but this finding did not emerge for boys (Custrini and Feldman 1989). In addition, children with poor emotion recognition skills are at risk for being victimized or rejected by peers (Barth and Bastiani 1997; Schultz et al. 2000).

Studies examining the outcomes associated with the recognition of body movements are growing, and these studies suggest that some of the same consequences found for facial emotion recognition extend to body recognition. Recognition of body poses by preschool-aged children was positively related to teacher-reported social skills for boys (Parker et al., 2012). In contrast, elementary school-aged boys who displayed a poor ability to label both facial and body expressions of fear had the highest levels of callous-unemotional traits (Muñoz 2009). In young adulthood, an inability to recognize emotion through body postures has been associated with reports of increased loneliness, social anxiety, and lower self-esteem (Pitterman and Nowicki 2004). We know of no studies on the social consequences of these skills in older adults; conducting such lifespan studies is an important goal for future research.

3 Sending

3.1 Spontaneous expression

3.1.1 When does spontaneous expression begin to be communicative?

Alert infants are highly expressive (Malatesta and Haviland 1982). Smiling in response to vocal and facial stimuli begins about the fourth week of life (Wolff 1987). These smiles develop further complexity and differentiation in their organizational structure, with simple smiles expanding into open-mouth, cheek-raising (Duchenne) smiles in response to socially pleasing situations (e.g., mothers' smiles or warm vocalizations) during the first half of the first year. At least four types of smiles are definable during the second half year of life (Fogel et al. 2006; Messinger, Fogel, and Dickson 2001). Social laughter also appears early in infancy, possibly as early as four months of age (Wolff 1987).

Beyond these simple statements, things get complicated indeed. Infants are thought to have readily available all the facial musculature necessary for enacting even complex facial expressions (Ekman and Oster 1979). Further, elements of basic emotional expressions, such as enjoyment/happiness, anger, sadness/distress, and interest are noted by three months of age (Malatesta and Haviland 1982). Nevertheless, specificity of infant expressions from broad blends of emotions to more differentiated expressions progresses slowly over the first year of life (Ben-

nett, Bendersky, and Lewis 2005; Stenberg and Campos 1990). Other research suggests that although infants may respond differently to anger- versus fear-inducing situations with body movements, their facial expressions may not reflect discrete emotions of fear and anger within the first year of life (Camras et al. 2002; Camras and Shutter 2010). This is also notable for other facial expressions; surprise, for example, is not at all identifiable by facial or vocal expressions in infants, although body and facial stillness/freezing and eye gaze directed at expectancy violations are good predictors in infants at least up until 14 months of age (Camras et al. 2002; Scherer, Zentner, and Stern 2004). Nevertheless, parents often make attributions about their infants' emotions even though infant anger expressions, for example, do not consistently occur in situations thought to evoke frustration (arm restraint) nor do they predominate over other emotions in those situations (including joyful expressions) even at 12 months of age.

In sum, infants are highly expressive, and their expressions are increasingly organized and interpretable over the first year of life. We cannot tell, however, if infants are learning to organize their expressions to effectively communicate the feelings they have had since birth (an important step in the ASC model), or if the feelings themselves are becoming more organized into discrete emotions, or if both processes are co-occurring. Further, it is also possible that infants have emotional experiences that they are not able to express in interpretable ways, and we are underestimating infants' emotional capacities due to failures in their expressive capacity. Finally, in their review of the literature, Camras and Shutter (2010) highlight three important points: (a) infant and adult facial expressions do not seem to be that morphologically similar, (b) the major assessment tools used by the field to reliably code what infants are feeling are not always or even often in accord, and (c) intrasituational and intersituational specificity does not occur until well into the first year of life. Together, the data suggest that infant facial expressions are not necessarily accurate windows into their emotional lives.

Further, although infant facial expressions are not yet reliable indicators of emotions, most parents nonetheless attribute feeling states to their infants based on their facial expressions and respond accordingly. Thus, in some ways, facial expressions in infancy may lead to parents' inculcation of feeling states rather than serve as a reflection of feeling states, and may promote parental and cultural socialization of emotion (Halberstadt and Lozada 2011b; Malatesta and Haviland 1982).

More cognitively complex emotions are the last to be identifiable, given the cognitive, intra- and inter-psychic underpinnings that are prerequisites. Embarrassment, jealousy, pride, and guilt are recognizable via face, body, gaze, and vocal cues between 15 to 24 months (e.g., Kochanska et al. 2002; Lewis, Alessandri, and Sullivan 1992; Lewis et al. 1991; Masciuch and Kienapple 1993; Reissland and Harris 1991), although precursors of these emotions, which may be expressed more as anger, are being noted a bit earlier (Hart and Carrington 2002). Although rich and

reliable measures of these expressions are available, consensus has not yet been achieved regarding which nonverbal cues are necessary or sufficient for these expressions to be labeled as such.

Parents can also tell whether their 4- to 6-year old children are viewing familiar versus unfamiliar others by watching their faces (Buck 1975; 1977). Dominance status (which itself may be somewhat unstable) of preschoolers through second graders is not apparent from children's facial expressions (Camras 1984). However, dominant behaviors in other channels, including voice and body, appear in children as young as two years of age, traditionally as behaviors signaling force (e.g., striking), possession (e.g., crying), and defense (e.g., locomoting toward peers; Hay et al. 2011).

3.1.2 What do we know about change in spontaneous expression across the lifespan?

Once these emotions are in place in childhood, an important developmental question is whether certain expressions are used to a greater extent over time, possibly because goals are changing, underlying feelings are changing, or habitual styles are forming through the lifespan. One interesting study hints at developmental processes. Approach behaviors (e.g., smiling, head and body orientation, head nods, etc.) occur equally often in conversations between children and their parents across adolescence (with some gender differences emerging); however, avoidant expressions (e.g., gaze aversion, arm crossing, backward leaning) are more common in adolescence than pre-adolescence, shame expressions are more common in early adolescence, and reciprocated contempt increases in mid-adolescence (Kahlbaugh and Haviland 1994). Following children and their families over time, and assessing goals and motivations as well as behavior would give us insight regarding the degree to which nonverbal communications continue to reflect actual feelings of individuals during these time periods, or are part of nonverbal scripts associated with being an adolescent in certain cultures.

Another understudied question concerns whether there is further differentiation of expressions acquired in early childhood as individuals mature into adulthood, and/or whether there is an economy of expression through the lifespan. We know that 6-month old infants are less expressive than 3-month old infants, and that toddlers show less full-feature emotions during a stressful situation and more fragments of facial expressions revealing distress at 18 months than at 13 months (Izard and Abe 2004). Of course, as children age, contexts change as do children's assessments of the contexts, and in this case, older infants' or toddlers' more fragmented facial expressions may imply less distress or greater emotion regulation of distress, as well as greater inhibition of expression. Thus, expressive frequency across the lifespan is always embedded within the meaning-making that individuals apply to the situations they are experiencing. Few studies have tried to create

similarly evocative experiences for younger and older children, teens, or adults, thus it is difficult to compare across age. We might still consider whether expressiveness changes across the many decades of adulthood, as comparisons within adulthood might more easily achieve similarity in experience and the meaning of that experience. The studies assessing subjective, physiological, and facial expressiveness of emotional experience of younger and older adults are somewhat complicated, but, overall, indicate that the frequency, intensity, and duration of facial expressiveness is largely unchanged over the course of adulthood (e.g., Tsai, Levenson, and Carstenson 2000; Kunzmann and Grühn 2005; Kunzmann, Kupperbusch, and Levenson 2005). This effect may simply reflect the nature of the emotions under study, as older adults tend to experience positive emotions at the same if not elevated levels as compared to younger adults (Charles and Piazza 2007; Magai et al. 2006). Thus, comparisons in sending ability among different ages may reflect measurement inconsistencies in the emotions measured as well as the contexts in which emotions are cultivated.

3.1.3 What factors predict expressiveness, and is there change over the lifespan?

Temperament may influence infants' and children's expressiveness, so that greater reactivity and less effortful control are likely to be reflected in greater expressiveness (Kieras et al. 2005). Inspection of a meta-analysis clearly indicates that extraversion and self-reported expressiveness are related in children as well as adults (Riggio and Riggio 2002).

Male infants are actually more emotionally labile and irritable than female infants, but sometime over the first year of life, they become relatively less expressive (Haviland and Malatesta 1981). Boys and girls 4- to 6-years of age are not differentially expressive of emotion when viewing familiar versus unfamiliar or unpleasant scenes, but boys' communication accuracy is *negatively* associated with age in this time period (Buck 1975; 1977). Girls are more expressive of specific emotions such as anxiety-sadness, shame, and guilt in preschool (e.g., Chaplin, Cole, and Zahn-Waxler 2005; Kochanska et al. 2002), but are less expressive of anger by second grade (Hubbard 2001), compared to boys. Girls are expressive of both positive and negative feelings for a longer time than boys by age seven, following peers making evaluative comments about them (Casey 1993). Together these studies suggest that, in accordance with American gender scripts for males to be less expressive, and particularly for vulnerable emotions like sadness, boys are working to reduce their expressiveness. (Brody 1999; Brody and Hall 2008; Buck, 1977). Certainly, children are aware of gendered social norms in preschool (Karbon et al. 1992) with increasingly sophisticated awareness throughout elementary school age (e.g., Fuchs and Thelen 1988; Zeman and Garber 1996).

Gender differences in expressiveness also continue through the lifespan, sometimes with curvilinear effects due to gender intensification in adolescence,

which is no surprise given the attention paid to heterosexism at that time in the lifespan, and an attenuation through the decades of adulthood (see Hall 1984; Chapter 21, Hall and Gunnery, this volume; Hall and Halberstadt 1986; Kring and Gordon 1998; LaFrance, Hecht, and Levy Paluck 2003).

At least some gender differences in other aspects of nonverbal communication emerge fairly early in development. Even in infancy, girls gaze at others for longer and are physically closer to others than boys (Hall 1984; Hall and Gunnery, this volume); in preschool, girls touch other children more frequently than boys (Stier and Hall 1984). Children are also gender differentiating their nonverbal expressions, with gender identifiable in vocalization by age four (Perry, Ohde, and Ashmead 2001). Hints that these gender differentiations are socially constructed come from findings demonstrating greater vocal similarity between boys and girls of working class background and greater differentiation between boys and girls of middle class background (Edwards 1979). Further, gender differences can change in direction over time; in early adolescence, girls appear to engage in relatively more avoidance than approach-oriented behaviors compared to young adolescent boys in conversations with their parents, but by mid-adolescence, girls engage in more approach behaviors with their parents than boys do (Kahlbaugh and Haviland 1994).

As briefly noted above, expressiveness is clearly shaped by caregivers who attempt to guide infants to fit with the values and goals of their culture, often by modeling through their own expressive styles (e.g., Halberstadt and Lozada 2011a; Malatesta and Haviland 1982). Babies who are more expressive may also evoke more expressive reactions from caregivers, given the nature of emotion contagion, thus creating a cycle of greater expressiveness in the family. Across a multitude of nonverbal channels, positive and negative expressiveness similarities with parents are notable well across the lifespan (Halberstadt and Eaton 2002). The effects of family expressiveness may be curvilinear with larger relationships in the early years, movement away from parents' styles in high school, but a return to parental styles in college and beyond. Use of various modalities may also be family-related. For example, infants show expression types and facial components (e.g., furrowing the brow or mouth-related movements) similar to those of their mothers by 3- and 6-months of age (Malatesta and Haviland 1982); they also show increasing convergence with their mothers' frequency of laughter (Nwokah et al. 1994) and gestures during interactive, joint-attention episodes (e.g., Iverson et al. 1999; Namy, Acredolo, and Goodwyn 2000) during the first or second year of life.

Although the literature on expressiveness across cultures is too extensive to summarize here, we note that culture is very much an influence on children's developing expressiveness styles (for a brief review, see Halberstadt and Lozada 2011a). Cultural goals of social harmony and beliefs about the value of emotional expressiveness have direct influence on expressiveness (Halberstadt and Lozada 2011b). These differences likely persist across the lifespan.

3.1.4 What types of social contexts influence spontaneous expressiveness?

Babies recognize and respond to their social context when they begin smiling at humans. The clear intentionality of the infant to smile and begin the process of engagement suggests that even young infants understand the smile as a communicative act for which they are amply rewarded, beginning an enjoyable cycle of communicative acts between adult humans and the participating infant (at least in some cultures; see Keller and Otto 2009).

By 10 months of age, U.S. infants' different smiles to strangers in comparison to mothers suggest control reflecting their assessment of the situation (Fox and Davidson 1988). By 18 months, toddlers appear to be rather sophisticated readers of the social environment in that they imitate and vocalize more in their interactions with older children than with same-age children (Brownell 1990), and are more and more quickly expressive of both positive and negative emotions in the presence of siblings compared to siblings and an adult (Garner 1995). At 24 months, children expressed sadness (during distressing episodes) more when looking at their mothers than not (Buss and Kiel 2004), reflecting their understanding that sad expressions may elicit support when directed at particular persons.

We know surprisingly little about how social contexts affect age-related changes in expressiveness over the lifespan. For example, when children begin school is there a discontinuity in their expressiveness style, due to teachers or peers influencing expressiveness styles? That is, do teachers work to reduce expressiveness in the classroom, so that children begin to expect that expressiveness is not valued in certain contexts? Or do peers teach each other dominance cues that are important to know on the playground, and which are distinctively different from familial messages? We know that children displaying dominant behaviors tend to elicit greater attention, imitation, and liking from their peers (LaFreniere and Charlesworth 1983; Strayer and Trudel 1984). Further, are these expressions passed down year to year by peer cultures? These are contextualized lifespan questions that have not been asked yet.

Another possible shift in expressiveness may occur following the onset of parenting. For example, fathers thrust into "mothering" because of reasons beyond their control (e.g., spousal death) report greater expressiveness and nurturance than fathers not in that position (Risman 1987). Observational studies have yet to be conducted on transitions of either gender into the parenting role.

Emotional experience appears to be as intense (and perhaps more positive) for older people as younger (Charles and Piazza 2007; Magai et al. 2006). Older adults' spontaneous expressiveness seems to be maintained as well, based on studies assessing spontaneous expressiveness in a variety of tasks, and including younger, middle-aged, and older adults from a wide array of regional subcultures in the United States (e.g., Malatesta-Magai et al. 1992; Magai et al. 2006; Tsai et al. 2000).

Throughout the lifespan, there may also be individuals who vary in the degree to which they are responsive to social contexts (Chartrand and Bargh 1999; Fried-

man and Miller-Herringer 1991). Do individuals become increasingly responsive to social contexts later in the lifespan and increasingly differentiate their own behavior in response to those contexts as they develop greater skill, or do they become less responsive to social contexts, being more content to be consistent and genuine in their nonverbal behaviors regardless of who they are interacting with? We know of no studies exploring this intriguing question.

3.1.5 What are the consequences of spontaneous expressiveness?

Does it pay to be a good sender, or is there such a thing as too much expressivity? In childhood, expressing positive emotion is a good thing. In a meta-analysis of 550 studies, children expressing greater positive emotionality (e.g., the experiencing and expressing portions of the ASC model) were rated (by teachers, parents, observers) as more popular and socially accepted, compared to children with less positive emotionality (Dougherty 2006). The social consequences of expressing negative emotion are less beneficial. Children expressing greater negative emotionality were less popular and socially accepted, and more rejected than children with less negative emotionality (Dougherty 2006). In addition, high expressivity as an overall style (both positive and negative) was perceived negatively in certain circumstances; although expressive children are seen by teachers as sociable and popular, they are also seen as impulsive, aggressive, and bossy (e.g., Buck 1975).

In adult relationships, positive expressiveness continues to be of value, e.g., creating favorable impressions as well as increasing the positive moods of others (Riggio 2006). In marital relationships, the well-known 5:1 rubric suggests spouses should include at least 5 positive messages for every one negative message (Gottman 1994). Negative expressiveness may have mixed consequences, with expression of negative emotion such as anger and disgust eliciting unwarranted feelings of fear, as well as inaccurate judgments of social competence by others (see Burgoon and Bacue 2003, for a review). Thus, people often try to control their expression of negative emotions. However, suppression of one's natural expressiveness when discussing an upsetting topic can also be costly; suppression negatively impacts the suppressor's own experience of the conversation and cardiovascular functioning, disrupts the flow of conversation and creation of rapport, and negatively impacts cardiovascular responding in one's dyadic partner as well (Butler et al. 2003).

Further, relational adjustment seems dependent upon the ability to express negative emotion. Women's lack of nonverbal expressiveness in response to evocative slides predicted husbands' complaints in their marriage (Sabatelli, Buck, and Kenny 1986). It may be especially beneficial for women to be more expressive in a marriage, assuming that their husbands are able to decode their messages. Longitudinal evidence indicates that spouses' nonverbal behaviors expressing disagreement and anger were initially indicative of unhappiness and negative interaction,

but were important predictors of improvements in marital satisfaction three years later. This was in contrast to nonverbal behaviors expressing positive interaction, which did not predict changes in marital satisfaction (Gottman and Krokoff 1989). These findings supplement claims that marital success is better predicted by nonverbal than verbal behavior (Gottman 1979; Gottman, Markman, and Notarius 1977), and that relationships are successful when partners are able to utilize nonverbal behaviors to express dissatisfaction with each other.

Finally, nonverbal cues that accurately reflect emotional experience may matter; husbands with low marital adjustment tend to flash their eyebrows more on positive messages, even though flashing eyebrows is not a valid cue for positivity. Husbands with high marital adjustment, on the other hand, tend to smile more when delivering both positive and neutral messages, suggesting that while overall positive expressiveness may be of value, it is also beneficial to send messages that are concordant with true feelings (Noller and Gallois 1986). To our knowledge, hypotheses about concordance of messages have not yet been tested with children. Based on the adult literature, it may be that children who are selectively negative (e.g., only expressing negative affect when something has achieved a certain threshold) and/or who send messages concordant with their feelings will be more popular and dominant, and have their goals met more frequently compared with children who are less selectively or ambivalently negatively expressive.

3.2 Encoding

3.2.1 When do the abilities of posed sending and masking begin?

As delineated in the ASC model, the first step in the successful sending of messages is an awareness that a message needs to be shared (Halberstadt, Denham, and Dunsmore 2001). In infancy, this is particularly difficult to measure because experiencing and expressiveness may initially be one and the same; unpacking the two is part of the developmental process. Further, certain social cognitive milestones must precede infants' abilities to intentionally communicate with others; for example, understanding that facial expressions or body cues are communicative acts is likely necessary, although it is also possible that very early masking occurs as an intrapsychic self-regulatory process. By nine months of age, and increasingly thereafter, infants use vocalization and gesture communicatively to invite adults to re-engage with them during an interruption in game play (Ross and Lollis 1987). By 12 months, infants use gesture to direct attention to objects and even to correct misunderstandings about objects (Liszkowski, Carpenter, and Tomasello 2007), and between 12 and 18 months, a shift may occur in which infants' communicative vocalizations and gestures increase in play paradigms, again signaling their awareness of communicative possibilities (Ross and Lollis 1987).

In contrast to posing skill, which involves being able to accurately convey emotions that one is feeling, or wants others to believe one is feeling, masking

involves suppressing affective information in one's face, voice, or other communicative channels. Knowing when to mask one's emotion in social interactions is part of being affectively socially competent (Halberstadt, Denham, and Dunsmore 2001). Rudiments of masking may actually appear in the first year of life. Ten-month old infants reveal a different smiling pattern by type (with or without the orbicularis oculi muscles engaged) and duration (longer or shorter) in response to their mother versus a stranger approaching; their different smiles also relate to different patterns of EEG activity (left versus right hemisphere). These findings suggest an attempt at regulating the situation with strangers, with infants not only smiling differently to different people, but perhaps using facial expressions to convince themselves of the positive import of the stranger or to try to engage positively with the stranger (Fox and Davidson 1988).

3.2.2 What do we know about changes in posing and masking skill through the lifespan?

Several small samples using different techniques to investigate children's facial posing indicate that 2-year olds are not usually able to pose any emotion-related facial expressions, but preschoolers are moderately skilled at happiness, anger, and sadness, with fear and surprise lagging behind (Barth and Archibald 2003; Camras et al. 1988; Lewis, Sullivan, and Vasen 1987). Posing the specific action units (i.e., muscle movements) associated with sadness was difficult for 5- and 7-year olds, with greater competency being revealed by 9-year olds (Gosselin et al. 2011; Lewis et al. 1987). Fear and disgust do not seem to be well posed until elementary school or later (e.g., Buck 1975; Field and Walden 1982; Lewis et al. 1987). Young children seem to specialize in posing with the mouth region, and employ the eye and brow regions less competently (Gosselin et al. 2011; Lewis et al. 1987). Posing emotions via body movements or gesture rather than facial channels may be easier for young children; although not often well-compared, we know that 4- and 5-year olds can pose emotions intentionally with their bodies, both in movements (Boone and Cunningham 2001) and symbolic gestures (Boyatzis and Satyaprasad 1994; Boyatzis and Watson 1993).

Posing skill increases throughout childhood, but then seems to level off by adolescence (Ekman, Roper, and Hager 1980). We know of no studies that assess whether encoding skill in terms of either posed sending or masking improves or deteriorates during the middle years and whether life experiences associated with these decades (e.g., work, marriage, parenting) impact adults' expressive clarity. For example, posing and masking, as well as overall expressiveness, might also increase following parenting; these are questions yet to be tested.

In older adulthood, the studies, which employ a variety of measures such as deliberate posing or vocal and facial control of relived emotional experiences, suggest slight decreases in posed accuracy for both positive and negative emotions in

older participants in their 70s, in comparison to younger and middle-aged participants (e.g., Borod et al. 2004; Malatesta et al. 1987); others do not (e.g., Magai et al. 2006). These effects may reflect motivational differences (older participants may find less meaning in conditions in which they are asked to intentionally communicate affect), and are in contrast to spontaneous expression studies which suggest that older adults are less inhibited in expressing emotions that they feel (Malatesta-Magai et al. 1992). Finally, older adults are able to suppress emotions at the same level as younger adults (Kunzmann et al. 2005).

Masking skill continues to develop through childhood. As parents already know, some 3-year olds are able to successfully lie about whether or not they have disobeyed an experimenter's request. In one study, children still revealed subtle nonverbal cues such as nervous smiles and self-touching, but untrained observers could not distinguish children who lied from children who did not (Lewis, Stanger, and Sullivan 1989). Attempts to mask disappointment or frustration are also apparent by ages four and five, when experimenters promise children highly desirable gifts, and then provide rather undesirable gifts (a situation that is later rectified; Cole 1986; Cole, Zahn-Waxler, and Smith 1994; Garner and Power 1996). Older elementary school-aged children may be better at facial and vocal suppression of negative affect and expression of unfelt positive affect following receipt of an undesirable gift or when pretending to have different likes and dislikes, compared to younger elementary school-aged children (Saarni 1984; Shennum and Bugental 1982; but see also Cole 1986, and Davis 1995). Nevertheless, in these studies, children still seem to be "leaking" negative emotion from behind their positive mask. However, when second and fourth graders were given a good rationale for inhibiting, simulating, and masking their feelings, they evidenced a high degree of competency, with the one exception of pretending that they disliked something that they actually liked a lot (Halberstadt et al. 1992). Fourth graders also used more sophisticated strategies.

In another paradigm, children, adolescents, and adults were asked to lie about the taste of a drink. Whereas children as young as preschool age were able to do this task, they and first graders were not very good at facially deceiving others, but seventh graders were, evidencing little difference between the truth- and lie-telling conditions, and college students "overshot" their truth condition, with greater positivity when lying than when telling the truth (Feldman, Jenkins, and Popoola 1979; Keating and Heltman 1994).

Inhibition of emotional expression seems to occur with age in U.S. culture even in the absence of a specifically framed rule, such as "be pleased when someone gives you a gift." By first grade, children reduce the intensity of their expression in the presence of an adult stranger (Yarczower and Daruns 1982), and are able to articulate the reasons (e.g., prosocial versus self-protective) for inhibiting emotional expressions (e.g., Ceschi and Scherer 2003; Saarni 1984). By second grade, children naturally inhibit some of their negative affect regarding activities they

disliked (Halberstadt et al. 1992; Shennum & Bugental 1982). With age, children produce more elaborate justifications, but their increasingly complex understanding does not reliably predict actual skill (Ceschi and Scherer 2003; Halberstadt et al. 1992). Inhibition in the presence of another continues into adulthood (Friedman and Miller-Herringer 1991; Kleck et al. 1976).

With regard to inhibiting or masking positive emotions, children as young as three may attempt to regulate their expression of pride following success at a competitive game which their sibling lost (e.g., by gestures which replace their hands moving upward in a triumphant gesture or cover a broad smile of pleasure), and are generally somewhat successful at masking their pride by age five (Reissland and Harris 1991). When 7-year olds and 10-year olds were asked not to laugh or smile at a very amusing clown scenario, they were able to vocally and facially suppress their amusement, largely by reducing the duration of their Duchenne smiles and replacing them with false smiles and control-related facial actions (Ceschi and Scherer 2003).

Masking skill seems to be stronger in the later years; when talking about strongly emotional experiences, middle-aged and older women (men were not studied) masked their negative affect by smiling, showed blended affect that included positive as well as negative elements simultaneously, and included fragmented or incomplete negative expressions more so than younger adult women (Malatesta and Izard 1984). This may also explain why older women are sometimes less accurately decoded (e.g., Borod et al. 2004); if older women are more successful in masking their emotions, then it is less likely that others will recognize their negative affect. In addition, in other studies in which participants are asked specifically to suppress or disguise their emotional experiences, older adults are as successful as younger adults or better at inhibiting facial affect (Emery and Hess 2011; Magai et al. 2006).

3.2.3 What factors predict posed sending and masking skill and is there change over the lifespan?

Sending skills within the ASC model are also influenced by factors that are unique to the individual, as well as the family and larger cultural context (Halberstadt, Denham, and Dunsmore 2001). With regard to temperament, few effects have been reported in the literature; however, locus of control predicts posed vocal sending in 6- to 10-year old children as well as adults (Friedman et al. 1980; Nowicki and Duke 1994). A meta-analysis also suggests that extraversion predicts posed ability in children as well as adults (Riggio and Riggio 2002).

Gender differences abound in posed sending and masking. In the disappointment paradigm, elementary school girls demonstrate greater skill than boys, even under highly motivating circumstances (Cole 1986; Davis 1995; Saarni 1984). Other patterns emerge with 5- to 12-year old children with regard to lying; facial dissem-

blance improved with age for girls, although at the expense of body dissemblance, and body dissemblance slightly improved with age for boys, although at the expense of facial dissemblance (Feldman and White 1980). Thus, girls seem to develop greater facial control with age whereas boys don't; boys, however, may increase control over body movements which reveal lying, whereas girls' body cues are still revealing their true feelings. Gender differences in facial dissemblance were further supported in adolescents aged 11- to 16-years old, with the additional finding that socially competent teens (as judged by parents) were the most convincing liars (Feldman, Tomasian, and Coats 1999). It is not known whether girls continue to have a skill advantage in masking into adulthood, but we do know that men tend to inhibit facial expression more than women. For example, fathers mask emotion-related facial expressions more than mothers when aware that their elementary-school children will see their faces (Dunsmore et al. 2009). Motivational and contextual goals may not be completely disentangled from skill in these studies, as teenage boys and girls may be differentially motivated to please experimenters, and fathers may be more motivated than mothers to reduce emotionality in their children (Brody and Hall 2008; Halberstadt et al. 2012). (For further reading on nonverbal communication and deception, see Chapter 16, Frank and Svetieva, this volume.)

Research on family expressiveness is mixed, with family expressiveness associated with both spontaneous and posed sending abilities in young adults in one study (Halberstadt 1983), but only the production of difficult expressions in another (Halberstadt 1986). Further assessment of these skills in younger populations would help clarify the trajectory of these relationships.

The ability to intentionally express or suppress nonverbal messages may also be predicted by cultural differences. Cultural display rules likely influence the ability to express and/or mask nonverbal behaviors, and are evident in children's self-reported use of emotion display rules (Novin et al. 2008). We know of no cross-cultural studies that ask children to pose, inhibit, or mask emotions; such studies would be highly informative. In contrast, the difference in emotional suppression and masking across cultures has been well-studied in adults (e.g., Matsumoto et al. 2008; see also Chapter 23, Matsumoto and Hwang, this volume). Cultural differences in expressivity may be partially mediated by emotion control values that differ across cultures (Mauss et al. 2010).

In an earlier section we speculated that adults may become more expressive when they become parents. We also wonder if adults become more skillful at both posing and inhibiting expression when they become parents. For example, many parents report anecdotally their attempts to mirror children's excitement and pleasure, or to act more serious about something when they are really secretly amused by children's misbehaviors; parents also note that they attempt to inhibit or mask expression of annoyance or anger when they feel it (Parker et al. in press). Given the opportunities for practice and the high motivations of parents to meet their

own performance standards, parenting may provide a valuable proving ground for encoding skill.

3.2.4 What types of social contexts influence encoding abilities?

As noted above, the use of “false” smiles by infants less than one year old with strangers suggests primitive forms of nonverbal regulation, and the ability to respond differently to different social relationships; also as noted above, infants are increasingly aware of changes in the social context and their ability to influence them. By first grade, children are articulating their knowledge with a good deal of specificity, reporting that they would reveal less of their anger and sadness to peers compared to parents. Although first graders are also expressing more overall compared to third and fifth graders, third and fifth graders are also revealing less of their anger and sadness to parents as well as peers, with a possible trajectory of reduced sharing of sadness and pain with fathers in particular. Gender differences in this middle-class, largely white population were as expected, with children more willing to share sadness and pain with their mothers than with their fathers, and girls more willing to be expressive of sadness and pain than boys (Zeman and Garber 1996). Awareness of social context is also evident in 5- to 10-year olds, who express more positive emotion to an experimenter after receiving a disappointing gift when mothers are present compared to when they are not present (Tobin and Graziano 2011), and inhibit expression of emotion in the presence of an adult, even when the goal is to pose emotions (Yarczower and Daruns 1982).

3.2.5 What are the consequences of posed sending and masking skills?

Children’s sending ability across several channels (face, gesture, vocal) has been linked with their likeability in both the preschool and elementary years (Field and Walden 1982; Halberstadt, Denham, and Dunsmore 2001; Nowicki and Duke 1994; for discussion of adults, see Chapter 14, Buck and Powers, this volume). Dominance and social competence have also been linked to masking skill (Feldman et al. 1999; Keating and Heltman 1994) from preschool to adulthood, suggesting associations throughout the lifespan. Also of interest are the associations between smiling in posed photos in college and adults’ self-reported nurturance, social competence, well-being, and lack of negative emotionality 31 years later (Harker and Keltner 2001).

An important and complicated aspect of encoding messages is deciding what and when to send nonverbal cues, as well as whether or not to send more or less than what one is currently feeling (Halberstadt, Denham, and Dunsmore 2001). Being able to inhibit and mask nonverbal messages from time to time is clearly of value as noted above; nevertheless, consistent use of suppression and masking strategies appears problematic, in terms of lower ratings of social support and

closeness to others, and less well-being and depression over time (Mauss et al. 2011; Srivastava et al. 2009). However, it is possible that the consequences of posed masking are moderated by cultural values, with relatively worse outcomes in cultures that value authenticity and honesty (as claimed by American culture) than in cultures that value relational harmony and personal restraint (Butler, Lee, and Gross 2007).

We know of no research that examines differential outcomes across the lifespan regarding sending abilities. We suspect that these skills are equally advantageous across the lifespan, although their frequency of use may change over the decades, as older adults may be experiencing greater positive affect (Carstensen et al. 1999). Further, given the shift in salience of emotional goals, older adults may send more concordant rather than discordant cues and may compensate for any age-related declines in sending ability by choosing to be around those individuals who are able to receive the cues they do send. This area provides many exciting opportunities for further exploration.

4 Summation

We began writing this review with the belief that research in the development of nonverbal communication was rather limited. Instead our search revealed over 400 relevant studies, and we have had to trim our chapter substantially to fit page constraints of the Handbook. Nevertheless, this review also highlights many gaps in the literature across lifespan periods. Although the traditional social framework has served us well, it is time to add in a developmental framework and developmental methods. Longitudinal cross-sequential studies would enhance our understanding of developmental processes, particularly when these include assessments of individuals' goals and motivations as well as how behaviors change across different social contexts. In addition, although many studies assess one cue channel or another, assessment of multiple channels simultaneously would be helpful in guiding prevention work for children at risk for developing nonverbal communication deficits. Prevention programs that target skills in receiving and sending emotion-related nonverbal cues (e.g., CPPRP 2000; Greenberg, Kusche, and Cook 1995; McMahon et al. 2000) may improve protective factors and reduce behavioral risk factors for children. As a field, we now have the technology to assess these larger questions; our hope is that this review helps guide researchers to further explore how nonverbal communication develops and changes over time.

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III Modalities of nonverbal communication

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6 Facial behavior

Abstract: We provide an overview of the current state-of-the-art regarding research on facial behavior from what we hope is a well-balanced historical perspective. Based on a critical discussion of the main theoretical views of nonverbal facial activity (i.e., affect program theory, appraisal theory, dimensional theory, behavioral ecology), we focus on some key issues regarding the cohesion of emotion and expression, including the issue of “genuine smiles.” We argue that some of the challenges faced by the field are a consequence of these theoretical positions, their assumptions, and we discuss how they have generated and shaped research. A clear distinction of encoding and decoding processes may prove beneficial to identify specific problems – for example the use of posed expressions in facial expression research, or the impact of the psychological situation on the perceiver. We argue that knowledge of the functions of facial activity may be central to understanding what facial activity is truly about; this includes a serious consideration of social context at all stages of encoding and decoding. The chapter concludes with a brief overview of recent technical advances and challenges highlighted by the new field of “affective computing” concerned with facial activity.

Keywords: Facial behavior, nonverbal behavior, affect program theory, appraisal theory, dimensional theory, behavioral ecology, social context, affective computing

1 Facial expression and emotion

It is not surprising that a word signifying a place, or point, where people or bodies meet is *interface* – literally that which is between faces. The underlying notion is basically that the face is the portal to identity and soul (Kappas 1997). Expressions such as “losing face” (*Gesichtsverlust* in German) or “facing something” (*faire face* in French) indicate that there is more to face than meets the eye. Much of the cortex of the brain is visual and there seem to be several locations that have sensitivity to faces (Kanwisher, McDermott, and Chun 1997). Infants are drawn to face-like visual arrays basically from birth, and they react with facial mimicry only hours thereafter (Olk and Kappas 2011).

Nonverbal communication is a multimodal process embedded in intra- and interpersonal networks. Yet, despite the multi-modality, there is not only visual primacy, but within visual information the face is said to play a special role and, thus, it is not surprising that there is more research regarding faces and facial expression than other nonverbal channels, and it is not unusual that a systems overview, like in the present volume, will start with the face.

It is impossible to interpret the current state-of-the-art regarding research on facial behavior without a (modest) historical perspective. While the importance of the face for nonverbal behavior is evident to the scientist and layperson alike, there are some specific key theories, studies, and methodologies that have shaped not only much research on nonverbal behavior in the last century, but that still project into the future, for example in the guise of *why* and *how* facial activity plays such an important role in current efforts to have machines “understand” internal states, to assist mediated communication in the coming decades, or in efforts related to the detection of deception.

Thus, we decided to provide a historical and theoretical backbone in this chapter to provide a critical framework that asks questions as it informs, reaches out to many disciplines, and tries to provide a narrative that transcends the evershifting tug-of-war between those who emphasize biological constraints and those who focus on cultural meaning and differences. We will propose that (1) facial behavior should always be understood at multiple levels that include not only intra-personal, but inter-personal processes, even if someone is physically alone. Furthermore, (2) because facial behavior is best understood as an intricate element of nested systems that have self- and other-regulatory functions, it is at time difficult to separate concepts such as “expression” or “communication” from “regulation.” Thus, the message we convey here is complex and might not always satisfy all readers. Despite our preference for the simplicity suggested by Occam’s Razor, we feel that some stories lose if they are oversimplified. Occasionally, summaries regarding the state-of-the-art in research on facial nonverbal behavior appear to us too reduced. So it is perhaps best to start with the simple and uncontroversial statement that *faces are important*.

1.1 Importance of faces

It is quite common for articles, chapters, or books on face perception, or on nonverbal behavior involving facial activity, to emphasize just how important faces are (Schweinberger and Burton 2011). Faces may carry much information regarding gender and age, ethnic background, health, and social status. We identify individuals typically based on their faces – hence we have pictures of our faces in our passports and not of our feet – and we believe that faces betray the character of a person, as well as their current affective state and intentions. The belief in the importance of faces is likely shared universally and in art and ritual much effort may be exerted in different cultures and historical periods to capture the facial likeness of a person in a painting, or sculpture, or in contrast to hide as much as possible of identity or affective state as not to distract the viewer. It is most likely no coincidence that the currently most popular Internet community was called *Facebook* and the *profile picture* in most cases consists of an image of a face created

and curated by the user in more-or-less conscious efforts to present oneself in a desired way. Current consumer cameras frequently possess programs optimized for portrait photography, increasingly even for specific expressions – such as smile detectors. All this apparently underscores the importance of faces and facial expressions.

1.2 Are faces special?

The discussion whether faces are *special* (Kappas 1997) is often anchored in particular findings or phenomena. For example, the groundbreaking research of Meltzoff and Moore (1977) demonstrated that infants imitate facial gestures literally hours after birth. As far as we know, this is not true for gestures or vocalizations. Furthermore, it is known that face-like configurations attract visual attention early on in life. In addition, there are neurological phenomena that seem to be specifically associated to perceiving faces (Young 2011); *Prosopagnosia* is a disorder that is associated with a selective deficit in distinguishing faces. In the meanwhile, with recently developed techniques for measuring activity in the living brain, an area in the fusiform gyrus of the human cortex has been identified that appears to be selectively activated when looking at faces. Nancy Kanwisher has coined the term fusiform face area (FFA; Kanwisher, McDermott, and Chun 1997) to refer to this region. Does this all add up to faces being not only important but *special*?

Each of the empirical findings mentioned can be qualified. Yes – infants imitate facial gestures – however, typically, these do not relate to what we think of as emotional gestures – such as opening the mouth, or sticking out the tongue. Yes, infants seem to be particularly attentive to faces, but this relates to specific distributions of cues in bounded objects – it is possible to create artificial stimuli that follow these rules and that are more attractive than face-like stimuli (Turati 2004). As regards the neuroscience findings – these are currently most discussed. There are several controversies, or at least exchanges. For example, there are also areas in the brain that react to man-made objects – this would argue against the necessity that faces are so special that they might come “prewired” for facial patterns. Also, FFA is activated when visual experts distinguish objects of their expertise, such as birds or cars (Gauthier et al. 2000). Additionally, Isabelle Gauthier has developed artificial objects, so-called *Greebles*, that have a similar complexity to faces and she and her colleagues could demonstrate that once people have learned to distinguish them, the FFA will be activated in this context (e.g., Gauthier and Tarr 1997). Lastly, research by Haxby and colleagues suggests that the distinction of faces and other objects can best be understood by distributed and overlapping activity in different brain areas (Haxby and Gobbini 2011), as can be houses and other natural and man made objects.

In summary, present research cannot answer clearly whether FFA activation is a product of being prewired for a particular pattern at birth or whether any pattern of particular complexity with particular constraints is likely to achieve maximum activation in that location due to the brain's network architecture. We have almost limitless data from different disciplines that faces – and facial expressions – are important, both with regard to popular belief and folk theories, and with regard to the role faces and facial expressions play in person perception and in human interaction. This is evident. We do not need to take recourse in neuroscience to justify or bolster the argument of importance – present findings are consistent with the notion that faces and facial expressions *are* important and current research is informative about *how* the processing of nonverbal behavior interacts with other processes. But neuroscience is neither necessary, nor conducive, for fundamental arguments regarding the importance of faces for example. Neither is research outside of neuroscience soft, vague, or less scientific. The question whether facial expressions are *special* does not seem to be particularly useful, beyond the acceptance of importance.

2 Brief historical and conceptual overview

2.1 Charles Darwin

While there has been interest in facial nonverbal behavior before Darwin, often from the arts and philosophy (e.g., Montagu 1994 on Le Brun), the most fruitful starting point for any narrative on facial behavior is the publication of Charles Darwin's *The Expression of the Emotions in Man and Animals* (1872). In this book Darwin translates his comparative approach from structural/morphological comparisons of shapes and features of animals and plants to behavioral comparisons of humans and animals. It was very important for Darwin to demonstrate that emotional expressions were not unique in humans but instead had clear precursors in humans' ancestral past. The key argument here was that the specific shapes or patterns of expressions were typically neither arbitrary nor conventional, but instead relate to some primordial function that was not initially communicative but served a particular purpose, such as opening the eyes wide in situations where unexpected things happened (=surprise) to allow more visual information to be processed (see Shariff and Tracy 2011). It is known that Darwin was specifically motivated to counter religious arguments (e.g., by Bell) regarding how distinctive emotional expressions were to humans as opposed to animals (see Kappas 2003) – because of this strategic intention, much of the narrative of the book is dedicated to analyses and speculations of the original purposes of specific expressions in humans and animals. The usefulness and adaptive advantage of having a complex and fast messaging system, something that today would seem to be a typical Dar-

winian argument, played hardly any role in Darwin's original statements (see also Barrett 2011).

The methodological innovation of *Expressions* is stunning – it was one of the first to use photography for scientific purposes and contained posed photographs, candid photographs, wood engravings, often based on photos of adults, children, and animals. Iconic are the photographs of the electrical stimulation experiments by Duchenne de Boulogne that Darwin included to demonstrate how particular emotional expressions were the sum of the activation of specific facial muscles (see Prodger 2009; Smith 2009). There was also a cross-cultural component to the empirical methodology, as Darwin developed a questionnaire he then sent to people who lived in faraway countries. Darwin skillfully combined all of these different aspects, together with systematic observation and anecdotes, to weave a tale of how emotional expressions came about that caused great interest at the time (Cornelius 1996).

Charles Darwin was quite aware that there were strong cultural influences on expressive behavior, but because the intent of the book was to demonstrate evolutionary continuity, regulatory aspects, particularly as a function of learned “cultured behavior,” were relatively deemphasized. This led in consequence to a simplification of the message in secondary and tertiary accounts and summaries, namely that Darwin supposedly focused on a small number of universal emotions and that their communication is of adaptive value. In reality, Darwin dealt with a *large* number of *mental states*, of which emotions are only a sub-group. For example, he discussed love and devotion, or meditation and determination. As Fridlund (1994) and Barrett (2011) point out, there are alternative ways to interpret Darwin's views on how socio-cultural influences impact facial expressions and their interpretation.

Darwin also discussed what later was referred to as the *Facial Feedback Hypothesis* by remarking that minimizing an expression would also diminish the associated feeling or that, vice versa, amplifying an emotional expression would lead to an amplification of the feeling. This is particularly relevant in the current renaissance of embodiment of emotional, motivational, and cognitive processes. Typically, the origin of the facial feedback theory is attributed to James who, later, proposed that bodily feedback, including facial actions, would impact or determine the subjective experience of emotion.

Initially, there was much interest in Darwin's book. However, in the succeeding decades, the “dark period” (Cornelius 1996), cultural differences were seen as much more pronounced than Darwin had suggested (see also Barrett 2011). In parallel, there was a general *Zeitgeist* that moved away from the analysis of internal states, such as emotions, as explanatory forces – particularly in the guise of behaviorism. While Darwin's theory of evolution was a major long term success, the *Expression of the Emotions* became one of the less important tomes in Darwin's impressive canon of work.

2.2 Paul Ekman: Neurocultural theory

It is the success of the work of Paul Ekman and his associates that has revived the interest in Darwin a century later. Ekman has arguably also shaped and channeled how we think about emotion, nonverbal behavior, and Darwin's contribution. In 1969 three key papers were published that together had a major impact for the field of emotion research and specifically on research on facial behavior. The first was an article published in *Science* (Ekman, Sorenson, and Friesen 1969) describing a study in which photographs of Americans were shown to participants in several countries, including Japan and Brazil, but also to members of the Fore tribe in New Guinea which had before this encounter almost no contact to the outside. Ekman and his colleagues showed their subjects photographic representations pre-selected to depict six emotional states. Ekman et al. reported that all of them were well recognized – following the predictions based on Tomkins' theory and Darwin's book (see Russell 1994 for a critique; also Ekman 1994).

The other two publications (Ekman and Friesen, 1969a, 1969b) dealt with different categories of nonverbal behavior and laid the groundwork for the concept of expression regulation and the display rule concept. Presently, this is known as the neurocultural theory, which assumes that there is a fixed link between a small number of basic emotions and various other components, including patterned physiological activation (Ekman and Cordaro 2011). Key, however, to what is regarded as basic emotions are the prototypical expressive patterns – specifically facial expressive patterns. The idea of the neuro-cultural theory is, in a nutshell, that if there was no motivation to regulate, for example due to cultural display rules, every human being would show the same expression for each of the basic emotions if it had been aroused by a biologically hard-wired or culturally learned elicitor. However, due to socialization different cultures, and also within cultures smaller social structures, would shape what is appropriate to show what, when, and to whom. In other words, the neuro-cultural theory has two components – the spontaneous expression of emotion and the regulation of expression that is a secondary process. This view can be illustrated most evidently on the basis of “felt” and “false” smiles. According to Ekman and colleagues (Ekman and Friesen 1982; Ekman, Friesen, and O'Sullivan 1988), a distinction should be made between smiles that occur spontaneously in conjunction with a positive affect and those that are voluntarily put on the face to hide or mask a negative emotion. In honor of the early work of Duchenne de Boulogne, the “Duchenne smile” has been proposed as a true indicator of enjoyment (Frank and Ekman 1993) that cannot be faked due to additional muscle activation around the eyes (i.e., orbicularis oculi muscle) which is difficult to control voluntarily (Ekman, Roper, and Hager 1980). Past studies have found that Duchenne smiles indeed tend to occur under circumstances of spontaneously experienced positive affect (e.g., Ekman, Davidson, and Friesen 1990; Ekman et al. 1988). However, there is also growing evidence which

questions this clear cut distinction between spontaneous and voluntary expressions by showing that Duchenne smiles can be posed similarly as any other type of smile (see Krumhuber and Manstead 2009; Schmidt, Bhattacharya, and Denlinger 2009). Similarly, smiles can be observed that involve only the lower part of the face and not the wrinkles at the eyes, despite the fact that the expresser is concurrently happy or amused as indicated by self-report. Thus, the term “felt smile” should not be used synonymously with a morphological description, such as “Duchenne smile”. It is the two-factor model exemplified by Ekman’s neuro-cultural theory that has led many researchers to study facial behavior by confronting participants with emotion-eliciting stimuli or situations in a condition of social isolation to demonstrate the link between subjective experience and facial behavior. We later review the empirical findings from the point of view of different perspectives. However, it is important here to emphasize that the belief in a clear separation of spontaneous and regulatory forces is the cause of the standard social isolation paradigm.

The impact of Paul Ekman was enormous also because of methodological developments, such as the development of the anatomy based Facial Action Coding System (FACS), together with Wallace Friesen (1978). One of the strengths of this system is that it does not impose meaning categories. This is necessary for comparative studies that follow from the Darwinian framework. However, a discussion of FACS and related methods is best found elsewhere, for example in Harrigan, Rosenthal, and Scherer (2008). Many attempts to automatically measure facial activity by computer are influenced by these developments and provide FACS codes as output (e.g., Bartlett and Whitehill 2011), while new standards for data transmission and facial synthesis, such as the recent audiovisual data format MPEG 4, are also strongly influenced by FACS (Pandzic and Forchheimer 2002).

A final consequence of the theoretical frame of reference of a clear separation of genuine and controlled expressions concerns the notion of leakage via “micro-expressions” which is relevant for the study of deception (see Vrij, Granhag, and Porter 2010). Indeed, this has become the most active part of Ekman’s research in the last decade prior to the publication of this handbook and has even entered pop culture in block-buster crime shows such as *CSI* (Levenson and Ekman 2006) and even a serialized television show *Lie to Me* that is based on a fictitious crime fighter who is using nonverbal behavior analysis for the detection of deception. Thus, the popularity of these methods and this framework has not only influenced scientists, but laypeople alike (but see Levine, Serota, and Shulman 2010).

2.3 Alan Fridlund: Behavioral ecology

The neuro-cultural theory and its variants were seriously challenged by Alan Fridlund in the 1990s. In a key experiment (Fridlund 1991) he demonstrated that

implicit sociality affects facial actions, but not subjective experience. In other words, implicit or explicit awareness of others is sufficient to moderate the relationship between expression and subjective experience of emotion even if people are physically alone.

Fridlund proposed a different interpretation of Darwin's position on facial actions and argued that a Behavioral Ecology View (BEV) better explains facial nonverbal behavior – in this model, what is shown depends *exclusively* on social motives. A thorough analysis (also Fridlund 1994) suggests empirical support for this view both in animal and human research. A series of relevant studies in this respect were, for example, reported by Kraut and Johnston (1979). In one of these Kraut and Johnston demonstrated that smiles shown when bowling were not contingent with the actual moment of scoring or the success of the throw, but mostly with looking at their friends. This is when smiles had a social function and not associated with the actual emotion eliciting stimulus. Considering the BEV has a dramatic consequence for the interpretation of the meaning of facial nonverbal behavior. According to Fridlund, there is no relationship to emotion – in fact, emotion might not be a useful construct in this context at all (1994). It is important to clarify that both Fridlund and Ekman are Darwinian in their approach – both argue that facial nonverbal behavior has evolved and is functional in the here-and-now, but they differ with regard to the *meaning* of facial behavior. Implications of these theoretical views will be further explained below in the discussion of the relationship between emotion and expression.

Subsequently, Hess, Banse, and Kappas (1995) could demonstrate that Fridlund's view might have been a bit too extreme – they replicated the basic finding of Fridlund (1991), but by using amusing material of different intensity, they could show that smiling behavior was a function of social context *and* of intensity of the emotional stimulus. Furthermore, they could demonstrate that the Fridlund-effect worked only with friends, but not with strangers. In the meanwhile, there have been further replications (e.g., Jakobs, Manstead, and Fischer 1999a, 1999b, 2001). At present, neither the neuro-cultural theory and its variants, nor behavioral ecology sensu Fridlund, can account for these findings. There is need for further theoretical development.

3 Facial expression and emotion

3.1 Issues regarding the cohesion of emotion and expression

One of the key interests in facial activity is the potential diagnostic value for an emotional state. Hence, the following sections will focus on how expression and emotion relate to each other. While this sounds like an easy enough question to answer (is it or is it not), it starts to get complicated when one considers the

issue of how emotion is specifically defined. In most current emotion theories, expressive behavior is not a consequence of emotion, but a component of emotion, together with other components, such as peripheral or central physiological activation, subjective experience, and action tendencies or changes in action readiness.

Researchers investigating how these components relate to each other study emotions based on their theoretical framework. Consequently, someone who comes from a background influenced by Ekman's work is likely to study only specific discrete emotions, so for example, jealousy or hate will not figure among these, because they do not appear to have universal expressions. A different important school of thought in current emotion research relates to appraisal theory. Starting from Darwin, via Craig Smith and Klaus Scherer, there are notions that specific evaluation processes are associated with specific expressions – for example blocking an obstacle might cause a frown. Research in this tradition has tested the question of emotion expression cohesion differently and will thus be discussed separately. A third important tradition conceives of emotions as entities associated with a two- or three-dimensional space, such as valence, arousal, and dominance/power. To complete the picture, we will also present relevant research embedded in the BEV.

3.2 Affect program theory

Current research on facial activity owes much to the work of Silvan Tomkins in the 1960s. Although most of the details of his theory have lost importance for present theories, the notion of affect programs itself is still influential. Both Ekman (e.g., 1992; also Ekman and Cordaro 2011) and Izard (e.g., 1997) propose that a core emotional repertoire exists, formed of a small number of fundamental emotions – for example, happiness, sadness, fear, disgust, anger, contempt, and surprise (Ekman 1982, 1984). Based on the notion of the affect program, each of these emotions is thought to be innate, categorically distinct, and characterized by specific physiological, expressive, and subjective responses (Ekman 1999).

For every fundamental emotion, Ekman assumes the existence of neuromotor affect programs which produce a fixed pattern of facial responses in response to the appropriate eliciting events (Ekman 1972). These emotion-specific facial patterns are prototypical and universal, each consisting of characteristic configurations of facial behavior as described in the Facial Action Coding System (Ekman and Friesen 1978; Ekman, Friesen, and Hager 2002). Thus, they occur in a consistent manner across different cultures and are reliably recognized as corresponding to one of the basic emotions.

Much of the empirical support for coherence between emotion and facial expression has come from recognition paradigms, thereby requiring participants

to categorize pre-selected photographs of posed expressions (see Russell 1994). Thus, the results are limited in what they can reveal about the expression of emotion. Some evidence for the occurrence of individual facial components that characterize basic emotions has been provided by encoding studies, but they have not been able to support more restrictive predictions concerning coherent or prototypical patterns of facial actions (Carroll and Russell 1997; Fernández-Dols et al. 1997; Krumhuber and Scherer 2011; Scherer and Ellgring 2007). Even in the most optimistic studies (e.g., Ekman, Friesen, and Ancoli 1980; Ekman and Rosenberg 1994) the pattern of association between emotional experiences and behavioral responses was rather moderate, with correlations rarely higher than $r = 0.50$ (see Mauss et al. 2005). In other words, people often experience and report different feelings than what their expressions supposedly show.

The idea of a few core emotions and facial prototypes can seem counterintuitive, neglecting the large variability of emotional states (Ellsworth 1991; Smith and Scott 1997). In light of this, Ekman (1999) has, more recently, argued for the concept of *emotion families* which consist of several related emotions that share certain characteristics of expression, physiology, or antecedent events. To use happiness as an example, there is, according to this view, not just one “happy” emotion, but a number of positive emotions such as amusement, pleasure, satisfaction, and contentment which all have a particular type of smile in common, but are distinctive states (Ekman 1989). Interestingly, Ekman (1992) also acknowledges the existence of certain emotions which occur devoid of a universal facial signal, but may be characterized instead by a specific vocal expression or brain activation state. This view is shared by Izard (e.g., 1997) who similarly assumes the existence of emotions such as embarrassment, shyness, and guilt which are not associated with a specific expression (1997: 60). Up to now, it has not been entirely clear what constitutes an emotion family and distinguishes one from another. As variants for a given emotion often share certain patterns with another emotion (e.g., eyebrow raise in surprise, fear, and sadness), many facial actions may be common to multiple expressions (Smith and Scott 1997). Russell and Fernández-Dols (1997, see also Fridlund and Russell 2006), critics of the approach by Ekman, Izard and their mentor Tomkins, subsume this and similar theories under the term *Facial Expression Program*. Reisenzein et al. (2006) use the term *Affect Program Theory* (APT).

None of the proponents of APT argue for an indiscriminate automatism of facial expressions. That is, no individual will *always* smile when feeling happy or amused. As reviewed above, according to Ekman and Friesen (1969b) emotional expressions are modulated by culturally determined *display rules* regarding the appropriateness of certain expressions. Display rules are learned early in childhood and govern who can show what expression and at what time (see Matsumoto 2006). They can have the effect of exaggerating, minimizing, masking, or qualifying a universal expression of emotion depending on the social circumstance, and

therefore interfere with the facial affect program. Early evidence was provided in a study by Friesen (1972) in which American and Japanese participants viewed highly stressful films. Whereas the Americans showed expressions of negative emotions (i.e., disgust, sadness), the Japanese participants were supposedly more likely to mask them with a smile in the presence of an experimenter (but see Fridlund 1994). The concept of display rules has been widely accepted within the framework of neuro-cultural theory and other variants of APTs, with research focusing on cultural differences in display rules (Matsumoto 1990) and inventories aimed at the assessment of display rule knowledge (e.g., Matsumoto et al. 2005). Such reasoning is not problematic in itself if display rule knowledge could be used to predict what expression should be shown in which situation (see Kappas 2009). Unfortunately, there is no consistent theory of display rules that would allow for a specific expression to be predicted as well as the types of contexts that elicit the modulation of facial displays (Kappas 2002, 2003; Parkinson 2005). In this sense, it seems to be the case that the notion of display rules would be used by several authors to justify negative empirical findings regarding predicted concordance of internal state and expressive behavior. Such an approach appears to circumvent the actual empirical investigation of the cause-effect relationship between emotions and expressions, thereby preventing an examination of the predictions by APT (Kappas 1996, 1999).

In order to demonstrate coherence between internal state and expression, the impact of display rules would need to be controlled or minimized. In doing so, the expression should be driven only by the emotion. Introducing such control should be possible if participants are studied alone, or if they are unaware of being observed (Kappas 2002). In other words, in social isolation the predicted cohesion between emotion and expressions should be strong. However, evidence from studies with participants whose facial expressions occurred in isolation does not entirely support this prediction (see Fernández-Dols et al. 1997; Fridlund 1991). Moreover, individual differences such as self-monitoring have an important impact on whether facial expressions are revealed or controlled (Friedman and Miller-Herringer 1991). The match between self-reported emotional state and predicted facial expressions therefore seems to be far from perfect. In consequence, it is problematic to use prototypical expressions as diagnostic for the presence of specific subjective experience, as the cohesion is demonstrably low.

3.3 Appraisal theories

Rather than assuming a limited set of basic emotions, appraisal theories conceive of emotions as dynamically emerging response patterns resulting from a series of evaluation appraisals (Ellsworth 1991; Roseman 1991; Scherer 1984, 2001, 2009). In this sense, emotions are not driven by neuromotor programs, but elicited and

differentiated by the way an individual evaluates (or appraises) the environment. These appraisal checks or information processing steps concern a number of criteria such as the relevance and implication of an event for a person's goals and needs, the required coping potential, and the normative significance of the event (Scherer 1984, see also Scherer, Schorr, and Johnstone 2001). Depending on the result of each appraisal check, different emotions are thought to be elicited. Proponents of appraisal theory further contend that appraisals trigger changes in several organismic subsystems (i.e., cognition, physiology, motor expression, subjective feeling; Roseman and Smith 2001; Scherer 2001), with evaluation outcomes in particular subsystems affecting one another. The emotion process is therefore considered to be a fluctuating pattern of change in various interfacing central and peripheral systems that become temporarily synchronized (Scherer 2009). Appraisal theories do not exclude the possibility of a number of discrete emotions such as joy, anger, or fear that are *modal* outcomes of frequently occurring patterns of appraisals (Scherer 1984). However, as opposed to basic emotion theory, appraisal theory alternatively posits an infinite number of emotions as well as large individual variability in emotional states and expressions (Scherer 2009).

Following this approach, facial expressions are linked with appraisal dimensions rather than specific emotions, and are determined by appraisal check outcomes. For instance, frowning as the emotional appraisal of goal obstruction occurs when perceiving an obstacle that hinders us reaching a goal. Given that more than one negative emotion can follow the perception of an obstacle, several patterns of facial action can call for the display of the frown (Kappas 2003). This allows for the possibility that the same appraisals, although in various combinations, are part of multiple emotions. Notably, the facial movement overlap for different emotions can indicate shared appraisal profiles (Scherer and Ellgring 2007). Facial expressions are therefore similar to one another to the degree that they have comparable outcomes for appraisal dimensions. In contrast to APT, this suggests that there is no emotion specific situation which elicits anger or fear expressions, and that individual appraisals are the determining factors for facial responses (Aue, Flykt, and Scherer 2007). In this sense, an angry person perceiving an obstacle may frown as would a person who is fearful (see Ellsworth 1991). Existing evidence indicates that there may indeed be an association between certain facial expression movements and situational appraisals. For example, eyebrow raising was found to encode appraisals of novelty and unexpectedness (Kaiser and Wehrle 2001; Smith and Scott 1997). Furthermore, eyebrow frowning was related with appraisals of goal discrepancy and anticipated effort (e.g., Kappas and Pecchinenda 1999; Smith and Scott 1997), whereas raising of the lip corners was observed to correspond to appraisals of subjective pleasantness (e.g., Aue and Scherer 2008).

While there is nothing *a priori* wrong with the assumption that certain appraisal-driven facial actions may occur for different emotions, the search for

componential cohesion is complicated by the fact that single muscle movements (e.g., frowning) can be driven by both different appraisals as well as other processes (concentration, visual requirements; Kappas 2009). The question here concerns the inversion of the predicted appraisal-expression link, i.e., whether a single expression is indicative of a specific appraisal (Kappas 2003). For example, the perception of an obstacle might lead to a frown. But, is it valid to use the presence of a frown to deduce that someone perceives an obstacle, or is simply engaged in effortful behavior? Moreover, Scherer and Ellgring (2007) recently suggested that frowning may also occur when experiencing an unfamiliar event (novelty appraisal). It is therefore impossible to infer appraisals and their alternative causes from these facial movements. Cacioppo, Tassinary, and Berntson (2000) refer to such facial actions and multiple determinants relationship as a *many-to-many* relation. Following this logic, specific changes in facial expressions cannot be reliably predicted on the basis of specific appraisal outcomes. Because some muscle movements are associated with several appraisals the diagnostic value of appraisal-specific facial actions consequently remains unclear (see Kappas 2003, 2009).

A fundamental difference between APT and appraisal views concerns the proposed nature in which facial expressions unfold over time. According to APT, facial actions triggered by a neuromotor commands simultaneously merge together exhibiting a prototypical pattern with overlapping apexes (Ekman 2003). This view differs from the general appraisal theories view in which facial movements are thought to occur with the outcome of the appraisal. Because appraisals occur in sequential fashion (Ellsworth 1991; Roseman and Smith 2001; Scherer 1999), each of the resulting facial responses is argued to accumulate over time, consisting of serial cumulative apexes with different contributing facial action sequences (see Figure 1; Scherer 2009; Scherer and Ellgring 2007). Apart from preliminary evidence for this sequence assumption (Krumhuber and Scherer 2011), the significance and fusion of partial expressions remain unknown. For example, do all appraisal-driven facial actions equally contribute in conveying a specific expression or are some actions more intense and longer lasting than others (Paleari, Grizard, and Lisetti 2007)? Do different sub-expressions merge over time and can this convergence be described as an additive process?

According to the appraisal view, there is not a single evaluation phase that instantaneously takes place. Instead, appraisals are thought to be constantly in flux with re-appraisals replacing initial appraisals (Scherer 2001). In this sense, evaluations are performed continuously to correct and update the organism's information about pertinent situations and events (Scherer 1999). If appraisals are recurrent processes, the following question emerges: What diagnostic value can be ascribed to individual facial actions? Given that appraisal-driven facial movements can be replaced by newer evaluation processes, they may simply contribute to a later evaluation stage and thus might not be meaningful on their own. In addition to questions concerning the temporal overlap of facial expressions, the significance

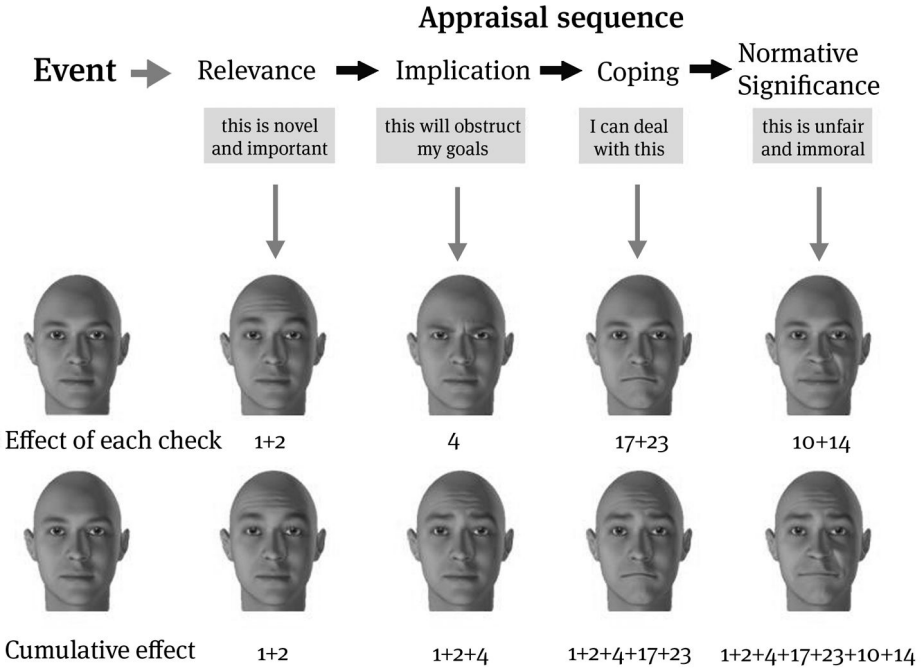


Figure 1: Illustration of the sequential nature of the micro process involved in the appearance of an emotional expression according to Scherer's Component Process Model (based on Scherer and Ellgring 2007). Numbers indicate FACS action units.

of individual elements of facial expressions as determined by appraisals remains an unresolved issue. Furthermore, it is doubtful that every evaluation process is in fact reflected in the face. As such, some appraisal processes may not lead to visible changes in the face and/or may be immediately replaced by newer evaluation appraisals and corresponding facial changes. Until now, there is no evidence that all appraisals are coupled to specific muscle reactions (see Kappas 2009).

In addition to these concerns, there is the problem that we often do not have conscious access to the appraisal process. In fact, appraisal theorists have argued that much of the appraisal process is automatic and occurs outside of conscious awareness (Leventhal and Scherer 1987; Scherer 2001; see also Kappas 2003, 2006). It is therefore difficult to prove whether a specific appraisal (for example that a person evaluates her coping potential as high) leads to a specific change in facial actions (tight lips) (see Scherer 2001). If facial movements are interpreted as signs of specific appraisals, there is the danger of being trapped in a circular argument as there is no independent criterion that would prove the existence of the underlying appraisals (Kappas 2009). Thus, independent of future findings, there are significant conceptual problems in using facial actions as diagnostic of underlying affective states to infer specific appraisals (Kappas 2003).

3.4 Dimensional views

Dimensional emotion theories view individual emotional states as localized within the space of a limited number of dimensions, typically either valence and arousal (2D), or with the addition of a third dimension called potency or dominance (3D; e.g., Bradley and Lang 1994; see Roseman and Smith 2001). On a conceptual level, dimensional views can therefore be interpreted, in a first approximation, as a mapping of higher-dimensional emotional states onto two or three underlying or “core” dimensions. The cost of this is a certain loss of information (see e.g., Zeng et al. 2009). However, the gain may be a clearer picture and comparatively reliable measures.

Compared to appraisal views, there are certain conceptual similarities with appraisal dimensions (e.g., “pleasantness”, “coping potential”) – however, the focus of the latter is more on the suggested processes and their components (see e.g., Scherer 2009), whereas dimensional views focus on how “single simple feelings,” i.e., “Core Affect” (see e.g., Yik, Russell, and Steiger 2011) as such can be studied rather than the entirety of a broader spectrum of appraisal processes. Compared to APT, dimensional views argue that it is the “core” dimensions which are basic (see e.g., Yik et al. 2011) rather than a specific number of conceptually distinct emotion constructs like *fear* or *anger*. For example, Russell (e.g., 1997) suggests that valence and arousal are primary and automatically perceived dimensions whereas categories are only derived in a second stage as a function of the social context (see also Fernández-Dols and Carroll 1997; Kappas and Poliakova 2007). In other words, here is a claim that a large part of mood and emotion could be understood if the main dimensions (e.g., valence and arousal) can be well understood. And, importantly, because these two dimensions are postulated to be simpler, they should be easier to access and more reliable to measure. This fits well with the theme of cohesion we have been discussing earlier in this chapter.

From a measurement perspective that focuses on the face, a reduction to just two or three dimensions immediately has advantages because it eliminates the need to categorize any and all possible patterns of facial muscle activation (e.g., using FACS). In support of the notion that such a simplification may be possible, a very consistent finding in the literature across different views has been that joy/happiness (i.e., positive valence) clearly appears to be the single most accurately recognized emotional state judged from faces (well above 90% correct), whereas differentiated judgments of negative emotions perceived in faces have been considerably less accurate (Ekman and Friesen 1971; Russell and Fernández-Dols 1997; Scherer and Scherer 2011). Furthermore, one could look at participants’ ability to report about their subjective experience. Here, dimensional views typically assume that participants can always access and express their momentary emotional state on the underlying dimensions (e.g., Yik et al. 2011), which may indeed be easier than a finer differentiation into, for example, basic emotion labels.

There is indeed much that can be said to be simpler about dimensional views than most of the competition, which clearly lends dimensional views a certain practical appeal. For example, instead of complex and time-consuming FACS-coding, a dimensional framework lends itself more easily to a measurement via facial electromyography, e.g., at the Zygomaticus Major (cheek) and Corrugator Supercilii (brow) sites. Simultaneously, there are a variety of measurement instruments available to obtain subjective experiences of valence and arousal, e.g., traditional Likert-type scales, the largely non-verbal “Self-Assessment Manikin” (Bradley and Lang 1994), or a continuous device like *FEELTRACE* (Cowie et al. 2000). However, it also has to be acknowledged that the simplification obtained by projecting a higher-dimensional space of discrete emotional states onto just two dimensions necessarily results in a loss of information where emotions like *fear* and *anger* can become indistinguishable (e.g., Zeng et al. 2009; Yik et al. 2011). Nevertheless, the critical question may be to see whether the reduction of complexity achieved by dimensional views can be translated into better cohesion between subjective experience and the face.

Regarding cohesion, dimensional views overall indeed appear to have found relatively reliable facial indicators for valence – whereas very few studies have been able to make a strong case for emotion specificity (Mauß and Robinson 2009; see also Reisenzein 2000, Reisenzein et al. 2006). More specifically, Cacioppo et al. (1986) suggested that activation of the Zygomaticus Major, which plays an important role in smiling by pulling the corners of the mouth to the side and up, and Corrugator Supercilii muscles, that pull together the eyebrows, is related to the valence and intensity of emotional states. Given this evidence, one would expect dimensional approaches to have a strong position whenever cohesion between subjective experience and facial behavior becomes relevant for applied purposes. The situation, however, appears to be more complicated.

In fact, the great majority of state-of-the-art vision-based practical efforts to automatically measure affect are concerned with detecting basic emotion categories (see Zeng et al. 2009). In this sense, the strength and general influence of the FACS is associated with a need of practitioners working with dimensional models to express their data also within the somewhat more familiar terms of basic emotions, action units, and their associated visible counterparts. An early example of how facial action units might thus be re-aligned into the pleasure-arousal space has been provided by Russell (1997; see Figure 2a). However, the applied potential of this approach may well exceed the task of a simple mapping as such, because dimensional models can also be applied as modeling functions on top of basic FACS units. This was shown beautifully, for example, by Grammer and Oberzaucher (2006; see Figure 2b).

But back to the question of cohesion: It has meanwhile become clear that Zygomaticus Major is active not only during positive but also during negative states (Kappas and Pecchinenda 1998; Larsen et al. 2003). This curvilinear relationship



Figure 2: a) Eight facial expressions in the Pleasure-Arousal space of a 2D dimensional view (reproduced with permission from Russell 1997). b) The completely reconstructed pleasure and arousal space (reproduced with permission from Grammer and Oberzaucher 2006)

means that one cannot unconditionally interpret the activation of this muscle in a test subject as a positive emotional state. In principle, activation of Corrugator Supercilii muscles appears to be a better correlate of emotional valence than a smile. Furthermore, a relative relaxation of the Corrugator Supercilii muscles has been observed for positive emotional states (e.g., Kappas, Bherer, and Thériault 2000), which means that a linear relationship with subjective valence can be expected for this muscle site. However, does this clear linear relationship allow an unambiguous mapping of activity of the corrugator muscle to positive and negative emotional states (see e.g., Larsen et al. 2003)? Unfortunately, the problem in this case is that the Corrugator muscle is also activated by factors other than valence (e.g., visual stimuli and concentration, as discussed in the previous section on appraisal), and that it also plays an important role in communication and interaction, for example in accompanying or emphasizing elements of speech. This means that there is no simple or unproblematic mapping of muscle activation to emotional states, not even for the suggested “core” dimension of valence. On the other hand, it should nevertheless in principle be possible to identify configurations or patterns of muscle activation that may possess higher diagnostic value – at least if given a sufficient understanding of the context. In addition, dynamic characteristics of facial behavior (see e.g., Krumhuber and Kappas 2005, Schmidt et al. 2006) may be able to contribute substantially toward distinguishing social components of facial activity from activity that may show better cohesion with subjectively reported valence – and perhaps also other dimensions. More research is likewise needed to determine to what extent complex information about facial activity may be combined with other data, e.g., in situations where people produce speech or written texts that can be analyzed (e.g., Kappas et al. 2011).

3.5 Behavioral ecology

Originally, the BEV (e.g., Fridlund 1991, 1994) has to a large extent been a counter-program to the overall more influential *Affect Program Theory* (APT). The contrast is perhaps most clear when focusing on the issue of cohesion between subjective experience of emotion and the face. APTs, in essence, hold that there should be an underlying perfect cohesion between emotion and the face if only the *noise* produced by culture, display rules, lying, etc. can eventually be fully accounted for with the right set of measures. In a pure BEV, there is no place and function for any kind of truthful transmission or “leakage” of emotion. Rather than something that is only added later via culture, core authors like Fridlund (e.g., 1994) consider deception as an inborn and omnipresent core constituent of facial behavior. To even speak of *emotional facial expressions* is, in this view, a misnomer (see Hess and Thibault 2009) because the face has not evolved to express emotions – rather, the purpose of the system is assumed to be entirely devoted toward commu-

nicating *social motives*, e.g., a readiness to play, to appease, or to attach oneself to another (depending on the context; see Fridlund 1994).

Not all authors who view themselves as belonging to the BEV reject the usefulness of emotion as a concept, and even Fridlund more recently seems willing to make concessions in this regard (see Fridlund and Russell 2006). However, a driving idea behind many of the studies from or related to this tradition is the assumption that *social context* or *social motivation* may be of greater importance for facial behavior than any potentially associated emotional states (see studies by Kraut & Johnston, 1979; Fernández-Dols & Ruiz-Belda 1995, 1997; Ruiz-Belda et al. 2003). As reviewed recently by Barrett and colleagues (Barrett et al. 2011), the often neglected importance of social context in perceiving emotion from the face has been clearly demonstrated by different studies and methods. Much of the increased sensitivity to the importance of the social context beyond the status of a nuisance variable in more recent studies may be due to research directly or indirectly inspired by behavioral ecology.

But what about cohesion between facial expression and social motivation – the construct that Fridlund and other representatives of BEV propose as causally related to facial behavior? Unfortunately, Fridlund is extremely vague about the psychological mechanisms that mediate social context (Kappas 2003). There is little empirical evidence for stronger cohesion between *social motivation* and facial behavior than between the latter and emotion. Attempts to combine *behavioral ecology* and *display rules* to explain emotion strongly suggest a need for integrative models (see Kappas 2002; Parkinson 2005; Parkinson et al. 2005). Almost certainly, neither the neuro-cultural model, nor other existing variants of APT can sufficiently explain the empirical data obtained by behavioral ecology (Kappas 1999). Conversely, studies from the BEV-context have clearly failed to eliminate the concept of emotion as one of the triggers of facial behavior (see Hess et al. 1995). Again, the verdict is not yet in. That both suspects have a part to play appears certain – yet precisely how this is orchestrated still remains a question in lack of definitive answers.

4 Facial communication and regulation

4.1 Framework

Early research on facial behavior, for example the questionnaires employed by Darwin, have confounded encoding and decoding processes. To know whether a particular expression occurs when someone is happy it is sufficient, in this view, to ask someone whether s/he has seen the expression. However, what if that person did not see it, but the expression was there? Hence, many researchers have stressed the importance of measuring independently the relationship of some internal state

and its externalization on the one hand and the relationship of particular expressive features and the perception and attribution on the other (Kappas, Hess, and Scherer 1991). However, even then, communication is often seen as a sequential process that can be seen as independent modules. This is a useful research paradigm for some questions, but there might be a price to pay – namely that the dynamics of interaction – perhaps the key aspect of nonverbal behavior gets lost.

As we have outlined above, we know now that expressions often do not express emotional states (low correlation between subjective experience, physiological activation, and expression), impressions fail (we know little about decoding of “real” expressions due to the stereotypical material used in many studies, but if spontaneous material is used “recognition” drops drastically), and we know almost nothing about what impact expressions have or in a more general sense what expressions *do* in interaction to the sender and receiver (see Kappas and Descôteaux 2003).

We believe that it is useful to think of expressions as part of a system that regulates. It regulates the expressor and those around, perhaps even those who are only explicitly around. The different levels of regulation are closely linked at times difficult to disentangle (Kappas 2011a, 2011b). Much of this process is outside of awareness and automatic. One component is cultural rules, mediated via social learning. However, at the heart of this process lies a nested set of regulatory influences associated with biological systems that we share with our evolutionary ancestors.

4.2 Critical evaluation of decoding studies

4.2.1 Encoding and Decoding

To capture the complexity of the communication process the modified Brunswikian lens model by Scherer and his collaborators has proven particularly useful (e.g., Kappas, Hess, and Scherer 1991; Kappas 1997). The model allows for the distinct contemplation of cues on both the encoding and decoding side by identifying, on the one hand, states or social motives which are encoded by the sender, and on the other hand, those which are perceived and decoded by the observer. Different processes such as display rules or social intentions can modulate or mask the encoding of internal states in nonverbal behaviors reviewed in the previous section. Even if there were objective encoding cues, for example fear in the voice, face, or posture, it cannot be assumed that they are also perceived or decoded in a specific situation (Kappas 2009). Accordingly, cues from both the sender and receiver side may be linked, but can equally be restricted to one side.

Evidence for the different utilization of facial features information comes from a study by Hess and Kleck (1994) in which participants had to differentiate posed and spontaneous expressions of happiness and disgust. Although participants were able to accurately report the facial cues they employed in the task (e.g., gaze

aversion), these cues were not valid discriminators of the posed and spontaneous expressions. Similar findings had previously been reported by Hess et al. (1989) in which parameters describing the temporal characteristics of posed and felt smiles were not correlated with the observers' ratings of the sender's happiness. The significance of facial cues therefore varies between sender and observer and thus cannot be assumed to be congruent.

Furthermore, the attribution process of perceivers may be grounded in idiosyncratic stereotypical knowledge of emotion expressions that lead to a biased perception of facial displays. These concern static (e.g., facial morphology) or dynamic features that are erroneously interpreted as a cue for a certain state or the intentional communication of the individual. For example, cultural and gender stereotypes have led to different interpretations of the same facial expression for anger and happiness (e.g., Hess, Blairy, and Kleck 1998, 2000). Also, particular facial configurations connoting physical attractiveness or maturity can influence the attribution process by suggesting social traits that resemble stereotypes (e.g., Langlois et al., 2000; Todorov et al. 2005). As such, the way facial behavior is judged can therefore depend less on the intent and actions of the sender, and more so on the biases and implicit theories of the perceiver. Unfortunately, there are only a few studies on the face which combine an explicit analysis of the encoding and decoding process (e.g., Hess and Kleck 1990, 1994; Hess et al. 1989).

4.2.2 The problem of using posed expressions for investigating the communicative function of expressive behavior

The complexity of the decoding process is commonly underestimated (see also Russell, Bachorowski, and Fernández-Dols 2003). In most studies the "recognition" of emotions is examined by using static, posed, and stereotypic expressions. These generally consist of still posed expressions (photographs) at or very near the peak of emotional display. Clearly, such stylized and static materials do not reflect the true form of facial expressions. In everyday communication we are confronted with complex expressions that move in space and time. Apart from the greater ecological validity in using moving expressions for research, facial dynamics on the whole play an important role in the decoding process (see Krumhuber and Kappas 2005; Krumhuber et al. 2007). The problems of idiosyncratic posed expressions have been evident at least since Feleky (1914). Hence, standardized sets of posed faces are often used, such as the *Pictures of Facial Affect* (Ekman and Friesen 1976), the *Japanese and Caucasian Facial Expressions of Emotion and Neutral Faces* (Matsumoto and Ekman 1988), the *Karolinska Directed Emotional Faces* (Lundqvist, Flykt, and Öhman 1998), the *Montreal Set of Facial Displays of Emotion* (Beaupré, Cheung, and Hess 2000), the *Radboud Faces Database* (Langner et al. 2010), the *Geneva Multimodal Emotion Portrayals* (Bänzinger and Scherer 2010), or the *Amsterdam Dynamic Facial Expression Set* (Van der Schalk et al. 2011).

Beyond these limitations, there is the additional and maybe greater underlying problem that posed (voluntary) and spontaneous (involuntary) expressions probably differ with respect to the innervation of the face (Damasio 1994; Gazzaniga and Smylie 1990; Rinn 1991; see also Kappas, Hess, and Scherer 1991). That is, voluntary and involuntary movements are enervated by different neural pathways. The presumed distinction is supported by double dissociation clinical reports. That is, there are patients who can show expressions on request, but are spontaneously inexpressive and vice versa (see Rinn 1991). Several facial muscles and regions differ in the degree to which they can be voluntarily activated. These differences become even clearer when dynamic movements are imitated compared to static expressions (Girard et al. 1996). Specifically, dynamic presentations have been shown to improve emotion recognition in brain damaged patients who are unable to identify expressions from static displays (Adolphs, Tranel, and Damasio 2003; Humphreys, Donnelly, and Riddoch 1993). Facial cues such as blushing, the presence of tears, or variation in gaze, all of which are likely associated with affect, are typically absent from all of these studies or standardized stimulus sets.

Therefore, faces in standardized photo sets may not show the emotional state as felt by the actor, but instead may be more depictive of a stereotype of said state. In most cases, the emotional state of the person is unknown. Although the particular target emotion is often detected in photos presented to participants in judgment studies, it may be more telling about the emotional portrayal of the actor (the emotion they want or should show) versus what the actor actually feels. The fact that some of these judgment studies reveal high agreement for specific, standardized expressions does not permit us to draw any conclusions with respect to the participants' ability to recognize what another person is actually feeling in a specific real world situation. This may be due to the fact that spontaneous emotional expressions are characterized by great variance in their appearance, as shown in studies from Landis (1924) to Fernández-Dols et al. (1997). Similar doubts apply to judgments studies with posed vocalization or postures (see Bachorowski 1999; Kappas et al., 1991).

4.2.3 The impact of the psychological situation on the perception of expressive behavior

Perhaps the biggest problem in numerous judgment studies lies in their use of limited facial primes; presenting faces without context. The (in)famous experiment by Lew Kuleschow powerfully demonstrates that the perceived meaning of an expression greatly depends on its specific context (Russell 1997; Wallbott 1988). Kuleschow, a Russian director, produced three silent films concluding with a close-up shot of the main actor. His expressionless face followed the depiction of a bowl of hot soup; a dead woman in a coffin; and a girl playing with a teddy bear. In all three cases, the same neutral expression was interpreted as demonstrating a differ-

ent emotion (Kalkofen 2007). Although Kuleschow was not an experimental psychologist and the “experiment” is poorly documented – no copy of the films apparently survived – the paradox inspired several researchers to systematically examine the role of context in the perception of expressions (see Barrett, Mesquita, and Gendron, 2011; Carroll and Russell 1996; Fernández-Dols and Carroll 1997; Fernández-Dols, Carrera, and Russell 2002; Russell 1997; Wallbott 1988). From their findings it is clear that social context can play a major role in the perception of emotional expressions. Moreover, other contextual information such as body postures (e.g., Aviezer et al. 2008), voices (e.g., de Gelder and Vroomen 2000), and surrounding emotional faces (e.g., Masuda et al. 2008) have been found to influence which emotion is attributed to the corresponding facial expression. Given these types of findings, it is highly unlikely that our brain processes emotional states according to a fixed set of six or seven emotions and that we detect others’ emotions via matching to these templates.

It is important that the critical remarks concerning the methodology used to examine the decoding of expressive behavior (regardless of modality) are not misunderstood. Expressive behavior is neither arbitrary nor purely a social construction. It may be more advantageous to look at certain expression patterns (of biological origins) in varied embedded social and cultural contexts. Most studies using static, posed, and context-free stimuli cannot then offer us any additional information. When we see a report on television about a demonstration in the Middle East as result of a terroristic act, do we really know how sad those crying and screaming people are? Can we accurately judge the success of a joke by looking at the faces of our friends?

4.2.4 The paradox of self-representation of our decoding skills and the actual skills

In general people do not have good (although higher than zero accuracy) estimates of their emotion detection skills (see Hall, Andrzejewski, and Yopchick 2009). Even the intensity of one’s own expression and the detection by others are often misjudged (Barr and Kleck 1995; Holder and Hawkins 2007). One of the many interesting results in this context stems from the well-named contribution by Ekman and O’Sullivan (1980) “Who can catch a liar?” Ekman and O’Sullivan demonstrated that even professionals who “read” faces for a living, such as police officers, psychiatrists, or judges, failed to distinguish real from faked emotion. However, when asked before and after the task how the participants viewed their own skills, it became apparent that subjects overestimated their skills. Such tendency to overconfidence was also found by several subsequent studies on lie-detection skills (for an overview see Vrij, Granhag, and Porter 2010). In a meta-analysis of 206 studies, experts (i.e., law enforcement personnel, judges, psychiatrists, job interviewers, and auditors) did not perform significantly better than nonexperts,

thereby replicating the findings by Ekman and O'Sullivan (1980). On average, people achieved a 54% truth-lie discrimination rate which is only slightly above chance performance of 50% (Bond and DePaulo 2006).

In light of these findings, how can it be that we believe that we are good in reading others' expressions when in fact we are not? Obviously, it is useful to have a certain sensitivity to the expression of others, but it is also useful to be able to strategically use the nonverbal messaging system to achieve certain goals. If each of these attempts were transparent, social intercourse would break down. Such arguments have been made in the context of lies in general, but they hold also with regard to nonverbal behaviors specifically and here facial actions. If every mother in law would understand that the tie was not a welcome gift (to use the stereotypical example of expression moderation), then different strategies would have to be used. This is all not very new. However, just as the theoretical schools (affect theory, appraisal, dimensional, behavioral ecology) shape experiments and paradigms, so does the naïve view that affects researchers as well. Just because stereotypical expressions are well recognized and this resonates with our subjective belief that overall, we are good in reading others, we should not be deceived. For example, meta-analyses have revealed that many nonverbal cues that are studied by researchers in deception studies show no relationship with deception at all (DePaulo et al. 2003). Moreover, studies using spontaneous expressions demonstrate much lower "recognition" rates. If we want to understand how much someone who has deficits in recognizing affect is handicapped, we need to know how good the "normal" person is, with candid stimuli that come from real situations.

4.3 Interpersonal emotion regulation

As outlined above, two-factor models that conceptually separate spontaneous from regulated expressions led to experimental paradigms that tried to isolate the social regulation from the "genuine" expression by isolating the subjects while they were being confronted with emotion-eliciting stimuli. In consequence, the social functions and effects of expressions have been completely pushed outside of the picture. In the attempt to separate encoding and decoding in different types of studies possibly much got lost regarding what expressions actually do (Kappas and Descôteaux 2003). At an intra-individual level, there is now convincing evidence that there are (facial) feedback processes that help to up- or down-regulate affective states – despite the fact that apparently sometimes the attempt to modulate expressive activity leads to the opposite effect (Kappas 2011b). At the interindividual level there are multiple processes that go beyond communicating the present state (APT) or communicating a present social motivation (BEV). There are complex patterns of contingent reactions, imitation, and synchrony that constantly modulate the interpersonal relationship and that play a critical part in empathy.

Understanding who does what and when on the face must be interpreted in social contexts – this is clearly one of the biggest lacunae in current nonverbal research. There is a long tradition of research on nonverbal behavior in interaction ranging from interpersonal accommodation (see Burgoon, Stern, and Dillman, 1994) to more recent interest in the chameleon effect (Chartrand and Bargh, 1999; see Chapter 18, Lakin, this volume). Research focusing on facial behavior, due to the theoretical forebears has been somewhat agnostic regarding activity in interaction. Of course, there are also pragmatic difficulties, but these are slowly becoming less of an issue. For example, the advent of synthetic agents whose behavior can be manipulated in real time opens new avenues that were not available when analyses had to remain at a descriptive level, or rely on conscious manipulation of expressions by confederates. More research is needed.

5 Practical applications of facial behavior research and their limits

Facial behavior is of great interest for a number of applied questions, e.g., traditionally in the clinical context (Kappas and Descôteaux 2003; Philippot et al. 2003), and in the last decade also in connection with fighting terrorism or other forensic issues (Ekman 2001; Kluger and Masters 2006; Vrij and Mann 2005). Connected to both fields as well as even everyday applications is the new field of “affective computing” (e.g., Kappas 2011c; Picard 1997; Picard et al. 2004) that has been vigorously moving towards real-time, real-life automatic monitoring of emotions made possible by new mobile devices (see e.g., Picard 2010). For the purposes of obtaining a technical readout of facial activity, such devices can be as simple as any commonplace inbuilt webcam connected to the internet (e.g., www.affectiva.com/affdex/). For clinical purposes, there are, for example, toolkits being developed to help people with an autism spectrum disorder to understand and respond to facial affect in ongoing social interactions (e.g., Madsen et al. 2009).

There is certainly reason to be enthusiastic about the new avenues of research being opened by mobile or everyday recording devices and sophisticated algorithms that may even be able to extract non-muscular activity from the face, e.g., heart rate variability (see Poh et al. 2011). However, while there are some truly amazing technical and algorithmic advances in the field of affective computing, such technological improvements alone cannot bridge the chasms that still remain on the side of psychological theory.

As we have discussed earlier in this chapter, perhaps the most critical question here is the issue of only moderate cohesion (see also Kappas 2010), even in the case of highly controlled laboratory studies. Without measures and algorithms that can parse not just the surface level of the image and how it relates to the muscles –

but also the complex level of the social and individual psychological context that gives meaning to the muscles – the challenge still remains to connect this data to systematic and accurate psychological meaning. Clearly, reliable real-time FACS coding is not a sufficient answer because cohesion can be so low (see e.g., Reisenzein 2000; Reisenzein et al. 2006). The temptation is there, obviously, to go ahead and develop products and applications based on the most optimistic assumptions of cohesion – up to the point where one would consider the entire problem to be solved once the technical problem is solved. However, to work on the basis of disproven assumptions here could be very costly indeed – since it could easily lead to mistakes, bias, and systematic error in interpreting facial muscle activity as expressing an emotion when it might rather communicate something else entirely in a specific social situation to which the system is agnostic. This criticism also applies for other applications that might build in part upon automatic analyses of facial activity, e.g., lie detection. Simply, as long as there is no reliable evidence of a “Pinocchio Nose” (DePaulo et al. 2003), one should not assume that the recognition of lies by automated procedures is likely to succeed.

This important caveat in mind, some of the emerging mobile devices and new algorithms may however very well be able to help pave the way to a better understanding of real-life social context and its role in the emotion theater. If real-world data can soon be more easily collected on a large scale (see e.g., Picard 2010), then contextual factors may become more visible, which could inform laboratory studies as well as drive intelligent applications that learn to incorporate real-world context effectively into their models. Certainly, basic laboratory research would still be needed for strict tests of data obtained from the field – but the boundaries between basic and applied field research may soon become significantly more permeable.

6 Summary

We have provided an overview regarding the current knowledge regarding facial behavior with a strong emphasis on the link between facial behavior and emotions. We have outlined some of the key theoretical positions regarding facial expressions of emotion because these theories affected research paradigms and the interpretation of findings. Some of the challenges to the field are a consequence of these positions – for example the strict separation between *push* and *pull* in nonverbal behavior. While there is merit to such decisions, it is also of epistemological importance to view the state of the field in the light of the theoretical reasons to look at facial behavior in a particular way.

We have argued that we need to know more about facial behavior in interaction. Very recent developments, particularly from social neuroscience and affective computing, will shape research in the next decades. It is critical that interdisciplinary approaches avoid that old theories get pushed into these new fields; instead,

current notions of interaction, cultural differences, and social context should be present there. We argue that knowing what facial activity *does* will help us to understand what facial activity *is*. New developments that involve the implementation of human like artificial systems will impact the study of facial behavior dramatically like no other development in recent decades.

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7 Vocal behavior

Abstract: The human voice has traditionally been considered less important than the face in the study of nonverbal communication. While the vocal channel conveys both verbal and nonverbal information, a great deal of information is communicated nonverbally with the voice, such as the speaker's physical and personality traits, and physiological and psychological states and intentions. In this chapter, we discuss the current literature on each of these topics using the Tripartite Emotion Expression and Perception model as a for nonverbal vocal communication. As such, we provide an overview of the various functions of vocal behavior from the speaker's (expressive) and listener's (perceptual) perspectives. We begin by examining the extent to which relatively stable and enduring speaker traits and dispositions can be marked by vocal parameters, providing distal cues for the communication process. As the transmission medium affects the integrity of distal cues reaching the listener, these factors are described next. Then we review the decoding literature, focusing on listener recognition or attribution of speaker traits, states and intentions. Since a different set of cues become relevant when a person is interacting with another person, we close the chapter with a discussion on the nonverbal cues involved in social interactions.

Keywords: prosody, voice quality, paralinguage, acoustic, suprasegmental, perception, emotion, TEEP model, nonverbal communication

1 Introduction

This chapter deals with nonverbal behavior produced by the human voice, specifically the way in which various types of speaker characteristics and communication intentions are marked or indexed in specific aspects or qualities of vocal behavior and how these affect the listener. These vocal cues are generally embedded into multichannel communication, including in most speech situations facial expression, gestures and posture but are increasingly encountered in isolation (due to the popularity of audio devices). In this chapter we will focus on the vocal audio channel or modality.

Evidence on the evolutionary history of tongue control in early *Homo sapiens* suggests that human vocalizing abilities may have been essentially in place 400,000 years ago, much earlier in time than the first archaeological evidence for symbolic behavior (Kay, Cartmill, and Balow 1998). This is consistent with the view that primitive vocalizations such as affect bursts (comparable to animal vocalizations) may have been at the root of the parallel evolution of music and

language (Scherer 1991; in press b). In the course of human evolution, vocalization has been selected to serve as the carrier signal for the most important code in human communication – language, or more specifically speech. This implies that the phylogenetically recent, highly cognitive mode of speech communication has been grafted upon a phylogenetically old vocal call system mainly used for affective and social signaling (Scherer 1994). As action tendencies continuously affect a speaker's respiration, phonation and articulation, all vocal behavior provides a continuous marking or read-out of the respective state of the speaker (as well as more stable traits and dispositions), which serve as important context information for the listener. Contrary to the visual appearance and expression of the person, always visible, vocalization can be turned on and off. Because speech is one of the most controlled human activities, the availability of nonverbal vocal signals of information processing, affect and attitude, which always accompany vocalization, is strongly determined by consciously controlled speech activity. It is this dual coding of all vocal communication, largely involuntary physiological processes affecting the vocal organs and highly controlled verbal activity using symbolic coding, which make the study of vocal behavior a complex and difficult undertaking.

To systematically review the literature in the general area of nonverbal vocal behavior, we have chosen a synthetic dynamic model, the Tripartite Emotion Expression and Perception model (TEEP, Scherer in press b) as a framework by adapting it to the more general case of nonverbal vocal communication, the topic of the present chapter (see Fig. 1). The model, a combination of Brunswik's lens model of perception (Brunswik 1956) and Bühler's Organon model of language (Bühler 1934), illustrates how the sender continuously expresses traits, states and message intentions through a multitude of distal cues to the observer, who perceives these in a more or less modified form as proximal cues. The degree of similarity between the proximal and distal cues depends on the quality of the transmission channel and the response characteristics of sensory organs. Based only on these proximal cues, the observer probabilistically attributes the states and processes unfolding in the sender. The model is "tripartite" as an application of Bühler's (1934) insistence that any sign has three functions: it provides symptoms of an ongoing physiological process or state in the sender, it serves as a signal of the process or state and thus appeals to the observer and, importantly, it symbolizes or represents meaning in the respective species or group (due to the ritualization of the link between symptom and appeal or the existence of a shared code for encoding and decoding). This third part is extremely important for the understanding of the communication process as it shows the importance of the sociocultural context and the existence of shared codes.

The TEEP model also takes into account the dual coding mentioned above, the fact that the production of the distal expressive cues and their proximal interpretation are determined both by continuous, generally involuntary, psychobiological

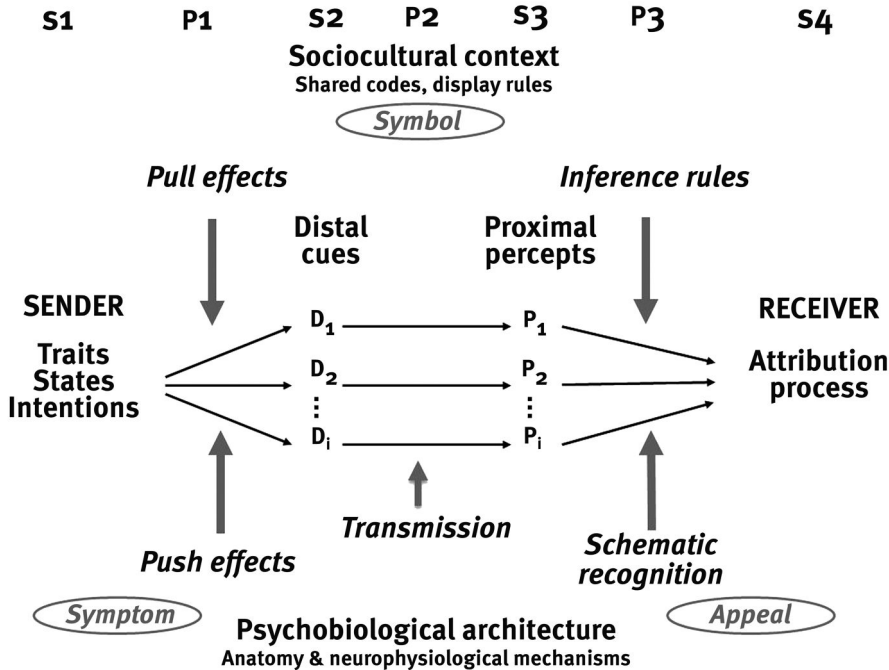


Figure 1: The Tripartite Emotion Expression and Perception model (TEEP) adapted to the more general case of the nonverbal communication of various types of sender characteristics

mechanisms and the rules generated by the sociocultural codes, such as language and normative expectations. In consequence, the model distinguishes between push and pull effects on the production side and schematic recognition and inference rules on the perception side (Scherer 2003; Scherer and Kappas 1988).

Push effects are motor response patterns due to physiological changes within the individual and to the preparation of motor actions as a consequence of appraisal. They usually have a rapid onset and are direct and uncontrolled externalizations of internal processes. They are “pushed” into existence by internal changes. Examples of expressions exclusively due to push effects are affect bursts (i.e. brief, discrete, sudden expressions as a consequence of emotionally charged events; Scherer 1994) or infant grunts. Push effects are supposed to occur universally, but their concrete appearances are relatively idiosyncratic and thus subject to individual differences. On the perception side, it can be assumed that organisms have, in the course of evolution, developed schematic recognition mechanisms (the extreme form being Lorenz’ innate releasing mechanisms, see Hauser 1997) for the quasi-automatic detection of meaningful patterns in the behavior of others.

By comparison pull effects are expressive configurations that are part of a socially shared communication code and so they are socio-communicative signals used to inform or influence other group members. They are “pulled” into existence

by the social context. Individuals learn through socialization to employ specific patterns of responses for communicating effectively, or deceptively, their internal states and behavioral intentions to other people.¹ In this sense, pull effects exclusively refer to cultural and linguistic rules. Examples of pure pull effects are conventionalized emotion expressions and “affect emblems” (expressions having a shared cultural meaning), such as ‘yuk’ and ‘ouch’ (similar to visual emblems; Ekman and Friesen 1969). As a consequence of their highly conventionalized forms, pull effects, thus show little inter-individual variations but a larger degree of intercultural variability. These responses can be decoded effectively only if they respect social rules and adhere to the fixed socially shared symbolic code. In consequence, on the perception side we expect mechanisms built on sociocultural inference rules.

As shown in Figure 1, the elements of the model are identified as *structural feature sets* (labeled S1–S4), describing the elements of the underlying mechanism and *process mechanisms* (P1–P3), which describe the causal relationships underlying the communication process. We will first briefly review the structural features before reviewing the literature on the major process mechanisms. Special emphasis is placed on the measurement operations available to capture the quality of these features in empirical research.

2 Structural features of vocal communication

2.1 Sender characteristics and intentions (S1)

Here we briefly list the major features that have been the object of study in vocal behavior research, starting with stable characteristics or behavior dispositions of a speaker (traits), to more short-term changes in the mental and bodily processes in a speaker that are due to psychological processes such as event appraisal and consequent action tendencies, homeostatic mechanisms, or external agents (states) and finally to specific message intentions that are destined to inform the listener about specific states of affairs (intentions). The examples given in the list below are not meant to establish a valid taxonomic system but mostly to illustrate the nature of the traits, states and intentions that have been regularly studied in this domain and that should thus be distinguished.

Traits

- Biometric (age, sex, weight, size, etc.)
- Social status (power, ascription, region of upbringing, native language)
- Dispositions (personality, attitudes, cognitive and affective disturbance)

¹ We do not cover the vocal cues to deception and truth telling in the present chapter although it is a message intention and thus a relevant topic for nonverbal vocal behavior. For further information on this topic, the reader is referred to Chapter 16 of this volume.

States

- Health (hormonal cycles, cold, drug effects)
- Affect (emotion, mood)
- Physiological alertness (fatigue, intoxication)

Intentions

- Interpersonal stances (politeness, hostility, rhetorical-persuasive intent, etc.)
- Message intensions (irony, emphasis, etc.)

In this chapter we discuss the current literature on each of these topics. However, we may refer to the large body of literature on affect and emotion for illustrative purposes, mainly during some of the earlier sections on measurement.

2.2 Distal vocal cues (S2)

Measurement of the distal cues of vocal behavior can be characterized at the motor and acoustic levels. The motor or physiological level includes descriptions of the positions and movements of the major structures involved in vocalizations, such as the vocal folds, velum, tongue and lips. The acoustic level refers to the acoustic description of characteristics of the speech waveform coming from the mouth. To understand the motor and acoustic levels, one needs a basic understanding of the voice production system. In this section we briefly describe objectively measurable vocal parameters that can be expected to carry information about the traits, states and intentions described above, starting with a brief survey of the production mechanisms, the vocal organs and their functions, that generate the parameters.

The voice production mechanism can be thought of in three sections, respiration, phonation and articulation. The respiratory system, including the collaborative movements of the diaphragm, lungs and related muscles, provides the air supply necessary for human sound production. During exhalation, the air flows from the lungs to the trachea until it reaches the glottis. Depending on the sounds to be produced, the air may pass through glottis with or without vibratory actions of the vocal folds (i.e., with or without phonation). During open breathing and the production of unvoiced sounds, the vocal folds are open (“abducted”), allowing the air to flow through the glottis without modification by the vocal folds. Instead, the sound is modified by the vocal tract, especially by the articulators. The resulting sounds often consist of turbulent noise (e.g., fricative sounds such as /f/ and /sh/) or bursts of air (e.g., stop consonants such as /p/ and /t/). These sounds are aperiodic as there is no repetition in the sound energy for specific intervals of time.

The act of phonation is referred to as voicing. Hence, phonation occurs for the production of “voiced” sounds. For phonation, air from lungs reaches the glottis and builds pressure below the closed (“adducted”) vocal folds. When this subglot-

tal pressure exceeds the force of the laryngeal muscles keeping the vocal folds adducted, the vocal folds are spread open. This is the opening phase of a vibratory cycle. The air flows at a high speed from the bottom to the top. As the top of the vocal folds open, a pressure change is produced mainly due to the high velocity air flow and released air. This pressure change (in addition to other factors including the Bernoulli effect) causes the bottom of the vocal folds to begin adducting (the closing phase), propagating upward. This represents one cycle of vocal fold vibration.² These cycles are repeated in a quasi-periodic way. The number of vibratory cycles per second is referred to as the fundamental frequency of vibration (f_0 ; units of Hertz). The f_0 is the lowest frequency of vibration. Vibration also occurs at multiples of the f_0 . These are referred to as harmonics. Many factors including the mass, length and elasticity affect the frequency of vibration (i.e., the f_0) and characteristics of the vibration.

Indeed, the two main factors driving vocal fold vibration is the subglottal pressure and airflow. The strength of the vocal output, i.e., the vocal intensity, can be modified by adjusting the amount of airflow and resistance of the vocal folds. For example, to increase intensity, the medial compression of the vocal folds should be increased. This in turn will cause an increase in the subglottal pressure and thus the strength of the vocal fold vibration. In high intensity phonation, the vocal folds tend to adduct faster to the closed position and stay closed longer than during normal phonation (Seikel, King, and Drumright 2010: 250). As the pulses of air continue through the glottis, it passes through the vocal tract. The vocal tract includes the pharyngeal, nasal and oral cavities as well as the articulators. The vocal tract acts as a filter with specific resonant characteristics resulting in the amplification of certain frequencies (the resonant or “formant” frequencies) and attenuation of others. These modifications to the sound change the quality of the sound.

Although the motor and acoustic levels are clearly not independent, it is useful to separately discuss the parameters associated with each level. One reason for this is because the mapping of parameters from one level to another is unclear. In addition, several physiological settings may correspond with a single pattern of acoustic cues. Our primary concern is the description of parameters that can be objectively assessed for both levels and also that seem useful for subjective measures of proximal cues in the perception process. As such, we present these parameters separately.

2.2.1 Measurement at the motor level

Studies investigating vocal behavior at the motor level deal with the physiological process of phonation and articulation or vocal pathology. Many of the techniques

² This is a simplified overview of the process of phonation. For a more detailed description the reader is referred to Titze (1994), Laver (1980), or Seikel et al. (2010).

used to study the production mechanism make use of sophisticated equipment and cannot be easily used to study interactions or lengthy segments of speech. For example, vibratory movements of the vocal folds can be examined using high-speed video stroboscopy (Kitzing 1985) and nasal and oral airflow (and pressure) can be investigated using Rothenberg oro-facial mask (Rothenberg 1977). Both of these techniques interfere with normal speaking habits because they pose an obstruction in the airflow pathway. Nevertheless, newer techniques are enabling the development of more versatile devices that also allow the study of speech as a dynamic process. These include magnetic resonance imaging (MRI), which has been recently used to study changes in the vocal tract in real-time while speaking (Kim, Narayanan, and Nayak 2009).

One powerful use of measurements at the motor level is the assessment of voice quality or the voice timbre. Voice quality has been suggested as an important marker of idiosyncratic speaker information and the expression of emotions and attitudes. Since differences in quality are mainly produced by variations in laryngeal, pharyngeal and articulatory settings, measurements at the motor level are a direct way to identify changes in quality. One way to estimate certain characteristics of vocal fold vibration is using electroglottography (EGG). EGG examines the lateral contact area between the vocal folds as the voltage difference between the two electrodes placed on either side of the neck (Childers and Krishnamurthy 1985: 133–134). Another approach is to estimate the sound produced at the glottis by a process known as inverse filtering. This technique attempts to cancel out the effects of the vocal tract and lip radiation on the vocal signal by passing the acoustic signal through a filter with a transfer characteristic that is the inverse of the vocal tract. These analysis techniques are performed on voiced sounds, specifically sustained vowels.

Although the peaks of the EGG waveform and the inverse-filtered glottal waveform indicate different points of the vibratory cycle (point of maximum closure in the EGG waveform and point of maximum flow or minimal closure in the glottal waveform), for both cases the number of pulses per second represents the f_0 . In addition, various aspects of the pulse correspond to characteristics of the vibratory cycles. Two parameters typically examined include those to describe the relative durations of the open and closed phases of the cycle (open quotient and closed quotient, respectively). Other parameters quantify the opening and closing phases of the cycle, such as the rate of opening and the rate of closing (measured as the maximum flow declination rate or MFDR), the ratio of rise time to fall time (speed quotient) and the amplitude quotient (AQ) or ratio of the pulse amplitude to MFDR.

An understanding of the motor processes of speech production can provide valuable insight into the relationships between physical and acoustic parameters. Another method of inferring the nature of the production process is on the basis of only acoustic patterns (Fant and Lin 1988; Gobl and Ní Chasaide 1999). Assessment of vocal behavior at the distal level can also provide unique information

about the speaker. Techniques for the measurement of these distal acoustic cues will be discussed next.

2.2.2 Measurement at the acoustic level

Changes to the voice production mechanism will inevitably have consequences on the acoustic signal and therefore, measurements performed on the acoustic signal are an indirect method of quantifying how the quality of voice production either reflects the sender's traits or has been influenced by the sender's states and intentions. The advantages of analyzing the acoustic signal instead of physiological measurements are many. Recordings of the acoustic signal are often faster to perform and less obtrusive than physiologic measurements and the resulting data can be interpreted with less training given the plethora of speech analysis software available today. Despite the ease at which a variety of parameters can be computed, with over 200 parameters to choose from (Žwan et al. 2007; 331 parameters reported), it is difficult to determine which to compute. There are four broad categories of parameters related to f_0 , intensity, voice quality and temporal aspects of speech. Of these, the true distal cues are the f_0 and intensity parameter groups as they are parameters measuring physical changes. We describe some of the main parameters that can be computed within each of these categories and suggest some important considerations to make when examining these cues below.

2.2.2.1 Fundamental frequency

Measurements of f_0 have been typically reported as global measures across the utterance, such as the mean, range, minimum, maximum and standard deviation. These measurements must be computed on only the voiced parts of speech. Since automatic f_0 extraction methods are not without error, it is useful to compute the minimum and maximum values as the 5th and 95th percentiles so as to drop any extreme values. More recent work has employed time-varying measurements of f_0 , such as the f_0 contour shape and gross trend of f_0 (Goudbeek and Scherer 2010; Greenberg et al. 2007). The advantage of these parameters is that a neutral or baseline sample is not needed for an assessment of changes. Another metric for describing the contour shape includes identifying the number of change points in the contour and the gradients in between points (Patel and Shrivastav 2011). The location at which the change points occur with respect to the linguistic information (e.g., within stressed syllables or words) is a possible method for using linguistic cues for examination of nonverbal messages.

2.2.2.2 Intensity

The intensity of a speech sample is the amount of energy in the signal. It is related to the amplitude of sound pressure. Therefore, it is a physical parameter that can

be objectively measured. The most commonly studied intensity parameters are global measures (i.e., computed as one measurement across the entire sample) including the mean, maximum, minimum, range and standard deviation. Note that intensity and amplitude are often confused with loudness. Loudness is a subjective quality. It is measured as the listener impression of changes in sound pressure or vocal effort and will be discussed later with the proximal cues.

2.2.2.3 Voice quality

Other intensity measurements, such as the amount of energy within certain frequency bands or the relative energy within certain bands, are more indicators of voice quality. Such cues include the Hammarberg index (difference between the energy maxima in the 0 Hz to 2 kHz band and the 2–5 kHz band; Hammarberg et al. 1980) and alpha ratio (ratio between the summed sound pressure level or SPL in the 50 Hz to 1 kHz range and the 1 to 5 kHz range from the SPL; Sundberg and Nordenberg 2006). Both parameters characterize the distribution of spectral energy. Other parameters to quantify the spectral balance, include the proportion of energy below 500 Hz and 1000 Hz (Van Bezooijen 1984), the spectral slope (the regression line through the long-term average spectrum) and indices of the flatness (the logarithm of the ratio of the geometric and the harmonic mean of the power spectrum) and skewness (the extent to which the spectrum skews around its mean) of the spectrum (Boersma and Weenink 2011).

Additional voice quality parameters include those used to describe the periodicity of the signal, namely jitter, shimmer, H1-H2 (level difference between the first and second harmonics), H1-A1 (level difference between the first harmonic and first formant) and harmonics-to-noise ratio (HNR; the proportion of the periodic and aperiodic components that are present in the signal). Jitter is the average absolute difference between a period and the average of it and its two neighbors, divided by the mean period and shimmer is the average difference between the amplitudes of consecutive periods, divided by the mean amplitude. The H1-H2 and H1-A1 parameters have been used extensively as measures of breathiness (Fischer-Jørgensen 1967; Ladefoged 1983), but some evidence suggests that these measures, H1-H2 in particular, may be better suited to measuring intra-individual differences in voice quality (Simpson 2009), for example, in comparing within-speaker differences due to emotion in expressive speech (Sundberg et al. 2011).

2.2.2.4 Temporal aspects of speech

The temporal aspects of speech include rhythm, fluency or timing and durational measurements. The parameters falling within this category generally have to do with the presence or absence of sound and the duration of the sound and silence intervals. While the term “pause” has been used to indicate an absence of vocal

energy, it is more accurately used as an indicator of the speaker's intent to continue after a break in the speech flow. Interesting timing events along these lines include false starts and hesitation, juncture and respiration pauses (Siegman and Feldstein 1979). Many of the other temporal cues used in nonverbal messages partially rely on the linguistic information outside of the semantic meaning, such as the mean vowel and fricative durations and speech rate (Forsell et al. 2007; Leinonen et al. 1997). Speech rate or articulation rate is usually defined as the number of syllables per second. In certain circumstances, such as for word- or vowel-length samples, the overall duration can be a sufficient measurement. This is also a viable solution in laboratory recordings when the text is kept constant (i.e., the same number of syllables is present for all samples). In general, evidence seems to indicate that duration measurements over smaller segments are more informative and useful than mean sentence length, especially since the mean sentence length cannot be compared across sentences of different texts.

2.3 Proximal vocal cues (S3)

An essential aspect of a well functioning communication aspect is that the sender-encoded signals are in fact accessible to the receiver and can be correctly interpreted. In the case of vocal communication, this concerns the ability of the auditory sense organs of the human listener to capture the acoustic differentiations in the perceived vocalization that carry information about the sender's traits, states and intentions. Here we review the rather limited evidence on how this information is represented in the listener's sensorium, including the meaning-bestowing categorization like to be made.

As sounds enter the auditory apparatus, physical changes in air pressure are converted to mechanical vibrations and finally electrochemical impulses. As a result of this complex processing of sound waves, the cues heard by the listener may not correspond to a one-to-one mapping of the objectively measurable distal cues. As such, we refer to the cues that are heard by listeners as the proximal cues. An understanding of the receiver's cue utilization is important for studies examining communication (for example, for emotion attribution and speaker identification). For this it is necessary to understand the categories or dimensions that listeners use to differentiate changes in the sound and be able to measure these variations reliably. The domain of psychoacoustics has provided invaluable insights into the connections between the perceptual domain (what is heard) and the physical domain (what is measured; for example, Moore 2003; Zwicker and Fastl 1999). One example is the acoustic measure of intensity, which is inversely proportional to the physical measure of sound pressure level. Psychophysical research has shown that the perceived loudness of tones is nonlinearly related to the SPL (and thus, the intensity) and further, is affected by the sound's frequency

and the timbre (Fletcher and Munson 1933; Stevens 1957). This example demonstrates that it may be necessary to vary several acoustic features for a single proximal cue. Nevertheless, much of this domain has used simpler sounds such as tones. The nature of this relationship for speech is not well understood.

The proximal cues can be directly obtained in rating tests of listeners' impressions of certain qualities; however, not many attempts have been made to measure the proximal cues. One approach for obtaining the proximal cues is to identify a set of verbal labels that listeners must use to describe certain qualities of the voice. This assumes that categories of voice attributes exist and that listeners can reliably assign labels to describe them. The problems with this approach are clearly evident in the clinical domain where many terms have been used to describe vocal qualities (e.g., shrill, harsh, creaky, metallic, etc.), complicating comparisons across experiments and stimuli. The characterization of vocal qualities in the clinic has been debated in the field itself, although significant advancements were made with the work of Minoru Hirano (1981), who developed a framework for describing voice quality using three dimensions including breathy, rough and strain. However, it is not clear whether this system for describing acoustic cues in clinical settings is ideal for normal expressive vocalizations. Other dimensions may be more useful for judging *expressive* speech, such as sharpness, stability, articulation, speech rate, intonation, loudness, pitch and roughness, as suggested by (Sangsue et al. 1997). These scales are currently being used to evaluate the acoustic features of a large, multimodal, expressive speech database.

2.4 Perceiver inferences and attributions (S4)

The issue here is the assessment of the information usage by the listener and its consequences, capturing what Bühler has called the *appeal* of a sign (see Fig. 1). In the large majority of studies in this research domain the appeal feature has been assessed in the form of recognition accuracy for the traits, states and intentions that were present (due to appropriate manipulation) or assumed to be present (based on expert observer judgment) in the sender at the point of encoding. Generally, this takes the form of discrete classification, i.e. listeners are asked to identify the gender of the speaker, or choose an emotion from a list, or decide if an utterance is meant ironically or not. In cases in which a continuous underlying dimension is used, listeners are asked to make judgments about degrees, e.g., rate the age of a speaker, the degree of extraversion, intoxication, or truthfulness, etc. The nature of the underlying psychological processes of perception, inference, judgment and attribution has been rarely studied and cannot be reviewed in the current context. However, this remains an important area for future research and theoretical development.

This concludes our overview of the structural features and we now turn to the process mechanisms, starting with production.

3 Process mechanisms of vocal communication

3.1 The encoding or production process (P1)

3.1.1 Traits and dispositions

The description of the objective characteristics of vocal expressions (the expressed or distal cues) is usually performed by identifying the acoustic characteristics of the recorded voice signal. Here we examine to what extent relatively stable and enduring speaker traits and dispositions can be marked or indexed in vocal parameters, providing distal cues for the communication process.

3.1.1.1 Biometric characteristics

Some information such as the personal characteristics of the sender is represented in the vocal signal without conscious encoding (i.e., without an intent to communicate). In particular, evidence has shown that much of a sender's biometric information is encoded in the voice. Sex, age, weight and body size have often been found to show sizeable correlations with a variety of vocal parameters. Speaker sex and age are perhaps the most easily defined, with sex corresponding to f_0 level (higher in women, lower in men) and age corresponding to formant frequencies (higher in children, lower in older adults³). Much of this can be attributed to physiological reasons. On average, women's vocal folds may be shorter causing their f_0 level to be higher on average than men after puberty (females: 200 Hz; males: 125 Hz; Titze 1994). In addition, women tend to have a shorter vocal tract length than men by 12.9 mm (Fitch and Giedd 1999), resulting in a shifted vowel spaces (ratio of first formant to second formant or F_1/F_2 spaces). Likewise, children have shorter vocal tracts. Acoustically, their vowel spaces are shifted farther from adults, enabling a rough estimation of age from the difference in vowel spaces. The vocal tract length may also be an indicator of a person's age and size. Fitch and Giedd (1999) reported a correlation of 0.926 between a person's vocal tract length and body height.

It is interesting that some information is not solely based on physical differences. For example, speaker sex can be identified even though physiological differences are not as pronounced, namely in preadolescents (Sachs, Lieberman and Erickson 1973). Perhaps some of these differences may be attributed to social training into gender roles. In a study of the vocal intensity on interpersonal distances, Markel, Prebor and Brandt (1972) showed that males spoke with greater intensity than females when speaking with an opposite-sex partner.

³ The lower formant frequencies in adults result in the harmonics being closer together. The perceptual consequences of this lowering are a deeper and fuller voice, especially characteristic of adult males.

3.1.1.2 Social status

As found in the case of animal vocalizations, human vocalizations do show reliable parameters marking different aspects of social identity and social status, such as power, role and status ascriptions, region of upbringing, native language, etc. Clearly, a person's education and intelligence level influence the perception of socio-economic background; however, plenty of evidence suggests that this trait is embedded in speech outside of these factors. Linguistic factors such as a person's word choice and sentence length and structure have been shown to correlate with socio-economic background, but surprisingly, the correlation remains high for linguistically-constrained neutral speech, such as a list of numbers (Ellis 1967). A number of studies have shown that anger can be used to exhibit power and control the social environment (Clark, Pataki, and Carver 1996; Tiedens 2001). Other studies have demonstrated a link between specific acoustic and/or fluency features with social status, such as low frequency energy (Gregory and Webster 1996) or the relative amount of silent pauses (Siegman and Pope 1965). More recently, Hall, Coats, and Smith LeBeau (2005) performed a meta-analysis of the nonverbal cues (including vocal parameters) marking the power-status-dominance dimension (referred to as "verticality") and reported a number of interesting results. For instance, people low in personality dominance may speak relatively softly, but people low in social class may speak relatively loudly. Also, people with higher verticality (personality dominance or role/rank) made more successful interruptions with more dominant personality types interrupting more frequently. No significant relation was found for cues such as laughter, speech errors, speech rate, or voice pitch.

3.1.1.3 Stable behavior dispositions

Psychologists have identified a number of stable traits that summarize behavioral dispositions of a person independently of a particular situation. The most pervasive class of these is temperament or personality (such as extraversion, dominance, etc.). Early work on personality and personality disorders was predominantly perceptual, but some research has investigated the relationship between certain speech fluency features and interpersonal personality traits. For example, extroverts have been shown to speak with a louder voice (Scherer 1978) and exhibit fewer and shorter pauses (silent and filled) compared to introverts (Ramsey 1968). More recently, acoustic evidence has been presented linking greater dominance with lower formant dispersion and f_0 (Puts et al. 2007). Automatic classification of personality types is an area that is currently receiving much attention especially from the affective computing domain. Algorithms such as support vector machines have been used to classify speech samples into categories based on the big five personality traits of extraversion, agreeableness, conscientiousness, neuroticism and openness to experience (Mohammadi, Vinciarelli, and Mortillaro 2010). Some-

what less pervasive are social attitudes, such as engagement, empathy and sympathy. Attitudes have not been explored to the extent of personality traits and basic emotional states. Still, some evidence exists in support of attitude specific acoustic changes (Yu, Aoki, and Woodruff 2004).

While we cannot survey the copious literature in this domain, we would like to draw attention to one of the potential applications of vocal analysis, namely as one type of diagnostic approach for cognitive and affective disturbances. Vocal behavior has been shown to change under a variety of abnormal conditions including stress, anxiety, depression and schizophrenia (Cohen et al. 2008). For example, articulation (quantified using the formant frequencies) is less precise under stressful conditions (Tolkmitt and Scherer 1986). On the other hand, individuals with depression typically exhibit a reduced amount of speech output, a slower rate of speech and decreased emphasis (Alpert, Pouget, and Silva 2001). Further research is necessary to identify a reduced number of cues that can distinguish these disorders. The relative amount of energy in certain frequency bands may be useful for this purpose, namely in differentiating schizophrenia and depression (Scherer 1979).

3.1.2 States

3.1.2.1 Health

Individuals may also express vocal symptoms of physiological health. Various immunologic and neurologic conditions (such as hypothyroidism and Parkinson's disease), psychopathological disorders (such as depression, schizophrenia and post-traumatic stress disorder), infectious diseases (including the common cold) and pharmacologic agents (such as alcohol, corticosteroids and decongestants) may affect voice production (for example, a lower pitch in hypothyroidism and decreased loudness and altered quality in Parkinson's disease; for details see Stemple, Glaze and Gerdeman 2000: 127–130). Certain hormonal changes due to menstruation and ovulation can also influence the acoustic signal (Higgins and Saxman 1989). For instance, in the days leading up to ovulation (high fertility phase), women have a higher f_0 on average than in the days following ovulation (low fertility phase; Bryant and Haselton 2009). Others have shown that voice quality features (the level difference between the first two harmonics and the level difference between the first harmonic and first formant or H1-H2 and H1-A1) changed with oral contraceptive use relative to menstrual cycle phase (Morris, Gorham-Rowan, and Harmon 2011). The use of voice analysis to detect physiological changes has prospective uses in diagnostics, rehabilitation and other health related applications.

3.1.2.2 Affect, emotion, mood

Not surprisingly, much of the literature in this area has been devoted to the vocal expression and communication of emotion – due to the obvious effect of the con-

comitants of many of the basic emotions on the vocal apparatus (Laukka, Juslin, and Bresin 2005; Patel et al. 2011; Sundberg et al. 2011). These effects are quite homologous with similar effects in animals (Morton 1977 suggested similar motivational-structural rules for the vocalizations of many species of mammals) and many scholars have commented upon them over the centuries. Bachorowski and Owren (1995) have proposed an evolutionary mechanism based on the notion that emotional vocalizations are shaped by the effects they are to produce in the listener. This may well be part of the story, related to Bühler's appeal function as shown in the TEEP model in Fig. 1 and the notion of "pull effects." However, it seems unlikely that this is the whole story as it neglects the symptom function.

Componential appraisal theory suggests a different account based on the idea that emotions have evolved to prepare adaptive action in response to important events affecting an organism. In his Component Process Model of emotion (CPM) Scherer suggests that these events are appraised on a number of criteria such as novelty, pleasantness, goal conduciveness and coping potential and that the results of these checks bring about efferent changes in the autonomous and motor nervous system that facilitate adaptive actions including signaling (see Scherer 1994). Table 1 summarizes the predictions of this theory for vocal expression, showing the effects of appraisal results on different voice parameters.

While there is indirect support for these theoretical suggestions, direct empirical evidence for the notion that appraisal results drive the changes in vocal expression (mediated by action preparation and its physiological underpinnings) needs to be obtained by experimental manipulation of appraisals, requiring research paradigms that remain to be developed. Scherer, Johnstone, and Klasmeyer (2003) have reviewed the converging evidence with respect to the acoustic patterns that characterize the vocal expression of major modal emotions. Table 2 summarizes their conclusions in synthetic (qualitative) form. Juslin and Laukka (2003) have provided an additional review, detailing 114 studies and have reported a meta-analysis of the results. The results of these and future studies which aim to objectively measure distal cues will be of central importance to our understanding of the vocal expression of emotion. Without having measured concrete acoustic parameters to which a decoder's perception can be compared, it will not be possible to disentangle the multiple components of the emotion expression – perception process.

Much of the research in this domain has focused on basic emotional states such as happiness, sadness, fear and anger and the psychological dimensions of arousal, valence and power. Most researchers now agree that it is possible and perhaps beneficial to examine emotions using a continuous dimensional structure, where emotion categories are described by their underlying psychological and acoustic properties (Laukka et al. 2005; Patel and Shrivastav 2011). Many of the cues examined are easy to compute via standard acoustic software, such as descriptive measures of f_0 , intensity, formant frequencies and speaking rate as

Table 1: Summary of Component Process Model Predictions of Appraisal Effects on Vocal Parameters

Check	Voice production	Type of voice	Acoustic parameters
Pleasant:	faucal and pharyngeal expansion, relaxation of tract walls, vocal tract shortened due to AU 25 action	“wide voice”	increase in low frequency energy, F1 falling, slightly broader F1 bandwidth, velopharyngeal nasality, resonances raised
Unpleasant:	faucal and pharyngeal constriction, tensing of tract walls, vocal tract shortened due to AU 15 action	“narrow voice”	more high frequency energy, F1 rising, F2 and F3 falling, narrow F1 bandwidth, laryngopharyngeal nasality, resonances raised
Not relevant:	no change		
Relevant and consistent:	overall relaxation of vocal apparatus	“relaxed voice”	F0 at lower end of range, low-to-moderate amplitude, balanced resonance with slight decrease in high-frequency energy
Relevant and discrepant:	overall tensing of vocal apparatus	“tense voice”	F0 and amplitude increase, jitter and shimmer, increase in high frequency energy, narrow F1 bandwidth, pronounced formant frequency differences
No control:	hypotonus of vocal apparatus	“lax voice”	low F0 and restricted F0 range, low amplitude, weak pulses, very low high-frequency energy, spectral noise, format frequencies tending toward neutral setting, broad F1 bandwidth
Control and high power:	Chest register phonation	“full voice”	low F0, high amplitude, strong energy in entire frequency range
Control and low power:	Head register phonation	“thin voice”	raised F0, widely spaced harmonics with relatively low energy

Note. This table is based on Table 5.3 in Scherer (2001) from which the pertinent predictions for vocal cues have been extracted and rearranged.

well as some voice quality measures such as jitter, shimmer and HNR. The most stable results are found for the arousal or activation dimension, with markers that include increased mean and variability of f_0 , increased intensity and a faster rate of speech for high arousal (Breitenstein, Van Lancker, and Daum 2001; Laukka et al. 2005). This dimension represents the degree of activity, ranging from alert and excited to relaxed and calm. Many scholars in this area have asserted that the

Table 2: Synthetic Overview of Selected Empirical Findings on the Effect of Emotion on Selected Vocal Parameters.

ACOUSTIC PARAMETERS	Happiness/ Elation	Anger/ Rage	Sadness	Fear/ Panic
<i>Speech Rate and Fluency</i>				
NUMBER OF SYLLABLES PER SECOND	>=	<>	<	>
<i>Voice Source – F₀ and Prosody</i>				
F ₀ MEAN	>	>	<	>
F ₀ DEVIATION	>	>	<	>
F ₀ RANGE	>	>	<	<>
F ₀ FINAL FALL: RANGE AND GRADIENT ^c	>	>	<	<>
<i>Voice Source – Vocal Effort and Type of Phonation</i>				
INTENSITY (dB): MEAN	>=	>	<=	–
INTENSITY (dB): DEVIATION	>	>	<	–
GRADIENT OF INTENSITY RISING AND FALLING	>=	>	<	–
RELATIVE SPECTRAL ENERGY IN HIGHER BANDS	>	>	<	<>
SPECTRAL SLOPE	<	<	>	<>
HARMONICS/NOISE RATIO	>	>	<	<
<i>Voice Source – Glottal Waveform</i>				
EXCITATION STRENGTH (EE)	>	>=	<=	>
<i>Articulation – Speed and Precision</i>				
FORMANTS – PRECISION OF LOCATION	=	>	<	<=
FORMANT BANDWIDTH	–	<	>	–

Note. “–” indicates that no data are available. In specific phonemes, as compared with neutral, “<” ≈ “smaller,” “lower,” “slower,” “less,” “flatter,” or “narrower”; “=” ≈ “neutral”; “>” ≈ “bigger,” “higher,” “faster,” “more,” “steeper,” or “broader”; “<=” = both “smaller” and “equal” reported; “>=” = both “larger” and “equal” reported; “<>” = both smaller and bigger have been reported. (Adapted from Scherer et al. 2003, p. 436).

consistency of the findings in this literature is mainly due to differential levels of arousal or activation in the underlying emotions.

The cues to the valence dimension are not as clear (i.e., pleasantness from negative to positive). Some researchers have suggested that low intensity and mean f₀, fast speech rate and shorter pauses link to high or positive valence (Schröder 2001). In fact, it has often been suggested that the voice could only signal levels of physiological arousal, whereas the face is capable of encoding qualitative differences between emotions (see Juslin and Laukka 2003 and Scherer 1979, for a

detailed discussion of the issue). However, such a conclusion seems somewhat exaggerated, especially as it cannot account for the fact that judges are quite accurate in inferring different emotions from vocal expression (while some emotions are less well recognized than in facial expression, others, like anger and sadness are often better recognized; see Table 2). The power or potency dimension is the least understood dimension and has contradicting reports (e.g., low and high mean f_0 , fast and slow speech rate; Laukka et al. 2005) and as a combination of two components including jitter shimmer, HNR and mean f_0 (Patel et al. 2011). Variations along this dimension range from high control to lack of control.

Several studies show that acoustic properties of speech vary with respect to the emotional quality, intensity and context (e.g., Bachorowski and Owren 1995). Also, a comparison between tonal and non-tonal languages shows that f_0 and speech rate are used differently by speakers of different cultures (Anolli et al. 2008; Ross, Edmondson, and Seibert 1986). Vocal expression does not exclusively signal physiological arousal but also qualitative and culturally sensitive differences between emotions. Qualitative differentiation of emotions in acoustic patterns, apart from arousal, has been difficult to demonstrate because (a) only a limited number of acoustic cues have been studied and (b) arousal differences within emotion families have been neglected (see Scherer 2003, for further detail). In consequence, it is urgent to develop and assess acoustic parameters that are maximally adapted to emotion-produced changes in vocalization rather than to speech production, as has been the case in the classical disciplines of emotion and speech communication.

Typically studies on vocal emotion encoding use stimuli that have been produced by professional actors or by individuals with some degree of acting training. In recent years, this approach has been criticized for its alleged artificiality and encouragement of exaggerated, stereotypical stimuli (especially in the affective computing community interested in automatic classification of vocal expressions (Batliner et al. 2011; Douglas-Cowie et al. 2003)). These and other authors suggest using “naturally” obtained samples, including recordings from TV programs, radio talk shows, psychotherapy sessions and so forth. Apart from the convenience of such samples, it is difficult to isolate the contribution of the nonverbal cues from the verbal cues or semantic context and that there is no or very little experimental control (ruling out the use of inferential statistics). Importantly, the recording conditions in natural environments are rarely suitable for high-quality sound capture which is an essential prerequisite for the clean extraction of acoustic parameters (particularly if advanced techniques such as inverse filtering of the waveform to measure glottal source characteristics are to be used; Sundberg et al. 2011).

In addition, there is no guarantee that expressions recorded on the fly are more natural or authentic. Scherer and Bänziger (2010) review this issue and point to the complexity of distinguishing what is natural or artificial, faked or authentic and real or fabricated. In particular, they point out that we all, much of the time,

engage in self-presentation, often for strategic reasons. Thus, recording speech in public is likely to also encounter serious limitations with respect to authenticity and naturalness. Scherer and Bänziger (2010) have also reviewed paradigms to obtain more naturalistic expressions from actors and to avoid exaggerated stereotypical presentations (use of emotion induction techniques and enacting such as the Stanislavski technique or verbal imagery).

3.1.2.3 Physiological alertness

One powerful application of voice analysis is the ability to detect fatigue, sleepiness and intoxication from the voice in real-time. In professions requiring vigilant monitoring of advanced machinery or transportation vehicles, a decline in cognitive performance due to fatigue (including inattention and miscommunication) can jeopardize the safety of all involved. With a noninvasive assessment technique such as vocal analysis, it becomes feasible to monitor the physiological alertness in drivers, pilots and conductors. Some basic cues suggested to mark sleepiness and fatigue include the harmonics-to-noise ratio and total word duration (Krajewski, Wieland, and Batliner 2008). Also, a preliminary model using Mel-frequency cepstral coefficients (MFCCs) showed promising results in differentiating various amounts of sleep deprivation relative to physiological and behavioral measures of fatigue (Greeley et al. 2007).

Alcohol-related impairment poses another important challenge for law enforcement (in the case of drivers) and employers. Its effects on vocal behavior include a slower speaking rate (Pisoni and Martin 1989), increased f_0 (Hollien et al. 2001) and diminished first/second formant ratio (“slurred” speech; Klingholz et al. 1988). Two-category classification systems based on advanced spectral feature modeling and classification have been shown to perform above chance level (68.6%; Bocklet, Riedhammer, and Nöth 2011). Recently, a number of challenges have been organized to examine the relative success of different laboratories and classification algorithms in the automatic detection of emotion in speech (see Schuller et al. 2011).

3.1.3 Intentions

While traits are typically not expressed deliberately, much of vocal behavior is expressed with some intent to communicate. A speaker’s intentions are a major aspect of vocal behavior that has a distinct function for nonverbal communication and here often functions as “co-verbal behavior.” Because of the close link to speech, especially in contributing the pragmatic meaning aspects of utterances, this domain has often been dubbed as “paralinguistic.” Given the manifold connections to the linguistics domain and the widely scattered literature, we cannot do justice to this important research area, which has been greatly neglected in the past

because of its borderline position to both linguistics and nonverbal communication studies. We will briefly review some selected studies to provide an impression of the type of phenomena under investigation.

3.1.3.1 Interpersonal stances

So far, we have focused on the marking or indexing of long-term speaker characteristics, generally due to anatomical factors, or to short term variations in cognitive or affective episodes, mostly resulting in physiologically mediated effects on the vocal organs. While the former are difficult to control for a speaker, the latter can be emphasized or deemphasized by voluntary control in the interest of conforming to display rules or for strategic displays of certain emotions or attitudes. For example, politeness and hostility are common interpersonal stances that are often carried in the voice. Persuasive intent and charisma, used by poets and politicians, may also be described by specific vocal patterns (Rosenberg and Hirschberg 2009). Persuasive speech has been described by an increased f_0 range and variation of the pitch register (Touati 1993) and it has also been described based on rhetorical structure and the coherence of arguments (Cohen 1987; see also Chapter 20, Schmid Mast and Cousin, this volume). It is clear that nonverbal cues play a role in communicating these intentions, but based on the current literature, it is difficult to tease apart the contribution of nonverbal and verbal information.

3.1.3.2 Message intentions

Message intentions such as irony and emphasis can strongly influence a person's voice and speech. Irony is often considered an incongruity between the prosodic features and the verbal message, which is used to convey the speaker's intention and attitude. The intonation pattern of irony has been characterized as increased nasalization, prolonged syllables, increased intensity or stress and a reduced speaking rate and other nonlinguistic vocal events, such as laughter (Anolli, Ciceri and Infantino 2000; Haiman 1998); however, these cues have been shown to vary depending on the type of irony (sarcastic or kind; Anolli, Ciceri and Infantino 2000). Like affective states, intentions are often unconsciously and automatically expressed, such as in attempts to manipulate or to indicate appropriate times for switching turns when talking during social interactions. Vocal indicators of such events are mostly nonverbal in nature, including pause usage, gaps and overlaps in speaking (Shriberg 2005). A very important device to encode message pragmatic intent is the use of a configurational principle, which involves the use of marked versions of accent or intonation, e.g., a falling contour in a question (see Ladd et al. 1985).

3.2 The transmission process (P2)

Human vocal sounds radiate from the mouth. The sound wave is carried through the air to the ears of the receiver where they are preprocessed and passed on to the auditory centers of the brain, where they are transformed and interpreted as proximal cues. Due to this transmission and transformation process the proximal cues are rather an imperfect representation of the distal cues emanating from the speaker's mouth. Scherer, Johnstone, and Klasmeyer (2003) have discussed two of the contributing factors in detail: 1) the transmission of sound through space and electronic channels and 2) the transform functions in perception, as determined by the nature of human hearing mechanisms. Here we provide a brief summary of the major mechanisms.

- 1) Many environmental and atmospheric factors impact on the transmission of vocal sound through physical space. These factors may negatively impact the acoustic signal causing some amount of degradation. A central factor is the distance between sender and receiver – the sender often attempts to compensate for information loss due to difficult environmental conditions, resulting in phenomena such as the Lombard effect (increased vocal intensity by the sender during the presence of noise). Greater vocal effort in turn, will affect a large number of other acoustic characteristics related to voice production at the larynx. Furthermore, the distance between speaker and listener may have an effect on posture, facial expression and gestures, all of which are likely to have effects on the intensity and spectral distribution of the acoustic signal. (In addition, other sounds such as background noise may disturb the signal or natural barriers such as walls will filter the signal). All of these factors will lessen the likelihood that the proximal cues can be a faithful representation of the distal cues with respect to their acoustic characteristics. Just as distance, physical environment and atmospheric conditions in the case of immediate voice transmission, in the case of mediated transmission by radio, TV, telephone or other technical means, the nature of the medium may have potentially strong effects on proximal cues. The band restrictions of the line, as well as the quality of the encoding and decoding components of the system can systematically affect many aspects of the distal voice cues by disturbing, masking, or filtering and thus render the proximal cues less representative of the distal cues. While much of this work has been done in the field of engineering (robust voice recognition), only little has been directly applied to modeling the process of the vocal communication of emotion (but see Wehrle et al. 2000).
- 2) The distal signal is also strongly affected by the transfer and processing characteristics of the human hearing system. For example, the perceived loudness of voiced speech signals correlates more strongly with the amplitude of a few harmonics or even a single harmonic than with its overall intensity. In

addition, listeners tend to use an internal model of the specific spectral distribution of harmonics and noise in loud and soft voices to infer the vocal effort with which a voice was produced. Similar effects can be shown for the perception of F0 contours and the perceived duration of a spoken utterance (see Scherer et al. 2003, for further detail and references). Scherer (2003) also highlights a multitude of feedforward and feedback processes between nonverbal modalities (e.g., visual-vocal), levels of processing (e.g., peripheral-central) and input vs. stored schemata (e.g., the effects of facial expression perception on voice perception) in the transmission process.

3.3 The decoding or perception process (P3)

Much of vocal behavior is expressed with the intent to communicate. In this section we review the decoding literature, focusing on listener recognition or attribution of speaker traits, states and intentions.

3.3.1 Traits and dispositions

3.3.1.1 Biometric characteristics

Many of the vocally encoded biometric characteristics mentioned earlier, including a person's age, weight and body size, are also detectable by listeners. Recent research has shown that specific age-related information might be embedded in the speaking rate and voice quality cues (such as tremor and noise) for males (Harnsberger et al. 2010). Recall that these cues may differ from the acoustic features found to best differentiate these characteristics because of the nonlinear mapping of acoustic-to-perceptual features. Listeners are in fact very accurate at detecting features such as speaker sex and age and to a lesser extent, body size (body-mass index or waist-to-hip ratio), height and weight (Collins and Missing 2003).

Vocal attractiveness is another characteristic that can be detected by listeners (Bruckert et al. 2010). Attractiveness is a purely perceptual feature as there is no physical or objective measure of attractiveness. Instead, the gold standard for its measurement is quantified using listener judgments. From the listener judgments, it is possible to identify the acoustic markers of perceived attractiveness (Feinberg et al. 2011). From such studies it has been shown that male listeners are more attracted to high-pitched female voices and female listeners prefer low-pitched male voices (Collins and Missing 2003; Vukovic et al. 2011). Also, formant frequency and dispersion information is frequently linked to voice attractiveness (Collins and Missing 2003; Feinberg et al. 2011).

3.3.1.2 Social status

Fewer studies have examined listener perception of vocal cues to an individual's social status compared with other traits and dispositions. Still, most of these report

above chance recognition levels. In a study of cross-cultural identification of social class, American judges were clearly able to differentiate eight upper and lower class Arabic speakers with 72% accuracy (Mays 1982). Others have shown that it is possible to differentiate between powerful and powerless speakers, using naturally obtained recordings of witnesses in court cases (Erickson et al. 1978). It is important to note that a variety of verbal and nonverbal cues were examined, some of which are on the boundary of verbal and nonverbal such as hesitations forms (“uh,” “you know,” etc.), making it difficult to examine the sole contribution of nonverbal cues.

Accents seem to play a role in affecting how listeners evaluate speakers’ competence, attractiveness, believability and socio-economic status (Mugglestone 2007). For example, Edwards (1979) showed that misclassification patterns of children’s gender (sampled from an even mixture of working class and middle class families) revealed insight into social stereotypes of voice patterns: girls were expected to speak with middle-class accents or patterns and boys were associated with the working-class patterns. In another study on socio-economic status, Hall and colleagues (Hall, Halberstadt, and O’Brien 1997) examined the relation between nonverbal cues (assessed using the Profile of Nonverbal Sensitivity or PONS, the Communication of Affect Receiving Ability Test or CARAT and the Interpersonal Perception Task or IPT) to the perception of subordination. Results did not support the commonly held belief (the subordination hypothesis) that more subordinate people are more sensitive to nonverbal cues (including, but not limited to voice).

3.3.1.3 Stable behavior dispositions

Much of the early interest in vocal indicators of traits, states and intentions centered on perception of personality and attitudes (Allport and Cantril 1934; Pear 1931). Unfortunately, a number of methodological issues may have affected the ecological validity of results, for example, in the validation of listener judgments of personality traits. Listener judgments were typically compared against objective assessment measures (such as Scherer 1978); however, it was often not clear whether listeners were judging the same concepts measured by the tests. Second, speech stimuli often consisted of read passages to remove semantic cues, potentially resulting in a speech pattern very different from conversational speech. Finally, many of these traits may require evaluation under certain conditions, minimally a dyadic social interaction, for ecological validity. Nevertheless, more recent research has shown that listeners are able to judge personality traits such as dominance vs. trustworthiness and gender attitudes such as femininity-masculinity fairly well (Vukovic et al. 2011).

3.3.2 States

3.3.2.1 Health

Perception of normal and abnormal health-related information from the nonverbal behavior has always been an area of clinical interest, although attention to the vocal modality has increased in recent years. Studies investigating nonverbal cues to abnormal health commonly compare the results of perception tests in a patient group with a non-patient control. For example, Luck and Dowrick (2004) tested the perception of emotional faces and voices in first-time and recurrent depressive patients and a control group and found a negative emotional bias in judging faces and voices for both depression groups, especially individuals with recurrent depression. Plesa-Skwerer et al. (2006) also tested the perception of emotional faces and voices but in individuals with Williams syndrome, age and IQ-matched individuals with learning-intellectual disabilities and an age-matched control group and found that even in a disorder characterized by increased sociability and expressivity, emotion perception abilities are impaired. Results of such studies may be used to develop cognitive and/or behavioral therapy programs for these individuals to modify their perceptions or behavior.

Other nonverbal cues may provide insight into normal changes in health, such as hormonal changes. Perception of a female's nonverbal indicators of ovulating or being at a fertile phase of the menstrual cycle is relevant for being seen as attractive and thus, reproductive success (Pipitone and Gallup Jr. 2008). While the importance of these indicators relative to other cues, such as facial cues and body movements, is not clear, it is interesting that the vocal modality serves as another channel for communicating this information.

3.3.2.2 Affect, emotion, mood

Identification of emotions and affect from vocal behavior has been a popular area of research over the last two decades. Studies in this area examine the extent to which listeners are able to infer speaker emotions from different types of speech samples. In some cases vocal expressions during experienced or induced emotions have been used, differing widely in style and verbal content. Most of these studies have used standard content utterances (e.g., meaningful sentences, sentence fragments, strings of nonsense syllables or simply sustained vowels) to control for effects of verbal meaning and a set of basic emotions enacted by professional actors. Listeners are asked to infer the nature of the portrayed emotions, generally on rating sheets with standard lists of emotion labels, allowing computation of the percentage of stimuli per emotion that were correctly recognized. Reviews of the literature (e.g., Scherer 2003) have commented upon the fact that the hit rate of listener recognition of emotion based on nonverbal vocal cues is somewhat lower than the hit rate found in studies of facial recognition of emotion. In addition, it is generally found that some emotion categories, such as disgust, contempt and

fear, have much lower than accuracy than others, including happiness, anger and sadness (for example, Banse and Scherer 1996 reported 82% accuracy for hot anger and only 15% accuracy for disgust out of 14 emotions).

It is instructive to examine the issue of nonverbal channel differences and differential emotion accuracy directly, using an appropriate data set. While most studies in the emotion recognition field have examined only facial, or only vocal emotion recognition respectively, a recent multimodal study by Bänziger, Mortillaro, and Scherer (in press) allows a comparison of these modalities and the respective emotion differences, for the same stimulus set. Figure 2 shows the facial and vocal recognition accuracy results for 12 emotions (out of a total of 17 emotions presented to judges), organized by groups of valence and arousal. While the overall results confirm that facial recognition is somewhat more accurate, a detailed analysis shows that this effect is almost exclusively due to better recognition of positive emotions, for which zygomaticus action (smile) is expected (and empirically confirmed for this dataset; see Mortillaro, Mehu, and Scherer 2011). Thus, drawing the lip corners up and back seems to constitute a super-sign for valence that by itself assures recognition of positive emotions, especially as different kinds of positive emotions show subtle differences in the dynamics of facial actions involving the zygomaticus (Mortillaro, Mehu and Scherer 2011). If one disregards these special cases, the vocal accuracy is not dramatically different from the facial one and the differences in recognition accuracy for different emotions are similar in both modalities (low arousal emotions being generally less well recognized). Figure 2 also shows that the recognition accuracy, as expected, is always higher when vocal and facial cues are combined in audiovisual presentation. Yet, it is noticeable that there is much redundancy between the channels as the gain over a single channel is relatively small.

The methodological paradigm used in nonverbal emotion recognition research is subject to criticism – especially if only a limited number of emotions is presented (e.g., four to six basic emotions). If there is only one positive emotion among these, which is frequently the case, the process of recognition is likely to become one of simple discrimination based on highly salient cues (like the degree of perceived arousal) or on frequency of occurrence and guessing. Russell (1994) has published a strong critique of the methods employed in emotion recognition research, especially cross-cultural studies, arguing that the forced-choice paradigm may have artificially forced agreement (but see also Ekman's, 1994, reply). As there are no reasonable alternatives for the type of questions asked, researchers, including the critics, keep using the forced choice format, unfortunately often without using proper controls such as a reasonably high number of alternatives and controlling for valence and arousal.

It is important to note that accuracy percentages or hit rates need to be interpreted as a function of the number of emotions studied – a parameter that varies widely across studies – as the chance level for guessing depends on the number of

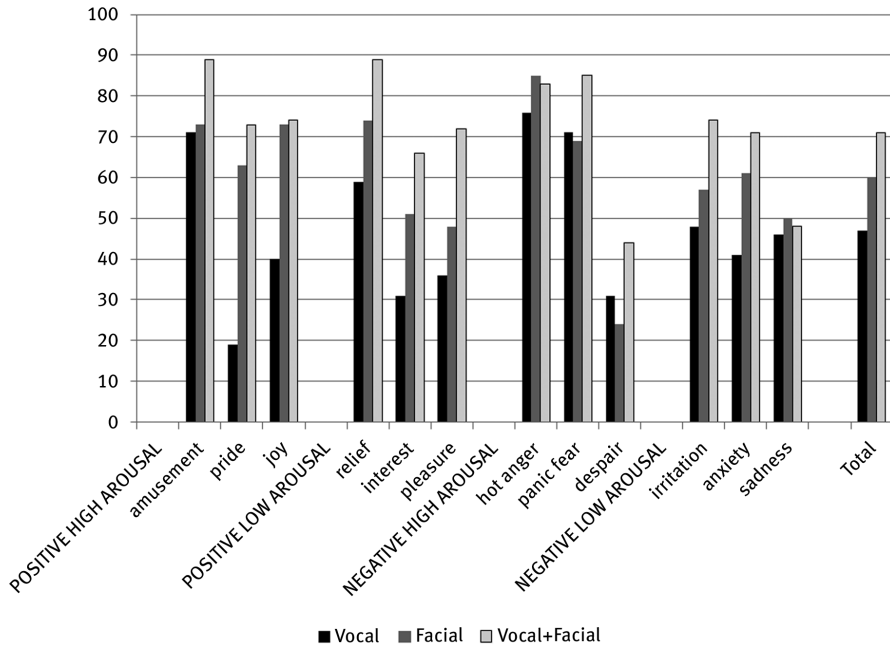


Figure 2: Accuracy of emotion recognition (in percent) for 12 emotions grouped for valence and arousal by presentation modality (vocal cues only, facial cues only, vocal plus facial cues combined).

Note: The figure is based on the data shown in the four rightmost columns (full stimulus set data) in Table 5 of Bänziger et al. (2010). Chance accuracy is 0.058% as 17 emotions were presented to judges for their ratings.

alternatives. Hall et al. (2008) have reviewed this problem and suggested a common metric, the *pi* index (Rosenthal and Rubin 1989), to compare mean levels of accuracy across different studies (see also Juslin and Laukka 2003). In a recent review of major studies on the recognition of emotion from nonverbal cues, Scherer et al. (2011) have reported the average recognition accuracy of six major emotions in studies on vocal emotion recognition over the last 20 years. Here we have used the respective accuracy percentages reported in Table A3 in the appendix of their paper to compute the respective *pi* coefficients. These are shown in Table 3, providing an overview of the mean accuracy levels for vocal emotion recognition. The *pi* coefficients reported by Juslin and Laukka (2003) for a different but somewhat overlapping set of studies are shown for the purpose of comparison, suggesting a high degree of stability of the respective mean accuracy indices. The results confirm the impressions reported in earlier reviews: anger and sadness are best recognized (possibly reflecting the importance of the arousal dimension discussed earlier), happiness, surprise and fear follow and disgust trails far behind. Bänziger et al. (in press, Table 5) confirm that disgust and contempt are less well recognized in

Table 3: Mean values for *pi* indices comparing accuracy %ages or hit rates over different studies on vocal emotion recognition

		Happiness	Surprise	Sadness	Fear	Disgust	Anger
Scherer et al., 2011	Western	0.86	0.86	0.92	0.82	0.73	0.93
	Cross-cultural	0.75	-	0.89	0.83	–	0.90
Juslin and Laukka, 2003	Western	0.87	-	0.93	0.88	–	93
	Cross-cultural	0.74	-	0.91	0.82	–	0.91

the voice than most other emotions. Especially for disgust, it is likely that one rarely speaks longer sentences with a disgust expression as it tends to be a very brief emotion leading to immediate avoidance.

Most of the studies summarized in Table 3 used sentence-like speech material. Affect bursts like sighs, laughter or vocal emblems – e.g., “Yuk” (Scherer 1994) – can be expected to have higher accuracy scores as they are often iconically coded and used as standardized interjections. This hypothesis is supported by Hawk, Van Kleef, Fischer, and Van der Schalk (2009) who reported that accuracy scores for non-linguistic affective vocalizations and facial expressions were almost equivalent across nine emotions and both were generally higher than the accuracy for speech-embedded prosody (with a few emotion specific exceptions, e.g., surprise). Similar findings are reported by Bänziger and Scherer (2010; Table 6.1.5) who compared vocal emotion expression through pseudo-sentences and pure affect vocalization using the *schwa* sound (/a/).

While the *pi* index corrects for differences in answer alternatives in different studies, it cannot remedy another problem of recognition studies, potential response bias of judges that can affect the response distribution and thus affect the accuracy or hit rate estimate. Thus if there is a response bias towards specific emotions, these are likely to obtain a higher accuracy rate. In consequence, it has been suggested to correct simple accuracy rates for such response biases to obtain an unbiased hit rate (Wagner 1993). However, it can be argued that potential biases in judgments can be best identified by computing and reporting the complete confusion matrix. The off-diagonals of the matrix indicate the extent to which the patterns of confusion are plausible or not (see Banse and Scherer 1996). This is important in comparing different groups of judges. Thus, whereas the recognition accuracy in Western studies is lower than in cross-cultural studies, the confusion

patterns are often highly comparable (Scherer et al. 2011), suggesting that similar inference mechanisms are used.

One issue of great theoretical interest that is rarely addressed in this domain of research concerns the mechanism that underlies emotion recognition or attribution from vocal utterances, in other words, the nature of the process depicted on the right side of the TEEP model introduced above. Do listeners make use of evolutionary prepared or socially acquired vocal expression schemata or gestalts to infer the underlying emotion? Or do they use more analytical approaches, identifying individual vocal parameters and deducing the most likely emotional state of the speaker via configurational inference? While the TEEP model can accommodate probabilistic schema matching, the underlying Brunswikian lens model is closer to the probabilistic cue inference explanation. This also fits in with the production mechanism proposed by componential appraisal theories as described above in the section on the encoding of emotion in vocalization. If it is indeed the result of different appraisal checks that have specific efferent effects on the vocal organs and, in a sequential-cumulative process, produce a “configured” pattern of vocal cues, it seems plausible that the perception process could work in reverse – in other words, the listener may infer appraisals or the effects in other components driven by appraisals, such as action tendencies or physiological symptoms, to infer the nature of the emotion expressed. A recent study by Laukka and Elfenbein (2011) lends indirect support to this hypothesis. The authors report that judges could rather reliably deduce underlying appraisal results from vocal expressions.

3.3.2.3 Physiological alertness

Physiological alertness is critical in many professions including truck drivers, construction workers and air-traffic controllers. It is necessary for those who drive or operate heavy machinery to be alert to ensure the safety of the individual and those around them. Although this is seemingly obvious, many accidents occur because we judge ourselves as being alert. It has been shown that people are able to reliably judge various aspects of physiological alertness from the voice, including fatigue, sleepiness and intoxication. However, it is not clear whether listeners are able to differentiate between strong and weak cases of inattentiveness or only strong cases relative to normal. For example, Hollien et al. (2009) report that listeners were able to identify intoxicated individuals (74% accuracy), although they were not very accurate in determining the magnitude of the intoxication (overestimating lower levels and underestimating higher levels). Nevertheless, the results are promising. If physiological state of an individual can be judged by others more accurately than the self-assessment of the individual himself, it is possible to develop objective measurement tools to automatically assess states of alertness thereby increasing safety in many situations.

3.3.3 Intentions

3.3.3.1 Interpersonal stances

The communication of intentions is more complex to examine in the laboratory than a speaker's traits and states because the ecologically valid elicitations of intentions may require at least a dyadic interaction. However, much of our current knowledge of speaker intentions has been obtained from single-speaker vocalizations. Specific intentions examined include politeness, hostility, persuasive intent and charisma. Listener evaluations of politeness and hostility are more explored, especially with regards to public safety and aggression. Judgments of other interpersonal stances such as persuasive intent and charisma are more difficult to obtain as these vocalizations are often biased by identification of the speaker (typically, well-known political figures). One recent study attempted to overcome such problems by obtaining vocalizations from less recognized politicians from the 2004 Democratic Party nominees (Rosenberg and Hirschberg 2009). The results showed greater ratings of charisma from the transcribed text alone than from the speech samples. Although it is possible that charisma is mainly carried in speech, it is possible that these speakers were simply not as charismatic as individuals such as Martin Luther King Jr. or Adolf Hitler and therefore, their prosody *decreased* their overall charisma. Still, judgments based on vocalizations obtained in conversational situations may provide additional insight into the use of nonverbal behavior to communicate intent (for example, see Schyns and Mohr 2004).

4 Vocal behavior in social interaction

Most of this chapter has focused on a single speaker's expressions or listener perception using prerecorded speech clips; however, when speaker and listener are examined together in a social interaction, another level of vocal cues are involved. Vocal behavior during social interactions involves coordinating speech streams from all individuals involved, including turn-taking and social accommodation (Gallois, Ogay, and Giles 2005; Salamin and Vinciarelli 2012). For example, Giles and Powesland (1975) have long since shown that interaction partners converge or become similar in their vocal characteristics for a variety of reasons, including to gain social approval, to account for the age of the interaction partners and to convey sympathy or the impression of a positive exchange. Likewise, the opposite effect is achieved in the case of increasing hostility – speakers diverge in their vocal characteristics.

The listener's nonverbal reactions heavily influence the course of a conversation, but can only be examined in social interactions where at least two interlocutors are involved. Through these “backchannel” vocalizations, the listener provides feedback that may assure the speaker of the listener's attention thereby encouraging the speaker to continue, or, indicate approval-disapproval of the content of

the speaker's utterances causing the speaker to modify (for example, by further elaboration or justification of what was said or by shortening the discussion) the course of his expressions based on the listener's nonverbal cues.

Another important use of nonverbal behavior observed in social interactions is the regulation of speaking turns. Some evidence suggests that these turn-taking cues may be carried in silence and pause durations (Mortensen 2007). Measures of the relative amount of "floor time" (duration of time for which a person holds the speaking floor) and the frequency of interruptions are useful nonverbal cues. Relatively equal amounts of floor time held by each of the interlocutors and fewer interruptions to take over the speaking floor suggest a positive conversation. On the other hand, an asymmetry of floor time may be indicative of certain personality dispositions (e.g., dominance-submissiveness or extraversion-introversion) or speaker conflict. Interruption frequency has been related to a dominance-submissiveness dimension, that is, speakers who frequently interrupt their interactions partners are judged as more dominant (Hall, Coats, and Smith LeBeau 2005).

5 Outlook

The vocal channel in nonverbal communication, which has long been the poor relative of the booming facial expression research, is becoming increasingly important. This may be due to the rapid development of speech processing in affective computing (Scherer *in press a*) the increasing interest of neuroscientists in the voice (Belin et al. 2011; Grandjean et al. 2005) and possibly the growing interest in comparisons between the nonverbal vocal communication in speech and in music (Juslin and Laukka 2003; Scherer *in press*). In this chapter we have attempted to review the state of the art in several important subareas and make a number of suggestions for further work on this important channel of nonverbal communication. Given that much of the research in this field has been produced without explicit grounding in a theoretical framework and often without explicit hypotheses or predictions, we have highlighted the utility of the TEEP model, which we have adapted to a more general form, covering many of the phenomena of interest to researchers in vocal nonverbal communication. An important research-guiding function of the model is to remind the researcher of the need to clearly specify exactly which question is asked.

If the researcher is interested in production aspects (process P1 in Fig. 1), great care must be taken to assess, as precisely as possible, the true sender traits, states and intentions and to measure a comprehensive set of distal acoustic parameters. The former is extremely difficult and requires great effort, but if the researcher really wants to understand the mechanisms underlying the effects of these determinants on voice and nonverbal speech patterns, no shortcuts should be taken. For example, in much of the work on the nonverbal vocal communication of speaker

affect states, attitudes and intentions, annotation methods are used in which a group of judges are asked to identify the emotions or attitudes the speaker is likely to have experienced when producing the test utterance. Apart from the thorny issues of the number judges needed and the level of agreement required, these designs conceptually resemble perception studies since only the relationships between the distal cues and the receiver attributions can be measured (S2 and S4 in Fig. 1). If the interest is indeed to classify listener inferences or attribution, this is a reasonable approach, but it should be clearly labeled as a perception study based on distal cues, rather than claiming that ratings by a group of judges constitute “ground truth” in terms of the states really experienced by the speaker. In addition, if the effort is to understand the production process, it may not be sufficient to extract standard acoustic parameters from the waveform; rather efforts should be made to estimate vocal production parameters directly (e.g., using inverse filtering; see Sundberg et al. 2011).

If the perception process is the focus of the research (P3 in Fig. 1), exclusive reliance on the measurement of distal cues (S2) is problematic because, as shown in this chapter, the transmission process (P2 in Fig. 1) will seriously modify the cues perceived by the receiver (if only through the transformations occurring as a function of the human hearing mechanism). In consequence, serious perception studies should attempt to directly measure proximal cues in addition to distal cues (Patel, Bänziger, and Scherer, Submitted; Sangsue et al. 1997; Scherer, 1978) or at least perform psychoacoustic transformations of the raw acoustic measurements.

The most advanced type of research question is of course a combination of the three processes underlying nonverbal communication – production, transmission and perception. Scherer (1978) has demonstrated the approach for the communication of personality in voice and nonverbal aspects of speech but there has been very little work in this direction. This is unfortunate as once the essential information is gathered (S1, S2, S3 and S4 in Fig. 1), all three processes of production, transmission and perception (P1, P2, P3 in Fig. 1) can be estimated using path-analytic procedures. A first effort to use this approach to model the vocal communication of emotion demonstrates the wide applicability of this procedure (Bänziger, Patel and Scherer submitted).

We will close this chapter by a remark on vocal stimuli and corpora to be used in this research domain. While much of facial expression has heavily relied on portrayals of static facial expressions by actors (still the method of choice in many studies in that domain; see Scherer et al. 2011), the production of vocal stimuli always requires a dynamic utterance. Thus, while many photos of different facial expression portrayals can be produced rather rapidly, the procedure is rather more demanding for vocal utterances produced by actors. In addition, there is increasing concern in the vocal communication community that actor portrayals are too artificial, often exaggerated and thus not sufficiently authentic. As a consequence, often convenience samples of vocal utterances are used, for example, recordings from

game or reality shows or YouTube clips, assuming that these represent authentic feeling states of speakers. Scherer and Bänziger (2010) have reviewed this issue and pointed out that this assumption may be quite unfounded as there is much evidence that strong pull effects (see above) operate in the type of public recording situations of this type, making it quite unlikely that the respective expressions are authentic in the sense of absence of control or strategic exaggeration. In addition, the issue of authenticity, genuineness, or realness is much more complicated than it may appear, given that push and pull effects are in constant interaction. These authors defend the role of enactment of affective states and attitudes by professional actors, through the systematic use of Stanislavski or imagery techniques. Recently, Scherer (in press a) discussed the general problem of corpora design and the necessary compromise between desired authenticity on the one hand and the necessary experimental control (particularly with respect to the precise operationalization of the underlying concepts) and reviewed alternative approaches to obtain appropriate corpora, such as induction procedures, games, simulations and standard situation designs. It is an urgent task for the future to come to grips with this central problem of experimental research on vocal nonverbal communication – a problem that affects other nonverbal modalities in a similar, but not always similarly obvious, fashion).

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8 Gesture and body movement

Abstract: The focus of this chapter is on the role of gestures and body movement in interpersonal communication. Modern research has shown that gesture is closely synchronized with speech in terms of syntax, meaning and vocal stress; it is also important in communicating emotions and interpersonal attitudes. It is often assumed that gesture is essentially secondary to speech, merely amplifying and elaborating the spoken word. However, gesture as a communication modality has notably different properties from speech. The key elements are that gesture is visual, silent, and constitutes a series of bodily actions. In addition, it is highly visible, and there are also differences in visibility between different types of gesture. Furthermore, it is to some extent optional, it constitutes part of a multichannel system of communication, and unlike speech, it lacks standard forms. As a consequence, certain communicative tasks can be performed more readily through gesture than through speech. This has significant consequences for the way in which it is used in social interaction.

Keywords: nonverbal communication, gestures, emblems, emotion and interpersonal attitudes, facial expression, illustrators, interactional synchrony, microanalysis, regulators, vocal stress.

The focus of this chapter is on the role of gesture and body movement in interpersonal communication. Interest in gesture has a long history, but it is only in recent years that it has become the focus of systematic scientific investigation. References to gesture and other expressive bodily movements can be found scattered throughout mankind's literary, religious, and artistic history. In ancient Rome, Quintilian and Cicero respectively wrote of the use of the hands during oratory (Hall, 2004), while in the 17th Century Bonifacio (1616) and Bulwer (1644) both published works on gesture, with Bulwer's *Chirologia: or the Naturell Language of the Hand*, and *Chironomia or the Art of Manual Rhetoricke* being the first works in English that dealt exclusively with gesture. During the 18th century, the prevailing view amongst philosophers was that gesture is a more "natural" form of communication than language and is common to all mankind. Gesture was considered to be a mode of expression that could operate independently of speech (Kendon 2004).

Several important works on gesture appeared in the 19th century (e.g., de Jorio 1832; Tylor 1865); Darwin (1872), in his seminal work, *The Expression of Emotions in Man and Animals*, outlined his hypothesis that emotional expression is universal and thus evolutionary in origin. Darwin believed this to be particularly true of

facial expression, and although his views on gesture appear to have been somewhat ambiguous, he forwarded the possibility that the shoulder-shrug gesture is universal (or at least nearly universal). To support this claim, Darwin provided anecdotal accounts of various primitive tribes who, even with little contact with Westerners, demonstrated this gesture, and an instance of a blind woman who shrugged her shoulders when feeling uncertain.

By the 20th century, advances in audio-visual technology allowed for a more detailed scientific examination of gesture and its relationship to speech (Bull 2002; see also Chapter 2, Knapp, this volume). As such, it became possible to view gestures/body movements repeatedly and even watch them at decreased speeds, rather than having to study them in real time. Recent decades have seen a considerable increase in empirical research on the topic, and, if anything, microanalytic studies of gesture have served to highlight its importance as a form of nonverbal communication. In fact, there is even an academic journal, *Gesture*, dedicated solely to the subject of gesture and other body movements. In contemporary psychological science, the term *gesture* can be defined as a visible body action which communicates a message; gesture can occur both in conjunction with, and in the absence of, speech (Kendon 2004). Gesture is typically contrasted with *posture*, which refers to static bodily positions (Bull 1987).

Even today, there is considerable dispute regarding the exact purpose of gesture. Some argue that its primary purpose is to facilitate understanding between speaker/gesturer and listener (e.g., Bavelas 1994; Clark 1996). Others believe that gesture is primarily beneficial to the gesturers themselves; for example assisting with the retrieval of lexical information, or reducing cognitive load (e.g., Butterworth and Hader 1989; Chawla and Krauss 1994; Pine, Bird, and Kirk 2007; Ping and Goldin-Meadow 2010). However, it is important to note that these theories are not mutually exclusive (Alibali, Heath, and Meyers 2001; Jacobs and Garnham 2007).

Overall, the results of modern research have shown that gesture is closely synchronized with speech in terms of syntax, meaning, and vocal stress; it is also important in communicating emotions and interpersonal attitudes (Bull 1994; 2012). In Section 1 of this chapter, gesture is discussed in relation to speech; in Section 2, it is discussed in relation to emotions and interpersonal attitudes. Notably, gesture and speech, considered as media of communication, have very different properties (Kendon, 1985). Key features of gesture are that it is visual, silent, and that it constitutes a series of bodily actions; these distinctive properties make it useful for a particular range of communicative tasks. In Section 3 of this chapter, the role of gesture as a mode of communication is discussed in relation to these distinctive properties.

1 Gesture and speech

1.1 The role of gesture in language development

It has long been acknowledged that there is a link between gesture and language acquisition, and that gesture is a precursor of spoken language (e.g., Colonnaesi et al. 2010; Iverson and Goldin-Meadow 1997; Iverson and Goldin-Meadow 2005; Iverson et al. 2000). Arguably, gesture has two roles for pre-linguistic infants. Firstly, it helps to establish joint-attention between child and caregiver, through, for example, the use of pointing and touching. Secondly, it serves as a means of communicating symbolic information, for example, cupping hands to indicate that a child wants a drink (Reynolds and Reeve 2002).

McNeil, Alibali, and Evans (2000) examined the effect of speech-accompanying gesture on the comprehension of verbal utterances across two groups of children: preschoolers (aged between 46 and 57 months) and those attending kindergarten (aged between 59 and 72 months). Across two separate experiments, participants listened to verbal messages that were variously accompanied by gestures intended to reinforce the spoken message (reinforcing gestures) and gestures intended to convey information incongruous with the spoken message (conflicting gestures). In the first experiment, participants listened to messages that were intended to be linguistically complex for the preschoolers, but not for the kindergarten children. It was found that reinforcing gestures facilitated speech comprehension only for preschoolers. In contrast, conflicting gestures hindered comprehension for kindergarten but not for preschool children. The second experiment followed a similar procedure; however, the verbal messages were simpler than those used in the first experiment (and were thus intended to be easier for the preschool children to understand). Unlike the first experiment, the preschoolers' comprehension was not facilitated by reinforcing gestures. In addition, for neither group of children was comprehension of the spoken messages hindered by conflicting gestures. McNeil, Alibali, and Evans concluded that the effect of gesture on speech comprehension by children depends both on the relation of the gestures to the spoken words, and also on the complexity of the spoken message.

In a more recent study, Kirk, Pine, and Ryder (2011) examined whether gesture aids the comprehension of verbal utterances for children with speech and language impairments. Language impaired children were compared with normally developing children in their ability to understand verbally presented scenarios across two conditions: speech only and speech and gesture. While both groups of children demonstrated better understanding of the information when gesture was present, only for the language-impaired children was this effect statistically significant. Other research findings indicate that individuals with developmental disorders (such as autism) demonstrate atypical use of gesture. For example, de Marchena and Eigsti (2010) found that while high-functioning autistic adolescents produced

spontaneous gestures as often as normally developing matched controls during a narrative task, their gestures were less closely synchronized with their discourse than neurotypical controls. As a consequence, the ability of people with autism to communicate information efficiently is diminished.

1.2 Synchronization of speech and body movement

Microanalytic studies have shown that a person's body movement is closely synchronized with their speech, a phenomenon often referred to as *self-synchrony* (e.g., Condon and Ogston 1967; Dittmann 1972). Woodall and Burgoon (1981) examined the effects of nonverbal synchronization on the processing and acceptance of a message by the listener. Participants in the experiment viewed one of three video recordings of a message: (1) gesture synchronized with vocal cues; (2) minimal amount of gesture; (3) gesture out of synch with verbal cues. Synchronization between gesture and speech facilitated the processing of information for the listener, and hence the ability to recall information at a later time. In addition, participants found synchronized messages to be much more persuasive than those in either the limited gesture or unsynchronized conditions. Furthermore, speakers in the unsynchronized condition were regarded as less credible than those in the synchronized condition. Similarly, McNeill, Cassell, and McCullough (1994) found that a mismatch between a person's speech and gesture created communicative problems for the listener.

According to Kendon (1972, 1980, 1988), there is a hierarchy of body movements that interact with speech. The hands change position the most, followed by forearm, then the upper arm. The torso and legs rarely move in conjunction with speech. Notably, hand gesture may or may not involve touching the body. Typically, non-touch gesture is related to speech, body-touch gesture unrelated to speech; the latter is used frequently for grooming purposes. For example, it may be used as part of a mating ritual, whereby people groom themselves in the presence of someone they find attractive (Schefflen 1965). These flirtatious preening behaviours can include stroking the hair, adjusting clothing, and (in the case of females), application of makeup. However, self-touching behaviour may also occur when a person is processing information and when they are experiencing negative emotions (Harrigan 1985). In addition, grooming behaviour may occur between individuals, a phenomenon referred to as *allo-grooming* (Enhuber 1989; Nelson and Geher 2007). Such behaviour may be driven by sexual-selection forces, as it helps to (a) encourage hygiene, (b) foster positive emotions, and (c) signal effective parenting (Nelson and Geher 2007).

Kuratate, Yehia, and Vatikiotis-Bateson (1998) examined the relationship between head movement and vocal production, and found that head movement correlates strongly with vocal pitch and amplitude of voice. In another study, Mun-

hall et al. (2006) produced realistic animations of the speakers' heads from the Kuratate, Yehia, and Vatikiotis-Bateson experiment. They asked participants to view these animated heads, which uttered sentences as part of a voice-in-noise task. Munhall et al. systematically manipulated the motion of the heads without altering other visual or auditory characteristics. Participants were significantly more accurate at identifying syllables from the vocalisations when the head's natural movement occurred, than when it was artificially manipulated. This finding serves to highlight the importance of nonverbal gesture (in this case head movement) in the perception of speech.

In contrast to self-synchrony, the term *interactional synchrony* refers to body movements that are closely synchronized *between* individuals (see also Chapter 18, Lakin, this volume). This phenomenon has also been called the “chameleon effect” (Chartrand and Bargh 1999). Synchronized movement arguably provides information to the speaker about the listener's level of interest and attention. This effect has been observed between mothers and their children (Bernieri, Reznick, and Rosenthal 1988), and between students and teachers (Bernieri 1988; LaFrance and Broadbent 1976). It has also been observed in clinical interviews (Geerts et al. 2006) and psychotherapeutic settings (Charny 1966; Ramseyer and Tschacher 2006; Scheflen 1964). A recent study by Holler and Wilkin (2011) suggested that co-speech gestures (gestures tightly linked to speech semantically, pragmatically, and temporally) often become synchronized between interlocutors during face-to-face dialogue. However, the concept of interactional synchrony is open to dispute. Critics claim that congruent movements between individuals occur at a frequency no greater than expected by chance (e.g., Gatewood and Rosenwein 1981).

Self-synchrony between gesture and speech can occur in terms of vocal stress, syntax, and meaning. Each is discussed below:

1.2.1 Syntax

Lindenfeld (1971) analysed the speech of a patient in a psychotherapy session. Changes in the patient's body position occurred typically within a syntactic clause rather than across clause boundaries, from which she concluded that there is a connection between syntax and gesture.

1.2.2 Vocal stress

Within speech, there are strings of words which appear to be spoken as a unit, termed a *phonemic clause*. Each clause consists of several words in which there is only one primary stress (also known as the *tonic stress*), characterized by changes in loudness, pitch or rhythm. This group of words is terminated by a *juncture*, in which the changes in pitch, rhythm, and loudness level off before the beginning of the next phonemic clause (Trager and Smith 1951). Pittenger, Hockett, and

Danehy (1960) observed that speakers of American English often demonstrate slight jerks of the head or hands that accompany their tonic stresses, while junctures are more typically accompanied by movements of the eyes, hands, or head. Bull and Connelly (1985) made video recordings of opposite-sex pairs of student discussing topics on which they disagreed. The students then watched these video recordings and were asked to indicate which body movements made by themselves and/or their conversational partners conveyed emphasis. Whereas the students generally reported that hand/arm movements were involved in the communication of emphasis, detailed microanalysis of the video recordings showed that it is movements of all parts of the body that were related to vocal stress.

1.2.3 Meaning

Unlike speech, gesture communicates information through a visual medium. *Metaphoric gestures* are used to communicate information about an abstract idea or concept. For example, the sentence “he gets down to business” might be accompanied by a drop in speaker’s hand, while “building a bridge to the next topic” might be depicted by making an arch with the hands (Straube et al. 2011). *Iconic gestures* are those intended to resemble a specific object or event. They may also communicate information about an object’s characteristics, such as its speed or size.

The findings of several studies suggest that iconic gestures can communicate more semantic information than spoken words, at least under certain conditions (e.g., Beattie and Shovelton 1999, 2001, 2002; Holler, Shovelton, and Beattie 2009; Riseborough 1981). In one experiment, Yap et al. (2010) asked participants to perform a primed lexical decision task, which involved discriminating between visually presented real words and nonsensical words. Before the presentation of each target word (e.g., bird), participants viewed a video clip depicting either a semantically related gesture (e.g., a flapping pair of hands) or a semantically unrelated one (e.g., drawing a square shape with both hands). Participants demonstrated significantly faster response latencies for related gesture-word pairs than unrelated pairs. Yap et al. concluded that mere exposure to iconic gestures facilitates recognition of semantically related words.

1.3 The function of gesture in conversation

Hostetter (2011) conducted a meta-analysis of 38 studies examining the effects of gesture on the comprehension of a spoken message during conversation. In particular, the meta-analysis was focused on listeners’ understanding across two conditions (speech only; speech with gesture). There were three main conclusions: (1) Gesture that depicts motor actions communicates more information than that intended to convey abstract ideas. (2) Gesture is more communicative when it pro-

vides information not expressed in the accompanying speech than when it is made redundant by the spoken discourse. (3) Children benefit more from gesture than adults.

Gesture used during conversation has been divided into three categories: *emblems*, *illustrators*, and *regulators* (Ekman and Friesen 1969a). Emblems usually have a direct verbal translation, hence their meaning is typically not dependent on speech. Illustrators on the other hand are directly tied to and/or accompany speech, and generally serve to elaborate and strengthen the verbal aspects of a message. In situations where speech becomes disrupted or reduced, illustrators may be used to facilitate understanding. Regulators are body movements which assist in controlling the flow of a conversation, for example, gesturing to a person that it is their turn to speak. Each of these categories is discussed below.

1.3.1 Emblems

Emblems have been referred to by various names, such as *autonomous gestures* (Kendon 1989), *semiotic gestures* (Barakat 1969), and *symbolic gestures* (Poggi and Caldognetto 1998). Emblems typically operate independently of the spoken word, given that they have an explicit verbal meaning. Examples include shaking the head from side to side and holding the forefinger perpendicularly across one's lips which, in the Anglosphere at least, mean "no" and "be quiet" respectively. Emblems characteristically vary from one culture to another, both in terms of their physical appearance and meaning. Some emblems are specific to one culture. In Italy, for example, pressing and rotating a straightened forefinger against the cheek (referred to as the "cheek-screw") is a gesture of praise; it is, however, little known elsewhere in Europe (Morris et al. 1979). Other emblems occur in many cultures, but their meaning may vary. For example, whereas the thumbs-up gesture in the West means "OK" or "good" in the Middle East it is considered obscene (Knapp and Hall 2006). The shoulder shrug, according to Jokinen and Allwood (2010), is interpreted by Westerners as indicative of uncertainty or ignorance, but by Middle Easterners as indicative of certainty and confidence. Jokinen and Allwood argue that although the shoulder shrug indicates a lack of knowledge, its use may reflect either an inability to continue an interaction or an unwillingness to do so. If the latter, the gesture may be perceived as arrogant and impolite, or even socially unacceptable. They propose that whereas some cultures focus more on uncertainty, others focus more on confidence and arrogance, hence the different meanings attached to this particular gesture. (For further discussion of cultural meanings of emblems, see Chapter 23, Matsumoto and Hwang, this volume.)

Other emblems may be specific to a particular profession or sport. For example, amongst skin-divers, opening and closing one hand rhythmically indicates that the gesturer is experiencing a cramp. Similarly, mariners gesture "Help!" by raising and lowering their arms stiffly from their sides. While such emblems convey

specific messages to specialist minorities, they may have no particular meaning for the public at large (Morris 2002).

While the origins of many emblems are lost in history, it is clear that some become associated with a certain cause or individual, and subsequently become popularized within the culture. A notable example of this is the V for victory gesture made famous by Winston Churchill during the Second World War (Schuler 1944). This emblem was later used amongst anti-Vietnam War protestors in the United States during the 1960s, although in this context it was normally intended to mean “peace” rather than victory.

Over the last decade, several important studies have been conducted which examined neurological aspects of the visual processing of emblems (e.g., Bernardis and Gentilucci 2006; Gallagher and Frith 2004; Knutson, McClellan, and Grafman 2008; Montgomery and Haxby 2008; Villarreal et al. 2008; Xu et al. 2009). Arguably, the most interesting finding to arise from this research comes from the study by Xu et al. Using functional Magnetic Resonance Imaging (fMRI) technology, these researchers discovered that autonomous gestures, as well as spoken language, are processed through a left-lateralised network of posterior temporal and inferior frontal regions. Xu et al. concluded that these areas of the brain, which since the mid-1800s have been considered as the centre of the brain’s language system, “are not in fact committed to language processing, but may function as a modality-independent semiotic system that plays a broader role in human communication, linking meaning with symbols whether these are words, gestures, images, sounds, or objects” (Xu et al. 2009: 20664).

1.3.2 Illustrators

The findings of several studies indicate that illustrative gestures help the listener to establish a complete and articulated mental model of the speaker’s discourse (e.g., Bucciarelli 2007; Cutica and Bucciarelli 2008). As a result, people can recall more information from a speaker’s discourse if it is accompanied by gesture (Church, Garber, and Rogalski 2007). Furthermore, illustrators appear to be beneficial for the encoder, as gesturing during speaking results in improved recall of information at a later time by the speaker him- or herself (e.g., Cook, Yip, and Goldin-Meadow 2010).

Cutica and Bucciarelli (2011) hypothesized that a person asked to recall gesture-accompanied discourse is less likely to gesticulate than a person recalling gesture-unaccompanied discourse. To test this hypothesis, two videos were made of an actor speaking about a series of events that took place at a carnival. In one video, the actor spontaneously used hand gesture as appropriate; in the other, he spoke without gesture. One group of participants watched the video of gesture-accompanied discourse, the other the video of gesture-unaccompanied discourse. Subsequently, participants were asked to recall the information they heard on the

video. Those who watched the video of gesture-accompanied discourse produced significantly less spontaneous gesture when recalling information than those who watched the video without gesture. Cutica and Bucciarelli concluded that the purpose of speech-accompanied gesture is to support the organization of thought by facilitating the construction of a mental model of discourse.

Recently, the effect of illustrative gesturing on recall and eyewitness accounts has been examined. Gurney and Pine (2011) showed participants mock-up CCTV footage of a robbery. Following this, an “on-screen” police officer asked a series of questions about the incident. Although all participants were asked exactly the same questions, the officer varied his use of hand gesture as he asked the questions. For example, on some trials while asking “Did you notice any jewellery?” he would simultaneously gesture to his wrist or ring-finger. Participants who witnessed these gestures were significantly more likely to report seeing jewellery than participants who had not witnessed them. This supported the hypothesis that gesturing by a questioner can facilitate the formation of false memories. Obviously, such findings have important implications for interview techniques in criminal justice settings.

While people typically use more illustrative gesture when talking to a seen than to an unseen person (Alibali, Heath, and Meyers 2001; Cohen and Harrison 1973), they may sometimes gesticulate when unobserved by others (Krauss et al. 1995; Pine, Gurney, and Fletcher 2010), and even when talking to blind people (Iverson and Golden-Meadow 1998). To some extent, this behaviour may be purely habitual, but it may also occur, according to Pine et al., because certain gestures become integrally associated with the semantic properties of the accompanying words. In instances where the semantic aspects of a word contain a high motor component, it is more likely that the corresponding illustrative gesture will occur, irrespective of whether or not a listener can see the gesture.

Finally, the use of illustrators by speakers can influence how their character is perceived by others. For example, Maricchiolo et al. (2009) found that people who gesture when speaking were regarded by listeners as more composed and competent than non-gesturers. Again, Kelly and Goldsmith (2004) found that listeners liked speakers who use gesture more than those who did not use gesture.

1.3.3 Regulators

Regulators are bodily movements that serve to control the flow of a conversation. For example, gesture can be used as an *attempt-suppressing signal* (Duncan and Fiske 1985) to prevent someone else taking over the turn in conversation. Conversely, when the speaker stops gesturing, this can function as a *turn-yielding cue*, one of a number of signals that offer a speaking turn to the other person (Duncan and Fiske 1985). Other functions of regulators are to request or reject further information, control the listener’s attention, and accept/reject the speaker’s proposals

(Nash 2007). Regulators may also be used when two or more individuals are parting. As such, the waving gesture may be considered a regulator (Hayes 2002). (For further discussion of conversational regulation, see Chapter 17, Patterson, this volume.)

2 Emotions and interpersonal attitudes

2.1 Facial expression and emotion

For much of the twentieth century, the conventional wisdom amongst social scientists was that facial expressions are socially learned and therefore vary among cultures, with no fixed relationship between a facial expression and what it signifies (e.g., Birdwhistell 1971; LaBarre 1947; Hunt 1941; Landis 1924; Munn 1940). However, this view was challenged by the results of a series of cross-cultural studies, which showed that the facial expression of at least seven emotions (anger, fear, surprise, happiness, disgust, sadness, and contempt) is universal across culture (Ekman 1972; Ekman and Friesen 1971; Ekman and Friesen 1986; Ekman and Heider 1988; Ekman, Sorenson, and Friesen 1969; Izard 1971). In addition, Tracy and Matsumoto (2008) recently provided evidence indicating that pride and shame are also characterized by universal facial expressions. From all this evidence for universality, it has been hypothesized that the facial expressions of emotion are innate, a view further supported by studies which have shown that blind individuals demonstrate the same spontaneous expressions as sighted individuals (e.g., Matsumoto and Willingham 2009). (See also Chapter 6, Kappas, Krumhuber, and Küster, this volume, and Chapter 23, Matsumoto and Hwang, this volume.)

As a result of his research findings, Ekman (1972) proposed what he called a neuro-cultural model of emotional expression. This model takes into account not only the innateness of emotional facial expression, but also recognizes that individuals may modify these expressions in accordance with the norms/customs of the culture or society in which they live through what are called *display rules*. According to Ekman, there are four such rules: *amplification* (exaggerating the intensity of the expression); *attenuation* (weakening the intensity of the expression); *concealment* (hiding an expression by adopting a neutral face); and *substitution* (displaying an expression incongruent with the emotion being experienced).

2.2 Gesture and emotion

Ekman's (1972) neuro-cultural model is focused specifically on the facial expression of emotion. Conversely, gestures of emotion, according to the prevalent view

amongst contemporary social scientists, are not innate but learned, and thus vary between cultures (Morris 2002). This perspective is based on the view that gestures (neither emblems nor illustrators) do not appear to have universal meanings.

Nevertheless, it should also be noted that emotion can be perceived from whole body movements, as evidenced by the findings of studies utilising both point-light displays (e.g., Atkinson et al. 2004; Clarke et al. 2005; Clarke et al. 2003; Dittrich et al. 1996) and full-light displays (e.g., Atkinson et al. 2004; Boone and Cunningham 1998; Van Meel, Verburch, and DeMeijer 1993; Wallbott 1998). For example, in the study by Atkinson et al., the researchers created two sets of stimuli (point-light and full-light displays) from video footage of encoders demonstrating emotional whole body expressions. Static images representing the “peak” of the emotional displays were also produced. The emotions expressed by the encoders were anger, fear, happiness, disgust, and sadness. It was found that decoders could accurately decode all these emotions from all three displays (full-light, point-light, and static); more readily from dynamic than from static stimuli.

Nor is it even necessary to view a whole body expression to perceive emotion. For example, Pollick et al. (2001) found that the way in which a human arm moved when performing certain actions led decoders to perceive it as encoding various emotions. From studies utilising neuroimaging techniques, it has been shown that the superior temporal lobe (Saygin 2007), premotor cortex (Saygin et al. 2004), and cerebellum (Sokolov et al. 2009) are all involved in the perception of the type of biological movement described in the above mentioned studies. Furthermore, the occipital and fusiform face areas appear to be involved in differentiating between biological and non-biological forms of motion (Grossman and Blake 2002).

2.3 Comparisons of facial expression and gesture

The relative importance of facial expression and gesture in judgments of emotion has been investigated in a number of studies, which have shown that emotions can be decoded more accurately from the face than the body (e.g., Pohlig 2008). However, it should be noted that accompanying bodily expressions can influence how emotions are perceived in the face, particularly when the facial expressions are ambiguous (e.g., Meeren, van Heijnsbergen, and de Gelder 2005; Van den Stock, Righart, and de Gelder 2007).

Typically, people spend considerably more time looking at a speaker’s face than their gestures during conversation (e.g., Beattie, Webster, and Ross 2010; Gullberg and Holmqvist 2006). For example, in Gullberg and Holmqvist’s experiment, participants spent between 91% and 96% of the time viewing a person’s face during social interactions, compared to between 0.2% and 0.5% of the time viewing their gestures. Such findings highlight the social importance of facial expressions in interpersonal exchanges relative to gestures and body movements.

2.4 The role of gesture in deception

It is frequently reported that certain gestures may be indicative of attempted deception. For example, covering the mouth, covering the face and/or eyes during a stressful exchange signal that a person is lying, according to Walters (1996). Again, it is sometimes reported that touching the nose can be a clue to attempted deception (e.g., Morris 2002). However, all these reports are in need of rigorous and systematic empirical investigation. Furthermore, it is important to stress that there is no specific cue which is invariably indicative of lying (Ekman 2009) – Pinocchio's nose is but a charming fairy tale. Ekman has stressed the importance of having a baseline measure of a person's nonverbal expressions/gestures before attempting to judge if s/he is being truthful or deceptive. In other words, to be able to make an informed decision regarding deceptive behaviour, one first needs to be aware of a person's customary nonverbal behaviour under non-deceptive conditions. (Chapter 16, Frank and Svetieva, this volume may also be consulted on the topic of nonverbal cues and deception.)

In a study of accuracy in deception detection, Warren, Schertler, and Bull (2009) found that reported use of facial expression was more important than reported use of gesture or other body movement. Participants (decoders) viewed audio-visual recordings of encoders describing videos clips of either an emotional or non-emotional nature; the encoders had been instructed either to describe accurately what they watched, or to lie about it. In addition to assessing whether or not the encoders in each clip were being truthful, the decoders answered a series of questions regarding which cues they had used in making their decisions. A significant positive correlation was found between reported use of facial expression and accuracy in emotional but not non-emotional lie detection. In contrast, reported use of a more general cue of "body language" did not correlate significantly with either emotional or unemotional lie detection accuracy.

2.5 Gesture and gender

Some gestures appear to be sex-typed, that is to say, they are used more by one gender than by the other. Three such gestures have been termed by Rekers (1977) the *limp wrist* (lacking firmness or strength in the wrist), *flutters* (rapidly moving the arms up and down), and *walking with a flexed elbow* (where the angle between the upper arm and forearm is between 0 and 135 degrees). In a study of normal children (aged between four and five, and between eleven and twelve), these three gestures were used significantly more by girls than boys (Rekers, Amaro-Plotkin, and Low 1977). In another study of normal children (aged between seven and eight, and between ten and eleven), girls made significantly greater use of gestures referred to as a *hand clasp* (touching the hands together in front of the body) and

palming (a grooming movement which involves touching the palm to the back, front or sides of the head above the level of the ears) (Rekers and Rudy 1978). Rekers (1977) observed that children with sexual identity problems have been shown to make exaggerated use of gestures associated with the opposite gender.

More recently, Nagy et al. (2007) examined the ability of neonates of both sexes to imitate index finger extension gestures. They found that girls demonstrated more accurate and faster imitative abilities than boys. This fits well with other research findings which indicate that women are generally better at decoding social/emotional stimuli than men (e.g., Hall 1978, 1984). Furthermore, it suggests that this female advantage results from innate mechanisms rather than simply being a result of gender-based social learning.

On average, girls begin to use language earlier than boys (e.g., Maccoby 1966; Ramer 1976). This, coupled with the important role that gesture appears to play in language development, led Ozcaliskan and Goldin-Meadow (2010) to examine gender differences in the use of gesture amongst toddlers as they progressed from one-word to multi-word speech. They found that boys produced multi-word combinations (e.g., “drink juice”) three months later than girls, and also produced gesture and speech combinations expressing the same types of semantic relations (e.g., “drink” + pointing at juice carton) three months later than girls. Given that gesture and speech combinations precede multi-word speech combinations in development, Ozcaliskan and Goldin-Meadow argued that children’s gesture provide the first evidence for the fact that boys tend to lag behind girls in the onset of sentence construction. (See Chapter 21, Hall and Gunnery, this volume, for further discussion of gender and gesture.)

2.6 Dominance and submission

Darwin (1872) argued that many animals, including humans, increase their apparent size to indicate dominance and reduce their size to indicate submission. Modern empirical research indicates that certain body movements and positions are regarded by onlookers as representing either a dominant or submissive stance. For example, Mignault and Chaudhuri (2003) found that a bowed head was perceived as more submissive than a raised head, and also associated with inferior affective states (i.e., guilt, humiliation, embarrassment, shame, and respect). A raised head on the other hand was regarded as displaying dominance, as well as encoding more positive/superior mental states including happiness, contempt, and pride. Such dominant or submissive body movements are believed to have an evolutionary underpinning, and thus function to ensure the survival of the organism. For example, by bowing the head and adopting a submissive stance, a person might dissuade another individual from attacking them (Preuschoft and van Schaik 2000). (Chapter 20, Schmid Mast and Cousin, contains further discussion of body movements and dominance/status.)

3 The role of gesture in interpersonal communication

While the concepts of illustrators and regulators may imply that gesture is secondary to speech, serving only to amplify and elaborate the spoken word, it should be emphasized that gesture and speech differ substantively as modes of communication. Thus, whereas speech is communicated through an auditory channel, gestures communicate information visually. Again, whereas in speech, the sequence in which words are spoken and syntactic structure is paramount, such factors are largely irrelevant to gesture, although gestures can directly represent action sequences. Despite these important differences, gesture and speech often co-occur in a highly integrated manner, with one medium taking precedence over the other depending on the nature of communicative task. The distinctive features of gesture and their implications for interpersonal communication will now be examined.

3.1 Gesture as a visual means of communication

An advantage of gesture over the spoken word is that it can quickly communicate orientational and spatial information that would be more time consuming to communicate through language. Thus, gesture may elaborate on, or provide additional information to that provided in accompanying speech. Furthermore, because gesture is a highly visible means of communication, it may be used to capture a person's attention in situations where using speech might be difficult or inappropriate. For example, Heath (1986) found that medical patients tended to use flamboyant gestures when they wished to catch their physician's attention. Arguably, in this context gesture has the advantage of indirectness in comparison to an explicit verbal request, which might seem disrespectful when addressing a person of higher status.

During public performance, gesture can be particularly helpful in visually communicating information to those members of the audience too far away to hear the spoken word. Furthermore, gesture may indicate that a speaker wants his/her audience to applaud. Thus, Atkinson (e.g., 1984) showed how politicians use rhetorical devices built into the structure of speech, such as *three-part lists* (simply a list of three items), to invite applause from their audience. Each element of a three-part list may be further articulated through the use of closely synchronized gesture, making the applause invitation more salient. However, the continued use of gesture beyond the three-part list might indicate that it is not yet time for the audience to applaud. According to Bull and Wells (2002), the importance of nonverbal behavior in this context is that it may indicate whether or not a particular rhetorical device is intended as an applause invitation.

For example, Bull (1986) examined video footage of a political speech by Arthur Scargill (former leader of the British National Union of Mineworkers), recorded during the 1983 British general election campaign. It was noted that Scargill used a rhetorical device to evoke audience applause called the *headline-punch-line* device. This technique involves the speaker saying that s/he will make an announcement, pledge or declaration, and then proceeding to make it. Bull found that on three separate occasions Scargill progressed from unilateral to bilateral gestures for the final part of this device. This transition appeared to have the effect of bringing the rhetorical device to a climax, and indicating to the audience that it was the appropriate time for them to applaud.

There are also differences in visibility between different types of gesture. Typically, more important aspects of speech may be accompanied by larger movements and/or movements involving multiple parts of the body (Bull 2002). Making a point is often indicated by movements in head position or in the eyes, whereas speech intended to change a person's opinion or point of view is usually accompanied by postural shifts (Schefflen 1964).

3.2 Gesture as a silent means of communication

As a silent means of communication, gesture is often used in situations where it is difficult to use speech, for example, where the noise level makes hearing a speaker impossible, or where speaking would interrupt an already flowing conversation. In addition, gesture may be used as a relatively discreet form of communication between two or more individuals. An example of this might be to signal collusion through a discreet thumbs-up gesture.

Another advantage of gesture is that certain communicative exchanges can be completed more quickly than through speech. For example, shaking hands on a deal is normally taken to mean that both parties will stick to their agreement, without having to take the time to state this explicitly.

3.3 Gesture as a form of bodily action

As a form of bodily action, gesture has certain advantages over speech in communicating particular types of information. Certain actions can be represented through gesture better than they can be described through words. For example, gesture may be particularly useful in mimicry or in demonstrating how particular skills should be performed.

Gesture can also provide visual animation to a speaker's discourse, thus enriching the quality of their verbal account. When gesture is intended to represent physical action, it may require extra forcefulness. For example, a clenched fist may

communicate anger more effectively than tirade of words. This may give gesture particular importance in the communication of emotions and other interpersonal attitudes.

3.4 Gesture as an optional means of communication

Although gesture has been shown to facilitate comprehension of a spoken message, it is of course perfectly possible to talk without the use of gesture. To the extent that it is optional, the mere presence or absence of gesture may in itself communicate information. Gesture can effectively be “turned off” at will, something more difficult to achieve with other nonverbal and vocal channels. Thus, integral characteristics of speech such as tone of voice, speech rate, and amplification will always be evident when an individual is speaking; one would effectively have to stop talking to eliminate these cues. Again, although facial muscles are to a large extent under conscious control and as such, may be manipulated to mask felt emotions, the occurrence of micro and subtle facial expressions may offer clues to underlying affective states, figuratively referred to as “nonverbal leakage” by Ekman and Friesen (1969b).

Not only is gesture intended to be communicative, its use may be taken as indicative of a wish to communicate. Thus, gesture may be used by a speaker to highlight certain aspects of discourse regarded as of greater importance. It may also be used when a speaker is trying to argue a point in a persuasive manner, rather than presenting it in a neutral fashion (Mehrabian and Williams 1969). In contrast, the absence of gesture can indicate an unwillingness to communicate. People suffering from depression were found to use significantly fewer illustrative gestures on admission to hospital than on discharge (Kiritz 1971; cited in Ekman and Friesen 1974).

3.5 Gesture as part of a multichannel system of communication

By now it should be clear that gesture is part of a multichannel system of communication. It operates not as an alternative to speech, but in conjunction with it. Further evidence for the intertwined relationship between speech and gesture comes from research showing that both communicative channels are regulated by a common area of the brain (Xu et al. 2009) and that gesture dissolves together with speech in aphasia (McNeill 1985).

Scherer (1980) identified four main functions of nonverbal signs in conversation: semantic, syntactic, pragmatic and dialogic. As a semantic function, nonverbal signs may affect the meaning of speech, or in themselves may signify meaning. They may also regulate the organization and simultaneous organization of verbal

signs and other nonverbal signs (syntactic function). Alternatively, they may communicate information about the characteristics of the message sender and receiver (pragmatic function). Finally, nonverbal signs may indicate the nature of the relationship between the interactants (dialogic function). As gesture can convey any or all of these functions, its use in conjunction with speech makes it possible to communicate simultaneously on several different levels.

3.6 Lack of standardization

Unlike language, which is governed by the rules of syntax, gesture does not have a standard form. A linguistic utterance that does not conform to a standard of form is considered ungrammatical and will often be unintelligible. However, due to their lack of standard form, gestures may be used in idiosyncratic but still recognizable ways.

4 Conclusions

Interest in gesture and body movement dates back for more than two millennia, but only relatively recently have they become the subject of scientific enquiry. There is now substantive evidence to support the hypothesis that gesture and speech are closely linked in terms of syntax, meaning and vocal stress. Gesture and other body movements also play a role in the communication of emotions and other interpersonal attitudes. Three main types of gesture have been identified, referred to as emblems, illustrators and regulators (Ekman and Friesen 1969a). The concepts of illustrators and regulators seem to imply that gesture is essentially secondary to speech, amplifying and elaborating the spoken word. However, as communication modalities, gesture and speech have very different properties (Kendon 1985). Gesture can be shown, through a consideration of its distinctive features, to be not so much subordinate to speech, as different. The key elements are that gesture is visual, that it is silent, and that it constitutes a series of bodily actions. In addition, it is highly visible, and there are also differences in visibility between different types of gesture. Furthermore, it is to some extent optional, it constitutes part of a multichannel system of communication, and unlike speech, it lacks standard forms (Bull 1994; 2012). As a consequence, certain communicative tasks can be performed more readily through gesture than through speech (Kendon 1985). This has significant consequences for the way in which it is used in social interaction. The challenge for future research is to spell out more precisely the different ways and different contexts in which gesture may be used as part of a multichannel system of communication.

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9 Eye behavior

Abstract: The eyes are often regarded as the “window to the soul.” In this chapter, we explore the science behind how they provide a window to social and emotional perception. From the moment of birth, we are attracted to eyes, and we are not the only species that is. The eyes allow us to read the intentions that others have toward us. In humans, contemporary research reveals that the ability to process the eyes of others plays a critical role in the development of complex mental state reasoning, a realization that has led to a wide spectrum of conceptually related work across several research domains including clinical, developmental, and social psychology, primatology, visual cognition, and the cognitive and affective neurosciences. In this chapter we review the vast literature on eye behavior, exploring both the classic and contemporary, making connections across them and highlighting taproot themes in the literature. Advances in theory and technology have led to new insights to old questions, as well as to entirely new questions of interest. What is clear throughout all this work is that the eyes hold special prominence in nonverbal communication, both as a source of social expression and as a channel of social perception.

Keywords: theory of mind, eye gaze, gazing, pupil dilation/constriction, reflexive orienting, eye tracking, social vision, shared signal hypothesis

The countenance is the portrait of the soul, and the eyes mark its intentions. – *Marcus Tullius Cicero*

Famous portrait artists have made considerable use of eyes in their work. In a unique analysis, Christopher Tyler (1998) measured the horizontal and vertical positions of the eyes in portraits by 165 artists done over the past 2,000 years. Intriguingly, the majority of artists depicted the eyes in the geometric center of the portrait. Tyler suggests that this placement reflects an implicit perceptual value judgment: The eyes are central to communicating the demeanor of their subjects. Certainly folk wisdom asserts that “*the eyes are the window of the soul*,” and empirical science amply corroborates a prominent role for the eyes in human nonverbal communication, across time, culture, and even species.

For humans, the eyes are particularly useful in ascertaining mental and emotional states of others. The same structures that surround and protect the eyes (lids, brows, conjunctiva, lachrymal glands) have been widely implicated as social cueing mechanisms facilitating nonverbal communication (Ekman and Friesen 1975). Thus, the analysis of these structures in terms of social and emotional

expression has been focused on the complex muscle patterning around the eyes. Because people fixate on the eyes when face-to-face, information from the eye region has, perhaps not surprisingly, proven particularly critical to nonverbal communication, and in particular to correctly identifying basic emotions such as sadness, fear, and anger expressions (Adolphs et al. 2005). The eye region is even more important when trying to infer complex mental states, where the eye region alone has been found to be as informative as the whole face (Baron-Cohen, Wheelwright, and Jolliffe 1997).

Although the facial muscle patterning around the eyes is clearly important to nonverbal communication, the purpose of this chapter is to focus on actual behavior of the eyes – not the region around the eyes – and the profound role such behavior plays in social and emotional signaling. The two eye behaviors receiving the most empirical and theoretical attention in the literature include: 1) eye gaze (i.e., looking behavior), and 2) pupil dilation/constriction. Herein we review evidence regarding both the social factors influencing when and why these behaviors occur, as well as the social signal value of these behaviors for perceivers observing them in others. Before surveying the literatures relevant to these specific eye behaviors, however, we first review evidence that humans possess a natural and exquisitely tuned attraction to the eyes, a necessary condition required for such subtle behaviors to exert the powerful social influences that they do.

1 Do humans possess a natural attraction to the eyes?

Evidence for the primacy of eyes in visual perception comes in part from observations of eye-spot configurations prominently branded on lower order animals such as birds, reptiles, primates, fish, and insects. The evolution of such eye spots has been described in terms of “mimicry” such that they act to mimic the eyes of a larger animal, and thus effectively ward off potential predators. This observation points to the eyes being an important signaling mechanism even cross-species (see Argyle and Cook 1976). In humans, despite the subtlety of movement that eyes are capable of (mere millimeter shifts), adults appear more sensitive to the direct eye gaze of others than to postural behaviors, and tend to become quite frustrated when others do not respond to their own looks (Ellsworth 1975).

Developmental research adds further evidence that we possess a natural predilection to process eye information by demonstrating early responding to eyes, presumably before much social learning can take place. The eyes have been found to be a minimal visual stimulus to generate a smiling response in infants (Argyle and Cook 1976). In fact, before the first two months of life, the simple presentation of two horizontal dots generates a smile response, whereas the presentation of other features of the face does not until later in development (see Argyle and Cook 1976);

furthermore, a whole face presented with eyes concealed fails to produce such smiling behavior. Hains and Muir (1996) added to this inquiry by demonstrating that infants aged 14–26 weeks smile more in response to direct than averted eye gaze. Infants also attend more to the presence of two large, horizontally-arranged spots, ignoring similar, single- and triple-spot schematic arrays (Hess 1975). Infants will also stare at a face with eyes directed at them longer than if its eyes are averted (Farroni et al. 2002), or than if the face has no eyes at all (Bakti et al. 2000). Further, as early as two days old, infants can follow the gaze of an adult (Farroni et al. 2004).

The eye region of the face draws significantly more attention from both infant and adult observers compared to any other area of the face (Janik et al. 1978; Morton and Johnson 1991). Not only do the eyes and their surrounding region appear to convey rich social meaning, but they are also thought to convey more *genuine* expressions of internal states than other aspects of the face (Buck 1988; Fridlund, Ekman, and Oster 1987; Rinn 1984). Being less prone to volitional, deceptive displays, the eye region is a particularly important cue to attend to in social interaction. Both children and adults also tend to recognize the eyes of others more readily than mouths (Joseph and Tanaka 2002; Tanaka and Farah 1993), suggesting that personal identity may be associated with eyes in particular.

There exist what appear to be dedicated areas of the brain specialized for processing eye information, in particular the superior temporal sulcus (Farroni and Senju 2010; Hoffman and Haxby 2000; Puce et al. 1998). There are also patches of neurons in the fusiform gyrus, widely argued to be selectively devoted to the processing of facial identity in both humans and nonhuman primates (see Kanwisher, Tong, and Nakayama 1998; McCarthy et al. 1997). Critically, this area of the fusiform gyrus appears particularly responsive when processing the eyes. Supporting this latter contention are ERP studies demonstrating that the N170 evoked potential – commonly believed to be generated by the fusiform gyrus (Deffke et al. 2007) and regularly recorded during face processing tasks (Bentin et al. 1996) – appears most sensitive to the eyes than other facial information (Bentin et al. 1996; Puce, Smith, and Allison 2000; Senju et al. 2005). Perhaps even more compelling evidence for this contention comes from work with autistic individuals who often show hypoactivation of the fusiform gyrus in response to faces, but importantly, they also tend to avoid eye contact when viewing faces. When explicitly instructed to look at the eyes, these same individuals then show fusiform responsivity to faces that is on par with matched neurotypical samples (Dalton et al. 2005).

Taken together, this work underscores how remarkably attuned we are to the eyes of others, whether innately prepared or not. Such an attunement is arguably essential for explaining the powerful effects that such subtle behaviors, like eye gaze and pupil dilation/constriction, exert on social exchange.

2 Eye gaze and looking behavior

Six muscles, called the extraocular muscles, control eye movements. There are four rectus muscles that control left to right and up and down movement, and two oblique muscles that when combined with the others account for diagonal movement of the eyes. With these simple movements, eye gaze conveys tremendous social information and function.

2.1 Where we look and why

Contemporary eye behavior research has benefited from advances in eye tracking technology, allowing for precise measurements of looking behavior with high temporal resolution. Because looking behavior and visual attention are so tightly bound – eye movements generally follow covert attentional shifts (Deubel and Schneider 1996) – we can infer the locus of one's visual attention from shifts in gaze (Deubel and Schneider 1996; Hoffman and Subramaniam 1995). Reviewed below are a number of ways in which looking behavior has been examined via eye tracking to elucidate its social and emotional function.

2.1.1 Looking behavior in emotion regulation

When faced with a negative stimulus, an effective method of coping with it is to simply ignore, or shift your eyes away from it. Shifting of eye gaze can be a powerful moderator of emotional distress (Xing and Isaacowitz 2006). One area where this effect has been shown is in examining the effects of aging on attention to emotional stimuli. In general, there is a robust *positivity effect*, where older adults show a greater propensity to process positively valenced emotional stimuli and avoid negative ones (Carstensen and Mikels 2005; Mather and Carstensen 2005). It has been suggested that older adults show a positivity bias because, as they approach the end of their lives, their goals shift from the acquisition of resources and information to the enhancement of present experience (Carstensen, Isaacowitz, and Charles 1999).

Across numerous studies, older adults show a positivity bias in visual attention by showing preferential looking behavior towards positive images (Isaacowitz et al. 2006a, 2006b; Isaacowitz et al. 2008; Isaacowitz et al. 2009; Knight et al. 2007; Mather and Carstensen 2003). These effects are driven both by a bias towards positive images and a bias away from negative images. Eye tracking and dot-probe studies provide similar results, although eye tracking provides much stronger results (Isaacowitz et al. 2006a), suggesting this is mostly an effect of overt orienting of attention.

This looking positivity bias is not a function simply of mood-congruent processing (i.e., older adults experience more positive moods, and therefore look at

positive stimuli more). Isaacowitz et al. (2008) used a mood induction paradigm to look at eye gaze patterns in response to emotionally valenced faces. In younger adults, a mood-congruent effect was found whereby a negative mood induction led to increased looking at negative faces and a positive mood led to increased looking at positive stimuli. In contrast, older adults showed a mood-incongruent bias when in a negative mood. They looked more at positive faces. This emotion regulation strategy is consistent with a motivational tendency to regulate and maintain a positive mood later in life (Carstensen et al. 2006).

Looking behavior favoring positive stimuli in older adults seems to be a controlled, yet very efficient, process. Mather and Knight (2005) argued that while there are predispositions to focus on negative stimuli, older adults are able to control these predispositions in favor of positive stimuli. In line with this, they later found that divided attention reverses the positivity bias in looking behavior for older adults (Knight et al. 2007). This suggests that sufficient cognitive resources are necessary to control the natural tendency to focus on negative stimuli. This is further supported by the finding that positivity biases are not evident until 500ms post-stimulus onset (Isaacowitz et al. 2009), which is beyond initial visual orienting (Posner 1980). Despite its controlled nature, positivity biases in looking behavior are relatively effortless (Allard, Wadlinger, and Isaacowitz 2010).

Positive looking biases in older adults also appear to be moderated by culture. Older Chinese adults look away from positive facial expressions (Fung et al. 2008) and this effect is moderated by level of interdependence (Fung et al. 2010). In interdependent cultures, negative information may signal that group cohesion is threatened, and therefore those who have their self intertwined with the group may find this information more informative (Fung et al. 2010). This adds further support for the notion that age-related changes in the positivity bias are driven by controlled processes that can be culturally transmitted.

2.1.2 Looking behavior during face and emotion expression processing

The face communicates the identity, emotional state, and direction of attention of others. Because of this, visual scanning of the face has been a topic of interest to researchers. In particular, examining how neurotypical controls scan faces compared to those with psychopathologies marked by impaired social perception, such as autism (Adolphs, Sears, and Piven 2001), has been fruitful in terms of identifying deficits in social functioning. In general, people tend to look at features of the face when engaging in face processing, including eyes, nose, and mouth. However, individuals with autism spend more time looking at non-features (Pelphrey et al. 2002). They will also tend to look more at the mouth region, whereas controls will look more at the eye region when engaging in general face processing (Klin et al. 2002) as well as emotion recognition tasks (Spezio et al. 2007a, 2007b). This effect may be driven by amygdalar-abnormalities, which are associated with autism

(Baron-Cohen et al. 2000). Amygdala-lesioned patients make less eye contact (Spezio et al. 2007c), but when they are explicitly instructed to pay attention to the eyes, emotion recognition accuracy improves, particularly for fear expressions in which the eye region is an important source of information (Adolphs et al. 2001). Additionally, autistic individuals show less amygdala and fusiform gyrus activation than neurotypical individuals, *except* when looking at the eye region (Dalton et al. 2005).

Gender of observer also appears to moderate face looking behavior. During facial emotion recognition, men look more at the nose and mouth than females (Vassallo et al. 2009). Conversely, women look at eyes more, and this is associated with better accuracy and faster reaction times (Hall, Hutton, and Morgan 2010). This may help explain the slight benefit for females over males in facial affect recognition (Hall 1978; McClure 2000). (For additional findings for gender and gazing, see Chapter 21, Hall and Gunnery, this volume.) There are also individual differences related to anxiety that will be important to explore in more depth. For instance, females high in social anxiety have been found to fixate longer on the eye region during a free viewing task (Wieser et al. 2009).

Other factors also have an impact on looking behavior in face processing. One such factor is culture. Cultures provide display rules that dictate when, where, and how much of an emotion one may express (Matsumoto 1990; Matsumoto, Yoo, and Fontaine 2009). In interdependent cultures (such as Japan), individuals are expected to mask their expressions, whereas people in independent cultures (such as the United States) are more freely allowed to express their emotions (e.g., Friesen 1972). Within the face, however, there are differences in the controllability of expressions. Two predominant muscles underlying facial expressions are the zygomatic major, which controls the mouth region, and the orbicularis oculi, which controls the eye region. While the zygomatic major can be controlled when attempting to mask facial expressions, as noted earlier it is much more difficult to control the orbicularis oculi around the eyes (Ekman and Friesen 1975; Ekman 1992). As such, it stands to reason that people in cultures that encourage the masking of expressions would be better off attempting to glean information from the eyes when attempting to decode facial affect. Yuki, Maddux, and Masuda (2007) found that American participants based their interpretation of facial expressions more on the mouth, whereas Japanese participants based their interpretations more on the eye region. When making non-emotion judgments (i.e., identity recognition, race categorization), Western Caucasians look first at the eyes, then the mouth, whereas eastern Asians focus more on the center, nose region of the face (Blais et al. 2008). (For more on cultural aspects of nonverbal behavior, see Chapter 23, Matsumoto and Hwang, this volume.)

There are yet other moderators of eye behavior in response to emotional targets. Deaf individuals look more at the eyes than hearing individuals when judging expressions, whereas hearing individuals looked more at the nose (Watanabe et al.

2011). Notably, the participants used in this study were all Japanese, thus replicating the previous findings of bias towards the nose found amongst East Asians (Blais et al. 2008). This counters the Yuki et al. (2007) findings of greater use of the eye region from Japanese participants during emotion judgments, which may be explained in terms of stimulus effects. Emoticons and Caucasian face stimuli may not discourage the application of direct eye contact as much as same-race, Japanese faces used in this study. In Japanese culture, direct gaze can be interpreted as a form of disrespect (Argyle and Cook 1976) and is often therefore avoided.

Age also moderates looking behavior at faces. Younger adults spend more time looking at the eye region than older adults, which in turn leads to more accurate expression recognition (Sullivan, Ruffman, and Hutton 2007; Murphy and Isaacowitz 2010). There has been speculation as to the etiology of these age-related differences. Sullivan et al. (2007) suggested that it may be due to cultural beliefs associated with this age group – that eye contact is not appropriate. Although the amount of overall direct gaze is not a consistent predictor of power and dominance (Hall, Coats, and Smith LeBeau 2005), and amount of time gazing at another while listening versus speaking is an important moderator of perceived dominance (Dovidio and Ellyson 1982), *continuous* eye contact can be a communicator of power and dominance (Kleinke 1986). Given the elderly are generally low in power, this may be a contributor to age-related differences. They additionally suggest that age-related changes, especially in the amygdala, may be driving the effects. Given the associations between the amygdala and eye contact with regards to autism mentioned above, this is also a possibility.

Recently researchers have also used eye tracking to examine motivational influences on looking behavior as a function of viewing same- versus other-race faces. For instance, White participants who are extrinsically motivated not to appear prejudiced experience social anxiety when viewing black faces that leads to attentional patterns indicative of a threat response, such that they quickly shift their attention towards a black face when it initially appears, but quickly disengage and shift attention away (Bean et al. in press). Other researchers have suggested that we pay more attention to individuating features on same-race faces, while focusing more on cues associated with group category on other-race faces. Kawakami, Williams, and Sidhu (2011) found that White participants looked towards individuating features when looking at White faces (i.e., eyes) and spent more time looking at them overall. These same participants spent more time looking at prototypically Afrocentric features, cues used to socially categorize race, on Black faces (i.e., nose, mouth). When offered monetary compensation to remember Black faces, however, White participants then looked more at the eyes, suggesting that motivation to individuate may play an important role in cross-race differences in visually scanning faces.

2.1.3 Impact of others' gaze on our own looking behavior

The direction of another person's gaze can modulate the looking behavior of the decoder as well. When another person looks at you, you may reciprocate with eye contact, or you may look away. If you see this person looking off at some object in the environment, however, you are likely to follow that gaze towards the object in order to see what is being looked at. We offer a brief overview of the relevant literature below, but refer the reader to Frischen, Bayliss, and Tipper (2007) for an extensive review on gaze following.

Gaze cueing, or following someone's gaze to a specific target, has been widely studied using visual attention and eye tracking paradigms. This is an essential component of shared, or joint, attention (Baron-Cohen 1994, 1995; see below for more details). In general, seeing a face with its gaze averted to the side will lead to facilitated identification of a target in the gazed at location (e.g., Friesen and Kingstone 1998). This effect is so powerful that even instructing participants that the target is four times more likely to appear opposite of that cued by gaze does not reduce early attentional biases towards gazed at locations (Driver et al. 1999). In other words, participants were not able to override their tendency to engage in joint attention even though they were aware that it undermined their performance. The primacy of gaze following can be seen across numerous species of primates (Tomasello, Call, and Hare 1998; Bräuer, Call, and Tomasello 2007), in human infants (Farroni et al. 2004; Hood, Willen, and Driver 1998; Reid and Striano 2005), and even goats have been documented to utilize gaze following of other goats to find food (Kaminski et al. 2005).

Infants will follow the gaze of an experimenter, but only when preceded by communication with the infant, either through mutual eye contact (Farroni et al. 2003; Senju and Csibra 2008) or speech directed at the infant (Senju and Csibra 2008). This suggests that gaze following in infants is contingent upon its communicative relevance to the infant. In adults, gaze following continues to be a powerful and seemingly obligatory response, even when observing cross-species' gazing. For instance, both humans and monkeys follow the gaze of another monkey, responding faster to targets of the gaze, and generating more error saccades when the gaze is an erroneous directional cue (i.e., looks away from a target), hence suggesting that both human and monkey participants' attentional orienting was reflexive (Deaner and Platt 2003).

The magnitude of gaze following can be moderated by a number of different variables. One such variable is the perceived dominance of a conspecific. Shepherd, Deaner, and Platt (2006) found that low status macaques follow the gaze of all other familiar macaques, but that those high in status will only follow the gaze of high status macaques. Jones et al. (2010) examined this in humans, and found similar results. Specifically, they manipulated dominance by presenting masculine faces versus feminine faces, and gaze following effects were significantly greater for the high-dominant faces. Additionally, they found that these effects only

occurred early in processing (i.e. 200 ms), suggesting again that this is a relatively obligatory, reflexive process that can later be controlled. Functionally, being tuned to the gaze of high-status others makes sense as these individuals are higher in power, and being in sync with them can lead to optimal outcomes.

While gaze following and joint attention play a critical role in child development, the ability to control gaze becomes an important skill later in life. One study administered a gaze cueing paradigm to older adults (Petrican et al. 2011). They were told that the gaze of the stimulus face would only predict where an impending target would appear 25 percent of the time, hence the target would appear opposite of the gaze direction 75 percent of the time. Participants who showed a relative inability to control gaze, that is, were still likely to reflexively orient towards the gazed at location (despite the probability of the target appearing there being low), were viewed by their spouses as being more constrictive of their autonomy, and demonstrated greater enmeshment, or the inability to clearly distinguish between “I” and “we.” When participants were diagnosed with Parkinson’s disease, however, these traits (low gaze control, greater degree of enmeshment) were associated with greater relationship satisfaction early in the disease, but later became less desirable.

2.2 Social signal value of eye gaze

The eyes provide us with an important source of sensory information. Through evolution, it appears that various species, including humans, have developed special perceptual capacities to process information conveyed by the eyes. Likewise, the morphology of the eyes has likely evolved to become a more effective communicator. For example, humans seemingly have evolved white sclera to facilitate gaze detection by others (Kobayashi and Kohshima 1997). By detecting where someone is looking, we may be able to determine the target of his/her attention, and use this information to infer his/her behavioral intentions toward us.

2.2.1 Signal of self-relevance

When others make eye contact with us, they signal that we are the target of their attention. Anything they are thinking or feeling likely implicates us in some way, thereby increasing the self-relevance of the social information they are conveying. Given that direct gaze is a signal of social relevance to the perceiver, it stands to reason that social cognitive processing would be substantially impacted by direct gaze versus averted gaze. One area where this has been examined is in face memory. Faces with direct gaze are remembered better by infants (Farroni et al. 2007), children (Hood et al. 2003), and adults (Hood et al. 2003; Mason, Hood, and Macrae 2004). Additionally, the well documented cross-race effect in memory, in

which memory for same-race faces is generally better than memory for other-race faces, has been found to be apparent only in faces looking at the viewer, not when directed away (Adams, Pauker, and Weisbuch 2010).

In addition to face memory, the process of social categorization is facilitated by direct eye gaze. Categorizing faces by gender is faster, and stereotype-congruent information is easier to access, when the faces display direct gaze versus averted gaze (Macrae et al. 2002). This effect is also found in normally developing children (Pellicano and Macrae 2009). Additionally, individuals are rated as more likable and more attractive when they gaze towards us rather than away from us (Mason, Tatkow, and Macrae 2005). Ratings of friendliness and trustworthiness are also influenced by gaze direction, especially when the perceiver is in a positive mood and therefore more likely to use heuristics in processing (Wyland and Forgas 2010). Eye gaze direction also modulates threat-related responses to other-race faces. White participants will show greater amygdala activation (Richeson et al. 2008) and will covertly shift attention more towards (Trawalter et al. 2008) a Black face that is looking toward them versus away from them, presumably because the direct gaze signals an intent to approach, which the authors argued that in combination with race-stereotypic attributions would increase the perceived threat-value of the face.

Cooperative behavior can also be impacted by the perception of direct gaze. For example, simply displaying posters with pictures of eyes with direct gaze in a cafeteria reduced the amount of littering behavior that ensued (Ernest-Jones, Nettle, and Bateson 2011). Interestingly, the verbal message that was included, either an anti-littering message or unrelated message, had no impact on littering behavior. The mere reminder that one is being watched, via presentation of direct eye gaze, is sufficient enough to promote prosocial behaviors.

2.2.2 Signal of approach and avoidance

Davidson and Hugdahl (1995: 362) stated that “approach and withdrawal are fundamental motivational dimensions that are present at any level of phylogeny where behavior itself is present.” Given that behavior is so fundamentally motivated, approach and avoidance tendencies should be communicated via the visual signals given off by the face, including by gaze. Indeed, direct eye gaze is known to signal an increased likelihood of approach and social engagement (Ellsworth and Ross 1975; Grumet 1999). Conversely, gaze aversion is a signal of avoidance and at times considered itself an act of hiding (see Redican 1982 and Chance 1962).

Stern (1977) provided evidence early on for the significance of eye gaze behavior in signaling approach and avoidance in social development. It is a way for infants to approach or withdraw from others in an effort to regulate an ideal level of arousal (direct gaze has been shown to increase arousal whereas averted eye gaze reduces it). In fact, before learning to crawl, gaze behavior is the primary

mechanism by which an infant can approach or avoid others. This ability to approach or avoid using gazing behavior has been extensively documented in adults as well (Argyle and Cook 1976). According to Mehrabian's Immediacy Model of social intimacy (1967; see more below), eye gaze is a critical cue for enhancing psychological closeness. Argyle's Affiliative Equilibrium Model extends this by specifically implicating approach-avoidance forces underling such immediacy behavior (Argyle and Dean 1965).

2.2.3 Signal of immediacy

Immediacy cues signal the need for intimacy and psychological closeness. These cues are used to modulate the degree of directness, or intimacy, between dyads of individuals. These cues are not statically occurring, but are rather a dynamic back and forth exchange that provides a nonverbal rules book, so to speak, across a conversation (Kendon 1967). Immediacy cues can range from eye contact to physical proximity to smiling behavior (Argyle and Dean 1965; Argyle and Cook 1976; Mehrabian 1967). The degree to which individuals will engage in these behaviors is dependent on a myriad interpersonal, personality, cultural, and situational variables. In general, however, when holding these factors constant, moderation is best. Argyle and Dean (1965; see also Argyle and Cook 1976) put forth an equilibrium model of affiliativeness, suggesting that there is an optimal level of psychological closeness communicated by immediacy cues. When the equilibrium is disrupted, compensation is sought to restore it. For example, if an individual in a dyad moves away from the other, that other person may engage in more eye contact, or smile more, in order to restore that level of immediacy. Much of the evidence supporting this comes from studies in which physical distance was manipulated, whereby increasing the space between participants has been found to increase looking behavior (see Kleinke 1986 for review). Argyle and Dean (1965) manipulated eye contact by having an experimenter either make eye contact with the participant, or stand with eyes closed. Participants would more closely approach the experimenter (by 23%) when the experimenter's eyes were closed versus when they were open. Additionally, individuals will make less eye contact with a listener as the level of intimacy of a topic they are discussing increases (Exline et al. 1965; Schulz and Barefoot 1974).

Although equilibrium is sought in nonverbal immediacy cues, Argyle and Cook (1976) acknowledged one limitation of Argyle and Dean's (1965) equilibrium model – namely that it did not account for dynamic changes in levels of intimacy between individuals. Conversations are dynamic exchanges in which looking behavior is constantly changing in response to conversational and interpersonal factors (Kendon 1967). They state, for example, that increased display of immediacy cues can be reciprocated rather than compensated for. Specific predictions about this can be made from Patterson's (1976) intimacy-arousal model of immedi-

acy. According to this model, immediacy cues increase arousal in the perceiver. If the perceiver appraises this arousal as positive, he/she will engage in reciprocation of immediacy. If he/she appraises this arousal as negative, compensation will likely occur, resulting in an effort to restore equilibrium.

The intimacy-arousal model has received support in recent years. Helminen, Kaasinen, and Hietanen (2011) found that perceiving direct eye gaze increases skin conductance responses (SCR) relative to averted gaze (see also Hietanen et al. 2008). Subjectively, however, the participants varied on their appraisal of the approachability of the face. Participants who were more emotionally stable were more likely to appraise the face as approachable, whereas those who were less stable were more likely to appraise the face as avoidable. In addition, individuals with Williams syndrome (WS), which is marked by hypersocial behavioral tendencies, will maintain greater eye contact during social interactions when they are asked difficult questions compared to non-WS controls (Doherty-Sneddon et al. 2009). While the authors argued that it may be due to overall hypoarousal in the WS participants, they do show some increases in physiological arousal to faces. It is therefore possible that WS participants do not avert their gaze because the eye contact is perceived positively. More research is necessary to confirm this. Additionally, individuals with social phobia, a disorder characterized by fear of negative evaluation of others, are more likely to interpret eye contact as a threatening stimulus, and as such tend to avoid it (Farabee et al. 1993; but see Wieser et al. 2009). Individual differences, such as those found in psychological disorders, can be used to supplement other research findings offering support for Patterson's (1976) arousal-intimacy model.

Another area in which immediacy should have an impact is in deception. Because engaging in lying behavior can be anxiety and guilt-provoking, efforts to increase psychological distance via "nonimmediacy" behaviors should occur (Zuckerman et al. 1981). Interestingly, despite the common belief that liars can be identified via these non-immediacy signals (i.e., gaze aversion), a meta-analysis by DePaulo et al. (2003) shows inconsistent evidence. While analysis of subjective ratings of eye contact shows that liars make slightly less eye contact than non-liars, an objective measure of this yielded no effect.

2.2.4 Signal of social status

The maintenance of group cohesion in primates is essential in order for a group of individuals to survive. It reduces the risk of attack from predators, particularly for primates living in open terrains (Eisenberg 1983). One important method of maintaining this cohesion in a vertical social structure is to understand one's status in the hierarchy and to monitor the behavior of more dominant members of the group (Chance 1967). By paying more attention to more dominant members, conflicts can be avoided by keeping distance away from the dominant member.

Additionally, high status individuals are more likely to hold resources needed by the individual (Neuberg and Fiske 1987; Ruscher and Fiske 1990). As such, it behooves low-status individuals to pay close attention to high-status individuals.

Supporting this, low-status Patas monkeys engage in more looking behavior towards higher-status conspecifics, but not vice versa (McNelis and Boatright-Horowitz 1998). Subordinate Brown Capuchin monkeys engage in more looking behavior towards all members of the group, whereas dominant members do not (Pannozzo et al. 2007). In a task where male rhesus macaques were able to look towards one target in order to receive a juice reward, or towards a visual target, they were more willing to look towards the visual target when it depicted a high-status male conspecific. They only looked towards low-status conspecifics after they opted for the juice reward (Deaner, Khera, and Platt 2005). In humans, participants engage in more looking behavior towards high-status males than low-status males or females (Maner, DeWall, and Gailliot 2008). High-status individuals in a short video clip were looked at more often and for longer periods of time (Foulsham et al. 2010). On the contrary, dominant individuals will look less at subordinate individuals while listening to them speak (Exline et al. 1975).

Under some conditions, however, dominant group members can use eye contact themselves as a tool to encourage subordinates to behave appropriately. Direct gaze can be used as a cue of dominance (Exline 1971; Ellsworth 1975; Exline, Ellyson, and Long 1975) and serve to increase the potency of a message (Graham and Argyle 1975). Individuals sitting at the head of a table are in a position of social dominance, allowing them to look at all members of a group (Webbink 1986). Students in a classroom will behave more when verbal reprimands are paired with direct gaze (Van Houten et al. 1982). Additionally, individuals (particularly men) who engage in high looking behavior are rated as more dominant (Hillabrant 1974; Thayer 1969) or powerful (Dovidio and Ellyson 1982). Subordinate individuals, on the other hand, will avert eye contact when looked at by dominant members (Ellsworth, Carlsmith, and Henson 1972; Strongman and Champness 1968). This communicates submissiveness and serves to avoid an aggressive encounter with the dominant individual.

2.3 The role of eye gaze in emotion perception

Many characteristics in the eye region are directly implicated in the communication of facial affect, such as eyebrow position, upper and lower eyelid position, and other musculature changes around the eye (Ekman and Friesen 1975). Not surprisingly then, complex emotions have been found to be accurately decoded from just the eye region when presented separately from other regions of the face (Argyle and Cook 1976). Research on emotion, however, has centered on the muscle patterning around the eyes, not the behavior of the eyes themselves. In fact, many

researchers have often equated the two, referring to the behavior surrounding the eyes, as “the eyes.” However, as already articulated in detail, the eyes are capable of their own socially meaningful behaviors. Research on the effects of these behaviors on perceptions of facial affect has, however, until recently, been lacking. As a case in point, influential and well standardized and studied sets of facially expressive photographs include models directing eye contact toward the camera. Remark- ing on a similar observation in their extensive review of the eye gaze literature, Fehr and Exline (1987: 286) concluded by stating, “One can imagine the pictured expressions...with the gaze directed at a number of different angles. What seems to change in this exercise is not the emotion expressed, but rather the target or stimulus of the emotion.”

The fact that the movement of the eyes (i.e., “looking behavior”) has been a highly studied *behavior* of the eyes, it is surprising that this particular aspect of the eyes remained overlooked in the emotion literature for so long. Ekman and Friesen (1969) regarded eye contact as one of the primary regulators of human social interaction, though they later neglected to mention its potential contribution in the expression of emotion (Ekman and Friesen 1975). Ekman and Oster (1982), however, later did also express surprise over the dearth of such research.

Researchers who, early on, did suggest that gaze might exert an influence on emotion processing, tended to agree that direct eye gaze might increase the intensity of *all* emotional facial displays. This was not entirely without empirical support, although such evidence, as will be seen, was relatively indirect and limited in scope. Most often cited in this regard were two studies conducted by Kimble and colleagues (Kimble and Olszewski 1980; Kimble, Forte, and Yoshikawa 1981). There were, however, two major limitations to this research. The first is that these studies were encoding, not decoding studies. In other words, participants were not asked to rate the intensity of emotion displayed on faces exhibiting direct versus averted gaze, but rather were asked to *act out* “strong” versus “weak” intensity emotional displays of anger and joy. The second, and more serious, limitation is that the only dimension of emotional experience considered important was “valence” (positive versus negative) of the enacted display. This perspective assumes that if an effect can be shown for both a positive (joy) *and* a negative (anger) emotional display, then it is likely that such an effect will generalize across all instances of specific emotions.

As already pointed out above, however, there are other meaningful dimensions along which to differentiate emotions, namely approach/avoidance motivational orientation. For example, on the one hand, anger and joy are distinguished by valence; on the other hand, they share an underlying “approach oriented” behavioral motivation. Similarly, anger and fear share a ‘negative’ valence, but are distinguished by behavioral motivation (i.e., *fight/approach* or *flight/avoidance*). Given that direct versus averted eye gaze also signal approach versus avoidance tendencies respectively, conclusions drawn based on investigations of only anger and joy

likely fail to address half of the phenomenon in question. Thus, as anger and joy share a fundamental behavioral motivation (approach), so too do fear and sadness (avoidance). Likewise, as direct and averted eye gaze are differentiated along these same motivational dimensions, it is likely that the congruence (or incongruence) of eye gaze direction and facial expression will impact facial affect perception. This has come to be referred to as the *shared signal hypothesis* (Adams and Kleck 2003, 2005).

Although research related to gaze and emotion had until recently been quite limited, what had been previously done generally supports the shared signal hypothesis. Several studies revealed emotion relevant perceptions based on the amount of direct looking behavior exhibited by a confederate. For instance, Kleck and Nuesse (1968) found that when confederates looked only 15% of the time at an interviewer (also a confederate) they were perceived as cold and defensive, whereas when they looked at an interviewer 80% of the time they were seen as friendly and self-confident. In general, avoidance-oriented emotions or moods such as embarrassment, sorrow, sadness, disgust, fear, and horror have been associated with averted eye gaze, whereas approach-oriented emotions or moods such as elation, surprise, joy, love, delight and interest have been associated with direct eye gaze. The above conclusions stem primarily from studies employing role-playing methodologies or methodologies that code the gaze behavior of individuals who are asked to recount emotional stories, who are subjected to mood induction, or who have mood disorders such as chronic depression. Similarly, individual differences related to affective dispositions such as affiliativeness, aggression, and extroversion have been associated with direct eye gaze, whereas depressiveness, anxiety, and introversion have been associated with averted eye gaze. The latter conclusions stem primarily from studies which gauge impressions made of confederates who exhibit different levels of eye contact or of individuals who are selected based on extreme scores on personality tests (see Argyle and Cook 1976, Fehr and Exline 1987, Grumet 1999, Kleinke 1986, and Rutter 1984 for reviews of the findings listed above).

More recently, direct support of the shared signal hypothesis has been conducted using speeded reaction time tasks and self-reported perception of emotional intensity. Adams and Kleck (2003, 2005) found that direct gaze facilitated processing efficiency, accuracy, and increased the perceived intensity of facially communicated approach-oriented emotions (e.g., anger and joy), whereas averted gaze facilitated processing efficiency, accuracy, and perceived intensity of facially communicated avoidance-oriented emotions (e.g., fear and sadness). Similar effects were replicated by Benton (2010) for anger and fear, by Sander et al. (2007) using dynamic threat displays, and by Hess, Adams, and Kleck (2007) who found that direct relative to averted anger expressions and averted relative to direct fear expressions elicited more negative responsivity in observers. Graham and LaBar (2007) also reported evidence for interactive effects, as well as a main effect of

gaze, and effects that were moderated by the relative salience of eye gaze and emotion cues in the face. Facial emotion has also been found to influence how eye gaze is perceived. Direct eye gaze is recognized faster when paired with angry faces and averted eye gaze is recognized faster when paired with fearful faces (Adams and Franklin 2009). In addition, perceivers tend to judge eye gaze more often as looking at them when presented on happy and angry faces than neutral or fearful, though this effect was particularly pronounced for happy faces (Lobmaier, Tidde-man, and Perrett 2008; see also Martin and Rovira 1982).

Finally, as mentioned earlier (section 2.1.3), gaze impacts visually mediated attention, which begs the question as to whether emotional expression modulates these effects as well. Based on the shared signal hypothesis, we might expect that congruent cues, such as fear coupled with averted gaze, would cause faster and more robust gaze shifting than neutral or anger faces coupled with averted gaze. Early findings were mixed. Hietanen and Leppänen (2003) found that emotion did not affect the cueing effect of eye gaze. Despite this, more recent work reveals significant effects. Mathews et al. (2003) found a faster cueing effect for fear faces than neutral faces for those with high anxiety but not low anxiety (see also Holmes, Richards, and Green 2006; Putman, Hermans, and van Honk 2006). Recently, Fox et al. (2007), reported interactive effects of gaze and emotion consistent with the shared signal hypothesis, such that fear expressions coupled with averted gaze yielded greater reflexive orienting than did neutral or anger expressions, whereas anger expressions coupled with direct gaze yielded greater attention capture than did neutral or fear expressions. These effects were also moderated by trait anxiety. Finally, when eye gaze was shifted after emotion expressions was presented, fearful faces were found to induce higher levels of cueing compared to other emotions for all participants regardless of anxiety level (Putman et al. 2006; Tipples 2006). This last set of findings offers support to the idea that relative differences in the temporal order of eye gaze and emotion detection can influence perceptual integration.

Despite the well established notion of such neural independence for processing distinct facial cues (e.g., Pourtois et al. 2004; see also Bruce and Young 1986; Haxby et al. 2000), growing evidence suggests there nonetheless exist mechanisms for functional interactivity between these cues. For instance, Adams et al. (2003) found evidence for interactivity, replicating the previous pattern for greater amygdala activation to fear than anger when coupled with direct gaze faces, but showing the opposite pattern for averted gaze faces. Other evidence supports greater amygdala activation to congruent threat-gaze pairs. For instance, in one study the amygdala was more active to averted gaze fear faces than to direct fear faces (Hadjikhani et al. 2008). In another study, greater amygdala activity has found for anger expressions looking toward compared to away from the observer (Sato et al. 2004). Where Adams et al.'s (2003) findings seem to implicate a top-down, reflective process involved in deciphering ambiguity, these more recent findings are more con-

sistent with the conclusion of early, reflexive integration of congruent combinations of gaze and emotion. These seemingly opposing findings may be explained by the dual process role of the amygdala in reflexive versus reflective processing of threat cues. Recent work varying the presentation duration of threat-gaze pairs offers direct evidence for this view, such that congruent threat-gaze pairs activated more amygdala response for fast presentations (i.e., 33ms and 300ms) whereas ambiguous threat-gaze pairs activated more amygdala response for sustained presentations (1s and 2s; Adams et al. 2011, 2012).

2.4 The role of eye gaze in theory of mind

According to Simon Baron-Cohen (1994, 1995), the innate capacity to process gaze information plays a critical role in the development of theory of mind. His influential model proposed that four mechanisms evolved via natural selection and constitute what he refers to as the “mindreading” system, which enables individuals to make attributions concerning the mental states and behavioral intents of others based on their nonverbal behavior. The first three of these systems rely heavily on the ability to perceive eye gaze direction. The fourth and ultimate “Theory of Mind Mechanism,” which subsumes the other mechanisms, represents an ability for ‘epistemic’ mental states such as dreaming, deception, pretending, fantasy, and belief, and will not be discussed in detail here. Some prominent developmental and brain researchers related their own work to this model, thereby providing evidence for relevant stages of early childhood development (Muir, Hains, and Symons 1994; Walker-Andrews 1997), as well as neurocognitive underpinnings (Perrett and Emery 1994). The three “eye gaze” mechanisms proposed by Baron-Cohen discussed below include, 1) the Intentionality Detector, 2) the Eye Direction Detector, 3) the Shared Attention Mechanism.

The *Intentionality Detector* is considered a mechanism that allows for motion to be interpreted in terms of volitional mental states driving goals or behavioral intent. Baron-Cohen (1995: 33–34) describes behavioral intent as “primitive mental states in that they are basic ones that are needed in order to be able to make sense of the universal movements of all animals: approach and avoidance.” Thus, it is considered an important mechanism for forming high-level dyadic representations of an agent and its object of attention.

A neurocognitive module consistent with an intentionality detector would need to be preferentially sensitive to biological versus random or object motion. Such cells have in fact been isolated in the STS (superior temporal sulcus) of monkeys in response to viewing whole body locomotion and hands interacting with objects (Bonda et al. 1996; Bruce, Desimone, and Gross 1981; Perrett and Emery 1994). Similarly, cells in areas of the amygdala of monkeys have been found responsive to viewing complex social interactions of conspecifics, such as viewing behavior

that is characteristic of an intent for social “approach” (Brothers and Ring 1992). Amygdala activation has also been associated with high level encoding of facial cues such as when viewing a conspecific’s direct gaze or an open mouth expression (Brothers and Ring 1993). Brothers and Ring (1993) concluded that the amygdala activation found in these examples likely represents the integration of activation patterns passed on from the STS, because such input would be necessary for generating an appropriate behavioral response to complex social interactions.

In humans, seemingly homologous STS activation to that just described in monkeys has been found using positron emission topography for the viewing of both whole body biological motion and goal-directed hand action (Bonda et al. 1996). STS activation has also been found in response to eye and mouth movement (Puce et al. 1998; Watanabe, Kakigi, and Puce 2001), as well as in response to static eye gaze detection (Hoffman and Haxby 2000; Sato et al. 2008). Based on these findings, Hoffman and Haxby (2000) conclude that the STS is likely associated with the processing of “changeable” aspects of face, even static representations thereof, such as those found in the gaze direction, and facial muscle patterning of emotional facial expressions.

The *Eye Direction Detector*, like the Intentionality Detector, is considered an important mechanism for forming dyadic representations of an agent and its object of attention. Information from these two mechanisms are further argued by Baron-Cohen to be integrated, allowing gaze to be interpreted in terms of desire or intent thereby making visual perception more meaningful (e.g., she is *looking* at me/she *likes* me). Before sharing attention and drawing inferences, one must first be able to distinguish between direct and averted gaze. Faronni et al. (2002) offered evidence of this ability in infants as early as one day old, suggesting this ability is innately prepared.

Although research suggests that “staring” eyes are generally perceived as threatening stimuli across a number of species, the eye-spot configuration has also been documented as a means of sexual attraction for some species including peacocks and male guppies (for review see Argyle and Cook 1976). Similarly, in most primates direct eye contact accompanies anger and attack, whereas averted eye gaze generally accompanies fear and flight (Chance 1962; Hinde and Rowell 1962; Redican 1982; van Hooff 1976); yet in many Old World monkeys and apes direct eye gaze has been reported to also serve an affiliative function such as for greeting and grooming (van Hooff 1972).

The notion of an eye direction detector presumes that there are brain cells specialized for the processing of different eye gaze directions. In support of this contention, Perrett and colleagues (1985, 1994) found cells in areas of the STS that are sensitive to particular eye gaze directions (note that these cells neighbor those responsive to biological motion discussed in the last section). In fact, many of these cells have been found to be simultaneously sensitive to head and body orientation, though they are preferentially sensitive to eye gaze (Perrett et al. 1985).

Furthermore, reciprocal projections from the STS to the parietal cortex, implicated in the processing of spatial awareness (Harries and Perrett 1991), suggest that gaze direction perception is obligatorily involved in reflexive orienting in the direction of another's gaze. Likewise, in humans similar STS and parietal activation have been documented during eye gaze detection (Hoffman and Haxby 2000).

Building on the ability to detect eye gaze direction, the *Shared Attention Mechanism* is defined as the compulsion to follow another's line of sight. Shared attention in this sense requires eye direction perception to form a triadic representation of an agent and its object or goal in relation to the "self." This mechanism therefore allows an individual to determine whether an object that he or she is attending to is the same object as that which another is attending to. It also allows an individual to follow the attention of another to some other point in the environment. Such shared, or joint, attention as been demonstrated in monkeys and apes, as well as in human infants and adults (Butterworth and Cochran 1980; Butterworth and Jarrett 1991; Driver et al. 1999; Emery et al. 1997; Friesen and Kingstone 1998; Hood et al. 1998; Langton and Bruce 1999; Povinelli and Eddy 1996; Tomasello et al. 1998).

Gaze following behavior is apparent very early on. While most studies have found this behavior beginning anywhere from three to 18 months (Butterworth and Cochran 1980; Butterworth and Jarrett 1991; Hood et al. 1998), as mentioned earlier Farroni et al. (2004) found gaze following in infants as young as two days old. The authors showed that gaze following only occurs in infants this young when there is a dynamic shift of gaze from direct to averted, and argued that this is likely the rudimentary precursor to more developed adult gaze following behavior.

3 Pupil behavior

The pupil is the opening at the center of the iris that admits light into the eye. The constriction and dilation of the pupillary aperture is produced primarily through autonomic nervous system control exerted on the muscles of the iris, the sphincter pupillae, and the dilator pupillae. More specifically, neuronal impulses from the parasympathetic nervous system activate the sphincter pupillae, causing pupillary constriction, whereas neuronal impulses from the sympathetic nervous system cause the simultaneous activation of the dilator pupillae and active inhibition of the sphincter pupillae to produce pupillary dilation. These movement patterns form the basis of several optical reflexes, including the pupillary light reflex (a change in pupil diameter in response to luminance levels) and pupillary reflex dilations (pupillary responses to psychosensory stimulation). Charles Darwin (1872) pointed out the relation of pupillary responses to autonomic nervous system activity in his book *The Expression of the Emotions in Man and Animals*, noting a possible relationship between pupil dilation and fear.

3.1 When and why our pupils dilate and constrict

Early work conducted by Eckhard Hess and his colleagues popularized the study of the pupillary response in response to social stimuli and as a signal of social responsivity. This line of research dates back to a study conducted by Hess and Polt (1960) in which male and female subjects were presented with various pictorial stimuli – photos of a baby, a mother with a baby, a nude male, a nude female, and a landscape. The researchers measured participants' pupil size upon viewing each picture. Men showed greatest dilation to the picture of the nude female photos, significantly less dilation to the photos of the mother and the baby, with almost no response to the photos of the baby. Women, on the other hand, showed the greatest dilation to the photos of the nude male; while the photos of the baby and of the mother and the baby elicited comparatively less dilation, women still showed significantly greater response to those images than did men. Hess and Petrovich (1987) even showed greater pupil dilation in responses to the visual presentation of two concentric circles (eye-like shapes) as opposed to one or three concentric circles, evidencing the possibility of an innately prepared tendency for responding to, and interest in, eye-like stimuli. Taken together the researchers concluded that pupil size could be used to index level of interest in a visual stimulus.

Hess subsequently extended these findings to include “bi-directional” responses. In one report (Hess 1965), he contended that participants exhibited pupillary constriction in response to viewing negative emotional stimuli (for example, mutilated bodies or crippled children). He concluded, “There is a continuum of pupil responses to stimuli, ranging from extreme dilation for interesting or pleasing stimuli to extreme constriction for material that is unpleasant or distasteful to the viewer” (Hess 1972: 511). This contention was supported in a number of other studies (Hicks and Dockstader 1968; Polt and Hess 1968; Metalis and Hess 1982). However, a number of subsequent studies have attempted to replicate Hess’s “bi-directional” effect to no avail. The preponderance of these studies found pupil dilation for emotionally engaging stimuli, regardless of valence. In a meta-review of this work, Janisse (1974) directly challenged Hess’s “bi-directional” view and argued that there is no pupil constriction to negative stimuli. Instead, he suggested that pupil size is linearly related to the affective intensity of a stimulus, and thus pupil size varies curvilinearly as a function of valence: dilation is largest at the negative and positive ends of the continuum and smallest in the center (which reflects minimal stimulation).

Loewenfeld (1993) conducted extensive work on the effects of various psychosensory stimuli on pupil size fluctuation and similarly argued that emotion, sensory stimulation, spontaneous thoughts, and physical or mental effort all elicit pupillary dilation. She noted, however, that the only stimulus to elicit pupillary constriction is increased light intensities (but see Harrison et al. 2006). In an even

more recent review concerning pupil size and mental activity, Beatty and Lucero-Wagoner (2000) concluded that the amplitude of pupillary dilation is an index of brain activity in response to the cognitive demands of memory, language processing, reasoning, and perception. Peak pupil dilation correlates with the magnitude of processing required by an intellectual task. Further, pupil dilation is commonly listed as a component of the physiological orienting response, an alerting mechanism elicited by unexpected, novel, and significant stimuli (Rohrbaugh 1984). Because pupillary dilation is also a sensitive indicator of processing load or mental effort, it follows that pupillary dilation in response to psychosensory stimulation reflects attention to and analysis of the stimulus. Consequently, the amplitude of the reaction depends upon the degree of arousal that the stimulus causes. There have also been reported gender differences in response to gaze direction. For example, females, but not males, show greater pupillary dilation in response to seeing direct gaze faces versus averted gaze faces (Porter et al. 2006). The authors suggest this response is an autonomic measure of increased processing of direct gaze and thus socially relevant faces.

3.2 The social signal value of pupil dilation/constriction

As noted, pupillary dilation can be a physiological marker of heightened arousal (Hess and Polt 1960). As such, it is possible that we have developed the ability to utilize this information to infer the internal states of others. Surprisingly, very little research has examined pupillary dilation from a perceptual standpoint. The vast majority of the work that has been done has looked at the effects of pupil dilation on attractiveness. Historically, the pupils have played an important role in perceptions of beauty (particularly in women). As far back as the 15th century, Italian women are purported to have put drops of atropine, commonly referred to as *Belladonna* (Italian for “beautiful woman”), in their eyes, dilating their pupils with the belief that it would make them appear more attractive (Heiser 1987). This belief has been supported by empirical science. Hess (1965) was the first to show that, by manipulating the pupil size of female images, males judged the female faces with larger pupils to be more attractive. This was subsequently replicated a number of times (Bull and Shead 1979; Hess 1975; Tomlinson et al. 1978). Additionally, going beyond simple ratings, Stass and Willis (1967) showed that males and females would select opposite sex partners for an experimental task that had their pupils medicinally dilated. The dilation preference effect has been explained in terms of reciprocal liking – we like those who like us (Tombs and Silverman 2004). Large pupils on a female face imply positive affect for the man at whom she is looking; therefore, a male is likely to be attracted to her. The effects have been more mixed for male attractiveness (cf. Tombs and Silverman 2004).

The results of several studies indicate that, more than simply implying interest, large relative to small pupils may reflect reproductive fitness. Illness (Loewenfeld

1993), chronic fatigue (Pressman et al. 1984, 1986), and other maladaptive conditions including neuroticism (Rubin 1970) and depression (Sokolowski et al. 2000) all diminish pupillary dilation reflexes. Additionally, older adults tend to exhibit less pupillary responsiveness to psychosensory stimulation as well as possessing a smaller absolute pupil size. In young people, however, absolute pupil size is larger and the same pupillary reflexes are stronger than in healthy adults (Bernick 1972; Hess and Petrovich 1987).

Up until recently the only study examining pupil size and emotion was Hess (1975), who gave participants two schematic faces – lines drawings containing only the outline of the face, the nose, the mouth, the eyebrows, and eyes – without pupils present. One face was smiling and the other was angry. When asked to “draw in the appropriate sized pupils” for each expression, fifteen out of twenty participants drew larger pupils in the happy face than in the angry face. More recently a line of research by Harrison and colleagues demonstrated that the perceived intensity and valence of sad facial expressions was moderated by pupil size, with constricted pupils leading to greater ratings of each (Harrison et al. 2006; Harrison, Wilson, and Critchley 2007). Furthermore, participants show pupillary mimicry – the size of participant’s pupils was correlated with pupil size on the stimuli (Harrison et al. 2006), and that the degree of this relationship predicted levels of emotional empathy (Harrison et al. 2007). Interestingly, anger, joy, fear, surprise, disgust, and neutral expressions were not impacted by pupil size. It is not entirely clear why only ratings of sadness were moderated by pupil size. The authors cited the importance of the eye region in identifying sadness, as well as its role as a short-distance emotion designed to draw others in to assist. Other emotions (i.e., anger), which are designed to communicate across longer distances, may not be impacted by minuscule changes in pupil size.

Recent neuroimaging work is beginning to elucidate how pupil perception may operate. The amygdala appears to be sensitive to pupil size, even in the absence of subjective awareness (Amemiya and Ohtomo 2012; Demos et al. 2008; Harrison, Gray, and Critchley 2009). Additionally, amygdala activation is found in response to human eyes, but not cat eyes, suggesting that the response is driven by relevance. Given the amygdala’s role in many aspects of emotion processing and in processing the affective-relevance of social stimuli (Sander, Grafman, and Zalla 2003), it seems evident and plausible that the pupil diameter of others is a social cue that we pick up on and use to understand others’ internal states and behavioral intentions.

Although there remains a relative dearth of pupil perception research, particularly in comparison to research on gaze perception, we are confident that these recent neuroscience findings will help spark further examination of how we may utilize others’ pupil sizes to glean important social information from them. Just as eye gaze can tell us what another individual is looking at, pupil diameter could conceivably tell us information about the intensity and magnitude of this looking response.

4 Concluding remarks

As we have outlined in this chapter, the eyes are an essential component of social behavior. They not only serve as our visual gateway to the world, translating our visual sensory experience into social perception, but they also provide us information about this gateway in others. In other words, the very apparatus responsible for enabling so much of our social perception also serves as our most provocative stimulus for social perception (our eyes are attracted to the eyes others).

Where we look is influenced by anything from motivation, the nature of available visual stimuli, and the relationship between perceiver and environment. If we are motivated to be in a good mood, we will look at pictures of cute puppies instead of scary snakes. If we are attempting to determine if someone is mad at us or afraid of us, we will look at the various features of the face to make a determination. If we are at work, we will look toward our bosses before our subordinates. Of course, social and cultural factors weave a moderating thread through all of this, making for a very complex, yet fruitful line of inquiry to examine. Given the complexity, these questions must be examined using a wide range of methods including neuroimaging, eye tracking, well-controlled behavioral studies, as well as studies utilizing naturalistic conditions (i.e., dyadic interactions).

As a social stimulus, the eyes have a wide range of moderating effects on multiple aspects of nonverbal perception. A dominant-looking stranger in an alley late at night looking at us may make us feel more threatened than the same person looking at us in a work context. Coming across someone in the woods with an averted gaze coupled with a fear expression may suggest to us a source of danger, perhaps a bear ready to attack, whereas the same face with a direct gaze may suggest the individual is in distress and requires assistance. Seeing a potential romantic partner with dilated pupils may signal mutual attraction, whereas someone with constricted pupils may tell us they are sad.

As research in social vision continues to advance in leaps and bounds, so too will our understanding of the role that eye gaze and pupil size plays in social sensory perception. Social vision has already begun to examine classic works in eye perception through a neuro-social-functional lens, understanding that as creatures whose visual-perceptual systems have evolved within highly social environments, we have likely evolved a propensity to efficiently detect cues that socially inform us, and therefore enhance our chances of survival. While a “soul” may be difficult to operationally define, the eyes do certainly appear to provide a “window” into it.

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10 Face and body physiognomy: nonverbal cues for trait impressions

Abstract: The association of character traits with face and body physiognomy has a long history that transcends cultures. In the present chapter we attribute these persistent links to the fact that variations in face and body physiognomy associated with age, sex, race, emotion, and fitness actually provide diagnostic nonverbal cues to a range of personal attributes. We discuss research supporting a set of overgeneralization hypotheses spawned by the ecological theory of social perception that builds on the diagnostic aspects of physiognomy. More specifically, this research reveals that psychological attributes that are accurately revealed by the facial or bodily qualities that characterize people of a particular age, sex, emotional state, race, or fitness level are overgeneralized to individuals whose appearance merely resembles those people. Consequently facial or body resemblance to a particular category prototype exerts a strong influence on trait impressions.

Keywords: physiognomy, attractiveness, babyfacedness, body perception, ecological theory, emotion, face perception, familiarity, first impressions, overgeneralization, prototypicality, nonverbal

Despite the exhortations ‘don’t judge a book by its cover’ and ‘beauty is only skin deep,’ a tendency to perceive links between psychological traits and the physiognomy of the face or body transcends culture and time. The Old Testament describes pairings of appearance and character that resonate even today. Issac’s twin sons are portrayed as opposites. Esau, extremely hairy at birth, grows up to be a hunter and a brash man, while his twin brother Jacob, smooth-skinned at birth, grows up soft-spoken and quick-witted. In the fifth century BCE, Confucius is said to have advised “Look into a person’s pupils. He cannot hide himself,” and more modern-day examples are seen in popular face reading stalls on the streets of Hong Kong and elsewhere. In ancient Greece, a treatise on physiognomy attributed to Aristotle described facial signs of traits, such as “men with small foreheads are fickle...large and outstanding ears indicate a tendency to irrelevant talk or chattering” (see Zebrowitz 1997: 2). In the same era, Galen linked four bodily ‘humors’ to appearance and personality traits. For example, an excess of yellow bile was associated with red hair, a wiry, thin body and a ‘choleric’ personality – volatile, vengeful, and ambitious – while an excess of blood was associated with a ruddy complexion, a chubby body, and a ‘sanguine’ personality – happy, generous, and optimistic (Stelmack and Stalikas 1991).

The 1700s witnessed the publication of Johann Kaspar Lavater's epic *Essays on Physiognomy* (Lavater 1783/1879), first printed in German and then translated into Dutch, French, and English, and having such an impact throughout Europe that the 8th edition of the *Encyclopedia Britannica* noted "In many places, where the study of human character from the face was an epidemic, the people went masked through the streets" (see Zebrowitz 1997: 3). By the 1900s, the notion that "gait is not only a means of moving the body purposefully from one place to another, but is also a valuable and reliable source of information about a walking person's character" became a well-accepted tenet by German Expression psychologists (Wallbott 1982: 24). Soon afterwards, the relationship between body type and personality traits emerged as a theme in contemporary American psychology. In his 1954 book, *Atlas of Men*, William Sheldon identified three body somatotypes and linked them to distinct sets of personality traits (Sheldon, Stevens, and Tucker 1940). Reminiscent of bodily humor profiles, thin ectomorphs were characterized as quiet and sensitive, muscular mesomorphs as active and combative, and fat endomorphs as relaxed and sociable. Pre-literate cultures also link physiognomy and traits, as seen in an analysis of traditional masks in which angular features are associated with threat (Aronoff, Barclay, and Stevenson 1988). The widespread fascination with physiognomy persists in modern cultures. Indeed, an Amazon.com search for books on physiognomy yielded 1,061 results, and Google searches for professional human body reading and face reading yielded 2,620,000 and 46,300 results, respectively. (For further reading on the face and on historical aspects, see Chapter 2, Knapp, this volume; Chapter 6, Kappas, Krumhuber, and Küster, this volume.)

How can we explain the persistent links drawn between physiognomy and character traits? To answer these questions, it is instructive to consider that face and body physiognomy do provide highly diagnostic nonverbal cues to a range of personal attributes. In particular, they reveal people's demographic qualities, such as their age, sex, and race, as well as people's more transient states of emotion and physical fitness, all of which provide guides to adaptive social interactions. A set of overgeneralization hypothesis spawned by the ecological theory of social perception (McArthur and Baron 1983) builds on these diagnostic aspects of physiognomy to explain links drawn between appearance and character in the absence of actual demographic or state differences.

The ecological theory of social perception, based on Gibson's (1979) ecological theory of visual perception, has four basic principles: 1) the assumption that 'perceiving is for doing,' which emphasizes the functional nature of social perception; 2) the related insight that perceivers detect opportunities for social interaction ('behavioral affordances'); 3) the focus on identifying the nonverbal stimulus information to which perceivers respond; and, 4) the articulation of factors that influence perceivers' attunements to this information. The *overgeneralization hypotheses* further hold that innate or well developed attunements to social interaction oppor-

tunities specified by facial or bodily cues can yield overgeneralized perceptions. More specifically, the psychological attributes that are accurately revealed by the facial or bodily qualities that characterize people of a particular age, sex, emotional state, identity, or fitness are overgeneralized to people whose appearance merely resembles those people (Zebrowitz 1996; 1997; Zebrowitz and Montepare 2008).¹ In this way, the nonverbal facial or bodily qualities that ordinarily reveal some personal characteristic that is important for adaptive social interaction can affect trait impressions even when the person being judged does not actually have that personal characteristic, but only resembles someone who does. To give one brief example, a person's babyish facial qualities give rise to childlike trait impressions even when the person is not a baby.

Rubrics of 'physiognomy' have referred both to qualities of external appearance and to the habit of finding character revealed in these physical qualities (Shookman 1993). The 'external appearance' qualities that we focus on in this chapter are structural and dynamic cues to the personal attributes of age, sex, emotion, race, and attractiveness that are provided by faces and bodies. We use the term 'prototypicality' to denote the extent to which a person's face or body physiognomy resembles that of individuals with one of these personal attributes, and we review research investigating trait impressions of people as a function of this physical resemblance. This research provides evidence for age, sex, emotion, race, and fitness overgeneralization effects that can explain the widespread tendency to associate face and body physiognomy with psychological traits.

1 Age prototypicality

1.1 Faces

1.1.1 Resemblance to babies' faces

The growth process from birth to maturity is accompanied by systematic changes in facial structure. Anthropometric comparisons of the faces of babies and adults show that the facial structure of babies is characterized by a rounder face with bigger cheeks, a larger forehead with a more vertical slope, a larger cranium, a smaller, less protrusive chin, a small, wide, and concave nose with a sunken bridge, thinner eyebrows, proportionately larger eyes and larger pupil size (Enlow 1990; Todd et al. 1980). Strong evidence that such differences are sufficient to convey age is provided by research that has changed the shape of heads using a mathematical formula (cardioid strain transformation) that simulates changes

¹ Animal overgeneralization, an additional source of trait impressions from faces, will not be discussed because, to our knowledge, there is only one scientific paper on the subject (Zebrowitz et al., 2011), despite being well-represented in the writings of physiognomists (e.g., Sorel 1980).

produced by actual maturation. People are able to identify the 'older' of two faces when the resultant difference in shape is only slightly greater than the smallest difference that can be detected (Mark, Todd, and Shaw 1981; Pittenger, Shaw, and Mark 1979), and reliable relative age judgments can be made of 3-dimensional heads to which the strain transformation has been applied, even when only shape information is provided (Bruce et al. 1989; Mark and Todd 1983).

Facial movement also changes in systematic ways from infancy to adulthood. Moreover, perceivers can extract age information from facial movement independent of facial structure. This has been demonstrated using point-light displays that depict facial movement as a set of small, moving luminous dots against a black background in which facial features are not visible. From these displays, perceivers can accurately identify the relative ages of faces that vary from 5 to 60 years of age although they overestimate the children's ages and underestimate those of older adults (Berry 1990).

People are sensitive not only to age-related differences in facial structure and movement, but also to differences among faces of any age that parallel age differences. For example, people with rounder faces, larger eyes, shorter noses, or smaller chins are judged more 'babyfaced' regardless of their actual age. This recognition of babyfacedness is shown across age and culture. Not only can infants differentiate faces that vary in age, but also they can discern differences in babyfacedness, as shown by the finding that 6-month-olds looked more at a photograph of a babyfaced young adult than a mature-faced young adult of the same age and attractiveness, and young children agree with adults when choosing which of two men looks more babyfaced. People from a variety of cultures and ethnicities, including the culturally isolated Tsimane' people in the Bolivian rainforest, also show agreement when judging the babyfacedness of adults, although agreement is sometimes weaker when judging outgroup faces (Zebrowitz, Wang et al. 2011; for reviews, see Montepare and Zebrowitz 1998; Zebrowitz 1997).

In addition to perceiving some faces as more babyfaced than others, people attribute childlike traits to babyfaced individuals, the *babyface overgeneralization* effect. Specifically, just as babies are perceived to afford greater submissiveness, naivete, warmth, honesty, and physical weakness than adults, so are babyfaced individuals compared with their peers. These effects of babyfacedness generalize across target age, race, and species, influencing trait impressions of faces that range from 6 months to 60 years of age, faces of Black, Asian, White, and Native American ethnicity, and even faces of non-human species such as lions, foxes, and dogs (Montepare and Zebrowitz 1998; Zebrowitz, Wang et al. 2011; Zebrowitz, Wadlinger et al. 2011).

Evidence that impressions of babyfaced individuals derive from their facial resemblance to babies is provided not only by perceivers' subjective ratings, but also by connectionist modeling. In this method, a computer network is trained to differentiate two categories of faces (e.g. babies and adults) based on their facial

metrics. When subsequently tested on metrics from a new set of faces, the network indicates the probability that each face belongs to one of the trained categories. This probability can then be used to predict human judges' impressions of the faces. This method demonstrated that the objective computer network estimation of adults' resemblance to babies predicted ratings of their babyfacedness and associated traits (Zebrowitz et al. 2003). The converse is also true: computer generated neutral expression faces morphed to exaggerate features associated with submissiveness looked more babyfaced, and those morphed to exaggerate features associated with dominance looked more maturefaced (Oosterhof and Todorov 2008).

Like the recognition of babyfacedness, the babyface overgeneralization effect is widely shared, suggesting a universal attunement. Young children attribute less dominance and greater warmth to faces that adults judged to be more babyfaced (Montepare and Zebrowitz-McArthur 1989). People from diverse cultures and ethnicities also attribute less dominance to more babyfaced people, as documented among White and Black U.S. perceivers as well as among Koreans and the Tsimane' people (Zebrowitz, Montepare, and Lee 1993; Zebrowitz, Wang et al. 2011). Just as age-related structural cues influence trait impressions, so do age-related differences in movement, with children's faces shown in point-light displays perceived as less powerful than adult faces, even with perceived age controlled (Berry 1990). It also may be that facial movement cues that characterize infants or young children elicit childlike trait impressions regardless of the person's age, although this has not been studied.

1.1.2 Resemblance to elderly faces

Like maturation, the aging process also produces facial changes, most notably in the thinning and graying of the hair and in the quality of the skin, which becomes progressively more leathery, wrinkled, open-pored, and blemished. Also, age-related changes in connective tissue, bone loss, and the reabsorption of fatty tissue yield a less angular jaw, pouches, sagging skin, and a double chin. In addition to impacting age identification (Aznar-Casanova, Torro-Alves, and Fukusima 2010), these elderly facial qualities may influence impressions of older adults. However, these effects have been largely neglected in research on elderly stereotypes (Nelson 2002). Indeed, although facial cues provide consensual and accurate judgments of an adult's chronological age (Henss 1991), investigators have rarely used facial images to study elderly stereotypes, relying instead on age labels. However, there is some evidence that stereotypes of older adults are linked not simply to knowledge of their chronological age, but also to their physical appearance. For instance, some faces of older adults yield positive stereotypes – 'Grandmother types,' who are accepting, helpful, and cheerful, whereas other faces yield negative stereotypes – 'Senior citizen types,' who are lonely, weak, and worried (Brewer, Dull, and Lui 1981). Although this work did not identify the particular appearance quali-

ties that were associated with different elderly stereotypes, other research has revealed that greater wrinkling and gray hair are associated with more negative impressions of elderly adults (Hummert 1994; Hummert, Garstka, and Shaner 1997), and baldness is associated with perceptions of lower power in older men (Muscarella and Cunningham 1996). Perhaps not only older adults with a more prototypically elderly appearance elicit more negative impressions, but also younger adults who are wrinkled, grey-haired, or balding.

1.2 Bodies

Body size and proportions change in systematic ways with maturation and provide age information to perceivers. Obviously, people grow taller from birth to adulthood, and head size (relative to the body) decreases as limb length increases (Tanner 1970). Across the adult years, people's height and weight undergo further changes as does their body shape (Whitbourne 1985). Around 40 years of age, vertebrae begin to settle together, causing the loss of one to two inches in height as trunks shorten while arms and legs remain the same length. The muscles holding the vertebrae also become less flexible, resulting in more bent postures with age. Changes in body weight appear to follow a curvilinear pattern, at least in American adults (Shock 1985), with weight tending to increase between 30 and 40 years of age and then declining between 50 and 60 years. The overall shape of the body also changes with age as a result of shifts in the location of fat deposits in the body. After 50 years of age, fat is lost in the face, legs, and lower arms while it is gained in the upper arms, abdomen, and buttocks, producing the well known middle-aged spread (Shimokata et al. 1989). The net effect of this redistribution of fat is that older adults tend to look heavier than they did in their earlier years even though their weight is likely to have declined.

Gait also changes systematically with age, with a mature gait pattern established by early childhood (Sutherland et al. 1980). The 'toddling' gait of very young children is differentiated from the adult gait by a wider stance with flexed knees and hips, shorter steps, and extended elbows. As gait matures, the wide stand diminishes, normal arm swing increases along with step length and walking speed (Cowgill et al. 2010). Changes in gait also occur during the later adult years. For instance, compared with younger adults, older adults take shorter steps and their gaits tend to be slower and to show less hip sway, arm swing, and knee bending, as well as more forward lean and stiffness (Hageman 1995; Montepare and Zebrowitz-McArthur 1988).

Perceivers' age judgments are sensitive to age-related bodily changes. Adults are sensitive to changes in body proportions and height from infancy to maturity, and young children also use height to judge age, in some cases disregarding facial cues in favor of height cues. Even infants as young as 7 months can use variations

in height to differentiate among strangers (for review see Montepare and Zebrowitz 2002). People also can use gait information to assess age when judging gait patterns in point-light displays of male and female walkers ranging in age from 5 to 70 years (Montepare and Zebrowitz-McArthur 1988). Although perceivers could discriminate the relative ages of all walkers, the actual ages of the youngest walkers were overestimated, likely reflecting the absence of height cues. A cross-cultural replication found strong consensus in American and Korean adults' perceptions (Montepare and Zebrowitz 1993). Age-related movement cues influence trait impressions as well as age recognition. The impact of dynamic cues can be seen in adults' perceptions of young adult walkers depicted in point light displays as more powerful and sexy than older adult walkers (Montepare and Zebrowitz-McArthur 1988). These perceptions of power are also shown by Koreans judging Korean walkers (Lee 1995), suggesting a universal attunement. (For further reading on culture and nonverbal communication, see Chapter 23, Matsumoto and Hwang, this volume.)

As in the case of age-related facial cues, there is an *age of body overgeneralization* effect, with age-related body structure and gait cues influencing impressions of people who are all the same age. The perception of taller adults as more powerful than shorter children is overgeneralized to people who do not vary in age, with taller men and taller women judged more physically, socially, intellectually, and professionally powerful than their shorter peers (Jackson and Ervin 1992; Montepare 1995; Roberts and Herman 1986). Age overgeneralization in impressions of people who vary in gait is shown by the finding that perceivers judged young adults with gait qualities more similar to those of 70-year-old walkers (e.g., more dragging feet and a slower walking speed) as less powerful than same-age peers with more youthful gait qualities (Montepare and Zebrowitz-McArthur 1988). A study of perceived vulnerability to physical attack also revealed age overgeneralization in response to gait qualities (Gunns, Johnston, and Hudson 2002). Point-light walkers perceived as 'hard-to-attack' walked with a gait style that was similar to the youthful, powerful gait identified by Montepare and Zebrowitz-McArthur (1988). Additional evidence for the trait implications of elderly gaits is provided by the finding that young adults who were primed with elderly stereotypes walked more slowly from the experimental session than those not so primed (Bargh, Chen, and Burrows 1996). Similarly, when older adults were primed with negative elderly stereotypic words, such as senile, dependent, and diseased, they walked more slowly than those primed with positive words, such as wise, astute, and accomplished (Hausdorff, Levy, and Wei 1999).

Overgeneralized impressions based on age-related body cues can result not only from stable individual differences, but also from more transient body modifications. For example, when women walked in their bare feet versus high-heeled shoes, their gaits were judged to be more youthful and as having more youthful qualities (e.g., larger arm swings and looser movements). And, women were perceived to be more dominant and sexy when they were barefooted compared to when they donned heels (Walter et al. 1998).

Finally, age overgeneralizations related to body structure and gait may also contribute to weight and sex stereotypes. Like impressions of short people, impressions of obese individuals may in part reflect an overgeneralization of reactions to chubby babies. Indeed, stereotypes of overweight endomorphs portray them as more childlike (e.g., warm-hearted, dependent, trusting) than thin ectomorphs or average mesomorphs, (Butler et al. 1993). Stereotypic impressions of obese individuals as having childlike traits may also reflect an overgeneralization of reactions to toddling children, since, compared with their normal weight peers, obese adults tend to walk more slowly with wider steps and with more bent knees (Spyropoulos Pisciotta et al. 1991). Similarly, an overgeneralization of reactions to short children may contribute to stereotypic impressions of women as having more childlike traits, because women are typically shorter than men (Montepare 1995).

2 Sex prototypicality

2.1 Faces

There are obvious differences in the facial appearance of adult men and women, and these can play a significant role in the recognition of a person's sex. Although culturally learned cues, such as hair length, may be required for automatic sex categorization (Brebner, Martin, and Macrae 2009), perceivers can accurately recognize sex from facial appearance even with such grooming cues removed, an achievement that is firmly established during the first year (Quinn et al. 2002). Accurate sex recognition is influenced by sex-prototypical facial qualities, including surface texture and shape, color (men tend to be darker than women; Nestor and Tarr 2008), luminance contrast (greater contrast between the eyes or mouth and surrounding skin in female than male faces; Russell 2003), and prominence of chin, nose, and brow, which is greater in men (see Bruce and Young 1998 for a review). Some of the shape cues that differentiate adult women and men parallel those that differentiate babies from adults. This sexual dimorphism derives from the earlier cessation of growth in women, and the absence of the masculinizing effects of male hormones, which yield larger jaws and more protrusive brow ridges in men in addition to larger noses (Enlow 1990). Accurate sex recognition is also achieved solely on the bases of differences in facial movement (Berry 1990; Morrison et al. 2007).

People are sensitive not only to sex differences in facial structure and movement, but also to differences among faces of either sex that parallel the differences between men and women. For example, manipulations to increase the protruberance of the nose, brow, or jaw in facial images increased their perceived masculinity (Bruce et al. 1993). In addition to judging sex and masculinity/femininity from facial cues, people also identify sexual orientation. Studies of 'gaydar' reveal that

people of all sexual orientations identify gay men from facial photos with better than chance accuracy (Rule et al. 2008), and that the use of gender atypical facial qualities contributes to this accuracy (Freeman et al. 2010). Human perceivers are also sensitive to the neotenous aspect of sexual dimorphism, showing a positive relationship between perceived age and facial masculinity (Boothroyd et al. 2005).

Just as age-related facial qualities contribute to variations in reactions to faces of the same age, so do sexually dimorphic facial qualities influence reactions to faces of the same sex, a *sex of face overgeneralization* effect. Well documented sex stereotypes, whereby men are perceived as more 'agentic' or dominant and women are perceived as more 'communal' or warm (Kite et al. 2008), are modulated by facial appearance. Leadership ability, a stereotypically masculine trait, was attributed more to persons with a typically masculine facial appearance than to persons with a typically feminine appearance, regardless of the person's sex (Sczesny, Spree-mann, and Stahlberg 2006). In addition, stereotypical perceptions of women as warmer and less powerful than men were eliminated or reversed when the prototypical sex differences in neoteny were eliminated or reversed by varying eye size and forehead to chin ratio (Friedman and Zebrowitz 1992). Further evidence for interconnections among facial femininity, neoteny, and trait impressions is provided by the finding that computer-generated neutral expression faces morphed to exaggerate features associated with submissiveness not only looked more babyfaced, but also appeared more feminine. Similarly, those morphed to exaggerate features associated with dominance looked more maturefaced as well as more masculine (Oosterhof and Todorov 2008). Although sex and age prototypicality are strongly linked, there are other facets of sex prototypicality, and these influence judgments of attractiveness, as discussed below in the section on facial attractiveness.

Research has not investigated effects of sex-prototypical facial movement cues on trait impressions, but it may be that regardless of a person's sex, facial movements that characterize men or women may elicit corresponding sex-stereotyped trait impressions. Given that women smile more than men do (LaFrance, Hecht, and Levy Paluck 2003) and generally show more facial expressivity (Kring and Gordon 1998), it may be that, people of either sex who show higher expressivity are judged to have more feminine traits.

2.2 Bodies

Men's and women's bodies differ in distinct ways. The average height for each sex within a population is universally different, with men on average being taller than women (Lippa 2009). Sex differences in body structure are also marked. In particular, the waist-to-hip ratio (WHR) is sexually dimorphic, with women typically having more hourglass figures and men having more tubular figures (WHR typically ranges from 0.70 to 0.90 for young women and from 0.80 to 0.95 for young men;

Weeden and Sabini 2005). Furthermore, differences in body shape give rise to sex differences in gait that become most evident following puberty (Montepare and Zebrowitz-McArthur 1988). Sex differences in relative hip and shoulder dimensions yield gaits in women characterized by more hip sway than shoulder swagger compared to the gaits of men (Mather and Murdoch 1994).

Perceivers' ability to identify whether a target is a man or a woman from movement cues has been well established, with high accuracy discriminating men and women walking in point-light displays within 3 seconds – the time required to complete only two walking step cycles (Barclay, Cutting, and Kozlowski 1978). Gender-related body movements influence more fine-grained gender-related discriminations than the dichotomous judgment of male or female. Compared with men and women who had been classified as androgynous or undifferentiated on the Bem Sex-Role Inventory, men classified as male sex-typed were judged more masculine when shown walking in point light displays, and women classified as female sex-typed were judged more feminine (Frable 1987). Body cues also contribute significantly to perceptions of sexual orientation (Ambady, Hallahan, and Conner 1999). Moreover, body movement interacts with body shape in a systematic way to inform both perceived and accurate judgments (Johnson et al. 2007). More specifically, gender-typical combinations of body shape and movement (i.e., tubular body moving with shoulder swagger or hourglass body moving with hip sway) are more likely to be judged heterosexual, and gender-atypical combinations are more likely to be judged homosexual. Interestingly, body shape is more likely to influence the perceived sexual orientation of women than men, whereas, motion has an equal influence for both.

Body cues also provide young children with gender-related information. For example, 5- and 6-year-old children readily used discrepant WHRs to evaluate which figures looked “most like a man” versus “most like a woman” (Johnson, Lurye, and Tassinari 2010). Given the observed potency of motion cues for sex recognition, it would not be surprising to also find that children are able to differentiate men and women from differences in their gaits, especially given the sensitivity to biological motion that takes root during earlier developmental stages (Bertenthal 1993).

Just as sexually dimorphic facial qualities influence impressions of faces that are the same sex, so do sexually dimorphic body structure and movement qualities, a *sex of body overgeneralization effect*. For example, a woman who is described as tall, strong, sturdy, and broad shouldered is perceived to have stereotypically masculine traits, while a man who is described as having body characteristics more typical of women is perceived to have stereotypically feminine traits (Deaux and Lewis 1984). Women whose bodies are judged to be highly feminine are also seen as less likely to engage in stereotypic masculine role behaviors (e.g., doing household repairs, taking out the garbage, moving the lawn) whereas women with more masculine-looking bodies are expected to be more likely to engage in these activi-

ties (Freeman 1987). Similarly, shorter men and taller women are seen as having counter-stereotypical gender traits (Chu and Geary 2005; Jackson and Ervin 1992). Young children's impressions of men and women also respond to sex-prototypical height cues (Montepare 1995). Like adults, children perceive taller individuals to be more physically and socially powerful than their shorter peers. Moreover, when sex prototypical height differences are reversed, with women appearing taller than men, children's stereotypic impressions of women and men are reversed (Montepare 1995). There is also some evidence that gender-related movements yield a sex of body overgeneralization effect. In particular, male and female point-light walkers who displayed a more prototypically masculine gait style were perceived as more powerful than those with more feminine gaits, although this effect was not independent of age-related gait qualities (Montepare and Zebrowitz-McArthur 1988). (For further reading on nonverbal sex differences, see Chapter 21, Hall and Gunnery, this volume.)

3 Emotion prototypicality

3.1 Faces

The facial qualities that objectively differentiate emotion expressions have been extensively investigated, including specific 2-dimensional static facial components (Ekman and Friesen 1971; Izard 1977), specific facial muscle movements (Cohn et al. 2006), and trajectories of facial movements shown in point-light displays (Bassili 1979). At least six basic emotions can be communicated by these variations in facial qualities: happiness, fear, surprise, anger, disgust, and sadness (Ekman et al. 1987; Wagner, MacDonald, and Manstead 1986). Even people from a culturally isolated group in New Guinea are able to recognize posed expressions by Westerners (Ekman and Friesen 1971).

The facial qualities that communicate emotional states also influence trait impressions, an effect that Secord (1958) dubbed *temporal extension*. People displaying transient angry expressions are perceived to have stable traits associated with low warmth and high dominance, those with sad, fearful, or surprised expressions are perceived as moderate in warmth and low in dominance, and those with happy expressions are perceived as high in warmth and dominance (Knutson 1996; Montepare and Dobish 2003). In addition to perceiving people with emotion expressions to have congruent traits, perceivers also show *emotion face overgeneralization*, attributing emotion-related traits to those whose neutral expression resembles an emotion expression (Zebrowitz 1996; Zebrowitz 1997; Zebrowitz, Kikuchi, and Fellous 2010).

Neutral faces that show more resemblance to an angry expression, either as assessed by human raters (Montepare and Dobish 2003) or by objective methods

(Said, Sebe, and Todorov 2009; Zebrowitz, Kikuchi, and Fellous 2010), or as manipulated by lowering eyebrow height (Keating, Mazur, and Segal 1981), are perceived as less likeable and trustworthy and more dominant, hostile, and threatening, with opposite impressions of neutral faces showing greater resemblance to a happy expression. The converse is also true: computer generated neutral expression faces morphed to exaggerate features positively associated with trustworthiness look happy; those morphed to exaggerate features associated with low trustworthiness look angry; and those morphed to exaggerate features associated with submissiveness look fearful (Oosterhof and Todorov 2008). The effects on trait impressions of resemblance to emotion expressions hold true with attractiveness, babyfacedness, and face sex controlled, demonstrating an independent effect of emotion overgeneralization (Montepare and Dobish 2003; Zebrowitz et al. 2010). Although the foregoing research has examined emotion face overgeneralization using static faces, dynamic cues are central to emotion recognition. Thus, it is likely that facial movements that resemble particular emotions also will give rise to the perception of that emotion and associated trait impressions in people who are not experiencing the emotion, but merely have facial movement patterns that resemble it.

Emotion recognition is moderated by face age, sex, and ethnicity, which may have implications for associated trait impressions. Faces of babies resemble surprise and fear more than do faces of adults, and babies resemble anger less, effects demonstrated both by subjective ratings (Marsh, Adams, and Kleck 2005) and by connectionist modeling using facial metrics (Zebrowitz, Kikuchi, and Fellous 2007). These structural variations suggest that fear or surprise will be more readily detected in children and anger more readily detected in adults. Indeed, perceivers recognize fear more accurately and anger less accurately in adult faces that have been manipulated to have a more babyish structure – larger eyes or rounder shape (Sacco and Hugenberg 2009). The effects of age cues on emotion resemblance may produce age-related emotion overgeneralization effects. In particular, age differences in facial resemblance to fear/surprise and anger may augment the impression that young children are less dominant than adults and that babyfaced adults are less dominant than their more maturefaced peers.

Although we know of no research investigating differences in the resemblance to specific emotions of older versus younger adult faces, there is some evidence that emotional expressions in older adult faces are harder to decode (Malatesta et al. 1987; Riediger et al. 2011), and the same may be true for younger adults with more elderly-looking facial structures. In addition, the effect of gravity to elongate the face with increasing age may foster the detection of sadness in older adults, since structurally longer faces look sadder and broader faces look angrier (Neth and Martinez 2009). Such an effect of age on emotion perception may produce an emotion overgeneralization effect that contributes to impressions of older adults as less dominant and more lonely or depressed.

Sex of face also moderates emotion recognition, with fear more quickly and accurately recognized in women than men and the reverse effects for anger (Becker

et al. 2007). Although these effects could derive from cultural assumptions about sex differences in the likelihood of experiencing these emotions, research using computer modeling has demonstrated objective differences in the resemblance of neutral expression female and male faces to these emotions, paralleling the differences between babies and adults (Zebrowitz et al. 2010). Moreover, when the usual sexual dimorphism in facial structure was reversed by pairing male faces with female hairstyles (apparent women) or vice versa, the tendency to perceive greater anger in male faces was also reversed, with the apparent men, who had more feminine features, judged less angry than the apparent women, who had more masculine features (Hess, Adams, and Kleck 2004). In contrast to sex differences in resemblance to fear and anger, computer modeling revealed no difference between male and female faces in their resemblance to happy expressions, suggesting that the greater speed and accuracy of recognizing that emotion in women reflects cultural stereotypes rather than sexual dimorphism in facial structure (Zebrowitz et al. 2010). The fact that faces of women show greater resemblance to fear/surprise than do men, who show greater resemblance to anger, may augment the stereotypic impression that women are less dominant than men.

Like age and sex, race may moderate emotion recognition. White perceivers high in prejudice were faster to recognize the onset of anger and slower to recognize the offset of anger in African-American faces than in White faces, whereas this was not true for those low in prejudice (Hugenberg and Bodenhausen 2003). White perceivers high in racial prejudice also were more likely to categorize angry than happy faces as African-American, whereas this was not true for those low in prejudice (Hugenberg and Bodenhausen 2004). However, it is important to note that these studies captured the overlapping cultural meaning of emotion expressions and racial category, rather than elucidating any overlap between racial and expression morphology, since the racial morphology was ambiguous by design. In contrast to the greater confusion of African-American faces with anger in these studies, connectionist modeling of facial metrics demonstrated that neutral expression White faces objectively resemble angry expressions more than do African-American or Korean faces, and African-American faces objectively resemble happy and surprise expressions more than do White faces. Moreover, these racial differences in emotion resemblance influenced race stereotypes. Specifically, the fact that African-American and Korean faces showed less resemblance to anger than did White faces partially suppressed White judges' stereotypes of African-Americans as more dangerous and less competent than White individuals, and it partially mediated their positive stereotypes of Koreans on these dimensions, with parallel effects of the greater resemblance of African-American faces to happy expressions on impressions of danger (Zebrowitz et al. 2010). (For further reading on racial and ethnic differences in nonverbal communication, see Chapter 22, Dovidio and LaFrance, this volume.)

3.2 Bodies

Just as Charles Darwin believed that people's faces communicate adaptive information about their emotional state, William James (1980) believed that walking alongside a person and observing or mimicking the person's walking pattern would reveal what the person was feeling. Although the empirical attention to bodily expressions has been scant (de Gelder 2009), researchers have begun to identify distinguishing features, demonstrating that both kinematics and configural information in body movement influence emotion recognition (Atkinson et al. 2007; Coulson 2004). Some specific cues include differences in trunk and arm movements, vertical or sagittal direction, force, and velocity in the context of actors displaying emotional movements (de Meijer 1998), and the degree of movement diagonality, angularity, and roundness in the context of emotional ballet poses (Aronoff, Woike, and Hyman 1992).

Consistent with William James' insight, variations in body cues associated with different emotions impact perceptions of emotional state. For example, perceivers can use static posture cues depicted in computer-generated figures to identify emotions (Coulson 2004). Simple dynamic gait patterns when walkers enacted feeling sad, angry, happy, and proud also inform emotion perceptions (Montepare, Goldstein, and Clausen 1987), as can other body movements and postures (Wallbott 1998). Research using point-light and motion capture techniques have confirmed the role of body movement cues in displays of emotion, showing that they are impacted by actual felt emotions (Atkinson et al. 2004; Crane and Gross 2007). In addition, the information value of body cues for communicating emotions can be seen in structured dance routines (Brownlow et al. 1997) as well as unstructured interpersonal interactions (Clarke et al. 2005). Moreover, while gross body movements figure importantly in emotion body displays, even single movements such as knocking on a wall can reliably convey positive and negative emotions (Gross, Crane, and Fredrickson 2010).

There may be a temporal extension effect for body cues to emotion, just as for facial cues, with body emotion displays eliciting associated trait impressions. Although this hypothesis has not been directly tested, there is some suggestive evidence. Specifically, body movements that communicate discrete emotions also differ in their communication of rejection versus acceptance, approach versus withdrawal, and preparation versus defeatedness (de Meijer 1998). In addition to temporal extension from body cues to emotion, there is evidence for emotion overgeneralization in trait impressions of people whose unemotional, neutral style of movement resembles a particular emotion. Specifically, compared with young adults who have youthful gaits, those with older-looking gaits, characterized by shorter strides, smaller arm swings, more dragging feet, stiffer joints, and less knee bending, bounce, or hip sway, are perceived not only as less happy but also as less dominant, a trait associated with the emotional expression of unhappiness

(Montepare and Zebrowitz-McArthur 1988). Thus, it is possible that the attribution of lower dominance to these walkers reflected not only age overgeneralization, as argued earlier, but also emotion overgeneralization. Body posture may yield similar emotion overgeneralization effects. For instance, Hummert (1994) suggested that stereotypic perceptions of elderly adults as lonely and impotent may derive from the perceived sadness associated with stooped postures.

4 Race prototypicality

4.1 A caveat

Any discussion of possible effects of a racially prototypical appearance on trait impressions must begin with the caveat that anthropologists and biologists question the validity of race as a scientific concept (e.g., Lewontin 1972). Indeed in a statement on the biological aspects of race, the American Association of Physical Anthropologists claim that “pure races,” that is, genetically homogeneous populations, do not exist in the human species (AAPA statement 1996; Wagner and Heyward 2000). Although race has a deservedly questionable status as a scientific concept, it is nevertheless, a widely accepted folk concept (Zuckerman 1990). In this section we use the scientifically ‘fuzzy’ yet culturally and socially potent category system of ‘Black’ ‘White’ and ‘Asian’ to denote groups that differ in physical appearance qualities. At the same time, we recognize that the groups that are conventionally labeled ‘Asian’ and ‘Black’ are more physically heterogeneous than those that are labeled ‘White’ (Smedley 1998), which limits the generalizability of the group differences we describe. For this reason, we are as specific as possible about the particular ‘Black’ and ‘Asian’ groups to which the research refers.

4.2 Faces

Faces from different racial groups are commonly assumed to differ in their skin tone and facial features. In recent years, research has assessed not only what group differences there actually are, but also how they contribute to social judgments. As one might expect, African-American faces show darker skin tone than both European and Asian faces in photometric measurements (Jablonski and Chaplin 2000), as well as differences in facial structure, including some that are not commonly recognized. Compared to European and American White faces, African-American faces have, on average, wider noses, thicker lips, smaller jaw widths, shorter chin to pupil height, higher eyebrows, wider and wider-spaced eyes with smaller eye height (distance from the upper to lower eyelid), and longer/thinner faces. Korean and Chinese faces have smaller eye height, greater jaw width, larger

eye separation, larger eyebrow separation, fuller lips, narrower mouths (smaller width), and higher eyebrows. Compared to Korean and Chinese faces, African-American faces have narrower jaws, wider and shorter noses, smaller eye separation, greater horizontal eye width, greater mouth width, and smaller eyebrow separation (Hajnis et al. 1994; Strom et al. 2012). There is also evidence for racial differences in facial movement, particularly between European Whites (Austrian) and Asian (Taiwanese) faces, with Europeans having generally larger facial movements than Asians. This was especially notable in the eyebrow, nose and mouth regions which showed significantly larger excursions in Whites. An important exception was in the eye region, however, where Asians had a larger excursion of the eyelids (Tzou et al. 2005).

The importance of identifying specific race-related facial differences is bolstered by evidence that responses to faces are strongly influenced by their phenotypic qualities regardless of racial category. For example, some faces are judged as more African-looking, more White-looking, or more Asian-looking regardless of their perceived racial category, and perceivers show high agreement in these judgments (Blair et al. 2002; Blair, Judd, and Fallman 2004; Strom et al. 2012). Although research has not always identified the particular facial qualities that produce these consensual racial prototypicality ratings, there is reason to believe that both skin tone and structure play a role.

Skin tone was consistently rated the most important cue when individuals were simply asked to rank the importance of various facial features and skin color in determining a target's race (Brown, Dane, and Durham 1998). Consistent with people's ratings of the importance of skin tone, both Black and White perceivers sub-categorize Black faces according to their skin tone. In an implicit recall measure in which individuals were asked to recall who said what, results for targets who differed in skin tone paralleled the results when they differed in race (Maddox and Gray 2002).

Studies directly comparing the influence of skin tone and facial structure on perceived racial prototypicality provide support for a greater influence of structure. Using the well established lightness contrast illusion, Brooks and Gwinn (2010) collected ratings of skin tone and racial prototypicality of gray scale facial images. As predicted, when the gray scale facial images that had been morphed to a mixed-race appearance were surrounded with Black faces, color ratings of the face were lighter than when they were surrounded with White faces. Nevertheless, the faces' perceived racial prototypicality was not affected, leading the authors to conclude that facial structure is the more influential cue (Brooks and Gwinn 2010). In addition, when shape and color information were varied independently, perceivers made greater use of shape than color in their identification of faces as Asian or White (Hill, Bruce, and Akamatsu 1995).

Race-related appearance qualities influence not only judgments about a person's resemblance to a particular race, regardless of perceived racial category, but

also trait impressions and related social outcomes, a *race of face overgeneralization effect*. Specifically both African-American and European-American White individuals who are judged to have a more prototypically Black facial appearance elicit more stereotyped trait impressions (Blair et al. 2002), more negative associations (Livingston and Brewer 2002), and harsher penalties in the criminal justice system (Blair et al. 2004; Eberhardt et al. 2006) than group members with a less prototypically Black appearance. The finding that White individuals with a more prototypically Black appearance are both judged more negatively and also ascribed the presumed traits of a racial group different from their own, indicates that race-related appearance qualities can influence within-category impressions consistent with race of face overgeneralization.

The foregoing research assessed effects of racial prototypicality without teasing apart the influence of skin tone and facial metrics. As discussed, skin tone often predicts differences in perceived prototypicality and may therefore be an important determinant of the trait inferences and social outcomes associated with race of face overgeneralization. Colorism (Okazawa-Rey, Robinson, and Ward 1987), skin tone bias (Maddox and Gray 2002), and skin color bias (Hall 1998), are just a few of the historically based theories, whereby darker-skinned African-Americans received harsher treatment than their lighter-skinned peers. These theories suggest that darker skin will elicit more negative stereotypes from perceivers, even for traits not normally associated with a particular racial group. Though largely documented in the fields of history and sociology, there is evidence that during slavery, light-skinned African Americans were given less unpleasant positions in the household, and, when slavery was abolished, were more likely to gain higher education and economic resources (Russell, Wilson, and Hall 1992). More recent investigations also evince benefits of lighter skin among African Americans (Hill 2000; Keith and Herring 1991; Klonoff and Landrine 2000), including better occupations and higher salaries, even when controlling for education level and social background (Hill 2000; Keith and Herring 1991). Darker-skinned African-Americans are also more likely to report racial discrimination than lighter-skinned group members (Klonoff and Landrine 2000).

The tendency for darker skin tone to yield more negative social outcomes is paralleled by more negative associations to darker skin. Averhart and Bigler (1997) found that African-American children showed better memory of what story characters did when the stories paired light-skinned Black targets with positive traits and high status occupations and dark-skinned Black targets with negative traits and low status occupations. Black and White judges also report more negative cultural beliefs about darker-skinned compared to lighter-skinned Black targets, with the reverse trend for positive beliefs (Maddox and Gray 2002). This preference for lighter skin also extends to cultures outside the United States. For example, there is evidence for skin tone bias in Japanese and Chinese perceivers (cf. Maddox 2004).

Although the preceding studies display consistent evidence for the importance of skin tone on *race of face overgeneralization effects*, it does not rule out a significant influence of facial structure. Indeed, many studies focusing on the influence of skin tone do not control for race-related variations in facial structure, which may be correlated with skin tone. The images conjured up when participants were instructed to think of darker- vs. lighter-skinned Black targets in the study by Maddox and Gray (2002), for example, likely differed on dimensions other than skin tone, most notably the prototypicality of their facial structure. A neuroimaging study provides evidence for the importance of facial structure. White perceivers showed stronger amygdala activation to African-American Black than European-American White faces, indicating greater emotional salience of the former. However, they showed equally strong activation to lighter- and darker-skinned Black faces, suggesting that a prototypically Black facial structure is emotionally salient regardless of skin tone (Ronquillo et al. 2007). Consistent with this finding, observers' evaluations of an African-American perpetrator in a simulated news report did not differ whether given light, medium, or dark skin (Dixon and Maddox, 2005). On the other hand, darker-skinned White faces elicited stronger amygdala activation than lighter-skinned White faces, indicating that darker skin can also be emotionally salient (Ronquillo et al. 2007). In sum, both skin tone and racially prototypical facial structure influence responses to faces even when those faces do not vary in perceived race. Although effects of movement cues on perceived racial prototypicality and associated trait impressions have not been investigated, the fact that there are racial differences in facial musculature and movement (Tzou et al. 2005) suggests that these too may yield race of face overgeneralization effects. (See also Chapter 22, Dovidio and LaFrance, this volume.)

4.3 Bodies

In contrast to the burgeoning investigations of racial prototypicality in facial structure, studies considering racial differences in body shape, size, or movement are sparse. African-American women are generally heavier than Caucasian women and display a significantly higher Body Mass Index (BMI) than do non-Hispanic White women. On the other hand African-American and White-American men do not differ in weight or BMI (Kumankiya et al. 1991). In addition to weight differences, there are racial differences in body proportions. Compared with European-American White individuals, African-American men and women tend to show greater mesomorphy in their body build (a build that is generally muscular and athletic) and they also tend to have shorter trunks with longer extremities than White-Americans (Malina 1996). It is important to note that socio-cultural forces play a role in some race differences in body qualities, and there is a necessary trend in body-composition research to focus on ethnic as well as racial differences (cf. Wagner and Heyward 2000).

There is also evidence for body differences between Caucasians and Asians, most notably in body fat distribution. Numerous studies demonstrate that even at the same BMI, age, and gender, Asians from various geographic locations have higher body fat percentages than Caucasians, effects that held up in South Asian Indians/Pakistani, East Asian Chinese, Japanese, Korean, Taiwanese, Indonesian, Singaporean, and Philipino samples (Chandalia et al. 2007; Forouhi et al. 1999). Many groups of Asians also tend to carry more weight in the waist and abdomen than Caucasians measured as waist circumference or waist-to-hip ratio, an effect found in Indians, Pakistani, Japanese and Philipinos (cf. Araneta and Barrett-Connor 2005; Wulan, Westterterp, and Plasqui 2010). There are also significant differences in body fat percentages within the Asian group, with Indians having the highest body fat percentage, followed by Malays, and Chinese (Wulan et al. 2010), and suggesting once again that differences in body proportions and body fat between different racial groups are heterogeneous across region/ethnicity. Racial and/or ethnic differences in body movement are also worthy areas of investigation. Perhaps the longer limbs of Blacks than Whites (Malina 1996) produce gait differences that are associated with differing racial prototypicality and trait impressions.

The question remains as to whether there is a *race of body overgeneralization effect*. Are people of any perceived race with bodies that resemble those that are more prototypically White, Black, or Asian judged to have traits stereotypically associated with the race their bodies resemble? For example, do larger women, regardless of race, look more prototypically Black and are they more likely to be perceived as having traits stereotypically associated with Black individuals? A related question is whether racial stereotypes are partially mediated by race-related body differences. For example, is the stereotyped perception of Black people as more dangerous than White people partially mediated by the tendency toward greater muscularity in Black individuals?

5 Attractiveness: Fitness prototypicality?

5.1 Faces

In contrast to the adage ‘beauty is in the eye of the beholder,’ there is a strong consensus in attractiveness judgments across perceivers of various ages and cultures (Berscheid and Walster, 1974; Dion 2002; Langlois et al. 2000) that is influenced by objectively identifiable facial qualities (see Little, Jones, and DeBruine 2011 and Rhodes 2006 for reviews). The qualities that enhance attractiveness include greater facial averageness (i.e., typicality), more uniform skin quality, a more sex-prototypical facial structure, although the latter effect has been more reliably demonstrated for female than male faces, and a more sex prototypical skin tone. Specifically, more prototypically masculine darker skin is positively related

to the attractiveness of mixed race (African and White) men, but negatively related to the attractiveness of mixed race women (Lewis 2011; Nestor and Tarr 2008).² Facial attractiveness is also influenced by dynamic cues. Less expressive faces are seen as less attractive (Riggio and Friedman 1986), and smiling increases attractiveness (Reis et al. 1990).

The *good genes* hypothesis proposed by evolutionary psychologists to explain preferences for more attractive mates argues that facial qualities of more attractive individuals signal greater fitness (Buss 1989). This hypothesis is grounded in the argument that low averageness and small deviations in bilateral symmetry (fluctuating asymmetry or FA) derive from an organism's inability to develop normally under stress, and that masculine facial qualities in men signal a strong immune system that can withstand the immune compromising effects of the high testosterone levels that produce more masculine features (Thornhill and Gangestad 1993). Although evolutionary theorists have not considered dynamic cues, it is noteworthy that low facial expressiveness or negative expressions not only signal negative behavioral tendencies, but also can be markers of physical and psychological disorders, such as Parkinson's disease (Pentland et al. 1987), depression, and schizophrenia (Schneider et al. 1990).

In contrast, to the good genes hypothesis, *anomalous face overgeneralization* holds that appearance provides an accurate index only of low fitness rather than a continuous index of quality, and that the greater attractiveness of certain faces is a perceptual by-product of reactions to low fitness. Consistent with this hypothesis, the attractiveness of normal young adult faces was predicted by the extent to which their facial metrics resembled those of individuals with craniofacial anomalies, as determined by connectionist modeling. Face age also influenced resemblance to anomalous faces, with the facial metrics of older faces more similar to anomalous ones. This is consistent with the lower attractiveness and lower fitness of older adults, and it may reflect an age-related increase in vulnerability to developmental instabilities that can yield facial asymmetries (Zebrowitz et al. 2003).

Variations in facial attractiveness are associated with positive trait impressions, dubbed the 'attractiveness halo effect.' People judged as more attractive are perceived more positively on many trait dimensions, including health, intelligence, dominance, and sociability (Eagly et al. 1991; Langlois et al. 2000). People from diverse cultures, including young children, all show more positive responses to more attractive faces, suggesting that these impressions reflect universal attunements rather than a cultural construction (Langlois et al. 2000; Zebrowitz, Wang et al. 2011). According to the anomalous face overgeneralization hypothesis, these

² There is also evidence for the greater attractiveness of a yellower skin hue in Caucasian faces, which may be linked to a healthier diet (Scott et al. 2010), and for the greater perceived health of a redder skin hue in both Caucasian and African faces, which may be linked to greater blood oxygenation (Stephen, Coetsee, and Perrett, 2011).

effects derive from the adaptive value of recognizing individuals with disease or bad genes who are likely to be unhealthy and often low in social and cognitive competence. These impressions are then overgeneralized to normal, but unattractive, individuals whose faces resemble anomalous ones.

Consistent with the anomalous face overgeneralization account, a review of the literature on the halo effect concludes that it reflects the perception that 'ugly is bad' more than the perception that 'beautiful is good' (Griffin and Langlois 2006). Also consistent with anomalous face overgeneralization, ratings of the health, intelligence, and sociability of normal faces were predicted by the extent to which their facial metrics resembled those of anomalous faces, as determined by connectionist modeling. Moreover, these effects could not be explained by corresponding variations in the actual health and intelligence of the people with normal faces, consistent with an overgeneralization effect (Zebrowitz et al. 2003). However, in a large, representative sample of faces, lower attractiveness was in fact correlated with lower health and IQ scores for faces below the median in attractiveness, but not for faces above the median, indicating that low attractiveness can be a signal of lower fitness than average attractiveness, whereas high attractiveness is not a signal of higher fitness. Despite the non-diagnosticity of high attractiveness, perceivers attributed greater intelligence and health to more attractive faces all along the attractiveness continuum. (Zebrowitz and Rhodes 2004). This overgeneralization effect may also play a role in trait impressions of older adults. As noted above, their faces resemble anomalous ones more than do the faces of young adults. In addition, greater confusion of elderly faces with anomalous ones partially mediated the stereotyped impressions of older adults as less warm and sociable, and less strong and healthy than younger adults (Zebrowitz et al. 2003).

5.2 Bodies

Like facial attractiveness, body attractiveness, including both structural and dynamic cues, contributes to the positivity of trait impressions (Riggio et al. 1991). The specific cues that influence body attractiveness include body symmetry, Body Mass Index (BMI), an index of healthy weight, waist-hip-ratio (WHR), which is sexually dimorphic, and height, also sexually dimorphic.

A positive effect of body symmetry has been demonstrated in studies using computer generated static models (Tovee, Taskera, and Benson 2000) and line drawings (Singh 1995) that show a modest impact on the perceived attractiveness of female figures. However, the extent to which this holds true for male figures and in general populations of men and women is yet to be determined (Weeden and Sabini 2005). An impact of body symmetry on perceptions of attractiveness may also be seen in dynamic presentations. When displays of point-light female walkers were synthetically averaged, the walkers were perceived as slightly more attractive

by both male and female observers, perhaps reflecting the resultant increase symmetry in the displays (Sadr, Troje, and Nakayama 2005).

Body weight (BMI) has a strong impact on perceptions of attractiveness, at least in Western populations (Weeden and Sabini 2005). Both men and women in overweight and emaciated BMI ranges are rated as unattractive, although very high BMIs are considered less attractive in women than men, while the reverse is true for very low BMIs, and the most attractive BMI for women is lower than for men (McCreary and Sadava 2001). The fact that sex moderates the impact of BMI on attractiveness may reflect sex prototypicality, since men generally have higher BMIs than women due to the confounding of BMI measures with the masculine attribute of high muscularity.

Sex prototypicality may also contribute to the effects of WHR on attractiveness. More feminine hourglass figures with lower WHRs (closer to 0.70) are more attractive in women, although this effect is weaker than that of BMI (Weeden and Sabini 2005). More masculine, V-shaped bodies with higher WHRs (closer to 0.90) are more attractive in men, although, as noted above, it difficult to assess the independent impact of WHR and BMI in men because high muscularity can contribute to both (Weeden and Sabini 2005).

Like the sex prototypicality of body shape, movement sex prototypicality also influences attractiveness. Women shown walking in point-light displays were judged more attractive when the displays were morphed to appear more feminine, and this positive effect on attractiveness was much greater than when the displays were simply averaged, which would have increased their symmetry and/or typicality (Sadr, Troje, and Nakayama 2005).

In addition to signaling age, as noted earlier, variations in height are associated with attractiveness. Shorter women were preferred more as dates, dated more frequently, and were rated as more attractive than taller women regardless of the height of men (Sheppard and Strathman 1989). In contrast, being tall is often cited as a socially desirable quality in men. Taller men are perceived as more socially attractive (Jackson and Ervin 1992); women rated men in photographs as more attractive when they were depicted as taller rather than shorter than an adjacent women; and women expressed a "relative height" preference for dating men taller than themselves (Sheppard and Strathman 1989). On the other hand, women did not rate their tall male dates as more attractive, and other work has found that men of average height (5'9" to 5'11") are perceived by women as more socially desirable than either shorter (5'5" to 5'7") or taller (6'2" to 6'4") men (Graziano, Brothen and Berschied 1978).

The effects of symmetry, BMI, WHR, and height on attractiveness have been attributed to evolutionary forces that focus attention on health and reproductive potential. Specifically, average body weights and heights that are not too extreme may signal better health, as may greater body symmetry, for the same reasons as facial averageness and symmetry. In addition, body weights and shapes that are

sex-prototypical may signal greater fertility (for a review of supporting research see Weeden and Sabini 2005). As in the case of facial attractiveness, it may be that cues that make a body less attractive than average are diagnostic of low health and fertility, whereas those that make a body more attractive than average are not indicative of higher health and fertility. If so, then a tendency to prefer super-feminine or super-masculine body shapes may reflect an anomalous body overgeneralization effect.

Trait impressions of particular body types are consistent with the notion that body attractiveness is associated with perceived fitness. For example, unattractive, heavy endomorphs are perceived as unintelligent, lazy, sloppy, and insecure, although also as kind, caring, and jolly (perhaps owing to their resemblance to chubby children). Unattractive, thin ectomorphs are also viewed as having culturally negative traits, such as anxious, quiet, introverted, fearful, and insecure. In contrast, male figures with attractive lean, muscular physiques were attributed positive characteristics, such as courageous, athletic, outgoing, and competent (e.g., Ryckman, Thornton, and Bouchard 1993), and men with the attractive features of normal weight and a masculine WHR were rated positively by women on traits associated with intellectual, social, and physical competence (Singh 1995). Similarly, female figures with the attractive features of thin or normal weight and a feminine WHR were judged by men as more healthy, sexy, and fertile (Singh 1993).

6 Attunements

The preceding sections have described *age, sex, emotion, race, and fitness overgeneralization effects* in trait impressions without regard to variations among perceivers. Yet, a fundamental tenet of the ecological approach to social perception is that the detection of opportunities for social interaction ('behavioral affordances') depends on the perceivers' *attunements* – their sensitivity to the stimulus information that reveals particular social interaction possibilities (McArthur and Baron 1983; Zebrowitz, Bronstad, and Montepare 2011). The concept of attunements captures the fact that what a person perceives in faces or bodies depends not only on what information exists, but also on what information the person is able to detect, which is influenced by perceptual learning, and what information is useful to that perceiver, which is influenced by social goals. Variations in attunements may influence the accurate perception of attributes conveyed by physiognomic qualities. For example, research has documented effects of perceiver attunements on the accurate recognition of age (Anzures et al. 2011); emotion (Elfenbein and Ambady 2003; Pearson and Lewis 2005; Sasson et al. 2010); ethnicity (Andrzejewski, Hall, & Salib, 2009); sex and sexual preference (Rule et al. 2007); and sensitivity to fitness cues (see Little et al. 2011 for a review). However, research has not examined how varia-

tions in attunements to the qualities that faces or bodies accurately reveal moderate face and body overgeneralization effects on trait impressions. This would be a fruitful avenue for future investigations to pursue.

7 Conclusions

Although the ideas of early physiognomists, like Aristotle, Galen, Lavater, and Sheldon, may seem fanciful and dated when stated as explicit principles, they are alive and well in an implicit 'lay physiognomy' that is evidenced by the influence of a person's face and body on trait impressions. This persistent influence requires some explanation, and we have proposed a set of overgeneralization hypotheses to account for it. The adaptive value of detecting and responding appropriately to a person's age, sex, emotional state, race, and fitness produces an overgeneralized tendency to respond similarly to those whose physiognomy merely resembles a particular age, sex, emotional state, racial group, or fitness level. Interestingly, there is considerable redundancy in these overgeneralization effects, with overlapping physiognomic cues to age, sex, and emotion. For example, facial qualities that differentiate babies from adults also differentiate women from men and surprise or fear from anger. These qualities not only contribute to effects of age, sex, or emotion on trait impressions, but also to effects of resemblance to a particular age, sex, or emotion on trait impressions. The fact that our responses to particular physiognomic cues are thus overdetermined may contribute to the persistence of lay physiognomy.

We have not considered whether there is any accuracy in these overgeneralized responses, as early physiognomists would predict. However, Zebrowitz and her associates (e.g., Zebrowitz and Collins 1997) have proposed several developmental pathways through which appearance and behavior may be linked. One is a self-fulfilling prophecy effect, whereby expectations wrought by the overgeneralization effects may be fulfilled. Another, favored by early physiognomists, is a biological mechanism that gives rise to both physiognomic traits and behavioral propensities, as in the case of Down's syndrome. A third is an environmental pathway through which certain life experiences influence both physiognomy and behavior, as in the case of fetal alcohol syndrome. A fourth is a pathway by which behavior influences appearance, as in the case of a prize fighter's 'cauliflower' ears. It is important to recognize that all of these pathways operate in the complex connections between physiognomy and behavior. It is equally important to be aware that implicit adherence to physiognomic thinking risks validating early physiognomists' explicit view that 'anatomy is destiny' through self-fulfilling prophecies.

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11 Proxemic and haptic interaction: the closeness continuum

Abstract: Sharing interpersonal space and touch is central to the human experience. Through proxemic and haptic behavior people communicate intimacy, warmth, immediacy, sexuality, nurturance, affection, inclusion, power, and even hostility. Fundamental to proxemic behavior is personal space, that portable, invisible barrier that surrounds a person, and territoriality, the fixed or semifixed space that people occupy. Proxemics also includes objects or material space, density, crowding, and body orientation, the angle we employ during interpersonal interaction. Haptic behavior includes instrumental behavior, used during care or servicing of other people, nurturant behaviors such as holding and cuddling, warmth or immediacy behaviors such as handshakes, hugs, and pats, and sexual behavior such as fondling, stroking, embracing, and sexual intercourse. Proxemic and haptic behavior is crucial to interpersonal influence attempts and the communication of power and control. Privacy, protection, and freedom from physical or sexual harassment necessitate boundaries that prevent inappropriate haptic or proxemic intrusions. Many aspects of tactile and spatial behavior are universals though considerable cultural and climatic differences also exist. Finally, individual differences, such as touch avoidance, resulting from both innate factors and learned experiences influence the appropriateness, utilization, and consequences of both haptic and proxemic behavior.

Keywords: haptics, influence, interpersonal space, intimacy, power, proxemics, sexuality, tactile behavior, touch, touch avoidance, nonverbal behavior

No aspect of the human experience is more central than interpersonally sharing space and touch. Relationships with infants, family members, lovers, spouses, and friends are conducted at close range with extensive touch. The more involving, affectionate, immediate, and intimate the communication, the more likely that close distances and touch are involved. But tactile and proxemic behaviors do more than communicate affection and intimacy. These behaviors communicate information about our culture, power, sexuality, personality, social influence, inclusion, and privacy.

Instead of viewing proxemics and haptics as discrete communication codes, as is often the case, this chapter treats them as a continuum ranging from distant to tactile. Scholars recognize the union of proxemics and haptics and call them “body codes” (Andersen 2008; Burgoon, Guerrero, and Floyd 2010). Touch is the most intimate human behavior (Morris 1971) and takes place within E. T. Hall’s (1968)

intimate zone of interaction. From the personality perspective, studies show that touch avoidant people sit at greater distances where tactile communication is impossible (Andersen and Sull 1986). Touch is impossible beyond Hall's (1968) personal zone (1 ½ to 4 feet) and usually occurs in the intimate zone (0 to 1 ½ feet) (Andersen and Sull 1975; Sussman and Rosenfeld 1978). From a societal view "contact cultures" (Hall 1959, 1966; Watson 1970) interact at close distances (Andersen 2008, 2011, Hofstede 2001). The inherent union of proxemics and haptics has been noted: "Of course, the closest interpersonal distance is no distance or actual touch" (Andersen 2008: 48).

1 Proxemic communication

Proxemics is the study of communication via interpersonal space and distance as well as a form of nonverbal communication that utilizes space to regulate interaction and send silent relational messages (Hall 1963). Eventually, Hall (1974) reconceptualized proxemics as "the study of man's [people's] transactions as he perceives and uses intimate, personal, social and public space in various settings while following out-of-awareness dictates of cultural paradigms" (2).

Proxemics is comprised of both physical territory, studied under the term territoriality, and personal territory, examined under the rubric of personal space. Physical territories are fixed or semi-fixed areas controlled and defended by an individual or group based on physical possession (Leathers 1978; Vargas 1986). One component of physical territory includes how boundaries are established around a space and the way artifacts are arranged within that space (Amad, Sujud, and Hasan 2007).

1.1 Personal space

Personal space has been conceptualized as a pervasive portable bubble (Sommer 1969), protective sphere (Hall 1966; Hediger 1950; Katz 1937), boundary control mechanism (Evans, Allen, and Lepore 2000), or physical zone surrounding each individual (Hall 1966, 1973). People's personal space bubbles vary in size and shape due to differences in personality characteristics and preferences (Fisher 1967; Weinstein 1965), situational variables (Little 1965), relational variation (Hall 1966; Høgh-Olesen 2008), and cultural background (Hall 1959; Watson and Graves 1966).

Hall (1966, 1974) suggests that humans possess an innate distancing mechanism modified by culture that helps to regulate contact within social situations. People value personal space and typically make their boundaries apparent to others. Personal space acts as a buffer protecting people from unpleasant feelings due

to spatially negative body experiences and aggressiveness (Cavallin and Houston 1980; Duke and Nowicki 1972).

Intrusion into one's personal space generates reactions of discomfort or flight (Evans and Howard 1973; Pederson and Bryne 1975; Sommer 1969). Most interactions occur in people's personal space zone (Little 1963) that strangers may not intrude upon or violate (Hayduk 1978; Sommer 1969). Personal space is also employed as means of communicating about interpersonal feelings and attitudes (Guardo 1969; Pedersen and Shears 1973) and avoiding close distances with particular individuals. Personal space zones suggest interpersonal relationships; four divisions of personal distances include public space (ranging from 12 to 25 feet), social space (4 to 12 feet), personal space (1.5 to 4 feet), and intimate space (distance within 1.5 feet) (Hall 1968).

When personal space is invaded, individuals attempt to maintain comfortable personal space boundaries by changing body orientation, reducing eye contact and other forms of immediacy, retreating, or leave taking (Hayduk 1993; Jason, Reichler, and Rucker 1981; Russo 1976; Sommer 1969). When personal space is violated, people may deploy body buffers such as purses, briefcases, and even body parts such as folded arms to ward off these intruders. In most situations, individuals will behave in ways that seek to reestablish comfortable levels of personal space (Baron and Byrne 1981).

1.2 Territoriality

Mammals, including humans, are territorial creatures with a range, territory, or lair to protect their food supply, offspring, and life against intruders or predators. Scholars maintain that territoriality is partly an innate biological drive rooted in human nature (Ardrey 1966; Lorenz 1963) but it is also a prized value. Territorial rights are so revered that the 4th Amendment to the U.S. Constitution guarantees that "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated..." Territoriality refers to stationary space with designated, marked boundaries (Amad, Sujud, and Hasan 2007; Sommer 1959). Altman (1975) conceptualized three types of territories: (a) primary, where people have executive rights to the space such as one's home; (b) secondary, where people interact with acquaintances in semipublic places such as a neighborhood bar; and (c) public territories, where everyone has temporary access such as the beach.

The advantages territoriality holds depends on the centrality and importance of the space and the duration an individual has occupied that area (Altman 1975). When a territory is of little significance, men and women are likely to leave when an intruder appears (Becker 1973; Becker and Mayo 1971) but passive barriers may be used (Jason, Reichler and Rucker 1981). The benefits of territoriality include

increased economic power or status (Mehrabian 1976), elevated perceptions of control over one's life (Ittelson et al. 1974), enhanced comfort (Roos 1968) and greater privacy (Brower 1965).

1.3 Material space

Material space or artifacts refer to the objects that one possesses including purses, wallets, briefcases, etc. (Goffman 1971). Such items serve as temporary or long-term “markers” that are often used as indications that the areas within and around the marker belong to the owner of that marker (Amad, Sujud, and Hasan 2007; Hickson and Self 2003). Markers limit invasions though invaders may simply move the object elsewhere to “abolish” the territory (Hickson and Self 2003: 269).

1.4 Density and crowding

The density of space, an objective measure of the number of people in a given unit of territory (Stokols 1972), constrains and guides how individuals interact. In socially dense settings, a large number of individuals creates density, whereas in a spatially dense situation, density results from the lack of physical space (Pons, Laroche, and Mourali 2006). Density is a correlate of an individual's perceived control in a particular setting (Proshansky et al. 1974) that can facilitate and obstruct desired behaviors (Hui and Bateson 1991). Perceived control is an essential intervening variable between density and crowding (Schmidt and Keating 1979) since in some situations like rock concerts and sporting events crowding is desirable (Andersen 2008).

While density refers to the physical dimension of spatial parameters, crowding can be seen as subjective, unpleasant feelings individuals may experience that reduce an individual's ability to perform a desired action (Altman, 1975; Hui and Bateson 1991; Rapport 1975). Generally, people view high density as uncomfortable and stressful (Aiello 1987; Sinha and Navyar 2000). Interpersonal or cultural contexts also determine if crowding will be perceived. Albas (1991) explains that closer distances are more appropriate for intimate interactions than for casual conversations. Hall (1966) notes that residents of contact cultures feel comfortable with closer distances than non-contact cultures; in theory, people from contact cultures may not experience much crowding. However, Evans, Allen, and Lepore (2000) explain that people from different cultures vary in their tolerance for conditions that elicit crowding; investigation of the literature reveals very little support for this. Aiello's (1987) review of the literature also concludes that the negative experience of crowding affects all people to some degree.

1.5 Body orientation

The angle of our body to other interactants is called body orientation. A direct or face to face orientation communicates greater warmth and immediacy (Andersen 1985). Similarly, actions such as leaning inward or towards the other individual signal more involvement. Powerful people are perceived to more directly position their body toward others (Carney, Hall, and Smith LeBeau 2005; Hall, Coats, and Smith LeBeau 2005; Mehrabian 1968). Burgoon and Saine (1978) suggest that when communicating in groups, the individual who is faced by the most people typically has the most influence. Jorgenson (1975) found that individuals of equal dyads assumed a more direct angle of orientation than those of discrepant pairs. (For further reading on power and influence in relation to nonverbal behavior, see Chapter 20, Schmid Mast and Cousin, this volume.)

2 Haptics

Throughout life our most intimate human contacts are tactile. From the intimacy of infancy, to the sexual involvement of adolescence, or the affectionate touch of long term relationships, haptics profoundly affects human experience.

2.1 Types of touch

Touch occurs in numerous forms. Heslin (1974) separated touch into five categories based on usage, function, and intensity. These categories are functional-professional, social-polite, friendship-warmth, love-intimacy, and sexually arousing touch. Morris (1971) identified over 450 types of body contact in one study. Hertenstein (2002) noted that touch can vary in its location, frequency, duration, action, intensity, and extent. Because there are numerous ways in which one person can touch another person it is important to note how aspects such as location can influence how touch is understood and evaluated, and what kind of relationship it implies (Floyd 1999).

2.1.1 Functional/instrumental touch

Functional-professional or instrumental touch, the least intense or personal category, occurs in institutional settings (Heslin 1974; Montagu 1978) constrained by rules of professional conduct. Doctors, chiropractors, and massage therapists touch areas rarely touched by non-intimates in everyday life, but in these situations ordinary rules of touch are inapplicable. In fundamentalist cultures this is not the case (Andersen 2011); many Muslim women would refuse an examination from a male

doctor unless their husband is present and permits the examination (Naqib al-Misri and Keller 1994).

2.1.2 Social-polite touch

Social-polite touch occurs in first-meetings, business, and formal occasions often in the form of a handshake (Andersen 2008). This function of touch signals respect and inclusion as well as conveying some degree of equality (Heslin 1974).

2.1.3 Friendship-warmth touch

The friendship-warmth function of touch is both the most important and the most relationally negotiated between partners. Touch in private bodily areas or excessive touch may convey sexual interest, whereas too little touch may suggest aloofness or indifference and may thwart friendship or the potential for relational development.

2.1.4 Love-intimacy touch

The love-intimacy touch is personal and distinctive because only people in relationships such as romantic partners, good friends, and close family members can exchange these touches. Kisses and handholding are examples of intimate and generally mutual touches that convey immediacy, affection, trust, and equality (Burgoon 1991).

2.1.5 Sexually arousing touch

The most passionate, physically intimate, and private form of touch is sexually arousing touch. Mutual consent is desired when this type of touch occurs due to its stimulating, personal, and anxiety-arousing effects. Sexual arousal can occur through many channels including words, sight, and even smell and taste, but the core of sexuality is conveyed through touch at very close interpersonal distances.

Non-sexual touch is restricted to specific body zones such as the shoulders, hands, small of the back, and arms. Men can be touched anywhere above the waist, but thighs, buttocks, and genitals are taboo areas for both sexes (Andersen 2004). In ascending order of sexuality are the ears, neck, mouth, thighs, breasts and genitals for women (Morris 1971). Women react negatively to uninvited opposite-sex genital touch from an acquaintance, whereas men often react positively (Struckman-Johnson and Struckman-Johnson 1993). Men typically initiate more sexual touch than women. In an extensive study of American couples by Blumstein and Schwartz (1983), both men and women reported that men initiated more *sexual* touch, depending on relationship status, than women. As we will see next there does not appear to be a large overall difference in touch initiation between men and women depending on relational stage.

2.2 Touch initiation

Touch initiation is an important issue in the communication of intimacy, power, immediacy, and gender. Despite the stereotype that men initiate opposite-sex touch more than women, numerous studies have shown small or nonexistent sex differences in touch initiation. Researchers have independently found that touch is highly reciprocal; in short, males touch females at about the same rate that females touch males (Guerrero and Andersen, 1994; Hall 1984; Stier and Hall 1984). When observing thousands of dyads in public places, Hall and Veccia (1990) found that at all ages and for all body parts, males and females touched with about the same frequency. Similarly, Guerrero and Andersen (1994) reported that couples' public touch is highly reciprocal. In public settings, if one partner touches the other, the recipient is likely to match the touch regardless of personality or touch-avoidance levels. The highest level of tactile matching occurs in long-term relationships, but the highest frequency of touch occurs in intermediate or escalating relational stages. Men initiate touch more often than women in casual dating relationships and married women initiate touch more than married men (Willis and Briggs 1992). Hall and Veccia (1990) also found that in dyads under age 30 males touched females significantly more, and vice versa in the over 30 group. (For further discussion of sex differences in touch, interpersonal space, and other nonverbal behaviors, see Chapter 21, Hall and Gunnery, this volume.)

3 Functions of touch and space

Humans are inherently affiliative, social creatures who interact at close distances with considerable touch. The affiliative functions of haptic and proxemic communication have been studied under many labels and constructs including affection, immediacy, intimacy, warmth, and involvement (Andersen 2008; Burgoon, Guerrero, and Floyd 2010). Although these concepts are not isomorphic, at their core are feelings of attraction, emotional closeness, liking, trust, and to some degree, love.

3.1 Nurturance

In the early stages of life, human infants live and thrive in a world of tactile interaction and close distances (Frank 1957) that constitute a basic human need (Bowlby 1969). In their absence infants fail to thrive, develop poorly, and even die. Numerous studies show that infants living in orphanages who were deprived of touch were more likely to have learning disabilities, poor development, weight loss, and pathological introversion (Frank 1957; Montagu 1971, 1978; Morris 1971; Shevrin

and Toussieng 1965). Premature babies who were assigned to a touch group gained 21 percent more weight and were discharged from the hospital significantly earlier than babies in the non-touch group (Scafidi et al. 1990). Premature babies in incubators exposed to a form of skin-to-skin contact between mother and child called “kangaroo care” showed benefits to the child and the caregiver both socially and emotionally (Feldman et al. 2003).

Lack of touch is detrimental to an infant’s well-being and harsh touch is shown to be associated with behavioral problems, violence, and mental illness as the child matures (Field 2002). Interestingly, children in America are touched considerably less than children elsewhere in the world and that may correspond with America’s high rate of violence and homicide (Field 2002) though the causal direction of this relationship is uncertain. Homicide rates for adolescents in the United States are the highest of industrial nations, approximately 20% higher than most nations and one of the largest risk factors for youth violence is neglect and abuse (Field 2002). Widom (1989) found that adolescents who were abused or neglected as children were 42% more likely to have a criminal record as an adult. Prescott (1990) reported that cultures exhibiting minimal physical affection toward their young children had significantly higher rates of adult violence, whereas cultures with high amounts of physical affection had virtually no adult violence.

3.2 Inclusion

Proxemics sends powerful messages of inclusion or exclusion. Inclusion occurs when people allow others into personal space or territory and use tactile greetings like handshakes or hugs (Hickson and Self 2003). Novelli, Drury, and Reicher (2010) illustrated that “people choose greater proximity to others when they regard them as members of a common in-group category” (223) or have other positive qualities. Bowlby (1969) explained bodily connection as the most basic and primitive form of inclusion.

Similarly, haptic behaviors often signal inclusion. Inclusion touches used by close friends and sexual partners create psychological closeness (Jones and Yarbrough 1985). These haptic declarations of togetherness such as arm locking or handholding create a sense of “withness,” and are known as tie-signs (Goffman 1971) that actually exclude others. Jones and Yarbrough (1985) found that half of touches are mutually initiated and signal validation and inclusion. While close friends, spouses, and other intimates engage in inclusionary touches, immediate family members rarely engage in this type of touch. A display of “withness” may be unnecessary among family members because they are already a psychologically secure unit (Jones and Yarbrough 1985).

Similarly, greeting touches, which are used by both sexes and in all relationships, occur at the opening of an interaction in conjunction with a verbalized

greeting and usually involve hand to hand or hand to other body part touch (Jones and Yarbrough 1985). Formal handshakes have traditionally occurred between men, while hand to body touches or embraces occur in cross-sex and female to female greetings (Greenbaum 1980; Jones and Yarbrough 1985) but increasingly women shake hands.

3.3 Immediacy

Nonverbal immediacy is a central topic in interpersonal and instructional communication. Immediate behaviors are those actions that simultaneously perform four functions: (a) availability for interaction, (b) positive affect, (c) increased psychological closeness, and (d) positive emotions including warmth (Andersen 1985; Mehrabian 1981). Immediacy is at the core of intimacy exchange and interpersonal warmth (Andersen 1998; Andersen and Guerrero 1998). While nonverbal immediacy is a multichannel construct including more than a dozen nonverbal behaviors, several behaviors central to the concept include eye contact, smiling, touch, and closer distances (Andersen 1985; Andersen and Andersen 2005; Hickson and Self 2003). Other proxemic behaviors including forward leans, direct body orientation, and interaction on the same vertical plane decrease physical and psychological distance and increase immediacy (Andersen 1985; Andersen and Andersen 1982; Hickson and Self 2003).

Immediacy behaviors foster feelings of warmth that are also precursors of close distances in increased touch (Andersen 1998; Andersen and Guerrero 1998). Studies show that individuals are likely to interact at closer distances with those whom they like (Coker and Burgoon 1987; Mehrabian and Friar 1967; Ray and Floyd 2006).

Close interpersonal distances typically result in more attraction, warmth, immediacy, and positive attitudes (Andersen 1985; Mehrabian and Ksionsky 1970). Research indicates that touch is not only capable of conveying warmth, but can also express other positive and negative emotions (Andersen 2011; Hertenstein and Campos 2001; Jones and Yarbrough 1985). Facial expressions and paralinguistic cues convey a range of emotions, but touch has also been shown to be capable of conveying specific emotions (Hertenstein et al. 2006; Hertenstein et al. 2009).

Touch is the most involving immediacy behavior and is instrumental in bonding and the development of close relationships (Field 2002; Jones 1994). Pisano, Wall, and Foster (1986) had people rate 31 descriptions of nonreciprocal touch in romantic relationships. Touch was usually interpreted as communicating warmth or love, though playfulness, sexual desire, and comfort were also common attributions, all of which are signs of increased immediacy. Similarly, Burgoon et al. (1984) had subjects watch videotaped dyadic interactions that either did or did not depict touch. Interactants in the touch group were rated as more intimate and immediate than those who did not touch.

Some immediacy behaviors have been conceptualized as positive affect touches. Jones and Yarbrough (1985) had undergraduates record all of their touch behaviors and subsequently separated them into six categories with the most prevalent being positive affect touch that is subdivided into four subcategories. Supportive touch, such as handholding and pats on the back, generally occurs in close relationships and provides nurturance, reassurance, and protection. Appreciation touches are common in opposite-sex relationships and are used as tactile messages of thanks. Sexual touches are common among sexual intimates and convey physical attraction and sexual interest. Last, the most positive form of positive-affect touch is affection touch. This occurs most often in opposite-sex relationships followed by same-sex female relationships. In short, touch functions to produce high levels of immediacy in interpersonal interaction.

Conversely, people employ decreased touch, increased distance, and less direct body orientation to decrease immediacy and to maintain personal space in public situations. Defensive maneuvers include body buffers and expanded interpersonal distance (Andersen 2008). Likewise, body orientation serves to protect individuals from threat and vulnerability in uncertain situations such as public spaces (Cavallin and Houston 1980). Changing the physical plane can also create distance from others.

3.4 Intimacy

Intimacy is a subjective feeling of relational closeness that has been variously conceptualized as a relationship type, an emotion, a feeling of warmth, a motive, a dimension of love, and a trait (Andersen, Guerrero, and Jones, 2006; Prager 1995). Like Andersen, Guerrero, and Jones (2006), this chapter conceptualizes intimacy as a feeling that occurs interactively. Touch and close distances produce and result in intimacy. The effects of these behaviors are explained by the direct effects model (Andersen 1985, 2008) that suggests a biological basis of the effect of immediacy behaviors on intimacy and influence, and by the social meaning model (Burgoon 1994) that suggests receivers attribute generally positive meanings to close distances and touch. These behaviors trigger virtually automatic feelings of closeness and affection (Floyd 1999). Intimacy, a basic and essential component of interpersonal relationships (Burgoon and Dillman 1995; Burgoon and Hale 1985), is in no small part a function of haptic and proxemic behavior. Of course, intimacy promotes more touch and closer distances as well.

Many theories have sought to explain the processes of haptic and proxemic intimacy exchange that result in positive responses and reciprocity of intimate behavior or negative responses and compensatory behavior (Andersen 1985, 1998; Argyle and Dean 1965; Burgoon and Jones 1978; Cappella and Green 1982). While explication of these models is beyond the scope of this chapter, each of these

theories posits processes whereby nonverbal behaviors such as touch and interpersonal space can foster or thwart interpersonal intimacy. Close distances and touch are at the core of these processes and facilitate behaviors such as telling secrets, whispering, embracing, comforting others, and lovemaking. Of course, intimacy can be avoided through increased distance between individuals. Patterson (1985) maintained that close, but unwelcome interpersonal approaches are met with compensatory behaviors such as gaze aversion, indirect body orientation, and increased distance which communicate resistance to what are inappropriate increases in the level of intimacy of a particular interaction. (For further discussion, see Chapter 17, Patterson, this volume.)

Tactile communication is arguably the most intimate form of nonverbal behavior, so intimate that Montagu (1978) submitted that love cannot be properly conveyed without touch. Jones and Yarbrough (1985) labeled three categories of touch that promote intimate experiences: touches that express attraction, sexual intent, and positive affection and regard. It is more than the type of touch that communicates relational intimacy and satisfaction; it is the quality and amount of touch (Beier and Sternberg 1977; Heslin and Boss 1980). While touch is central to the communication of intimacy, research suggests that it is more important in the development of intimacy than in its maintenance. Studies show that touch increases in early relational stages when people are establishing intimate and romantic relationships but declines in long term relational stages (Emmers and Dindia 1995; Guerrero and Andersen 1991; McDaniel and Andersen 1998).

3.5 Affection

Recent research has demonstrated the interpersonal and physiological benefits of interpersonal affection (Floyd, Pauley, and Hesse 2010; Guerrero and Floyd 2006; Pendell 2002). Affective exchange theory (AFT) that details the ways humans communicate affection and the outcomes of such communication (Floyd 2006) is a neo-Darwinian theory, which maintains the communication of affection is essential to the maintenance of human pair bonds and their role in human fertility and survival (Floyd 2006; Guerrero and Floyd 2006). Affection is a feeling, but communication of affection is essential for development and maintenance of interpersonal relationships (Floyd and Mormann 1998; Hesse and Floyd 2011). Affection has been shown across a number of studies to be essential for satisfaction and stability of close relationships (Gulledge, Gulledge, and Stahmann 2003; Gulledge, Stahmann, and Wilson 2004; Pendell 2002).

Touch is a central part of affection and comforting in close relationships (Dolin and Booth-Butterfield 1993) and a primary means of communicating affection including backrubs, caresses, cuddles, strokes, kisses, pats, and handholding (Gulledge et al. 2003, 2004; Jones and Yarbrough 1985). Handholding, which

involves continuous, mutual physical contact, communicates affection, commitment, and exclusivity by relational partners (Brodie and Villaume 2008). Borderman, Freed, and Kinnucan (1972) had college women participate in a bogus “ESP” experiment in which researchers were actually observing effects of touch. Women in the touch group found their experimental partner to be more attractive, responsive, and likable than those in the no-touch group. Of course, close proximity is essential for affectionate touch to occur. Close interpersonal distances are often thought to be affectionate even without touch. Research shows that people exaggerate the degree of interpersonal closeness with those with whom they are most physically close (Freeman and Webster 1994). Hall (1968) suggested that it is in intimate space, within 18 inches, that close affectionate behavior most likely occurs.

The positive physiological and biochemical effects of affection are well documented (Floyd et al. 2010). Touch, in particular, has considerable physiological benefit. Hugs and kisses from one’s spouse are associated with several positive physiological indicators (Floyd and Riforgiate 2010). Experiments show that when forewarned of appropriate touch, tactile contact significantly lowered subjects’ heart rate (Drescher, Gantt, and Whitehead 1980; Drescher et al. 1982). Reassuring touch by dentists in controlled experiments significantly reduces children’s nervousness and fidgeting (Greenbaum et al. 1992). Studies consistently show that massages are both relaxing and have positive effects on blood pressure, heart rate, anxiety, and depression (Moyer et al. 2004). Abundant research on the extensive benefits of touch for infants has been summarized by Field (2002). In sum, touch is able convey affectionate behavior in the most direct way resulting in numerous benefits to the sender and the recipient of touch.

3.6 Sexuality

While sexual interaction involves the senses of sight, sound, and even smell and taste, touch is the core behavior of sexual interaction. Similarly, although phone sex and cybersex may be increasingly common forms of sexual behavior most sexual behavior takes place in close proximity in the intimate zone of interaction.

Men frequently conflate warm, friendly, nonverbal behaviors including touch and close distances with sexuality, leading to overattribution of sexual intent (Abbey 1987; Abbey and Melby 1987; Shotland and Craig 1988). Four important consequences result: (a) men may attempt to initiate sexual interaction based on misinterpretation of tactile or proxemic cues from women; (b) women may fail to correctly interpret men’s sexual intent; (c) women are more touch avoidant of men than men are of women; and (d) men are more touch avoidant of men than women are of women, which is discussed below.

Men typically find opposite-sex touch as more appropriate than same-sex touch because they tend to associate touch with sexuality (Andersen and Leibowitz

1978; Fromme et al. 1986). Moreover, women tend to equate sexual touch with commitment to a higher degree than men (Johnson and Edwards 1991). As a result, as touch becomes increasingly intimate the probability of miscommunication increases in opposite-sex relationships. For example, in studies by Nguyen, Heslin, and Nguyen (1975, 1976) college-aged males and females were asked what it meant for them to be touched by a person of the opposite sex on eleven body zones. The findings show that the more that women perceive touch as sexual, the less they perceived it as friendly, playful, or warm. The more men perceived a touch as sexual, the more they rated it as pleasant, warm, or playful. Though proxemics and haptics are the *sine qua non* of sexual relations, gender differences may cause disparate attributions and potential for miscommunication.

4 Interpersonal control and influence

One of the most fundamental dimensions of human communication is control, power or influence (Burgoon and Hale 1984; Ruesch and Bateson 1951; Schutz 1966; White 1958). Power and influence often occur nonverbally, particularly via space and to a lesser degree via touch (Andersen 2008). From international relations to interpersonal relations, control of territory is the prerogative of the powerful. Control is a basic drive, defined as the need to demonstrate one's competence, superiority, and mastery over the environment (White 1959). Proshansky, Ittelson, and Rivlin (1974) believe individuals feel and behave more positively when they perceive that there is more control in the environment in which they are interacting, including their interpersonal environment.

4.1 Power

Power is the ability to influence and control others (Andersen 2008). Research on power suggests that high-status individuals are afforded more personal space, provided with larger territories, and can invade other people's space (Argyle 1975; Henley 1977; Remland 1981). Power distance refers to the extent to which less powerful individuals accept inequality of power in their society and consider it normal (Hofstede 2001; Stohl 1993). As power distance increases among interactants, physical distance increases as well (Dean, Willis, and Hewitt 1975). High regard for subordinates may reduce spatial discrepancies through the behavior that each individual communicates (Remland 1981). Superiors touch subordinates more than their subordinates touch them (Remland 1981) though touch is more associated with affection than power (Hall and Veccia 1985). (For further discussion, see Chapter 20, Schmid Mast and Cousin, this volume.)

4.2 Protection and privacy

Privacy management is an important theoretical issue in communication. People regulate their proxemic and haptic acts to maintain privacy boundaries. Communication privacy management theory (Petronio 1991, 2002) maintains that people set up boundaries to control the risks intrinsic to privacy violations. Changnon (1983) explains that privacy is one of our culture's most satisfying achievements, yet people do not think about it until they suddenly do not have that privacy anymore.

Personal space serves as a privacy mechanism (Hall 1966; Sommer 1969) and protects people against unwanted intrusions (Herzeld 2009) though privacy needs vary from one person and culture to another. Spatial violations are generally violations of cultural rules (Goffman 1971) and sometimes legal rules (Hickson and Self 2003). However, privacy is not the same for all bodily areas or relationships. Heslin et al. (1983) found that touch by strangers was a greater invasion of privacy than touch from friends.

4.2.1 Negative violations

Studies on interpersonal space violations have consistently found that invasion of space increases arousal, stress, and discomfort (Banziger and Simmons 1984). Personal space can be used for protection against these unpleasant feelings (Dosey and Meisels 1969). Greater amounts of space can be viewed as a way of fending off aggressive individuals and minimizing feelings of anxiety and increasing security (Knight 1942).

4.2.2 Positive violations

There are specific situations in which invasions are wanted or at least tolerated. When an attractive individual violates one's personal space, people experience favorable feelings and respond positively, but if the intruder is unattractive, negative emotions and avoidance may result (Banziger and Simmons 1984; Burgoon and Jones 1976). Reaction to personal space is influenced by many characteristics: race (Hendrick and Bootzin 1976), eye contact (Argyle and Dean 1965; Buchanan, Goldman, and Juhnke 1977), physical disability (Comer and Piliavin 1972), attractiveness (Dabbs and Stokes 1975), and sex (Buchanan, Goldman, and Juhnke 1977; Buchanan, Juhnke, and Goldman 1976). Men ranked sexual touches from a female stranger as most pleasant, but women ranked non-sexual touches from an opposite-sex friend to be most pleasant (Heslin et al. 1983).

In situations in which individuals have limited control over their personal space, they are more accepting of these violations. Invasions of personal space are tolerated in certain situations such as on crowded subways (Jason, Reichler, and Rucker 1981), but in these circumstances defensive behaviors such as avoiding eye contact and ignoring others in that space are deployed (Fried and DeFazio 1974).

4.3 Persuasion

Traditionally persuasion has emphasized verbal messages such as language intensity, gain/loss frames, evidence, message sidedness, and others. However, nonverbal variables including touch and interpersonal distance have been recognized as important variables in the persuasion process (Segrin 1993). Jones and Yarborough (1985) found that “compliance touches” are commonly reported in interactions.

4.3.1 Tactile persuasion

Abundant research shows touch is a potent persuasive tool in interactions with strangers in many settings. When touched appropriately, people are more willing to sign petitions (Willis and Hamm 1980), fill out questionnaires (Guéguen 2002; Nannberg and Hansen 1994), positively assess service encounters (Fisher, Rytting, and Heslin 1976), return change left in a phone booth (Kleinke 1977), buy a used car (Erceau and Guéguen 2007), watch a large dog while its owner shops (Guéguen and Fischer-Lokou 2002), purchase more goods while shopping (Hornik 1991, 1992; Hornik and Ellis 1988; Smith, Gier, and Willis 1982), comply with requests to score experimental tests (Patterson, Powell, and Lenihan 1986), drink more alcohol in bars (Kaufman and Mahoney 1999), and give away a cigarette (Joule and Guéguen 2007). Waitresses who touch receive larger tips with an enhanced effect for cross-sex touch (Crusco and Wetzel 1984; Ebesu-Hubbard et al. 2003; Hornik 1992; Stephen and Zweigenhaft 1985). Levav and Argo (2010) found that when a woman gave a light, comforting pat on the shoulder, both men and women took greater financial risks. Guéguen and Fischer-Lokou (2003) found that women who touched male bus drivers were allowed to board despite not having enough money for bus fare more often than women who did not touch. This is a culturally robust phenomenon since studies of persuasion from France show similar results (Erceau and Guéguen 2007; Guéguen 2002, 2004; Guéguen and Fischer-Lokou 2002, 2003; Joule and Guéguen 2007; Vaidis and Halimi-Falkowitz 2008). Touch has positive effects on compliance whether or not recipients were consciously aware they were touched (Guéguen 2002; Fisher, Rytting, and Heslin 1976). Studies have consistently shown that when a small verbal request is followed by a large request, compliance is increased, a technique called foot-in-the door strategy (Dillard 1991). This effect is augmented when touch accompanies the request (Goldman, Kiyohara, and Pfannensteil 1985).

Rose (1990) argued that interpersonal touch produces more compliance because recipients of touch view the toucher as likeable and genuine, and they trust them. This suggests the effects of touch are due to cognitive, interpretational factors (Gallace and Spence 2010). Reite (1990) believed that positive reactions to touch are formed because touch relieves stress in early childhood. Andersen's (2008) direct effects model suggests that immediacy behaviors, including touch,

produce increased compliance through increased attention, perceptions of power, the positive effects of warm affect, and greater liking for the source. This research suggests that positive persuasive effects associated with interpersonal touch may be automatic and inherent (Gallace and Spence 2010).

4.3.2 Proxemics and persuasion

Burgoon and Jones' (1976) expectancy violations theory suggests proxemic behavior is governed by cultural norms. Close or far distances, that violate cultural norms makes interpersonal distance and communicator characteristics more salient. Across several experiments rewarding communicators who, as judged by the receiver, possessed desirable traits such as beauty, wealth, or prestige, were more persuasive when violating norms (Burgoon, Guerrero, and Floyd 2010). Unattractive or unrewarding communicators are more persuasive at culturally normative interpersonal distances.

4.4 Harassment through proxemic and haptic behavior

The dark side of communication including violations, transgressions, and harassment is a popular topic in communication (Cupach and Spitzberg 1994). Violations of personal space and territory can constitute both sexual and physical harassment. Sexual harassment has been defined as "the unwanted imposition of sexual requirements in the context of a relationship of unequal power" (MacKinnon 1979: 1). These unwanted sexual acts are often perpetrated through unwarranted invasion of one's space. This type of harassment has also been described as "repetitive, unwelcomed, and inherently coercive acts" (Katz et al. 1996: 35). Women compared to men are the most frequent targets of sexual harassment through unwanted touching and the invasion of personal space (Uggen and Blackstone 2004), though verbal behavior can be harassing as well.

While touch is usually viewed as an immediacy behavior, it can be threatening because it can cause actual physical harm and has sexual implications. Indeed, cognitive valence theory (Andersen 1998, 2008) suggests that when interpersonal distance or touch is perceived as inappropriate, compensation and relational distancing occurs. This is true for cultural, interpersonal, personal, situational, and relational inappropriateness (Andersen 1998). Jones (1994) suggests several forms of touch are inappropriate: unrequested touch between strangers and touch that is hurtful, aggressive, startling, intrusive, frightening, or irritating. Touch that moves another person out of the way is viewed as rude or pushy and if it must be done, individuals should touch the back while verbalizing an apology such as "pardon me." Last, negative verbalizations and negative touch is perceived as unsupportive and aggressive. Lee and Guerrero (2001) reported that being touched by a co-

worker on the face and waist were seen as most harassing and inappropriate while tapping the shoulder was seen as the least harassing. In intimate relationships face touching is received positively suggesting that the affective and emotional valence that interpersonal touch carries is influenced by factors such as context, gender, relational stage, and culture.

Physically abused or battered children need more personal space and have more negative attitudes toward touch (Fromme et al. 1989; Vranic 2003). Research shows that callous touch from mothers is associated with emotional as well as behavioral problems in children (Weiss et al. 2001). Infants who receive nurturing as opposed to harsh touch were less depressed, anxious, aggressive, and destructive (Weiss et al. 2001).

5 Factors associated with touch and space

Proxemic and haptic behavior does not occur in a vacuum. Relational, physical, and psychological factors affect the way these behaviors function and are perceived.

5.1 Relational factors

The use of touch and space is affected by and affects interpersonal relationships. From the first day of life, infants share close space and touch with their mothers and other caregivers. This close space keeps mother and child attached and bolsters their relationship (Bar-Haim et al. 2002; Bowlby 1969). This is a mutually causal relationship; research shows that securely attached infants and children permit touch and enjoy larger permeability of personal space than less secure infants. In romantic relationships space is reduced and touch is increased as intimacy increases (Argyle and Dean 1965; Hall 1966). Once a comfortable level of intimacy has been achieved, pressure to maintain that level of intimacy exists (Emmers and Dindia 1995; Guerrero and Andersen 1991; Patterson 1977). Although the amount of spatial and tactile interaction wanes in long term intimate relationships (Guerrero and Andersen 1991) relational maintenance requires that proxemic and tactile intimacy be displayed across all relationship stages.

5.2 Physical factors

Interpersonal space and touch provide physical satisfaction in close relationships (Floyd 2006). Biochemically, affection is physically beneficial (Floyd, Pauley, and

Hesse 2010). Accordingly, moods, gender, age, health status, and personality are benefitted by interpersonal distance and touch behavior (Altman 1975).

5.3 Psychological factors

When space is limited between people, it can affect them psychologically. Research on crowding shows that increasing population density has pathological effects on individuals' physiological functioning and behavior (Aiello 1987; Calhoun 1962; Christian 1961). As people typically prefer greater distances from strangers, crowding of individuals specifically creates arousal, stress and discomfort.

6 Human universals in haptics and proxemics

Regardless of culture or ethnicity, humans are members of the same species, so substantial similarities exist in human behavior. In all cultures people stand, sit, and sleep near loved ones. Across the world people's tactile and proxemic behavior shows considerable consistency. Research has shown that universal human rituals include hugs, play, massage, sport, fighting, medical interventions, grooming, affectionate kissing, and sexual behavior, all of which involve substantial human tactile contact and close proximity. In most countries mothers or other caregivers spend considerable time feeding, cuddling, changing, and holding infants (Andersen 2011). Breastfeeding is a nearly universal tactile behavior that bonds mother and infant, provides security and delivers nutrients that are difficult to obtain in other ways. In some technologically advanced societies mothers may bottle feed since it is perceived as more efficient or convenient. About two-thirds of women breastfeed, even in highly developed countries like the United States (Healthy People 2010). During much of the history of Europe and the United States, and in less-developed countries today, mothers wear little clothing while nursing, though most American mothers nurse babies fully dressed, reducing mother–infant tactile contact to the area around the nipple (Montagu 1978). Infants receive considerable touch; they are in contact with adults about two-thirds of the time (Muir 2002). Though ethnic, latitudinal, cultural, and class differences affect haptic behavior, universally infants and their adult caregivers engage in substantial touch.

Tactile expression differs across culture, but immediacy and intimacy everywhere are expressed through touch (Andersen 2008, 2011; Andersen, Guerrero, and Jones 2006; Andersen et al., 2002; Prager 1995). Even in the most touch-avoidant cultures, intimacy and affection are expressed tactilely in romances, friendships, and families. Recent research shows a biochemical basis for cross-cultural similarities in touch. Touch releases oxytocin, a chemical that produces feelings of

warmth, closeness, and love (Floyd 2006; Floyd, Mikkleson, and Hesse 2007; Morhenn et al. 2008).

Human sexual activity does display some variability based on relationship status (marital vs. premarital), religious values, cultural customs, though sexual contact among humans typically occurs in private (Andersen 2011). Likewise, incest is a universal human taboo and is relatively uncommon in virtually every culture (Brown 1991).

7 Cultural differences in touch and space

Despite these extensive universal similarities, abundant research shows that proxemic and haptic behavior differs widely among cultures (Andersen 2011; Andersen and Leibowitz 1978; Andersen, Lustig, and Andersen 1987; Field 1999; Hall 1959, 1966; Miller, Commons, and Gutheil 2006; Prosser 1978; Samovar, Porter, and Jain 1981). People's proxemic values and behaviors are deeply embedded, learned at an early age (Evans and Howard 1973), and approximate adult norms by the early teenage years (Jones and Aiello 1971) so they contribute to numerous misunderstandings between people from different places (Hall 1964, 1966). Touch varies across culture in the location, form, amount, and setting in which it takes place (Albert and Ah-Ha 2004; Andersen 2011; Jones 1994; McDaniel and Andersen 1998). Hall (1959, 1966) coined the term *contact cultures* for ones that engage in more touch and closer distances than *noncontact cultures* (Andersen et al., 2002; Andersen 2011; Watson 1970).

Andersen and his associates argue that the immediacy dimension of intercultural behavior systematically explains differences in haptic and proxemic behavior (Andersen 2011; Andersen et al. 2002; Andersen and Wang 2006). Cultures that display large amounts of these immediacy behaviors are known as *contact cultures*. Individuals in these cultures touch more, are more expressive, and stand closer together (Hall 1966). Countries in the Mediterranean region, the Middle East, Arab countries, Eastern Europe, Latin America, and countries near the equator are all immediate or contact cultures (Andersen et al. 2002; Andersen and Wang 2006; Condon and Yousef 1983; Jones 1994, Jones and Remland 1982; Mehrabian, 1971; Patterson 1983; Samovar, Porter, and Jain 1981; Schefflen 1972). Studies suggest that the United States, Great Britain, and Canada (previously identified as noncontact cultures) may be considered contact cultures due to their relatively high levels of touch and close interpersonal distances (McDaniel and Andersen 1998; Remland, Jones, and Brickman 1991). Noncontact cultures include the majority of Northern Europe, Hong Kong, Japan, South Korea, the Philippines, Taiwan, Thailand, and Vietnam, with Asia being the most touch avoidant region of the globe (Andersen, Andersen, and Lustig 1987; Heslin and Alper 1983; Jones 1994; Jones and Remland

1982; McDaniel and Andersen 1995; Mehrabian 1971; Patterson 1983; Samovar, Porter, and Jain 1981; Schefflen 1972; Watson 1970).

Though numerous studies have been conducted on cultural differences in space and touch, little effort has been attempted to unite the two and even less has examined the origins of these cultural differences. The research has been mostly descriptive with few efforts to explain why Brazilians touch more than Koreans or why Italians have smaller personal space zones than Norwegians. The use of space and touch differs widely across the globe, but these differences are not random; instead they lie along latitudinal, longitudinal, and urban/rural dimensions. The largest difference is latitudinal; contact cultures tend to live near the equator and noncontact cultures tend to occupy higher latitudes (Anderson 2011; Andersen, Lustig, and Andersen 1987; Andersen et al. 2002). In the northern hemisphere people touch less and interact at greater distances than southern people. A second dimension is longitudinal; Asian people touch far less than “western people” (McDaniel and Andersen 1998). The third dimension is urban/rural; urban people touch more and maintain closer distances due to restricted space and the inevitable consequences of living in an urban area. (See Chapter 23, Matsumoto and Hwang, this volume, for additional discussion of culture and nonverbal behavior.)

7.1 Changes in latitude: Climatic differences in haptics and proxemics

Research shows that the largest difference in touch and space across the globe is latitudinal. Why is this the case? Four explanations may account for these differences (Andersen 2011). In the northern hemisphere: 1) northerners are more task oriented and less sociable; 2) increased sunlight and neuroendocrine processes make southerners more tactile and sociable; 3) cold weather decreases skin sensitivity, making touch and close distances less important than in warm weather; 4) cold weather decreases social and haptic interaction.

7.1.1 Latitude differences in seriousness and sociability

In the northern hemisphere, people are more task oriented and less sociable than those from the south. Andersen et al. (1990: 307) maintained:

In *Northern* latitudes societies must be more structured, more ordered, more constrained, and more organized if the individuals are to survive harsh weather forces ... In contrast, Southern latitudes may attract or produce a culture characterized by social extravagance and flamboyance that has no strong inclination to constrain or order their world.

Similarly Pennebaker et al. (1996) suggested that in colder climates people spend more time preparing for winter, dressing, and storing food whereas in warmer

climates people have more time for social interaction. The result is that northerners are more serious, organized, prepared, and technological but less warm, affiliative, and gregarious than southern people. Northerners perceive southerners as frivolous, disorganized, and lazy. Southerners' extensive touch and closer distances seem invasive and inappropriate. Conversely, southerners may perceive northerners as aloof, uptight, and overly organized. Likewise, Hofstede (2001) reported that residents' latitude produces a chain of events that begins with more planning and technology to survive cold climates. Indeed, Hofstede's global studies show a 0.68 correlation between latitude and gross national product. Cultures at higher latitudes value planning and labor more than sociability or interpersonal interaction, but the reverse is true at low latitudes. A worldwide mapping also reported a negative 0.83 correlation between latitude and population growth, suggesting that people in warmer climates, with less technology and less clothing, are more inclined to engage in reproductive sexual activity. Likely, other factors also contribute to this relationship such as hormonal differences in sunnier regions, which are discussed next.

7.1.2 Sunlight and neuroendocrine processes

Sunlight's effects on neuroendocrine processes, the hypothalamus, and the pineal gland have been suggested as an additional source of the relationship between sunlight and social or sexual behavior (Andersen, Lustig, and Andersen 1990). Considerable research has shown that abundant sunlight is positively associated with happiness and negatively associated with depression, marital conflict, suicide, and aggression (Benedetti et al. 2001; Low and Fiessner 1998; Thorson and Kasworm 1984). The neuroendocrine system is light sensitive and it regulates melatonin, oxytocin, and other hormones that affect the entire body (Andersen et al. 1990; Sampson 1975). Sexual behavior and desire are deregulated in the presence of sunshine via the pineal gland, a neuroendocrine transducer and through the production of more sex hormones (Axelrod 1975; Myerson and Neustadt 2011; Reiter 1980; Wurtman, Axelrod, and Kelly 1968). Depression, social withdrawal, and reduced human tactile contact are characteristics of seasonal affective disorder, a social and psychological problem in climates with less seasonal light (Lurie et al. 2006; Rosenthal et al. 1986). In short, decreased sunlight at high latitudes increases inhibition and decreases social interaction, including greater interpersonal distances and less touch, the opposite of what is found at low latitudes.

7.1.3 Climatic differences in skin sensitivity

Montesquieu ([1748]1989) reported centuries ago that people in warmer climates are conscious of tactile sensations and are more sensual than northerners who are less sensitive to feelings, less passionate, and less tactile. He suggested that in

warm countries skin is more relaxed and nerve endings are more responsive to sensation. A recent review could locate no studies that showed reduced sensitivity is a habitual reaction to chronic cold (Andersen 2011). Recent research on haptic memory shows that people recall various types of haptic sensations and experiences (Kaas, Stoeckel, and Goebel 2008) that may be habituated by climate over time.

7.1.4 Climate as a facilitator or inhibitor of social and tactile interaction

Warmer, sunnier weather generates increased social interaction; in colder climates at high latitudes outdoor travel to friends may be thwarted and outdoor social activity inhibited. This was an even greater issue for ancestors of cold climate peoples who traveled on foot rather than by train, airplane, or car, severely limiting social interaction.

Paradoxically, greater social interaction, closer distances and more touch may not facilitate closer relationships. People in warmer, sunnier climates are more socially isolated than people in colder, cloudy environments (Andersen, Lustig, and Andersen 1990). Cold weather keeps people inside with loved ones actually facilitating high levels of social intimacy. Conversely, the opportunity to interact with many more people in a warm climate may produce more relationships but not necessarily closer relationships.

7.2 East versus west: The longitudinal dimension of space and touch

A second great dividing line in the use of touch and space lies between the east and west. Asian cultures are the least touch-oriented of any in the world, at least for public touch (Barnland 1978; Jones 1994; McDaniel and Andersen 1998). In a study of public touch during departures at an international airport, McDaniel and Andersen report that the largest difference is between Asians and all other cultures. Among 26 nations observed in the study, residents of all 10 Asian countries showed less touch than residents of any of the other 16 nations. Consistent with the latitudinal effect discussed above, Northeast Asians displayed even less touch than Southeast Asians.

Generally, Asians are social individuals who prefer to do activities with others and are often found in groups (Mateo-Babiano and Ieda 2007), reflecting their collectivist cultural value. Despite Asians' aversion to touch, Hall (1966) considered them a contact culture that prefers closer interpersonal space and distance. More recent research has shown that Asians maintain somewhat closer distances than those from the United Kingdom or the United States (Beaulieu 2004). Whether this is due to their collectivistic tendencies, smaller physical stature, or the high density of Asia is unclear. The tactile restraint among Asians may be an adaptive mecha-

nism to the spatial density of their cultures. Asians or people of Asian descent (Aiello 1987; Aiello and Thompson 1980; Altman and Vinsel 1977; Evans, Lepore, and Allen 2000) can better tolerate closer distances and more crowding, but like people everywhere, do not appreciate excess crowding. Of course people from rural areas in contact cultures may require considerable space and urbanites in noncontact cultures may tolerate less space (Andersen 2008). Aiello (1972) explains that crowding is a cultural phenomenon in which the social behaviors in groups rely on the individual's cultural values toward space.

The difference between Asia and the rest of the world may be attributed to collectivism (Andersen 2011; Hofstede 2001; Nisbett et al. 2001). Asian collectivist cultures are among the oldest and most homogeneous in the world and have developed norms and codes of conduct that prescribe harmony as a major value. By contrast the most individualistic countries, Australia, England, and the United States (Hofstede 2001), are multicultural societies that have accommodated many disparate cultural traditions over the millennia. Across Asia, Confucianism and Buddhism, which emphasize civility, decorum, and group harmony (Joe 1972; McDaniel and Andersen 1998), discourage public touch which may be perceived as uncouth, impolite, and even sexual. Likewise Asians afford each other considerable personal space and tend to move in more organized patterns in crowds than other cultural groups. The exception, of course, is in the dense urban areas of Asia where public touch on trains and sidewalks is inevitable.

8 Individual differences in touch and space

8.1 Touch avoidance

Individuals vary considerably in the degree to which they like or dislike touch. Jourard and Rubin (1968) first studied “touchability,” the inverse of touch avoidance. Considerable research has examined touch avoidance, which indicates people's liking and approach or dislike and avoidance of same-sex or opposite-sex touch (Andersen, Lusting, and Andersen 1987; Andersen and Leibowitz 1978). Although touch avoidance is an attitudinal measure, Sorensen (1979) found that people's self-reports of touch avoidance or touch comfort correlate with actual behavior. Similarly, Guerrero and Andersen (1991) conducted a study in which experimenters discreetly observed and recorded the tactile behaviors of people waiting in lines at the zoo and theatre. Afterward, participants completed a questionnaire about their relationship and touch-avoidance attitudes. Touch avoidance correlated with their actual touch behavior.

Touch avoiders are less open and expressive, lower in self-esteem, but more religious than touch approachers (Andersen 2008). Touch avoiders have more negative perceptions of people who touch them than do touch approachers (Soren-

sen 1979) and stay “out of touch” by utilizing larger personal distances and touching less, leading to less intimacy overall (Andersen et al. 1987; Andersen and Leibowitz 1978; Andersen and Sull 1995; Guerrero and Andersen 1991). Andersen and Sull (1985) interviewed students concerning their television-viewing preferences. Upon arriving at the interview, students were asked to pick up a chair and set it up near the interviewer. Consistent with sex of the interviewer and interviewee, students scoring high on one of the previously administered touch-avoidance measures set up their chairs twice as far away from the interviewer as students scoring low on the measure

As mentioned previously, touch avoidance and touch comfort may actually be an index of a person’s general intimacy or immediacy level. As Andersen and Leibowitz (1978: 90) originally argued, “The failure to utilize touch is indicative of interpersonal avoidance and lack of interpersonal closeness.” Touch comfort is positively correlated with life satisfaction, self-satisfaction, self-confidence, assertiveness, social success and happiness, problem solving, and social acceptance (Fromme et al. 1989).

8.1.1 Same-sex touch avoidance

As indicated above, males are more touch avoidant of same-sex individuals than are females, regardless of age, religion, or marital status (Andersen and Leibowitz 1978; Silverman, Pressman, and Bartell 1973). Derlega and colleagues (1989) report that in friendships males exhibit less tactile intimacy with males than females, and less tactile intimacy than females display with other females. Because men are more likely to link touch with sexuality than women, men find opposite-sex touch to be socially acceptable but not same-sex touch (Fromme et al. 1986). Many men avoid gentle or nurturing touch with men as these actions are not viewed as masculine. Men’s avoidance of men may be due to homophobia or appearing to be homosexual (Andersen and Leibowitz 1978; Derlega et al. 1989; Floyd 2000). When men touch other men it often takes the form of roughhousing or contact sports. Not surprisingly, if parents are comfortable with same-sex touch, their children report more comfort with same-sex touch (Fromme et al. 1986).

Men and women with specific personalities are more likely to be same-sex touch avoiders. Authoritarian and rigid individuals are more likely to be same-sex touch avoiders (Larsen and LaRoux 1984). Similarly, same-sex touch avoiders of both sexes have more negative conceptions of femininity.

8.1.2 Opposite-sex touch avoidance

Men are more comfortable than women with opposite-sex touch regardless of where they are touched or how well they are acquainted (Andersen and Leibowitz 1978; Fromme et al. 1986). Men initiate sexual touches regardless of marital status

(Blumstein and Schwartz 1983). Traditionally, women have been enculturated to believe “forward” tactile acts are unfeminine and excessively aggressive, an explanation for women’s higher opposite sex touch-avoidance than men (Andersen, Andersen, and Lustig 1987).

8.2 Gender/sex

Sex and gender differences in the use of touch and space are numerous. Sex differences are biological and reproductive and have evolved over many millennia whereas gender differences are culturally based on differences in socialization and sex roles of men and women. Sex and gender differences are difficult to disentangle and may reinforce one another. Despite these differences, there are considerable similarities in the tactile and spatial behavior of men and women that should be recognized (see also Chapter 21, Hall and Gunnery, this volume).

Research has failed to find sex differences in tactile sensitivity at birth (Jacklin, Snow, and Maccoby 1981; Yang and Douthitt 1974), but gender differences start early in life; female babies are the recipients of more touch than boys (Field 2002). Indeed, adults believe that touching boys, but not girls, is increasingly inappropriate as infants grow into children (Harrison-Speake and Willis 1995).

Some studies (Blumstein and Schwartz 1983; Major, Schmidlin, and Williams 1990) find that overall, women are the recipients of more touch from both sexes than men, but most studies find little or no difference in the amount of touch men and women initiate or send (Guerrero and Andersen 1994; Hall 1984, 1996; Hall and Veccia 1992; Knapp and Hall 2010; Stier and Hall 1984). In early relational stages men touch women more than the reverse, but in long term relationships, particularly marital relationships, women touch their male partners more than the reverse (Guerrero and Andersen 1994; Willis and Briggs 1992). This gender asymmetry, with men as touch initiators, is more likely to occur between strangers and acquaintances than with close friends or family and is attributed to gender-based status differences (Major, Schmidlin, and Williams 1990). Likewise, males have traditionally used their higher status to appropriate and violate space (Madden 1999). Status organizing theory suggests that males are afforded more space than lower “status” females (Leffler, Gillespie, and Conaty 1982). According to this view, gender rules for proxemics and haptics established male dominance and female submission (Henley 1977).

Henley (1977) also proposed that men use touch to dominate women but the research to support Henley’s position is equivocal at best. First, as indicated above most touch between men and women is reciprocal. Second, considerable research has shown that touch is primarily an affiliative cue that indicates interpersonal closeness, not a cue of power and dominance (Andersen 2008; Hall, Coats, and Smith LeBeau 2005). People seldom report that appropriate touch is associated with negative affect (Jones and Yarborough 1985) even among strangers.

Women occupy less space and are less obtrusive than men (Exline 1963; Exline et al. 1965). Henley (1977) believed that women's femininity is gauged by how little space they take up, while men's masculinity is judged by their expansiveness. The unequal power in interpersonal distance between men and women can be seen in that people will more closely approach females than males (Knapp and Hall 2010; Madden 2008). Early socialization teaches females to stay closer to a defined space while males are encouraged to find their own space (Harper and Sander 1975; Lewis 1972).

9 Conclusion

Sharing space and touch are fundamental components of human experience. In all societies interactions with infants, family members, romantic partners, close friends, and acquaintances occur at close distances with frequent touch. As communication becomes more affectionate, immediate, and intimate, people employ closer distances and more touch. Proxemic and haptic behaviors communicate messages about one's culture, power, sexuality, personal qualities, inclusion and privacy and are central nonverbal communication codes that are indispensable to the development of relational closeness, intimacy, and self-disclosure. Touch occurs in close interpersonal space suggesting that the two elements of nonverbal communication are inherently interrelated and should be studied in tandem. Haptic and proxemic behaviors display many cultural variations but communication scholars should always be mindful of the many universal aspects of these and other nonverbal behaviors.

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IV Focus on the individual

Tamara D. Afifi and Amanda Denes

12 Feedback processes and physiological responding

Abstract: The integration of biology into the study of social relationships has become extremely desirable to researchers, particularly because of the impact that physiological responses can have on individuals' personal and relational health. The purpose of this chapter is to highlight the research on physiology and nonverbal communication. We focus on topics generated by scholars studying nonverbal behaviors and biosocial markers. Brief background information on some of the biological stress response systems (and corresponding ways to measure these stress responses) is discussed, followed by an overview of a few of the common theories used to explain these connections. A review of the research on nonverbal communication and physiological responding, namely the research on facial cues, oculesics, vocalics, kinesics, and haptics, is then provided. Finally, we close the chapter with a discussion of possible future directions.

Keywords: nonverbal communication, hormones, physiology, biosocial markers, biological stress response systems

The integration of biology into the study of social relationships has become extremely desirable to researchers and external funding agencies in recent years – and with good reason. Stress can alter the immune system, which can threaten people's health (Gordis et al. 2006; Kiecolt-Glaser 2009). Research has shown, for instance, that the dysregulation (i.e., abnormally high, low, irregular, or inability to react or recover from stress) of the hypothalamic-pituitary-adrenal axis (HPA) and/or the sympathetic nervous system (SNS) is associated with a host of physical and psychological health problems, including diabetes and coronary heart disease (Matthews et al. 2006), slower wound healing (e.g., Kiecolt-Glaser 2009), depression and anxiety (e.g., El-Sheikh et al. 2011), and externalizing behaviors (e.g., aggression, delinquency) (e.g., Gordis et al. 2006). Biosocial research has become integrated across a wide array of disciplines, including psychology, sociology, biobehavioral health, family studies, and communication, largely because of the impact that the body's physiological stress response systems can have on people's health.

While biosocial research is a prominent and important part of the social sciences, this was not always the case. Until relatively recently, there were significant gaps in knowledge about how biology influences human behavior (Booth, Carver, and Granger 2000). In addition, while researchers have a vast amount of knowledge of some hormones, such as cortisol, knowledge of other hormones

and enzymes (e.g., alpha amylase) and how they affect behavior is continually evolving. Researchers are also trying to better understand how multiple stress response systems (and corresponding biosocial markers like cortisol, testosterone, alpha amylase, and oxytocin) work together to combat stress (see Gordis et al. 2006 for an example). Information about the body's physiological stress response systems has grown exponentially in recent years, as has the complexity of the relationship between physiology and human interaction. Much of the earlier work tended to apply a simplistic, reductionist perspective to the influence of biology on social relationships, with the idea being that biology dictates every aspect of behavior and that this relationship is unidirectional. This deterministic or "covering law" paradigm, combined with the lack of technology to access hormones, made many scholars resistant to biosocial research (Booth, Carver, and Granger 2000).

It was particularly difficult for communication scholars to accept biosocial research because of the belief that the deterministic approach left little room for human choice. The importance of biology was brought to the forefront in the field of communication by Beatty and McCroskey with their "communibiological" approach (Beatty and McCroskey 1997; McCroskey 1997), and was further emphasized by Cappella (e.g., 1991, 1996), and others (e.g., Andersen, Garrison, and Andersen 1979; Horvath 1995; Knapp, Miller, and Fudge 1994). These efforts were initially met with resistance and skepticism about the role of biology in communication. Today, research on biology has become increasingly prominent in the field of communication (e.g., Afifi et al. 2011; Lewis 2009; Priem, McLaren, and Solomon 2010; Priem and Solomon 2009), with Kory Floyd's work on affection (discussed later) being the most evident application to nonverbal communication.

What most researchers have come to recognize is that the relationship between biology and communication is dynamic and nonrecursive. Reductionist models have been replaced by transformative and mutually influential ones. Biology lays the groundwork or foundation for how people communicate when they are faced with stressful stimuli (Gottlieb 1992). As Gottlieb notes, however, these stressful circumstances alter the way people communicate, which, in turn, influences people's hormone emissions. Communication is critical to the body's ability to adapt to stress because if one is able to communicatively manage a stressor, the stress can be addressed at the behavioral and cognitive levels without the need to evoke a physiological response. When people cannot manage stress through their communication and cognitions, their biological stress response systems are activated to help fight against the stress. Thus, communication plays an essential role in the activation of biological stress response systems.

In addition to scholars recognizing the important link between biology and communication, the introduction of noninvasive measures of biological markers has made biosocial research more feasible. The ability to analyze hormones, enzymes, and genes through participants' saliva (rather than blood) in relatively

inexpensive ways significantly advanced biosocial research. The crossing of interdisciplinary boundaries also made physiological research more available to scholars across a wide variety of disciplines (Booth, Carver, and Granger 2000; Hellhammer, Wust, and Kudielka 2009). The knowledge gained through transdisciplinary research teams has provided a more complete picture of the links between biology and human interaction.

The purpose of this chapter is to highlight the research on physiology and nonverbal communication, specifically. We focus on topics generated by scholars studying nonverbal behaviors and biosocial markers. Brief background information on some of the biological stress response systems is first discussed, followed by an overview of a few of the common theories used to explain these connections. A review of the research on nonverbal communication and physiological responding, namely the research on facial cues, oculosics, vocalics, kinesics, and haptics, will then be provided. Finally, we close the chapter with a discussion of possible future directions.

1 Overview of some primary biological stress response systems

The two main components of the physiology of stress involve the hypothalamic-pituitary-adrenocortical (HPA) axis and the sympathetic nervous system (SNS). The SNS is one of three components of the autonomic nervous system (ANS), which maintains the body's organs. The general purpose of the SNS is to mobilize the body's resources to manage a threat – activating a “fight or flight” response – in order to restore the body back to its homeostasis (Cannon 1914). The SNS can send signals throughout multiple parts of the body simultaneously and tends to be triggered by threats that can be controlled or measured (Henry 1992), as well as novel and/or challenging situations (Hellhammer, Wust, and Kudielka 2009).

The HPA is comprised of a series of feedback loops among the hypothalamus, the pituitary glands, and the adrenal glands. All of these components constitute the HPA axis, which is a primary part of the neuroendocrine system. The hypothalamus triggers the corticotrophin releasing hormone (CRH) when it is stressed. This, in turn, prompts the release of the adrenocorticotrophic hormone (ACTH) from the pituitary, which activates the release of cortisol (and other hormones) from the adrenal glands (Lundberg and Frankenhaeuser 1980). While the SNS has been called a “defense reaction,” that is, an active response to a controllable situation, the HPA has been called a “defeat action,” or a passive response to a perceived lack of control over a situation, and which corresponds to withdrawal, inaction, and emotional distress (Lundberg and Frankenhaeuser 1980). The activation of the HPA system and the subsequent release of cortisol is a normal, healthy and adap-

tive response to the demands of one's environment (Lundberg and Frankenhaeuser 1980).

While the activation of the HPA system is natural and necessary, when it does not respond in a way that is adaptive (e.g., it is over active, under active, or dysregulated in some way), it can result in negative health and behavioral problems (Gordis et al. 2006; Pendry and Adam 2007). Physiologically, the body has an optimal operating level and its ability to return to homeostasis after it becomes stressed is called "allostasis" (McEwen 1998). When people endure chronic activation of their biological stress response systems, through constant exposure to stressful situations such as poverty, discrimination, joblessness, chronic conflict, it can create a burden on that stress response system or "allostatic load," resulting in the body's inability to effectively adapt to the stress. People who experience allostatic load are at risk for a variety of diseases and other negative physical and psychological effects (Granger et al. 1998).

Nonverbal research also tends to focus on the cardiovascular system. Two common indicators of the cardiovascular system in the social sciences are heart rate and blood pressure (see Floyd and Afifi 2011, for a more detailed review). The heart rate or pulse rate measures the number of beats the heart makes within a specific time period (e.g., in a minute). This is often measured with the electrocardiograph (ECG), which interprets the electrical activity of the heart across a period of time by placing electrodes across the chest (Wagner 2001). Blood pressure is another important vital sign and is the pressure of blood exerted on the walls of blood vessels. *Systolic blood pressure* is the maximum force when the heart is contracting and *diastolic blood pressure* is the minimum force when the heart is resting (see Floyd and Afifi 2011).

The other primary biological system of interest is the central nervous system, which consists of the brain, spinal cord, and retina (Floyd and Afifi 2011). The central nervous system influences all bodily functions. The spinal cord receives information from the brain to coordinate motor activity, relays information from the sensory organs to the brain, and coordinates reflexes (Maton et al. 1993). Indicators of central nervous system activity in nonverbal communication research often include skin temperature, galvanic skin response, and pupil dialation (Floyd and Afifi 2011). While all of them measure arousal, galvanic skin response or skin conductance is probably the most commonly used indicator of arousal, particularly with research on facial cues. Even though galvanic skin response is thought to measure arousal, arousal can come from a host of different emotions (e.g., excitement, anger, anxiety), making it a somewhat crude physiological measure. Brain activity is also measured with the electroencephalogram (EEG), which assesses electrical activity in different regions of the brain by attaching electrodes to the scalp (Abou-Khalil and Musilus 2006). Finally, probably the most sophisticated assessment of brain activity is the functional magnetic resonance imaging (fMRI), which is a type of MRI scan that measures changes in blood flow related to neurological activity in the brain (Matthews and Jezzard 2004).

Because much of the current research on nonverbal communication focuses on the endocrine system, a basic review of some of the primary hormones that are assessed is necessary. Below is a very brief description of some of the most common hormones and enzymes that one might encounter in the literature.

1.1 Testosterone

Testosterone is an androgen released by the endocrine system that has been associated with a host of interpersonal behaviors, such as aggression, dominance, risk taking, and confidence (Cohan, Booth, and Granger 2003). Men tend to have much higher testosterone levels than women, which is often used to explain men's higher levels of dominance, risk taking, and desire to maintain social status compared to women (Booth, Carver, and Granger 2000). When testosterone is examined in women, similar patterns have been found, with women who are higher in testosterone being more dominant, outgoing, and less maternal than women with less testosterone (Cohan, Booth, and Granger 2003).

1.2 Cortisol

Cortisol is a hormone released by the HPA system and is indicative of stress and anxiety. It regulates immune functioning, metabolism, the body's fight or flight response, and sensory experiences (Booth, Carver, and Granger 2000). Cortisol follows a diurnal rhythm where it reaches its highest peak approximately 30 minutes upon waking and declines throughout the day, reaching its lowest point in the middle of the night (Kirschbaum and Hellhammer 1989). This pattern or rhythm allows the body to regenerate itself and combat stress. In acute stress tasks, salivary cortisol tends to peak approximately 10 minutes post-stress task and recover 30–40 minutes post-stress task (Gordis et al. 2006). These changes are also the body's natural way to adapt to a stressor and bring it back to homeostasis (Miller, Chen, and Zhou 2007). Dysregulated (e.g., sporadic, inability to recover from a stress task, over reacting or under reacting to a task) cortisol response patterns tend to be signs that the body is having difficulty regulating to the stress. The ways of measuring changes in cortisol, as with other hormones, can vary widely. Some researchers are interested in the diurnal rhythm of cortisol, while others examine the cortisol awakening response (CAR or how much the cortisol increases from the time of waking to 30–40 minutes post waking), others focus on acute stress tests that induce cortisol responses to analyze the response and recovery patterns, while still others focus on chronic stress and how this influences cortisol patterns over time.

1.3 Oxytocin

Oxytocin facilitates bonding and social relationships. Oxytocin is a peptide hormone that inhibits the release of glucocorticoids or stress and anxiety-related hormones (Hiller 2004). Traditionally, oxytocin helps uterine contractions during labor, as well as assists in milk flow during lactation (Campbell 2010; Carter 2003; Hiller 2004). When women are pregnant and after they give birth, they have greater amounts of oxytocin. Oxytocin regulates that release of numerous neuropeptides, which help mothers bond, both emotionally and through touch, with their babies and promotes better psychological well-being and pleasure (Hiller 2004). When oxytocin is released through sensory stimuli, such as touching, warm sensations, or odors, it tends to create positive moods and calmness (Uvnas-Moberg 1998). Oxytocin has also been shown to facilitate bonding and social skills in a variety of relationships (Feldman, Gordon, and Zagoory-Sharon 2011; Neumann 2008). It is often referred to as a “social” hormone because it tends to make people less inhibited in new social situations and facilitates pair bonding (Feldman, Gordon, and Zagoory-Sharon 2011). Finally, oxytocin has long been associated with sexual activity. Oxytocin is released during foreplay, sexual activities, and in the touching that occurs between couples after sexual activity, which can enhance emotional connections between romantic partners.

1.4 Dehydroepiandrosterone (DHEA)

Dehydroepiandrosterone is a steroid that is primarily produced by the adrenal glands. DHEA-S is the sulfated version of DHEA and is often used instead of DHEA in the social sciences because it is easier to measure and more stable (Brown et al. 2008). DHEA is often a precursor to other hormones like testosterone (Brown et al. 2008). Some research has linked DHEA-S with aggression and delinquency in adolescence (Golubchik et al. 2009) and enhanced memory and mood (Alhaj, Massey, and McAllister-Williams 2006). Whereas cortisol typically increases with stress, DHEA-S typically decreases (Floyd and Riforgiate 2008). Researchers have also investigated the ratio of cortisol to DHEA-S, showing that both of them together may be a better marker of stress than either of them alone.

1.5 Alpha-amylase

Alpha-amylase is a physiological marker that researchers have been testing more frequently in recent years. It is an enzyme that aids in digestion in the oral cavity and helps fight bacteria (Scannapieco, Torres, and Levine 1993). When the body is stressed, the sympathetic nervous system secretes alpha-amylase through the sali-

vary glands (Chatterton et al. 1996). Salivary alpha-amylase is activated immediately when the body becomes stressed and its response is short lived (Gordis et al. 2006). While researchers are not yet completely certain about what it measures, an increasing amount of research suggests that it is reflective of stress, arousal, and anxiety induced changes in the ANS (Afifi et al. 2011; Nater and Rohleder 2009).

2 Common theories used to study physiological processes

2.1 Evolutionary theory

Much of the research on physiological processes and nonverbal communication uses evolutionary theory as its basis. While we do not have enough space to cover evolutionary theory in depth here, evolutionary psychology focuses on how past behaviors have contributed to reproductive capabilities and how current behaviors further enhance these capabilities (Booth, Carver, and Granger 2000). It argues, for example, that women are more likely than men to focus on protecting and caring for their offspring than men. Women also tend to be more selective in their choice of mates compared to men, focusing on their potential as a breadwinners and fathers (Booth, Carver, and Granger 2000). Men focus on reproductive success and passing on their genes, which may lead to more promiscuous behavior compared to women (Booth, Carver, and Granger 2000). Males seek out female partners that are fertile and who would be good mothers (Miller and Maner 2010). Nonverbal behaviors and bodily features of men and women signal mating preferences. For example, women's fertility may be revealed to men by her skin tone, waist-to-hip ratio, facial symmetry, vocal pitch, and smell. Evolutionary theory may explain why fathers are more likely to show affection to their biological sons compared to their adoptive sons and stepsons (Floyd and Morman 2003). Fathers have also been found to give more affection to their heterosexual sons than their homosexual sons (Floyd 2001). Parents, in general, may have a tendency to give more attention and affection to children who can pass along their genetic information to future generations. Two theories that focus on nonverbal (and verbal) behavior that use evolutionary theory as a foundation are tend and befriend theory (Taylor et al. 2000) and affection exchange theory (Floyd 2006).

2.2 Tend and befriend theory

Many theories of stress responses focus on a “fight or flight” tendency where people either flee when faced with a stressor or aggressively fight against it. Taylor

et al.'s (2000; 2002) tend and befriend theory provides an alternative to the fight or flight approach – an approach which may not always be adaptive for women. Taylor et al. argue that women have evolved to respond to threatening situations in ways that maximize the survival of themselves and their children. The fight or flight response might be disadvantageous for women because women do not have the same types of hormones that facilitate aggression (or a “fight” response) like men (Taylor et al. 2002). The theory suggests that women tend to rely on interpersonal relationships to strengthen and preserve their family relationships. Specifically, women tend to communicate in ways that protect their offspring from harm and minimize the activation of their behavioral stress responses that could jeopardize their offspring (tending), as well as associate with other people who can reduce social threats (befriending) (Taylor et al. 2000; Zwolinski 2008). From an evolutionary standpoint, women may also not respond with a fight response because they are primarily responsible for caring for their offspring and family relationships in general. Engaging in a fight response might be maladaptive for women they could get injured or killed, which would leave their children and future family lineage vulnerable, or it could endanger their children (Floyd, Pauley, and Hesse 2010).

According to tend and befriend theory, then, women's most important goal is to protect their offspring (Taylor et al. 2000). While this protection sometimes involves aggression (see Taylor et al. 2000), most of the time it involves tending and befriending behaviors. When a threat from the environment presents itself, women's instinct is to protect their children by soothing and reassuring them and giving them affection, and aligning themselves with others who can help protect them (Taylor et al. 2000). Tend and befriend theory also suggests that when women perceive a gap in their positive relationships, it poses an interpersonal threat (Zwolinski 2008). Women become aware of these social cues and tend to respond by affiliating with others in attempt to lessen that social gap and minimize their physiological stress response (Zwolinski 2008).

2.3 Affection exchange theory

Affection exchange theory (AET) (Floyd 2006) is another evolutionary theory that involves affiliative behaviors in interpersonal relationships. Affection exchange theory revolves around physiological stress response systems and expressed and received affection. The purpose of AET is to explain why people engage in affectionate behaviors and with what ramifications. The theory is based in neo-Darwinian assumptions in the sense that it argues that humans have a general tendency to procreate and survive and affectionate behaviors are often used to achieve these goals (Floyd, Judd, and Hesse 2008). A primary proposition of AET is that the need for affection is inborn (Floyd, Judd, and Hesse 2008). All people are born with a

need for affection in order to thrive. Affection is also comprised of behaviors and actions that are verbal (e.g., saying 'I love you' or telling people how much you care about them) and nonverbal (e.g., hugs, kisses, touching, holding hands). Another central assumption of AET is that affection facilitates pair bonding and advances procreation and viability of the human species (Floyd 2006). Being able to give and accept affection freely communicates to potential mates that one is a viable dating and marital partner and future parent (Floyd 2006). As Floyd notes, however, most affection is positive and facilitates adaptation, but it is not always positive. It depends upon societal expectations and individual preferences. Some people may provide so much affection that it violates societal norms (e.g., too much affection to a stranger or acquaintance), creating anxiety and stress. Affectionate behaviors that violate a person's preferred range of affection are physiologically aversive (Floyd, Judd, and Hesse 2008).

A final and important assumption of AET is that expressing and receiving affection provide important stress reduction functions. The expression and receiving of affection activates neuroendocrine responses that prepare the body to fight against stress, as well as protect it from the ill effects of negative forms of stress (Floyd 2006; Floyd, Judd, and Hesse 2008). Floyd's research, some of which is reviewed later in this chapter, has found that affection helps people maintain healthy diurnal levels of cortisol throughout the day, as well as helps them recover quickly physiologically from stressful, acute laboratory tasks (see Floyd, Judd, and Hesse 2008 for a review). Because it helps buffer negative stress, receiving and expressing affectionate communication also enhances people's health (e.g., Floyd et al. 2007; Floyd and Riforgiate 2008).

2.4 Attachment theory

Another theory that is commonly used to explain the connection between physiology and nonverbal communication is attachment theory. Attachment theory is particularly applicable to the research on touch and physiology. According to Bowlby (1982), children form bonds or attachments with their parents that are a primary result of parenting practices. These attachments shape how positively or negatively they perceive themselves and others in relationships (Collins and Feeney 2004; Collins and Read 1990). Specifically, it affects how they approach and view intimacy in relationships. Children develop internal working models of how to approach relationships that can affect the nature and quality of their future relationships (Campbell 2010). While one's attachment can be changed throughout the life course, particularly in response to major life events (e.g., divorce, traumas, losing a job, abusive relationships), people's working models have been shown to be relatively stable throughout the lifespan (Hazan and Shaver 1987). A secure attachment helps children go forth and explore new and unfamiliar circumstances

(Bowlby 1982). Children with secure attachments also tend to be moderately disclosive, tend to have high self-esteem, are able to recover easily from failure events, and tend to give and receive affection freely (see Guerrero, Farinelli, and McEwan 2009; LePoire et al. 1997).

Because of its bonding function, oxytocin is the biosocial marker most closely associated with attachment theory. Oxytocin facilitates attachments between primary caregivers and children. This is particularly the case with mothers because of their biological connection with their infants, which includes oxytocin levels before and after pregnancy. For example, oxytocin enhances mother-infant attachments when infants nuzzle against their mothers, signaling the release of oxytocin and subsequent milk flow (Campbell 2010). Lactation promotes touch between mothers and infants, as well as reduces mothers' cortisol levels. The oxytocin generated during lactation also enhances mothers' moods. All of these processes can positively affect mothers' attachments with their infants. Research also shows that oxytocin levels enhance the bonding and trust between mothers and infants beyond breastfeeding. While most of the research on attachment and physiology focuses on mothers and oxytocin, similar social bonding functions occur in other social relationships.

3 Feedback processes and physiological responding

Research on nonverbal communication and physiological response patterns has broadly explored connections between neurological, cardiac, and endocrine responses and different nonverbal channels such as facial cues, oculesics, vocalics, kinesics, and haptics. The following sections present a review of this literature and some of the pivotal studies linking nonverbal behavior to physiological responses. This body of literature has focused primarily on facial cues and haptics, though work relevant to other nonverbal channels is also included. While this line of research has found interesting patterns of physiological responses, there are still a number of questions that exist and unclear pathways that warrant future testing.

3.1 Facial cues

One of the most extensively explored areas of nonverbal communication that has been linked to physiological response systems involves facial cues and emotional expression through those facial cues. This work has broadly explored two domains: (1) how forming certain facial expressions, and the emotions that correspond with those facial cues, influence people's physiology and (2) how viewing others' facial expressions (and sometimes experiencing others' emotions and moods that corre-

spond with those facial cues) influences people's physiology. When examining how one's own facial expressions influence physiology, researchers have either had individuals portray a certain emotion with their face or led participants through a series of directed tasks to make certain facial expressions without being told which emotion they are portraying (e.g., Ekman, Levenson, and Friesen 1983; McCaul, Holmes, and Sheldon 1982). In both of these approaches, researchers have continually found that making the facial expressions associated with various emotional states triggers physiological responses similar to how individuals would react if they were actually experiencing the emotion.

Two of the most prominent researchers in physiology, facial cues, and emotions are Levenson and Ekman, whose work developing the Directed Facial Action task (Ekman, Levenson, and Friesen 1983) led to a series of studies exploring physiological responses to facial expressions. In the Directed Facial Action task, individuals were instructed to move their facial muscles in certain ways. Though the participants were not told which emotion they were expressing, the directed facial movements resulted in the formation of prototypical emotional facial expression. Before the Directed Facial Action task, research had demonstrated the relationship between individuals' expressions of emotions and physiological responses. For example, McCaul, Holmes, and Sheldon (1982) had participants make the facial expressions of being afraid, calm, and normal and found that when individuals portrayed fear (compared to portraying calm or normal), skin conductance and pulse rate increased. However, Levenson and Ekman's work advanced this approach by testing facial expressions of emotion without the participant being *told* which emotion they are expressing.

The Directed Facial Action task has been validated in different cultural groups (e.g., Levenson et al. 1992) and among different age groups (e.g., Levenson et al. 1991). In their program of research, Levenson and Ekman (2002) have consistently found that facial configurations that correspond with anger, fear, and sadness result in greater increases in heart rate than those that correspond with disgust, with facial configurations that suggest happiness and surprise being somewhere in the middle (between anger/fear/sadness and disgust). They have argued that it is the *emotions* associated with the various facial configurations that lead to the differences in cardiac response (Levenson, Ekman, and Friesen 1990), as opposed to the difficulty of making the facial configurations as suggested by Boiten (1996). For a full analysis of the debate over this issue see Levenson and Ekman (2002).

While Levenson and Ekman's work has focused on cardiac responses to facial expressions, their approach has been expanded to test for respiratory responses. Boiten (1996) nearly replicated Levenson, Ekman, and Friesen's (1990) findings involving cardiac changes during the Directed Facial Action task. However, Boiten (1996: 129) also explored respiratory responses. He found that when individuals were making the emotional facial configurations, "their respiration became more shallow, whereas the duration of inspiration and expiration time decreased" com-

pared to the baseline condition. Boiten (1996) also found that expiration time, total duration of the breathing cycle, and changes in functional residual capacity (i.e., after passive expiration, the amount of air that remains in the lungs) varied between the different expressions, but depth/volume of breathing (as found by Levenson et al. 1992) did not. In other words, it is not only individuals' cardiac responses resulting from facial expressions that mimic emotional responses, but also their breathing patterns.

Levenson's facial work has also explored in the context of marital conflict and cardiac responses. Gottman, Levenson, and Woodin (2001) examined connections between facial expression and physiological responses during a discussion of marital conflict between husbands and wives. The authors found positive correlations between husbands' physiological responses and their facial "action units" during a discussion of marital conflict. Specifically, they found that the total number of husbands' facial action units was positively related to husbands' higher heart rate. Additionally, husbands who had more facial action units also had shorter pulse transit time or "faster blood velocity" (Gottman et al. 2001: 51). Pulse transit time is "a measure of the time it takes blood to arrive at the finger of the nondominant hand after an R-wave of the electrocardiogram" (Gottman et al. 2001: 51). Even though this finding existed only for husbands, their work demonstrated the positive association between facial responses during conflict and physiological responses, as the more facial movements husbands made, the higher their heart rates and the faster their blood velocity.

The aforementioned research on husbands' and wives' facial movements and physiological responses is particularly important because facial expressions depicting certain emotions during marital conflict and corresponding physiological processes have been shown to predict relationship dissolution and divorce. For example, Gottman and Levenson (1992) found that wives' greater autonomic activation during marital conflict was associated with marital dissolution four years later. Husbands who were able to keep their heart rates lower during marital conflict, primarily as a function of their wives' "physiological soothing" or affection and social support, reduced the likelihood of divorce six years later. According to Gottman, men become physiologically aroused easier and faster (e.g., faster heart rates, higher skin conductance, stronger finger pulses) during marital conflict than women (Levenson, Carstensen, and Gottman 1994). As a result of greater physiological arousal during conflict, men may have a greater tendency than women to stonewall or avoid responding emotionally and communicatively during conflict to prevent themselves from lashing out verbally and/or physically. Ultimately, however, marital couples who are distressed tend to reciprocate negative affect with each other and have stronger physiological reactions during conflict compared to non-distressed couples (Levenson and Gottman, 1983). This negative reciprocity can ultimately affect personal and relational health.

The research on affect, which can be communicated through facial cues and other nonverbal channels (e.g., vocalics, kinesics, haptics) often illustrates the sys-

temic nature of behavior in relationships. Research on affect has shown that couples' physiological responses are positively correlated with each other, but that these correlations are stronger when the couple's affect is negative. For example, Saxbe and Repetti (2010) investigated the co-regulation of husbands' and wives' moods and cortisol four times a day for three days. The husbands' and wives' cortisol scores were positively correlated. However, marital satisfaction diminished the strength of this association – husbands and wives who were more dissatisfied tended to have higher cortisol scores. The husbands' and wives' perceptions of their partner's negative mood (i.e., sad, angry, tense) also made them more dissatisfied. However, their positive moods did not significantly affect their satisfaction. As one might expect, the husbands' and wives' cortisol scores were more highly correlated when they were physically home together in the morning and evenings than when they were working outside the home and also correlated with negative moods. In general, couples' negative moods and their cortisol levels fluctuated in accordance with each other. (For further reading on nonverbal communication and relationships, see Chapter 19, Guerrero and Wiedmaier, this volume.)

In general, the domain of facial work that explores individuals' physiological reactions to forming certain facial expressions has broadly found that emotional facial expressions can themselves result in significant physiological responses. This has been demonstrated in the consistent finding that making fearful and angry expressions (whether being told to demonstrate that emotion or being led to make the expression without knowing which emotion they are portraying) produces physiological responses, such as increased heart rate and skin conductance, similar to actually experiencing those emotions (McCaul, Holmes, and Sheldon 1982; Levenson and Ekman 2002). Due to suggestions that fearful and angry faces may be linked to amygdala activation (Morris et al. 1996; Whalen et al. 1998; detailed below), the connection between such responses seems logical.

The second domain of research exploring facial cues and physiology focuses on individuals' physiological responses to various facial stimuli. For example, research on facial stimuli has explored neural responses to various faces. Specifically, researchers investigated differences in amygdala activation in response to different facial stimuli, such as angry faces versus neutral faces, and masked versus unmasked presentations (Morris, Öhman, and Dolan 1998). The amygdala has been found to play an important role in the cognitive processing of threat, such as images portraying fearful faces, even when such facial stimuli are presented below the level of conscious processing (Morris et al. 1996; Whalen et al. 1998). For example, Suslow et al. (2006) presented fearful, angry, and happy faces to participants while undergoing an fMRI. The faces were presented in a backward masking procedure, meaning that the emotional faces were presented for a short time (33 ms), followed by a neutral face (i.e., the mask) for 467 ms. The backward masking group was compared to a no masking group and a control group that viewed a gray rectangle. Using this design, Suslow et al. (2006) found an association between

amygdala activation and facial stimuli. Specifically, for the masked fearful face condition, they found a positive correlation between the number of fearful faces detected and activation of both the left and right amygdala. For the masked angry face condition, they found that right amygdala activation correlated with the number of angry faces detected. They point out that “high amygdala activation facilitated the visual processing of inputs of fearful and angry faces and made these threat-indicating or directly threatening stimuli more available for conscious information processing” (Suslow et al. 2006: 247). In other words, individuals’ neural processing of facial stimuli appears to play an important role in interpreting threat cues.

Responses to facial cues have also been explored extensively by Dimberg and colleagues in their work mimicking facial reactions (for a full review of work on facial stimuli and psychophysiological responses, see Dimberg and Öhman 1996). For instance, Dimberg, Thunberg, and Elmehed (2000) tested whether individuals mimic facial expressions unconsciously perceived. Using a backward masking technique similar to the one explained above, participants were presented pictures of angry, happy, or neutral faces. These faces were presented too quickly to consciously perceive and were immediately masked by a neutral face. Facial electromyographic (EMG) reactions were used to measure responses to the facial stimuli by attaching miniature electrodes to the areas of the participants’ faces that had previously been found to respond to happy and angry faces (i.e., the zygomatic major and corrugator supercilii muscles, respectively). The researchers found that the predicted muscles were activated by the masked stimuli. In other words, even unconsciously perceiving a happy or angry face resulted in mimicking that facial expression (Dimberg, Thunberg, and Elmehed 2000).

Research on facial cues and physiology has also explored links with cortisol and testosterone. Van Honk, Putman, and colleagues have explored these connections in their extensive program of research. For example, in a pilot study, van Honk et al. (1998) found that individuals in a high cortisol group attended away from masked angry faces. Van Honk et al. (2003) also discovered that basal cortisol levels predicted avoidant attentional responses to angry faces. To test for a causal relationship between facial stimuli and cortisol, the researchers conducted an experiment with an oral dose of cortisol. Putman et al. (2007) used a Stroop task with fearful facial expressions inserted in the task subconsciously to test the influence of cortisol. Twenty men participated in the study on two days, one day receiving an oral dose of cortisol and another day receiving a placebo. In comparing high-anxious versus low-anxious participants, they found that high-anxious participants had a “masked fearful Stroop bias in the placebo conditions” (Putman et al. 2007: 797). However, when given a dose of cortisol, this fearful response disappeared, suggesting that cortisol may aid in reducing individuals’ selective attention to fearful faces (i.e., cues to threat).

In their work on facial cues and testosterone, van Honk et al. (1999) found that individuals with higher basal testosterone levels selectively attended to angry

faces. They based their study on the theory that higher testosterone is related to more aggressive personalities and a desire for interpersonal dominance, and that angry faces signal threat and possible dominant-aggressive responses. Angry facial expressions can signal dominance and social control, with testosterone facilitating these types of facial expressions through its influence on dominance. In another study, van Honk et al. (2001) gave women an oral dose of testosterone or a placebo and exposed them to neutral, happy, or angry faces. The researchers tested whether cardiac responses were influenced by testosterone and facial expression exposure. They found that cardiac acceleration occurred only in the angry face condition, and that women given testosterone had significantly accelerated cardiac responses to the angry faces compared to the placebo group, possibly indicating the beginning of a fight-or-flight response.

Taken together, this work has found important changes due to testosterone and cortisol levels. Specifically, cortisol is associated with attending away from and avoiding angry faces, even when those faces are unconsciously perceived (van Honk et al. 1998; van Honk et al. 2003). Additionally, when anxious individuals (who normally have a bias towards fearful faces) were given cortisol, the fearful responses disappeared (Putman et al. 2007). The opposite effect seems to occur for testosterone. Individuals with higher levels of testosterone attended to angry faces, and individuals given oral testosterone experienced increased cardiac responses to the angry faces (van Honk et al. 1999; van Honk et al. 2001). Thus, while the research suggests a link between cortisol and attending *away* from angry and fearful faces, testosterone links to attending *toward* angry faces.

A growing line of work on psychophysiology and facial cues involves the hormone oxytocin. Much attention has recently focused on oxytocin due its pro-social and affiliative functions. For example, Schulze et al. (in press) found that even when only briefly presented with faces demonstrating different emotional states, individuals given intranasal oxytocin demonstrated enhanced recognition accuracy compared to the placebo group. To distinguish between emotions, Fischer-Shofty et al. (2010) explored whether oxytocin has a selective effect on individuals' ability to recognize specific emotions. They did this by exposing an oxytocin-induced group and a placebo group to faces displaying different emotional expressions, arguing that "an important means for conveying non-verbal information is through facial expressions, which reflect the dynamically changing emotional states of others in response to their internal and external experiences" (Fischer-Shofty et al. 2010: 179). Though only tested on males, Fischer-Shofty et al. (2010) found that oxytocin does have a selective effect, as individuals given intranasal oxytocin were better able to recognize facial expressions of fear than those in the placebo group, but not better able to recognize happiness, anger, surprise, or disgust. Conversely, Marsh et al. (2010) found that individuals (both males and females) given intranasal oxytocin were better able to recognize happy facial expressions compared to the placebo group, but not better able to recognize anger, disgust, fear, sadness, or surprise.

While much research has detected differences in emotion recognition due to oxytocin, other research has failed to establish such a connection with oxytocin (e.g., Guastella et al. 2009). Di Simplicio et al. (2008) did not find a significant difference between the group given intranasal oxytocin and the placebo group in terms of facial expression recognition, though oxytocin did appear to help subjects avoid certain emotional misclassifications. Specifically, the researchers suggest that intranasal oxytocin “slows reaction time to correctly identify fearful facial expressions and reduces the misclassification of positive or ambiguous emotions as negative ones” (Di Simplicio et al. 2008: 246). Overall, the link between oxytocin and emotional facial recognition has yet to be fully understood, and given the contradictory findings in this line of work, many scholars are refining and expanding their experimental techniques in the hope of more clearly understanding why and how oxytocin influences individuals’ ability to “read” certain emotional stimuli. A future direction for work on oxytocin is to use samples that include both men and women, and to try to understand why similar studies produce such contradictory findings. Exploring oxytocin’s interaction with other hormones and physiological stress response systems may help illuminate some of the complexities in these findings.

Beyond the complexities of linking oxytocin to emotional responses, the hormone has also been explored in several other domains. For example, attraction and trustworthiness of faces has also been associated with the hormone. Theodoridou et al. (2011) explored individuals’ masculine and feminine facial preferences when given intranasal oxytocin. Using a computer program, individuals were instructed to make male and female faces as attractive as possible, which was done by clicking on a mouse to adjust the faces to be more masculine or feminine. They found that individuals administered intranasal oxytocin (regardless of participant sex) had a greater preference for masculinized male faces than those given a placebo, but this effect did not occur for feminized female faces. Theodoridou et al. (2009) also found that both men and women given intranasal oxytocin perceived male and female faces as more attractive and trustworthy than individuals given a placebo.

When exploring perceptions of facial trustworthiness, researchers draw on the extensive work exploring oxytocin’s connections to fear, trust, and stress. This research suggests that oxytocin decreases fear and increases trust (e.g., Kosfeld et al. 2005), responses that have been linked to individuals’ brain functioning (Kirsh et al. 2005). Kirsh et al. (2005) found that greater oxytocin levels were associated with a reduction in the area of the brain associated with fear (i.e., the amygdala), and thus suggest that the sense of ease felt from the release of oxytocin may be linked to a reduction in social threat cues. Oxytocin’s stress-reducing effects have also been connected to the stress hormone cortisol (Legros 2001; Legros, Chiodera, and Geenen 1988; Legros et al. 1984; Legros et al. 1987). For example, Ditzen et al. (2009) found that couples given a nasal spray of oxytocin had lower

cortisol levels after discussing conflict-inducing issues with their partners than couples given a placebo, suggesting that oxytocin not only has stress-reducing effects, but also influences pro-social behavior and pair-bonding.

Specifically testing facial cues, Domes et al. (2007) found that individuals given intranasal oxytocin demonstrated attenuated right amygdala activation in response to emotional faces (regardless of valence). Despite this body of work, Domes et al. (2010) found contrary evidence in the oxytocin-fear link. Specifically, they found that in women, intranasal oxytocin “selectively enhances amygdala reactivity to fearful faces in the luteal phase of the menstrual cycle” (Domes et al. 2010: 90). Their work suggests that sex differences may exist in individuals’ responses to emotional faces as it relates to oxytocin.

A significant amount of work on oxytocin and facial cues has examined individuals’ ability to remember faces. For example, Guastella, Mitchell, and Matthews (2008) found the males given intranasal oxytocin were better able to remember happy faces a day later (though not angry or neutral faces), suggesting that oxytocin may help males encode positive social cues. Conversely, Petrovic et al. (2008) found that oxytocin reduced negative associations with faces conditioned with shock and abolished the brain activity responsible for the conditioning. Savaskan et al. (2008) also found that individuals given intranasal oxytocin after being exposed to human faces with different emotional expressions were better able to recognize those faces both in the short term (30 minutes after exposure) and long term (24 hours after exposure). However, this effect occurred only for faces with neutral and angry expressions, and not for faces with happy expressions, the opposite of Guastella et al.’s (2008) study. Once again, such findings point out the need for further research to explore other mechanisms that may explain seemingly contradictory findings.

Rather than investigate varying emotions and memory, Rimmele et al. (2009) explored human versus non-human recognition. They found that individuals given a nasal spray of oxytocin before being exposed to social (e.g., human faces) and nonsocial (e.g., objects, photographs, and art) stimuli were better able to recognize the social stimuli 24 hours later than those who were given a placebo, and that this effect only held true for social stimuli and not for nonsocial stimuli. Rimmele et al. (2009) point out the advantage of oxytocin for being able to recognize previously encountered faces in social situations. Such research may aid in understanding the physiological components that underlie individuals’ ability to read facial cues—nonverbal indicators important for healthy communication.

In general, there is increasing evidence that the hormone oxytocin influences facial processing and preferences (e.g., Theodoridou et al. 2009; Theodoridou et al. 2011), such as increasing individuals’ ability to accurately infer emotions from facial stimuli and to remember different faces (Guastella, Mitchell, and Matthews 2008; Savaskan et al. 2008; Rimmele et al. 2009; Schulze et al. 2011). However, there is great variability in how oxytocin influences physiological responses and

which emotions are targeted. For example, in some studies, oxytocin increased ability to recognize fear, but not happiness, anger, surprise, or disgust (i.e., Fischer-Shofty et al. 2010), while in other studies it increased ability to recognize happy faces, but not anger, fear, disgust, sadness, or surprise (i.e., Marsh et al. 2010). Other research has found that oxytocin increased ability to recognize neutral and angry faces short and long term, but not happy faces (Savaskan et al. 2008), again contradictory to other findings that oxytocin increased ability to remember happy, but not angry or neutral faces (Guastella, Mitchell, and Matthews 2008). In a similar contradictory pattern, oxytocin was found in one study to attenuate right amygdala activation in response to emotional faces (i.e., Domes et al. 2007), while in another study oxytocin increased amygdala activation to fearful faces (i.e., Domes et al. 2010). Thus, the preliminary findings on oxytocin point to its ability to influence perceptions of emotional facial stimuli, but the exact emotions influenced and the reasons why some studies find significant changes and others do not is unclear. Future work exploring additional biomarkers that may be interacting with oxytocin may help clarify some of the contradictory findings and illuminate the underlying mechanisms guiding oxytocin responses.

As a whole, the research on facial expressions of emotion suggests that expressions, as well as perceptions of expressions, have important influences on physiological responses. The research has broadly found that making certain facial expressions to portray various emotions induces physiological responses, such as accelerated cardiac responses and intensified respiratory responses (e.g., Boiten 1996; Levenson, Ekman, and Friesen 1990), similar to actually experiencing those emotions (e.g., Ekman, Levenson, and Friesen 1983; McCaul, Holmes, and Sheldon 1982). Physiological responses, such as increased activation of areas of the amygdala, have also been found in response to increased recognition of certain facial stimuli – i.e., fearful and angry faces detected in a backward masking procedure (Suslow et al. 2006). Finally, individuals respond to facial stimuli by mimicking expressions, even when the faces are unconsciously perceived (Dimberg, Thunberg, and Elmehed 2000).

Finally, a new program of research over the past several years has explored the effects of oxytocin on facial cues. While the research is still developing and attempting to make sense of the somewhat contradictory findings, work so far has suggested that oxytocin enhances the recognition of certain emotions (Fischer-Shofty et al. 2010; Marsh et al. 2010), affects perceptions of facial trustworthiness and attraction and preference for masculinized faces (Theodoridou et al. 2009; Theodoridou et al. 2011), influences the ability to remember certain facial expressions (Guastella, Mitchell, and Matthews 2008; Savaskan et al. 2008), and improves the ability to infer affective states by looking at the eye region (Domes et al. 2007). Overall, this research trend suggests that oxytocin will continue to be explored as an important hormone in understanding the link between facial cues and physiological responses.

3.2 Oculesics

Much work exploring eye behavior and physiology has focused on individuals' ability to read emotional cues as a result of oxytocin induction or oxytocin levels. For example, Domes et al. (2007) found that men who were given a nasal spray of oxytocin performed better on a test of their ability to identify affective states by looking at individuals' eye regions. Similarly, Guastella, Mitchell, and Dadds (2008) found that individuals given a nasal spray of oxytocin gazed longer into the eyes of neutral faces (as well as the mouth and nose areas, also important indicators for facial cues), an area that the authors point out as important for assessing emotions, threat and interest.

Lutchmaya, Baron-Cohen, and Raggatt (2002) explored the relationship between fetal testosterone levels and eye contact, contributing to work on hormones and autism spectrum disorders. Their work drew on theories connecting fetal testosterone levels to autism spectrum disorders. Specifically, they cite Geschwind and Galaburda's (1985a, 1985b, 1985c, 1987) proposal that increased fetal testosterone levels lead to autism spectrum disorders and impaired language abilities. Though they did not specifically address language, Lutchmaya, Baron-Cohen, and Raggatt (2002) used eye contact as an indicator of social development. They found an inverse linear relationship, such that higher levels of fetal testosterone were associated with decreased amounts of eye contact in children at 12 months of age. They also tested whether this could be explained by sex differences. While this relationship did not emerge when analyzing girls, the inverse relationship between fetal testosterone levels and eye contact was replicated when examining boys.

Fetal testosterone has also been explored as a predictor of empathic ability as demonstrated by the ability to infer emotions from the eyes. Chapman et al. (2006) used the same test as Domes et al. (2007), and found that children with higher fetal testosterone levels had lower scores on the test. In other words, children who were exposed to more testosterone in the womb had greater difficulty inferring emotional and mental states of individuals by looking at the eye region. Unlike Lutchmaya, Baron-Cohen, and Raggatt (2002), Chapman et al. (2006) found this same relationship when analyzing boys and girls separately, demonstrating both within-sex and combined-sex correlations.

Higher fetal testosterone levels have also been linked to greater difficulty inferring emotion from the eye region of the face (Chapman et al. 2006). However, oral hormone administration appears to change these effects. For example, high-anxious individuals who attended to fearful faces in a placebo condition did not experience the fearful responses when given an oral dose of cortisol, and women given an oral dose of testosterone experienced increased cardiac responses when viewing angry faces compared to a placebo group (Putman et al. 2007; van Honk et al. 2001). In sum, much of the research on oculesics focuses on the ability of oxytocin

to enhance people's ability to register others' affective states when looking at the eye regions of their face. Other hormones, such as cortisol and testosterone, could affect these abilities as well. Whether these abilities depend upon the sex of the participant, however, is still rather inconclusive. (For further reading on eye behavior, see Chapter 9, Adams, Nelson, and Purring, this volume.)

3.3 Vocalics

Another channel of nonverbal communication that has been linked to physiology involves vocal cues or vocalics. Seltzer, Ziegler, and Pollak (2010) tested whether exogenous oxytocin is influenced by vocalizations following a stressor when the vocal stimuli is the only form of social contact. They tested this relationship for pre-pubescent girls ages 7–12 and their mothers to help control for hormone levels. To explore this relationship, they first exposed girls to a stressor and then had them either (1) reunite with their mothers, which included physical contact, (2) talk with their mothers on the phone, focusing on vocal stimuli, or (3) watch a neutral film as a control condition. Cortisol and exogenous oxytocin were measured at several time points before and after the stressor. Both physical contact and vocal stimuli via the telephone resulted in greater declines in cortisol levels compared to the control group. Though physical contact did reduce cortisol levels at a faster rate, children who spoke with their mothers over the telephone compared to those who had physical contact with their mothers ended up at nearly the same level by the end of the study. Seltzer et al. (2010) also found that exogenous oxytocin was released by the children following both the physical and speech-only (telephone) conditions. This change occurred within 15 minutes of the stress task and lasted up to an hour, while no change occurred in the control group.

Research has also investigated the influence of mother-daughter vocal interaction compared to instant messaging (Seltzer et al. 2011). Seltzer et al. (2011) sought to differentiate whether it is the comforting words of a mother to her daughter or the vocal delivery of those words that has a comforting effect. They predicted that vocal cues would have a stress-reducing effect unmatched by instant messaging. To test this relationship, they first exposed the daughters to a stressor, and then had them engage in face-to-face interpersonal interaction with their mothers (a positive control), rest alone with no contact with their mothers (a negative control), speak to their mothers on the telephone (vocal cues), or instant message their mothers (words only without vocal cues). They found that girls who spoke to their mothers on the telephone after a stressor had low cortisol levels similar to those who interacted face-to-face with their mothers, and that girls who instant messaged their mothers had high cortisol levels similar to those who had no interaction with their mothers. Individuals in the face-to-face and phone conditions also had similar oxytocin levels that were significantly higher than individuals' levels in the

instant message and no contact conditions. In general, Seltzer and colleagues' program of research suggests that vocal cues – not simply words – influence physiological responses to comforting messages between mothers and daughters.

This research shows the importance of vocal expressions on physiological responses. Vocal interaction (over the phone) after a stressor had a similar impact on cortisol and oxytocin levels as physical interaction (Seltzer et al. 2010), perhaps suggesting that vocal cues play an equally important role in support and comfort. Additionally, vocalics research indicates that it is not the words used to comfort, but something about the vocal delivery of the message that has a physiological effect on individuals (Seltzer et al. 2011). Similar to the first finding, communication over the phone had a similar effect on cortisol and oxytocin levels as face-to-face interaction, while instant messaging (i.e., words with no vocal cues) had a similar effect as no interaction at all. Overall, these studies show the importance of vocal cues in interpersonal interactions, and the stress-reducing effects of such contact as demonstrated by decreases in the stress hormone cortisol and increases in the hormone oxytocin following a stressor. (For further reading on vocal behavior, see Chapter 7, Patel and Scherer, this volume.)

3.4 Haptics

A final important area of research linking nonverbal communication to physiological responses involves touch, or haptics. Similar to the work on facial cues, research on haptics has led to complicated and sometimes contradictory findings. One area that represents such complications is work on massage, which many have equated with affectionate or warm touch, and hormonal responses. Some of the mixed findings regarding haptics and the hormone oxytocin specifically may be due to hypotheses based on animal research. Much of the research on massage and oxytocin responses arose from work on rats. Lund et al. (1999, 2002) found that male and female rats that were massaged experienced increased oxytocin secretions, and that with increasing massage sessions, anti-stress patterns emerged as a result of increased stimulation of the parasympathetic nervous system. After these discoveries, many researchers wondered whether the same effect would emerge in humans as a result of touch.

Several studies have failed to replicate the positive association between massage and oxytocin in humans. For example, Wikstrom et al. (2003) tested peripheral oxytocin after 30 minutes of Swedish massage and found no difference in oxytocin levels. In a study involving several biosocial markers in addition to oxytocin, Ditzen et al. (2007) found that after husbands gave their wives a 10-minute neck and shoulder massage, the wives' cortisol levels were reduced, though their plasma oxytocin levels did not increase as predicted. However, other research has found that intranasal oxytocin aids in social support responses (e.g., warm partner

contact). Specifically, Heinrichs et al. (2003) found that individuals who received social support from a friend while preparing for a stressful task and received intranasal oxytocin were calmer and had lower cortisol levels in response to a social stressor than individuals who received either social support *or* intranasal oxytocin alone. In general, this work seems to suggest that cortisol is more consistently affected by touch than is oxytocin. While intranasal oxytocin does seem to influence cortisol levels in several studies involving haptics, individuals' own oxytocin levels do not seem to be consistently influenced by touch.

Another inconsistency in the research involves *when* oxytocin differences are found (e.g., pre-intervention, mid-intervention, post-intervention, etc.). For example, in a study exploring multiple biosocial markers, Holt-Lunstad, Birmingham, and Light (2008) tested an intervention on couples to explore if warm touch would influence couples' ambulatory blood pressure, oxytocin, alpha amylase, and cortisol levels. When comparing plasma oxytocin levels pre- and post-intervention, no significant main effect emerged from the intervention. However, during the 4-week long intervention, couples also collected salivary oxytocin samples at home (which were taken on days when the couples engaged in the warm touch intervention). Holt-Lunstad, Birmingham, and Light (2008) found a significant main effect of the intervention for the at-home salivary oxytocin samples. Individuals who engaged in the warm touch intervention had significantly higher levels of salivary oxytocin than individuals who did not engage in the intervention, even after controlling for gender and after adjusting for pre-treatment plasma oxytocin levels.

Warm touch has been explored as a tool for reducing the effects of a stressor. For example, Light et al. (2000) tested the effect of touch between a mother and child on the mother's oxytocin levels and blood pressure following a stressor (i.e., a speech task). They performed the task on two days; one day the mothers held their babies and one day they did not. Light et al. found that mothers whose oxytocin increased over baseline after engaging in warm touch with their babies had lower blood pressure before, during, and after the speech task (on both the days with and without the child) compared to those whose oxytocin levels decreased after holding their babies. The mothers who experienced an increase in oxytocin levels after the speech task did not experience this effect when not holding their babies, indicating that warm touch is a pivotal part of the oxytocin response.

The research on touch has also explored the influence of partner support on physiological responses. Extending the link between warm contact and physiology, Grewen et al. (2005) explored individuals' oxytocin, norepinephrine, cortisol, and blood pressure levels following a period of warm partner contact between couples. They explored whether individuals who reported more partner support in their relationships had different physiological levels than individuals who reported less partner support. First, they found that individuals who reported greater partner support in their relationships had lower systolic blood pressure after a period of

warm contact with their partners compared to individuals who reported less partner support. However, further analyses revealed that this pattern was mostly limited to women. Second, analyses of heart rate, diastolic blood pressure, norepinephrine, and cortisol revealed no significant differences. Lastly, plasma oxytocin levels were found to vary significantly based on reported partner support. Specifically, individuals who reported having high partner support also had higher plasma oxytocin levels throughout the experiment (baseline, 4, 7, 10 minutes after warm contact). Further analyzing gender, the differences in oxytocin for high support versus low support individuals remained for both men and women at the baseline measurement, though after warm contact the effect only existed for women. The influence of warm touch on oxytocin appears inconsistent, as “only in women were plasma [oxytocin] levels transiently increased after partner contact” (Grewen et al. 2005: 536).

Grewen et al. (2005) also explored dyadic consistency to investigate whether partners’ varying or similar reports of support influenced oxytocin levels. They found that dyads in which both individuals reported low partner support had significantly lower baseline oxytocin levels than dyads in which at least one individual reported high partner support. Finally, the researchers tested whether oxytocin mediates the relationship between partner support and norepinephrine in women. Grewen et al. (2005: 535) found that greater reported partner support predicted higher baseline oxytocin levels and lower baseline norepinephrine levels, and that adding oxytocin levels to the model reduced the effect on norepinephrine, “... suggesting that [oxytocin] may be a partial mediator of the attenuating effect of partner support on resting levels of circulating [norepinephrine] in women.” Overall, this research broadly suggests that supportive partners have higher oxytocin levels and that warm contact influences cardiac responses, but it is not clear how oxytocin levels are influenced by a period of warm contact nor why several other biosocial markers were not significant in their analyses.

Further exploring partner support, Light, Grewen, and Amico (2005) investigated physical partner support and its influence on physiological measures in premenopausal women. Based on patterns of oxytocin in animals, Light et al. predicted that the frequency of massage/warm touch and the frequency of hugging between partners would predict oxytocin responses in a warm touch/hugging lab exercise. They found support for this hypothesis, as individuals who reported greater frequency of “partner hugs” and “partner massages” also had higher baseline oxytocin levels. Additionally, greater partner hugs were negatively correlated with baseline blood pressure and heart rate levels when preparing for and engaging in a stressful task (i.e., giving a speech) during a stressor.

A combination of warm touch with other supportive responses and perceptions may also be paramount to eliciting oxytocin responses. For example, Morhenn et al. (2008) tested the interaction of touch and trust on endogenous oxytocin release. They found that, for individuals who received a massage, the more money they

received during an economic trust game (with more money received signaling greater partner trust), the greater the change in their oxytocin levels. However, this relationship did not exist for individuals who did not receive a massage and then engaged in the trust game or for individuals who only received a massage and did not partake in the trust game. Morhenn et al.'s (2008) study showed that warm touch (in the form of massage) can increase monetary sacrifice, and that the sacrifice can be predicted by the change in oxytocin levels.

Even though most of the research on touch shows that it reduces stress, its consequences depend upon the type of touch and the context in which it occurs. Research has found that how people respond physiologically to touch depends upon the relationship with the person doing the touching and whether the person is male or female (e.g., Drescher, Gantt, and Whitehead 1980; Nilsen and Vrana 1998). For example, Nilsen and Vrana (1998) found that being touched in a professional way decreased heart rate and blood pressure for women and men, but this was especially the case when the person doing the professional touch was female. However, when people were touched in a social way, participants showed initial increases in heart rate and blood pressure, but this effect was observed for women who were touched by men. Being touched by a stranger may also elicit physiologically aversive responses if it violates social norms for what constitutes appropriate touch (see Edens, Larkin, and Abel 1992). Some of the contradictory findings mentioned earlier on touch may have to do with the context and relationships involved.

Overall, a common theme in many of the studies on haptics and oxytocin is that the *overall frequency* of warm touch, partner hugs, and supportive behaviors, rather than a one-time warm touch/hugging interaction, influences oxytocin levels. Additionally, warm contact and partner hugs seem to influence baseline oxytocin levels rather than acute oxytocin responses. In much of the work on oxytocin and haptics, it seems that experiments in which oxytocin is administered (e.g., Heinrichs et al. 2003) have more consistent effects than studies where a touch intervention is predicted to increase oxytocin levels. Given the consistent finding that intranasal oxytocin administration influences the processing of facial stimuli (detailed above), a valuable future direction would be to conduct more experiments testing the influence of intranasal oxytocin on touching behavior.

When examining affection more broadly, a significant amount of interpersonal and family research has shown that nonverbal behaviors such as affection, responsiveness, and warmth tend to be important moderators of the effect of stress on the SNS and HPA systems (e.g., Pendry and Adam 2007). Mothers, for example, who demonstrate more warmth tend to have children with a steeper cortisol diurnal rhythms (or who are able to effectively manage the stress of a day) (Pendry and Adam 2007) and infants who are able to recover quicker in their HPA responses to stressful and emotion-inducing tasks (Fortunato et al. 2011). Some of the most powerful research on affection and touch probably examines how these behaviors affect children's physical development and neurology or brain activity. Research

on premature infants shows that tactile stimulation can speed up their rate of physical development (Kuhn and Schanberg 1998). In addition to enhancing attachments with infants, touch can help them develop physically and mentally. Another example of this development is the research on children who grow up in extremely deprived and abusive conditions and brain imaging. Some research suggests that children who are severely abused or neglected have a smaller corpus callosum (e.g., Teicher et al. 2004), and smaller brain hemispheres and hippocampuses (e.g., Stein 1997), and irregular brain activity compared to children who are not abused or neglected.

Research has also shown that people vary in their trait levels of affection, which could affect their health. People who have higher trait levels of affection may have a different physiological composition, such as less greater electrical activity in the left prefrontal cortex compared to the right prefrontal cortex (Lewis 2009) than people with lower trait levels of affection. Importantly, people with higher trait levels of expressed affection may also be healthier, on average, than those who are less affectionate, primarily because the affection impacts their physiology. For example, people who are more affectionate tend to have lower glycated hemoglobin (Floyd, Hesse, and Haynes, 2007), higher natural killer cell toxicity (Floyd, Pauley, Hesse, Veksler, Eden, and Mikkelsen, 2010), and higher numbers of antibodies to latent Epstein-Barr virus (Floyd, Strasser, Boren, Veksler, and Hesse, 2010) compared to people who are less affectionate. Floyd's research, in particular, has been instrumental in showing that both giving and receiving affection serve important physiological stress reduction functions (see Floyd 2006; Floyd and Riforgiate, 2009). His research has supported one of the assumptions of AET (Floyd 2006) that expressing and receiving affection activate neuroendocrine responses that mobilize the body to fight against stress.

While both expressed and received affection tend to buffer the effects of stress, received affection has been shown to be a stronger moderator of stress than expressed affection (Floyd et al. 2005; Floyd and Riforgiate 2008). For example, controlling for received affection, Floyd (2006) found that the amount of affection individuals' expressed to others throughout a typically workday was predictive of higher waking cortisol levels and aggregate cortisol values. It was also positively associated with the amount of morning-to-evening decrease in cortisol level, which is a diurnal rhythm that is indicative of healthy adaptation to stress. Typically, affection reduces people's acute physiological stress responses (e.g., cortisol, salivary alpha amylase) and also helps them recover from stressful interaction in laboratory or field tasks. However, cortisol is also a healthy and necessary hormone that helps motivate or energize the body to fight against stress. These cortisol patterns are important because cortisol at waking hours typically energizes the body to combat stress throughout the day and a stronger reduction in cortisol as the day progresses is indicative of the body's ability adapt to the stress (Cannon, 1914; Hellhammer et al., 2009). In another study with twenty married couples,

Floyd and Riforgiate (2008) investigated their reports of expressed and received affection in their marriage. They asked the couples to collect their own saliva samples at four points during the day and assayed the samples for cortisol waking levels, cortisol change, and the cortisol/DHEA-S (dehydroepiandrosterone-sulfate) ratio. Floyd and Riforgiate (2008) found that the amount of affection spouses reported receiving from each other was consistently a stronger predictor of healthy hormone levels than expressed affection. Specifically, they found that spouses' reports of the amount of verbal, nonverbal (e.g., kissing, hugging, touching), and supportive affection received were all predictive of waking cortisol levels, evening cortisol levels, diurnal change, and CDR (cortisol divided by DHEA-S), even after controlling for expressed affection. This work is especially important because it reaffirms that affection affects multiple psychological stress response systems simultaneously. In general, expressed and received affection act as important stress moderators, but received affection tends to serve a stronger protective function.

Another form of affection and touch – kissing – can also have important physiological stress reduction functions in relationships. For instance, fifty-two couples in married or cohabitating relationships were randomly assigned to an experimental group where they were asked to kiss their partner more than they normally do or a control group where they were not told to do so over a 6-week period (Floyd et al. 2009). The results showed that partners in the experimental condition where they increased kissing with their partner reported better perceived stress, were more satisfied with their relationship, and had lower serum cholesterol. (For further reading on haptics, see Chapter 11, Andersen, Gannon, and Kalchik, this volume.)

3.5 Kinesics

Work on kinesics has also explored connections between physiology and bodily cues. Carney, Cuddy, and Yap (2010) examined associations between posture and physiological responses systems. Drawing on high power and low power positions research combined with work on neuroendocrinological responses to power, the researchers predicted that individuals' power poses would influence testosterone and cortisol levels. Specifically, they argued that, because previous research has found that dominant behaviors increase testosterone levels and powerful individuals have lower cortisol levels and reactivity, individuals in high-power poses may experience increases in testosterone and decreases in cortisol compared to individuals in low-power poses. Power positions in the study varied along two dimensions, "expansiveness (i.e., taking up more space or less space) and openness (i.e., keeping limbs open or closed)" (Carney, Cuddy, and Yap 2010: 1364). As predicted, individuals in high-power poses experienced increases in their testosterone levels and decreases in cortisol levels compared to individuals in low-power poses.

The link between kinesics and physiology has also been explored by looking at different types of cues. For example, Gonzaga et al. (2006) explored whether nonverbal affiliative and sexual cues were linked to releases of oxytocin in 63 heterosexual romantic couples. They found a positive correlation between affiliative cues (e.g., smiles and head nods) and oxytocin release, but not for sexual cues (i.e., lip lick, lip bite, lip touch, lip suck, tongue protrusion). Their study is the first to show a link between affiliative nonverbal cues and oxytocin responses in humans, lending further support to arguments for oxytocin's pro-social effects. It remains to be seen, however, if these nonverbal affiliative cues extend well beyond romantic relationships. In addition, there has not been much physiological work that has examined the influence of body positioning, gestures and nodding. (For further reading on kinesics, see Chapter 8, Bull and Doody, this volume.)

4 Concluding remarks

The research on physiology and nonverbal communication has grown rapidly in recent years. Researchers have garnered an incredible amount of information on facial cues, touch, and affection, in particular, and physiology. Interestingly, however, most of this research has occurred in fields outside of communication. Nevertheless, physiological research is quickly becoming an integral part of nonverbal communication research within the field of communication and will continue to do so. As the researchers become more interdisciplinary, the research on physiological processes also becomes more prevalent. When researchers across disciplines are able to share their knowledge and methodological approaches, it makes biosocial research more accessible, creative, and socially meaningful.

The review of the research on nonverbal communication and physiology also suggests numerous avenues for future research across disciplines. The research on facial cues would benefit from being extended beyond primary emotional experiences. For example, how might the experience of fearful surprise alter physiological responses? While disgust and fear/anger result in significantly different physiological responses, how might the dual experience of fear or anger combined with disgust influence such responses? Recognizing the multitude of emotional experiences that often occur simultaneously and/or within the same conversation may enhance the external validity of these findings, as very rarely do emotional experiences happen in a vacuum like when they are tested in a laboratory. Such an approach may require the manipulation of other nonverbal channels as well. For instance, it may be possible for an individual to make a facial expression indicating one emotion while also experiencing another emotion not expressed on his/her face (e.g., expressing disgust on one's face while also expressing fear in one's posture).

As we indicated at the beginning of this chapter, the dysregulation of the HPA and/or SNS has been associated with negative physical and mental health indices (see Kicol-Glaser 2009; Gordis et al. 2006). However, much of the physiological research lacks theoretical grounding for why certain nonverbal behaviors might be associated with certain physiological responses and how these physiological responses, in turn, affect people's health. An important avenue of future research is to better understand the underlying theoretical connections among nonverbal behaviors, physiology, and health. For example, some of the inconsistent findings on facial cues, and the emotions that underlie them, and cortisol could be due to rather crude measurements of emotions as positive or negative rather than the specific facial cues and emotions themselves and their appraisals (Denson, Spanovic, and Miller 2009). As Denson et al. argue, how people respond emotionally and their *appraisals* of the emotions may mediate the effects of stress on people's health. These authors suggest that whether someone perceives a stressor as imminent, as threatening social status, or if it requires extended effort determines how they appraise it and how they respond emotionally, which, in turn, results in a specific physiological reaction. For example, if one perceives a stressor as a threat, it may result in facial cues of surprise, anticipation and disgust, which might predict acute increases in cortisol due to an immediate desire to eliminate the threat. In their meta-analysis, Denson, Spanovic, and Miller (2009) found that global measurements of emotional states were not significantly associated with cortisol. However, the way that people cope with the stressor or the way they appraise it, could affect people's physiological responses, which could alter their health. Ultimately, the deeper theoretical connections among the stressor, nonverbal behaviors, physiology, and health may provide greater insight into why some behaviors influence people's health more than others. The most important avenue of future research is identifying the underlying theoretical infrastructures that connect nonverbal communication and physiology with various outcomes. Researchers also need to clearly define the nonverbal facial cues that they are using to operationalize particular moods and emotions.

Recent research on both verbal and nonverbal communication has also adopted a multi-systems approach. That is, researchers are examining biosocial markers that tap into more than one stress response system in the body. For example, because the HPA and SNS work simultaneously in the body to combat stress, it makes sense to examine biosocial markers that correspond with both systems (e.g., cortisol as an indicator of the HPA and salivary alpha-amylase as an indicator of the SNS). There are still large gaps in the literature about how these stress response systems, and the hormones that are emitted from them, function together when the body is stressed and which ways of functioning are most harmful for people's health. For example, the HPA and SNS could operate in an "additive" fashion whereby both systems operate in a similar or symmetrical manner, resulting in hyper-arousal (i.e., high levels on both systems) or hypo-arousal (i.e., low

levels on both systems) (Bauer, Quas, and Boyce 2002). A counter argument could be that the systems are asymmetrical or “interact” with each other in response to stress (i.e., high on one and low on the other) (Bauer, Quas, and Boyce 2002). Both patterns could potentially result in a dysregulated stress response. Not enough research has been conducted to truly confirm either perspective, though slightly more evidence seems to support the asymmetrical or interactive perspectives for the SNS and HPA predicting maladaptation (see Bauer, Quas, and Boyce 2002; Gordis et al. 2006). In another example of a multi-systems approach, Mehta and Josephs (2010) note that some of the inconsistencies regarding testosterone’s influence on dominance could be explained by its integral role with cortisol. They found that influence of testosterone on dominance depended upon cortisol. They found evidence that the neuroendocrine reproductive (HPG) system and HPA axis interact together to influence dominance. When cortisol was low, high amounts of testosterone increased dominance and higher social status. When cortisol was high, high testosterone encouraged low dominance and social status. In short, because the body’s stress responses systems work simultaneously to address stress, a multi-systems approach can help capture some of this complexity. Tapping into multiple stress response systems might also shed light on some of the inconsistent findings regarding nonverbal communication and physiology. When one hormone is activated and not another, or when one hormone or enzyme is a moderator of the other, it could explain what the nonverbal behavior is activating in the body.

Biosocial research has really only been an active focus of communication scholars over the past ten to fifteen years, with most of this research focusing on verbal communication. Yet, as this review suggests, there is a plethora of nonverbal communication research with connections to physiology that communication scholars could explore. The presence of biological research across disciplines, including the latest research in the field of communication, suggests that it is an extremely important part of the study of nonverbal communication and will continue to be in the future.

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Robert Gifford

13 Personality is encoded in, and decoded from, nonverbal behavior

Abstract: Attempts to deduce personality from nonverbal behavior go back to ancient times and continue in everyday life today. Modern scientific attempts to understand how nonverbal behavior reflects personality began in earnest with Allport and Vernon's work in the 1930s. Brunswik's 1940s lens model provides a useful framework for understanding the encoding, decoding, and encoder-decoder agreement about personality inferences from nonverbal behavior. Since the early 1960s, many studies have investigated one or more of these three processes for the Big Five personality dimensions as well as a dozen other dispositions. The results from this eight-decade effort, although intriguing, remain highly fragmented and incomplete, and progress is challenged by 13 research complexities that are not always taken into account. This chapter summarizes the findings to date and offers an example of a study that employs the full lens model (encoding, decoding, and accuracy) and takes most of the complexities into account.

Keywords: personality, nonverbal behavior, lens model, Big Five, traits, dispositions, body language, kinesics, accuracy, encoding, decoding

"Whoever examines this countenance cannot but perceive in it the traits of fortitude, deep penetration, determined perseverance, and inventive genius." J. C. Lavater (d. 1801)

1 Introduction

Nonverbal behavior and appearance have been assumed to reveal personality for at least 2400 years. Aristotle wrote in *Prior Analytics*, "It is possible to infer character from features, if it is granted that the body and the soul are changed together by the natural affections..." (350 BCE). This thinking re-appeared in the 17th century in the writing of Charles Le Brun, who asserted that nonverbal expression was the royal road to understanding the "passions," and Le Brun offered a "theory of expression" (*Conférence sur l'expression générale et particulière*, 1668). As the Lavater quotation above demonstrates, this assumption remained strong in the century following his death,¹ and writers such as Balzac, Hardy, and Dickens frequently

¹ Lavater's book supposedly went through 150 editions.

used physiognomic character descriptions in their novels. Popularizing writers continued the tradition into the late 20th century (e.g., Young 1993).²

The confidence expressed by Aristotle, Le Brun, and Lavater turned to respectable scientific optimism in the 1930s (cf. Allport and Vernon 1933). However, research over the next several decades led to critiques and pessimism over the claim that personality is clearly encoded in nonverbal behavior or that personality could be decoded through nonverbal behavior (e.g., Bull 1983). This occurred because researchers were reporting various kinds of problems with the proposition that nonverbal behavior and personality have a simple or direct connection. Not long ago, ten species of complexities that cloud the study and nature of the “simple” relation between nonverbal behavior and personality were recognized (Gifford 2006). Nevertheless, the first steps toward further progress involve taking these complexities into account. Progress toward understanding the veritable but complex connections between personality and nonverbal behavior can be made, but it is not easy.

1.1 Early modern history

Probably modern psychology’s first important foray into the question was the important monograph by Allport and Vernon (1933), although they did not attempt to relate nonverbal behavior to particular personality dispositions. At that time, Allport and others, most notably Henry Murray and his colleagues (1938), tended to view personality in much more holistic terms than is the current general tendency.³ Their goal was to find unity (or something close to it) *among* a person’s expressive movements. This may have reflected the Aristotelian proposition that one’s corpus and personality are a unity in which every aspect is mirrored in every other aspect. The purpose of the Allport-Vernon monograph was to investigate whether a person’s expressive movements did indeed exhibit this consistency. Their results were somewhat supportive of this premise: they concluded that two clusters of expressive movements, one “general” and one “specific,” existed, although their reliability was not strong.

The Allport-Vernon book provided some guarded optimism that personality and nonverbal behavior could be profitably studied in a scientific way. However, not much new research appeared for at least three decades. Perhaps the first post-1933 study in this tradition was Exline’s (1963) investigation of visual interaction, who found that need for affiliation⁴ was related to mutual glances, but differently

² Not everyone was enthralled with phrenology. In his sardonic definition, Ambrose Bierce (1911/1999) defined phrenology as “the science of picking the pocket through the scalp. It consists in locating and exploiting the organ that one is a dupe with.”

³ This is reflected in Murray’s (1938) suggested name for the field, *personology*.

⁴ Note the continuing influence of Henry Murray.

for men and women: highly affiliative women look at each other more than less-affiliative women do; the trend for men is the reverse. Exline's study is also notable for recognizing that nonverbal behavior should be examined during interpersonal interactions, rather than implicitly assuming that people express themselves nonverbally without reference to others, as did, for example, the physiognomists.

Since the time of Exline's study, research on the relation between personality (as opposed to other constructs, such as emotion, culture, etc.) and nonverbal behavior has proceeded, but progress has been slow, fitful, and not well recognized even "locally" (by mainstream personality researchers).⁵ The pessimistic view was expressed in fairly stark terms: the expression of personality in nonverbal behavior "cannot be said to be strongly supported by the evidence" (Bull 1983: 113) and "[i]n general, much of the research on personality correlates has shown...relatively weak relationships to nonverbal behaviour ..." (Heslin and Patterson 1982: 131).

1.2 A promising approach

Thus, near the beginning of the 21st century, considerable research remains to be done before the complex connections among personality, nonverbal behavior, and inferences about personality from nonverbal behavior will be well-understood. In this writer's view, much of the progress since the baleful lines above were written in the early 1980s has been based on adaptations of Egon Brunswik's (1956) lens model. Although the lens model was not originally proposed in the context of personality and nonverbal behavior, numerous researchers have found it very useful over the last 25 years, and Brunswik himself did a bit of work pertinent to this theme.

This chapter summarizes the challenges in this research area, much of the work that has been completed, and describes a paradigm that might accelerate progress. It begins by defining some fundamental constructs.

2 Key distinctions: Encoding, decoding, accuracy, and agreement

Encoding (sometimes called ecological validity or cue validity) is the outward, objective, visible manifestation of personal dispositions in nonverbal behavior. The fundamental hypothesis of researchers in this area is that valid encoding does occur. For example, the interpersonal circle or circumplex (Leary 1957; Wiggins 1979) is based on two major orthogonal dimensions (dominance-submissiveness

⁵ The two leading handbooks of personality contain no reference to nonverbal behavior in their indexes.

and warmth-coldness, also known agency and communion). Those four cardinal points are supplemented by four other intermediate points that represent combinations of the cardinal four. Nonverbal behaviors clearly map onto the interpersonal circle (Gifford 1991; Gifford and O'Connor 1987). Nevertheless, a crucial, and still largely unanswered, question remains: how *much* encoding occurs, under which conditions, and for which dispositions?

Decoding (sometimes called cue utilization) is the use by observers of others' nonverbal behavior to infer their personal dispositions.⁶ Decoding doubtlessly occurs in everyday life. The interesting question concerns the *accuracy* of that decoding, by different decoders, for different dispositions, under different conditions. Throughout this chapter, the terms encoding and decoding will be used for clarity, but it is well to remember that these are not restricted to exotic targets and special observers: we are all encoders and we are all decoders. Furthermore, this moment's encoder is also this moment's decoder.

Accuracy is the degree to which decoding correctly infers encoding. It is a simple enough concept, but measuring accuracy is problematic. The validity problem occurs because we cannot be sure that self-reports are accurate,⁷ although they are often treated as if they are. In fact, we can *never* be certain about a person's true dispositions because they are not, by nature, physically observable entities. Probably the best approximation to their veracity is a combination of assessments by people who know a person well, but even this may not be perfectly accurate (cf. Funder 2003; Kenny 1994).

A second main problem involving accuracy is this: How well do decoders detect the (true) level of an encoding person's dispositions from that person's nonverbal behavior? In the typical study, decoding accuracy is measured as the discrepancy or correlation between the decoder's assessment of the disposition and the encoder's self-rating (or the ratings by the encoder's significant others). Given the fallibility of ratings, even those by the encoding person's significant others, personality ratings cannot be granted the status of Truth. Nevertheless, they obviously possess *some* validity; in fact, they probably hold considerable validity: they are, after all, the views of encoding persons by those who know them well.

Given that encoders' self-assessments and those by significant others may not be flawless, to tarnish any lack of agreement with their assessments of the encoding person's personality on the part of decoders as inaccurate would be unreasonable. Furthermore, decoding has its own inherent interest as the view of third parties who have observed the encoder's nonverbal behavior, with the advantage of some

⁶ Encoding, for this author, refers to any degree of validity between a personal quality and a nonverbal behavior. Decoding similarly refers to the *effort* of another person to discern qualities of another person; it does not necessarily mean that the other's inferences are *accurate*. Neither encoding nor decoding are either "on" or "off" – both occur in degrees or probabilities.

⁷ Or, for that matter, that they are *inaccurate*!

perspective, detachment, and often, objectivity, but also with some degree of bias, stereotyping, attraction or repulsion.

Thus, the two assessments of the encoder's disposition should be granted equal ontological status, and any difference between the two assessments should be characterized as a *discrepancy* rather than as *decoder error*. In sum, neither the encoder's nor the decoder's rating is necessarily valid, and therefore the neutral term *agreement* should be used, rather than accuracy.

3 Thirteen complexities

The decoding of personality is fraught with problems. As just one example, assessments of an encoder's dispositions vary with the type of information available. Participants in a personnel study (Motowidlo et al. 1996) who were unacquainted with the person being interviewed saw either a silent videotape of the interview (that is, only the visible nonverbal behavior), or read a transcript of the same interview (thus, no nonverbal behavior). The correlations between the assessments based on the visual and the transcript presentations of the person's extraversion and conscientiousness were $r = 0.27$ and $r = 0.30$ respectively; that is, they shared about nine percent of their variance. Given that the overlap between the assessments based on transcripts and visual information was quite low, they cannot both be accurate. Which assessment of the two dispositions was more accurate: that based on the person's words, as written, that based on the wordless nonverbal behavior, or neither?

Current knowledge about nonverbal behavior and personality will be surveyed shortly, but conclusions must be considered with care, given that at least 13 complexities that can lead to Type I or Type II errors or other validity problems. Because ten of these complexities have been described at length (Gifford 2006), they will be only briefly described here, and three additional complexities will be described after the ten. Although some of the complexities are obvious, they are mentioned because one still sees manuscripts whose authors seem unaware of these issues or, what's worse, attempt to skirt them.⁸

First, all measures should have adequate internal consistency and interrater reliability (usually, at least 0.75, but 0.80 or better is desirable). Single-item scales probably would be unreliable on the basis that fewer items usually make for less-reliable scales, but their internal consistency reliability cannot be estimated any way.

⁸ Note recent critiques of research by Simmons, Nelson, and Simonsohn (2011), Fiedler (2011), and others that raise issues about how psychological research is conducted with a bias toward reporting (possibly) false-positive results.

Second, the disposition should be investigated in a context in which the nonverbal behavior with which it is hypothetically associated might reasonably occur. For example, interpersonal traits should be investigated in interpersonal contexts; conscientiousness in situations that call for carefulness, etc.

Third, research must consider the very real power of environmental or situational factors to influence both encoding and decoding. Dispositions are not omnipotent influences on the expression of nonverbal behavior, as is obvious when one considers how an extravert might behave at a party versus at a funeral. Or, one's expressed emotions can importantly influence one's perceived personality (J. A. Hall, Gunnery, and Andrzejewski 2011). Being assigned a role that does not fit one's preferred interpersonal role (e.g., being asked to act in a submissive position when one prefers a dominant position) can change the expression of nonverbal behavior (Schmid Mast and Hall 2004). Instructions given to decoders, and the social context of decoding, also may affect that process. For example, if interviewer-decoders only hear or only see interviewees, their personality assessments of the candidates vary (De Groot and Gooty 2009).

The fourth complexity relates to the nature of the encoder's activity while encoding is being investigated, such as (for example) when individuals are lying versus telling the truth (cf. Vrij, Akehurst and Morris 1997) or even whether the two people shake hands (Bernieri and Petty 2011); the encoding of personality changed with the nature of the encoder's communication task.

Fifth, problems can result when different sources of behavior ratings or observations are treated as equivalent when in fact they are not. For example, in some studies, nonverbal behaviors are scored from encoders' self-reports while others are scored from the observations by decoders (cf. Campbell and Rushton 1978), which can lead to differing apparent relations between nonverbal behaviors and personality.

The same can happen with dispositions: different report-sources for the same disposition may correlate differently with a given nonverbal behavior. Self-awareness of nonverbal behavior has a tendency to blindness (J. A. Hall, Murphy, and Schmid Mast, 2007; Hofmann, Gschwendner, and Schmitt 2009). In a study that illustrated the problem of considering encoder-ratings and ratings by others to be equivalent, encoder-report measures of emotional expressiveness yielded different relations to a disposition (neuroticism) than did rated behavioral assessments of emotional expressiveness by others (Riggio and Riggio 2002).

Sixth, relations between personality and nonverbal behavior can differ with different combinations of traits. For example, individuals who are shy *and* sociable avert their gaze more and engage in more self-manipulation than others (Cheek and Buss 1981), but this was not true of the other combinations (e.g., shy but *not* sociable persons).

Seventh, dispositions can be encoded by a *group* of behaviors without any single behavior doing so (cf. Aries, Gold, and Weigel 1983).

The eighth complexity is related to gender: a given encoding-personality relation may be true for one gender, but not for the other (e.g., Gangestad et al. 1992; Levy and Duke 2003; Lippa 1998; Schmid Mast and Hall 2004). In a study that used moving stick figures as encoders, those representing male figures were decoded more as emotionally stable and extraverted; those representing females were decoded more as agreeable (Koppensteiner and Grammer 2011). Also, male and female dancers encode personality differently in their movements (Levy and Duke 2003).

Ninth, encoding may also vary with the gender *composition* of an interacting group: significant encoding may occur in same-gender groups, but not in mixed-gender groups (Aries et al. 1983). That is, correlations between encoders' dispositions and their nonverbal behavior may be found when they interact with members of the same gender, but not when they interact in mixed-gender groups.

Tenth, personality is encoded by nonverbal behavior differently across cultures. That is, not only are there cultural differences in the amount or frequency of nonverbal behaviors (e.g., E. T. Hall 1966), but nonverbal behavior may differentially encode (correlate with) dispositions in different cultures (e.g., Andersen and Guerrero 1998).

Eleventh, researchers employ a range of expressive behaviors that varies from complex, overall patterns (e.g., nonverbal involvement) to single acts (e.g., blink rate). Perhaps the first scientific approach to the question, that of Allport and Vernon (1933), favored the macro approach. Others from the early days favored a particular act, such as in Exline's (1963) study of gaze. This variation in behavior scale is natural, given the different goals and approaches of researchers, but one wishes that this variation were more systematic and less idiosyncratic. As it is, the literature is an unruly hodge-podge of micro and macro nonverbal measures. A sub-problem is that some micro behaviors are *part of* macro behavior packages, so that the micro behavior results often are lost in the packages.

Twelfth, but related to the foregoing, nonverbal behavior is examined as an expression of personality at different body parts and scales. Some work focuses on the eyes, some on the face, some on the nonverbal aspects of speech, some on posture or gesture, some on trunk orientation, some on hands, legs, or feet, and some on whole-body movement. Nonverbal behavior assessment tools that include every part of the body have been developed (e.g., SKANS 5.2; Gifford 1994b), but they do require more time and effort.

Finally, on the personality side of the equation, researchers have investigated a large array of dispositions. These include the Big Five (openness, conscientiousness, agreeableness, extraversion, and neuroticism), but also dominance, internal-external locus of control, field dependence, self-monitoring, attachment style, emotional expressiveness, Type A-B personality, trait anxiety, psychopathology, socio-sexual style, and need for achievement, among others. To do so is not incorrect – in fact, it is necessary to the eventual full scientific understanding of personality

and nonverbal behavior – but in concert with the other dozen complexities, it adds to the difficulty of research in the area. At minimum, researchers should be aware of these 13 complexities. Better yet, each should be acknowledged in every report. Best of all, each one that applies should be correctly dealt with.

4 The holey matrix

A hopeful reader might wish that this review of the literature would produce something like a tidy, completed matrix comprised of rows of nonverbal behaviors, from micro to macro, crossed with columns of personality dispositions, with the resulting cells plump with clear and informative study results. Such a reader will be sorely disappointed. When such a matrix is constructed, as was done in preparation for this chapter, approximately 85% of the cells are empty. Even more discouraging is the realization that most of the cells in the 15% that have an entry are filled with one or two studies.

In considering the pattern of results for the few personality dispositions on which many studies have been conducted and meta-analyzed [e.g., J. A. Hall, Coats, and Smith LeBeau (2005) for dominance or La France, Heisel, and Beatty (2004) for extraversion], the reviewer is forced into greater diffidence. One learns that positive encoding correlations in any given study may well be offset by negative or neutral correlations in another. If only one or two studies (or none!) exist in a cell, conclusions so far must be very tentative.

Further, given the unavoidable lack of generalizability in most studies, caused by the particularities of the participants in any one of them (the encoders' and decoders' age, gender, and culture, among many other known influences on nonverbal behavior), one must conclude that about 80 years into this enterprise (since Allport and Vernon), the study of personality's expression in nonverbal behavior remains in its infancy. The positive side of this is that plenty of opportunity remains for the ambitious young researcher!

5 So, what *do* we know?

As might be expected, some studies focus on encoding, some on decoding, and a few focus on the full lens model, that is, they include encoding, decoding, and an estimate of agreement between the encoder's measured personality and decoders' assessments of the encoder's personality in a single data set. An example is described later.

We might also ask, what is personality? Its many constructs will be grouped in this chapter into the Big Five (agreeableness, openness, extraversion, conscien-

tiousness, and neuroticism), plus dominance, internal-external locus of control, field dependence, self-monitoring, attachment style, emotional expressiveness, Type A-B personality, trait anxiety, psychopathology, sociosexual style, and need for achievement. Others await researchers' attention.

5.1 Encoding

We now survey what is known from studies that focus on encoding. In an ambitious study that might serve as a broad generalization, many expert-chosen behavioral criteria were correlated with encoder-rated Big Five dispositions (Back, Schmukle, and Egloff 2009). Each disposition could be predicted at $r = 0.30$ or better from the aggregated behaviors, which is a hopeful sign (but correlations for the specific behaviors assigned by the experts with the Big Five dispositions were not reported, which is unfortunate). The findings are presented by disposition.

5.1.1 Agreeableness

One example of a relatively straightforward encoding study comes from a study of interacting female dyads (Berry and Hansen 2000). More agreeable women gestured more, used more open body postures, visually attended to their interaction partner more, used fewer visual dominance behaviors, and displayed fewer negative facial expressions than did less agreeable women. Warm-agreeable individuals nod more (Gifford 1994a). An interesting study measured dancers' bodies as they responded to six genres of music using an optical tracking system. Finnish university students were selected to represent either quite high (67th percentile or higher) or quite low (33rd percentile or lower) on each of the Big Five dimensions. Five kinds of movement were measured: local movement, global movement, hand flux, head speed, and hand distance. Those with greater agreeableness scores used more local movements than those with lower agreeableness scores (Luck, Saarikallio, Burger, Thompson, and Toivainen 2010).

5.1.2 Openness

Women who were more open to experience visually attended to their interaction partners more than those who were less open to experience (Berry and Hansen 2000). Dancers in the music-stimulus study who had higher openness scores engaged in more local movements than those with lower openness scores (Luck et al. 2010).

5.1.3 Extraversion

Perhaps the most-studied personality dimension is one that includes such related constructs as extraversion, approach (vs. avoidance), sociability, need for affilia-

tion, low social anxiety (Patterson and Strauss 1972), gregariousness, and less shyness. Individuals on the more-social end of this spectrum tend, not surprisingly, to choose closer seating arrangements (Cook 1970; Mehrabian and Diamond 1971; Patterson 1973; Pedersen 1973), look more at others (Daly 1978; Exline 1963), make more eye contact (Borkenau and Liebler, 1995; Kendon and Cook 1969), speak more (Campbell and Rushton 1978; Daly 1978), speak more loudly and faster (Borkenau and Liebler, 1995; Siegman 1978), have friendly and more self-assured expressions (Borkenau and Liebler, 1995), smile and laugh more (Borkenau and Liebler, 1995; Ruch and Deckers 1993), and nod more (Gifford, 1994a) than individuals on the less-social end of the spectrum. More extraverted persons also use more gestures (Gifford 1994a) and faster and more energetic gestures using the hands farther from the body (Borkenau and Liebler, 1995; Lippa 1998) than more introverted persons, and have a more refined appearance (Borkenau and Liebler, 1995).

Illustrating complexity three above (that situational influences matter), the oft-found tendency for people who have more sociable or interpersonal dispositions to nonverbally engage others (e.g., closer interpersonal distance), women with stronger interpersonal orientations who also found themselves in a hostile interaction actually leaned forward more often than chance, and those with weaker interpersonal orientations leaned backward more often than chance in friendly interactions (Smith and Ruiz 2007).

A meta-analysis concluded that across many nonverbal behaviors, the correlation with extraversion averaged $r = 0.13$ (La France et al. 2004). However, not all known studies were included, and perhaps some behaviors were examined in the studies sampled that should not have been, except in an exploratory sense, which might have reduced the magnitude of this average correlation. For example, in one study not in the sample (Gifford 1994a), the multiple encoding correlation between extraversion and four nonverbal behaviors was 0.41. In the meta-analysis (La France et al. 2004), nonverbal behaviors in some studies were strong encoders of extraversion: longer ($r = 0.73$) and more frequent ($r = 0.65$) gaze, more talking than silence ($r = 0.64$), fast ($r = 0.59$), broad ($r = 0.57$), and more frequent gestures ($r = 0.52$), and a “full” voice ($r = 0.53$), as well as another dozen behaviors with correlations over 0.40.

5.1.4 Conscientiousness

Dancers with higher conscientiousness scores in the music-stimulus study exhibited more global movements, head speed, and hand distance than those with lower conscientiousness scores (Luck et al. 2010). They have a more refined and formal appearance (Borkenau and Liebler, 1995).

5.1.5 Neuroticism

In the same study, dancers with higher neuroticism scores exhibited more local movements, but fewer global movements, and less hand flux, hand distance, and head speed than those with lower scores (Luck et al. 2010).

5.1.6 Dominance

Dispositional dominance is the tendency to prefer power in interpersonal interactions, but individuals with this trait are not necessarily in actual positions of power. Many studies have examined the encoding of dispositional dominance. For example, in one (Levy and Duke 2003), males who describe themselves as higher in dominance were less likely to engage in “enclosing” movements than males who described themselves as low on dominance. They gesture more, manipulate objects less, extend their legs more and lean their legs outward more while sitting (Gifford 1994a).

A meta-analysis found very mixed results (J. A. Hall et al. 2005), but it should be noted that personality dominance was often not distinguished from other forms of “vertical” (i.e., power-related) attributes of the encoders. Most *visible* nonverbal behaviors, such as smiling, gazing, nodding, gestures, and facing orientation did not consistently reflect trait dominance, perhaps contrary to popular stereotypes of the dominant person. To be clear, some studies have found those connections, but others have not. A few visible behaviors more consistently encode trait dominance: smaller interpersonal distance, more open posture, more facial expressiveness, and skill at posing emotions. Quite a number of *vocal* behaviors also showed no consistent relation to trait dominance in the meta-analysis, but some did: dominance tendencies are consistently encoded in louder speaking, interrupting others more (especially in successful interruptions), speaking with less variability, and speaking with a more relaxed voice.

5.1.7 Internal-external locus of control

This personality dimension taps the notion that some people generally think of themselves as in control of events that touch them, whereas others tend to think of themselves as controlled by influences outside themselves (Rotter 1966). Some evidence suggests that “externals” prefer lower levels of involvement because they are uneasy because they sense that they have little control in a social interaction (Duke and Nowicki 1972). However, other evidence suggests a different pattern: “internals” spoke less and looked at others less than did “externals” (Rajecki, Ickes, and Tanford, 1981), so more research is needed in this area. Children with more internal, rather than external, locus of control tendencies smile more and engage in fewer off-task activities (Carton and Carton 1998).

5.1.8 Field dependence

The cognitive styles of some people lead them to rely on their surroundings, whereas others tend to rely on internal referents (Witkin and Goodenough 1977). The former (“field dependents”) usually choose closer interpersonal distances (Holley 1972), look at others more (Nevill 1974), and use more dependency-oriented

nonverbal behaviors, such as the palms up gesture, touching their mouths, and more lip and tongue activities than the latter (“field independents”) (Greene 1973).

5.1.9 Self-monitoring

Some people appear to monitor their actions more than others. As might be expected from this, “high self-monitors” tend to be better at controlling the display of the most desirable aspects of their expressive behaviors than “low self-monitors” (Lippa 1976). They also are more likely to initiate conversation, feel more self-conscious about their actions, and rely on their conversational partner’s actions as a guide for their own (Ickes and Barnes 1977). Because “high self-monitors” also actively check social cues, they are more likely to vary their nonverbal involvement across situations depending on their assessment as to whether more or less involvement is appropriate.

5.1.10 Attachment style

Individuals with avoidant attachment styles tend to choose larger interpersonal distances (Kaitz et al. 2004), as do those with greater social anxiety (e.g., Patterson 1973) and weaker affiliative tendencies (e.g., Mehrabian and Diamond 1971).

5.1.11 Emotional expressiveness

Some people are expressive in the sense that they laugh, touch, and hug more, and seem more like actors or actresses (H. S. Friedman, DiMatteo, and Taranta 1980). Male encoders at risk for heart attacks who assessed themselves as less emotionally expressive engaged in more “repressed” nonverbal behaviors, such as crossing their legs more, playing with small objects while talking more, using more body-focused gestures, and clasping their hands less (H. S. Friedman, Hall, and Harris 1985). They also spoke less and engaged in less eye contact. This “repressed” pattern also distinguished between presumed healthy encoders (Type Bs and healthy Type As) and unhealthy encoders (unhealthy Type As and “false” Type Bs).

5.1.12 Type A-B personality

Encoders in the H. S. Friedman et al. (1985) study who scored high on Type A personality used more defensive and hostile nonverbal behaviors, such as closed fists, leg movements, hand-to-head contact, and emphatic object-focused gestures.

5.1.13 Trait anxiety

Individuals with greater social anxiety tend to choose larger interpersonal distances (Patterson 1973). In the study that examined dispositions in relation to impro-

vised dance-like movements (Levy and Duke 2003), males who rated themselves as higher in trait anxiety employed “enclosing” movements (e.g., hands in pockets, hunching shoulders, hang head) more than those who rated themselves as lower on trait anxiety. More anxious females were less likely to use “sagittal” (horizontal) body movement or to “emphasize effort” in their movements.

5.1.14 Psychopathology

Among incarcerated males, greater psychopathology is encoded as greater verbosity but also more speech hesitations, increased blinking, and greater use of illustrators. When they told lies, they also increased their head movements (Klaver, Lee, and Hart 2007).

5.1.15 Sociosexual style

This tendency refers to whether a person needs little or much “closeness” before choosing to engage in sex. Men who are more “unrestricted” (need little) smile, laugh, gaze more directly, and engage in more flirtatious glances than more “restricted” (need much) men (Simpson, Gangestad, and Biek 1993). “Unrestricted” women lean forward more and cant their heads more than “restricted” women.

5.1.16 Need for achievement

In the expressive movement study (Levy and Duke 2003), males who described themselves as higher in this trait were less likely to engage in “enclosing” movements than males who described themselves as low on need for achievement. The authors view the high need for achievement males as expansive, erect, outward-oriented, with heads up.

5.2 Decoding

Whether or not dispositions are encoded in nonverbal behavior, decoders quite strongly believe that they are (cf. Gifford 1994a; J. A. Hall et al. 2005). For example, in an early study, personnel managers were quite confident that job application photographs revealed the applicants’ character (Viteles and Smith 1932). Individuals who speak in a tight-lipped manner or who turn their heads while speaking may be decoded as “uptight,” those who speak with a hand over their mouths or smile with a closed mouth as shy, and those who smile less as too serious (Ferrari and Swinkels 1996). Decoders’ ratings of encoders’ traits may be reliable, but sometimes they do not correlate with any of the encoders’ physical features or nonverbal behavior (e.g., Cleeton and Knight 1924), let alone encoder personality.

So, are decoder assessments of encoder personality mere “decoding errors” (Bull 1983)? The Bull et al. (2010) study suggests that not only might decoders misdiagnose a given disposition in others, they might confuse a benign disposition with a dangerous one. Decoders appear to decode *confidently* and with strong consensus (Gifford 1994a; Lippa and Dietz 2000), but the evidence that they do so *accurately* is mixed or even discouraging. Other possible reasons for decoding inaccuracy are that transitory emotions expressed by a person can lead decoders astray when they infer dispositions (J. A. Hall et al. 2011), and the decoder’s social knowledge, motivation to read others, development (age) and ability to multi-task (McLarney-Vesotski, Bernieri, and Rempala, 2006, 2011).

On the positive side, some research shows that removing nonverbal behavior from a job interview (by conducting it by telephone, as opposed to in person) reduces accuracy (Blackman 2002). Thus, nonverbal behavior certainly *can* contribute to accurate judgments.

In sum, perhaps decoding is best considered *as* decoding, and nothing more; prudence and experience certainly dictates against thinking of it as a necessarily valid measure of encoder personality. However, decoding does have its own, independent scientific charm as a valid measure of person perception. What do we know?

5.2.1 Agreeableness

Gifford (1994a) reported that decoders believed that 14 head, trunk, hand, and leg behaviors displayed by people in conversations signalled warm-agreeableness (of these, only one—nodding more—encoded warm-agreeableness). The strongest of these were attending more to others, smiling more, leaning forward, and keeping legs straight, calm, and together. An interesting study that manipulated mere stick figures and asked participants to decode their personality (Koppensteiner and Grammer 2010) reported that stick figures that displayed a small amount of body activity, interrupted by phases of high activity were regarded as more agreeable. Borkenau and Liebler (1995) found that a friendly and smiling expression and a pleasant, calm voice was decoded as more agreeable. Those who seem to enjoy interacting, express warmth, talk *with* rather than *at* others, interrupt others less often, and are not condescending or cynical are seen as agreeable (Funder and Sneed 1993).

5.2.2 Openness

Stick figures that displayed pronounced changes in their movement direction were decoded as more open, and those that used rounder movements and more head movements were decoded as less open (Koppensteiner and Grammer 2010). More pleasant, fluent speech, effortful reading of text, and a less indifferent expression

were significant behavioral decoding indicators of openness (Borkenau and Liebler 1995).

5.2.3 Extraversion

Quite a number of encoder actions are decoded as extraversion. Some of these include more friendly and smiling facial expression, stronger voice, more energetic and self-assured body movement, greater originality of speech content, direct looks, more fashionable dress and hair, and smaller interpersonal distance (Back, Schmukle, and Egloff 2011; Borkenau and Liebler, 1995; Funder and Sneed 1993). In the stick-figure study, greater extraversion was attributed to figures that engaged in greater total activity, more horizontal and vertical arm movement, and smaller fluctuations in their rate of movements (Koppensteiner and Grammer 2010). More relaxed gait and more head movements are also decoded as more extraverted (Borkenau and Liebler, 1995). Individuals who speak with a hand over their mouths or smile with a closed mouth are decoded as being more shy (Ferrari and Swinkels 1996). Fourteen acts were believed by decoders to reflect encoders' gregariousness-extraversion in Gifford's (1994a) study (in this case, three of those acts, more nodding and gesturing and thus less arm wrapping, did encode gregariousness-extraversion). The strongest of these were gesturing more, shaking the head more, and holding the head back.

5.2.4 Conscientiousness

Moving one's head less (at least as a stick figure) was decoded as being more conscientious (Koppensteiner and Grammer 2010). A more refined, formal appearance and more effortful reading of text signalled conscientiousness for Borkenau and Liebler's (1995) decoders. To those in Funder and Sneed's (1993) study, it was marked by slower speech, constant eye contact, displays of ambition, interest in the partner's views, and interest in intellectual matters.

5.2.5 Neuroticism

Teacher-decoders rated encoder-students who touched themselves more, paused more during conversations, and engaged in fewer expressive gestures as more neurotic (Campbell and Rushton 1978). Yet in the stick figure study, when encoders moved their head more, made sudden changes in their rate of activity, and changed the "dominant activation" of their body often, they were decoded as being more neurotic (Koppensteiner and Grammer 2010). Individuals with less-friendly and un-self-assured expressions, less smiling and less pleasant voices who spoke in a more tense, awkward, or uncomfortable, or "hectic" manner were seen as more neurotic (Borkenau and Liebler 1995; Funder and Sneed 1993).

5.2.6 Dominance

Researchers have investigated putative nonverbal “power codes” (Schwartz, Tesser, and Powell 1982) and the “shared meaning” of postures (Kudoh and Matsumoto 1985). “High-persuasive” nonverbal behavior patterns in encoders (direct gaze, more gestures, fewer self-touches) are decoded as indicating that the encoder is more assertive, forceful, and powerful (Hart and Morry 1997).

Decoders apparently believe that as many as 35 cues reveal sender power or dominance (Carney, Hall, and Smith LeBeau 2005). The Gifford (1994a) study alone found 10 such acts (two of which actually encoded dominance: gesturing more and extending one’s legs more while seated; the strongest others were orienting the head left and right more, shaking the head more, and leaning back more). As for most qualities, however, decoding strength (i.e., correlations between decoder attributions and nonverbal behaviour; called cue utilization by some authors) is stronger than encoding strength (the correlation between encoder personality and nonverbal behavior; called cue validity by some authors) (J. A. Hall et al. 2005). The main cues used by decoders, according to the authors’ meta-analysis, include more gazing, lowered brows, more facial expressiveness, more gestures, greater body openness, small interpersonal distances, more nodding, less self-touching but more touching of others, and a louder, lower, and more relaxed voice with faster speech (J. A. Hall et al. 2005), though as noted earlier personality dominance was often not distinguished from other forms of interpersonal power in that review. (For further discussion of the relation of power and dominance to nonverbal behavior, see Schmid Mast and Cousin, Chapter 20, this volume.)

5.2.7 Narcissism

Individuals who, upon first meeting others, display flashy and neat clothing, charming facial expressions, self-assured body movements, and humorous verbal expressions tend to have more narcissistic personalities (Back, Schmukle, and Egloff 2010). Unfortunately, these cues also predict perceived popularity, and thus the negative consequences of becoming involved with a narcissist are facilitated by the concurrent inference that this is a popular (and thus presumably desirable) person. Indeed, in brief exposures, more narcissistic individuals are rated more positively than less narcissistic individuals (Back et al. 2010; J. N. W. Friedman et al. 2006).

6 Decoding ability and decodability

A variant on the study of decoding is the study of decoding *ability*, sometimes called nonverbal sensitivity (e.g., Rosenthal 1979). Decoding as a skill related to the decoder’s own experience and background is often applied to constructs other

than personality, particularly emotion (e.g., Mullins and Duke 2004). Apparently, more intelligent decoders are more accurate (Lippa and Dietz 2000), at least for some dispositions: more intelligent university-student decoders assessed dispositional extraversion and an omnibus (across-dispositions) measure more accurately than less-intelligent university-student decoders.

On the decoding side of the lens, which dispositions are easiest to decode from nonverbal behavior? Several studies (e.g., Ambady, Hallahan, and Rosenthal 1995; Borkenau and Liebler 1992; Gifford 1994a; Lippa and Dietz 2000) report that sociability or extraversion is the most legible or accurately discernible disposition. However, this may be a function of complexity two (domain relevance): most studies use conversations as the activity, and extraversion is particularly salient for conversations.

7 Full-lens studies

7.1 Full-lens studies are most informative

Few studies have investigated the full lens, that is, encoding, decoding, and accuracy, in the same sample. Most studies have examined either encoding or decoding, which disallows the possibility of understanding the relations between the two processes, and encoder and decoder measures cannot be investigated in relations to intervening variables such as nonverbal behavior.

For example, one study showed that encoder and acquainted decoder ratings of encoders' personality were better correlated than encoder and unacquainted decoder ratings of it, but the researchers did not investigate the behavioral cues on which the ratings were based (Funder and Colvin 1988). Watson (1989) noticed this gap and called for studies of judgments that also include behavioral cues. Nevertheless, many "cueless" studies are still reported (e.g., Ambady et al. 1995; J. N. W. Friedman et al. 2006). For example, "sociable" encoders were found in the Ambady et al. study to be more legible (that is, easier to "read" or accurately decode) than less sociable encoders, based on encoder-decoder agreement, but the pathways or mediating behaviors underlying this phenomenon were not examined. A few years later, these results were replicated, and many potential mediating cues were investigated. Extraverts used more energetic gestures, kept their hands farther from their bodies, and changed their facial expression more than introverts (Lippa 1998).

7.2 The elements of a full-lens study

The advantages of including all three phases (encoding, decoding, and an estimate of accuracy) within one study design are many and important. In one such study,

the nonverbal behaviors of conversing individuals as a function of eight interpersonal circle dispositions were reported by Gifford (1994a). This section proposes a paradigm based on that study, one that may deal with the crucial accuracy problems in the most useful way. Its essential feature is that encoding and decoding are both included in the same study.

The proposed paradigm includes the following elements: reliably measured personality constructs⁹ that are investigated within the context to which they apply, and three independent groups of raters are used: (1) the encoder-rated personality or raters who know the encoder well, (2) raters trained in a carefully developed nonverbal behavior scoring system, and (3) decoders of the encoder's personality, who are unacquainted typically with the encoder, so that their ratings are not influenced by previous personal experience with the encoder.

More particularly or operationally, the paradigm's structure is an adaptation of Brunswik's (1956) lens model (Figure 1). Encoding (or what Brunswik called ecological validity) is represented by the lines connecting personality to nonverbal behavior. Encoding, as defined here, occurs when reliable self-assessments significantly correlate with reliably scored nonverbal behaviors. Inferences from these cues (decoding, or what Brunswik called cue utilization) are represented by the lines connecting nonverbal behavior and impression formation on the part of the decoders.

Decoding, as defined here, occurs when reliable decoder assessments are correlated with reliably scored nonverbal behaviors. The curved line linking the ratings of the encoders' dispositions with the decoders' ratings of those dispositions represents what Brunswik called achievement, or what is here called agreement.

The large oval signifies the context in which the judgments are made. Encoding and decoding are influenced by the context in which they occur. What transpires in a conversation may not flow the same way in a debate as during a business discussion, a romantic interaction, or an interrogation, or in interactions within versus across cultures. One illustration of this comes from a study of deception (Vrij et al. 1997). In this study, the encoders were interviewed twice, once when they told the truth and once when they lied. Encoders with higher levels of public self-consciousness used their hands differently (less) when they lied than when they told the truth. Thus, the adapted lens model in Figure 1 requires its surrounding oval to signify the context in which the encoding and decoding occur. Few studies have done what seems most productive, however, that is, to investigate all three processes and the relative strengths of encoding, decoding, and agreement, and to take the context into account in order to provide some understanding of *how* nonverbal behavior communicates (and mis-communicates) personality. Some

⁹ The paradigm could, of course, be used for any hypothetical construct, such as intelligence (cf. Reynolds and Gifford 2001), motivation, or attachment style. Personality simply is the current topic.

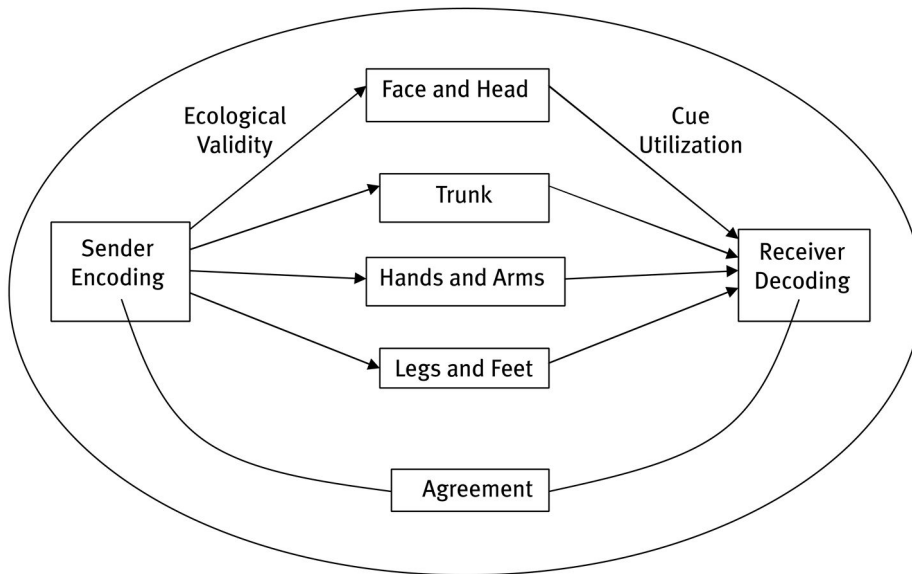


Figure 1: The contextual lens model (Brunswik, 1956), updated. An oval should be imagined around the diagram that would represent the larger social context in which the interaction occurs.

notable exceptions that focus on nonverbal behavior and dispositions include those by Borkenau and Liebler (1992) and Lippa (1998).

The paradigm is employed, in part, to understand the cue-utilization policies of decoders, individually or in aggregate. Some early studies focused on individual abilities, such as those of clinicians (e.g., Hoffman 1960) and found that their judgments, as revealed through their use of cues, do not match well with their own impressions of how they use those cues. Another individual-level focus has been on the ability or sensitivity of individual decoders (e.g., Rosenthal 1979). In contrast, when researchers have more nomothetic goals (“How do *people* decode?”), their studies combine the ratings of multiple decoders who, ideally, represent a defined population or even “everyone.”

Of course, if decoders in general or from a particular group utilize nonverbal cues idiosyncratically, the interrater reliability of their encoder disposition ratings will be low, and it will be inappropriate to correlate their ratings with the nonverbal behavior scores (decoding correlations) or with the encoder-ratings (agreement correlations). Thus, studies with nomothetic goals depend on, and therefore must hypothesize, that a group of decoders will reliably agree on encoders’ dispositions. If a specified group of decoders do not agree, then conclusions about their cue-utilization policies cannot be stated, probably because members of that group do not use the same cues.

7.3 Development of the full-lens paradigm

The earliest study that used this paradigm was one by Brunswik himself in 1945, although it was not reported until later (Brunswik 1956: 26–29). The central cues he employed were, perhaps appropriately enough for a first and early study, physiognomic: encoder's height of forehead, length of nose, etc. A decidedly *verbal* study using the paradigm to study extraversion in relation to vocal behavior was published two decades later (Scherer 1978). In one study that fulfilled most of the goals of the proposed paradigm, behavioral cues were examined as mediators of the encoding-decoding process (Borkenau and Liebler 1992). The same decoders served as raters of the physical cues and as decoders, however, which compromised the independence of the behavior scores and trait ratings.

Perhaps the first study that examined nonverbal behavioral mediators and used behavior scorers who were independent of both encoders and decoders was that of Gifford, Ng, and Wilkinson (1985). That study identified nonverbal cues exhibited by job applicants that mediated (and failed to mediate) agreement between job applicant and personnel officer assessments of the applicant's social skill.

7.4 The potential outcomes of full-lens studies

Before describing the paradigm in more detail, it may be useful to discuss the generic potential outcomes of studies that use this paradigm. The first assumption is that all the judgments (e.g., encoder-ratings, behavior scoring, and decoder ratings) are reliable; if some are not, they cannot be used with any pretence of validity. In general, encoding, decoding, and agreement may be weak or strong for any disposition, and the pattern of results may be different for each disposition.

The first type of potential outcome occurs when, for a given disposition, encoding, decoding, and agreement all are weak. In this case, (1) personality is not consistently reflected in nonverbal behavior (at least not in the behaviors studied), (2) decoders do not use this set of behavior cues to arrive at their inferences, and (3) decoder inferences do not agree with the encoders' self-assessments or knowledgeable others' assessments of the encoders.

Second, if decoding is strong but encoding is weak, decoders apparently are using invalid stereotypes. (One suspects, without the benefit of data, that this was the case with Lavater and his fellow physiognomists.) Agreement should be weak in such a case, because there are no true relations between personality and nonverbal behavior for decoders to decode legitimately.

Third, if strong encoding but weak decoding is found, decoders are unable to deduce correctly which nonverbal cues reflect the encoders' personality. The potential for strong agreement is present, but it is unrealized.

Fourth, if agreement is strong but both encoding and decoding are weak, decoders must be using nonverbal behaviors for decoding that the researcher has not measured. Some nonverbal cue or other must have been providing valid information about the encoder's personality, or agreement would not be possible. The researcher must explore the impression formation process, perhaps through interviews with decoders, to learn which unstudied nonverbal cues the decoders might have been using to succeed in matching the assessments of the encoders.

Fifth, if weak encoding and high agreement are found, decoders again must be using valid but unmeasured nonverbal cues, unless the unlikely case that the decoders are clairvoyant holds true (Reichenbach 1938). As Wiggins (1973: 159) wryly noted, "(s)uch a possibility is assigned rather low priority as a contemporary scientific explanation." This is a case in which researchers must re-think their choice of cues, seeking other ones that *do* encode the disposition. One way to accomplish this might be to interview the decoders, asking them to reflect on their inferences: what about the encoders *did* cause you to assess them as high or low on the given disposition?

Finally, if strong encoding, strong decoding, *and* strong agreement are found, one may conclude that the whole process is working as researchers in this area hope it does, and they may be able to supply a satisfying account of this assessment process. A sober second thought, however, is that encoders (or their intimates) and decoders *could* be agreeing on an inaccurate view of the encoders' personality, something akin to a *folie à deux*. A more likely interpretation is that the strong mediation of objective nonverbal behaviors, reliably assessed by independent decoders, would be substantial evidence that the decoders' decoding is valid, given that they have been demonstrated to rely on the same objective (visible) aspects of reality as encoding. If so, the centuries-old conviction that dispositions truly are "legible" would receive convincing support.

8 A full-lens exemplar study

One full-lens study, with three independent groups (encoders, behavior raters, and decoders), investigated nonverbal behaviors and how they encode well-established dispositions as well as which of these same nonverbal behaviors were employed by decoders to infer encoders' personality (Gifford 1994a). That study will be described in some detail as an exemplar. It examined the eight dispositions that comprise the interpersonal aspect of personality and form a circumplex (Wiggins 1979). The primary axes of the circumplex are dominance and warmth. Interpersonal dispositions were deliberately selected because the encoders in the study were engaged in a conversation; other dispositions (e.g., conscientiousness, openness to experience, and emotional stability) were not included because they would not have been examined in a context that should have made them particularly

salient; the second complexity (of the 13 above) asserts that personality-nonverbal relations should be examined in a social context that is likely to elicit nonverbal behavior appropriate to that context.

8.1 Methodology

The study is presented partly for its results, which illustrate many specific encoding and decoding relations with personality and nonverbal behavior, but also as a way of introducing many of the intricacies of conducting encoding-decoding research, including proposed solutions to problems that arise in the course of analyzing the data in such studies.

Based on the available literature, the hypotheses of the study were that encoding would be weak to moderate, but decoders would have a strong tendency to decode. Agreement, based on research that indicates dispositions are communicated to different degrees (Gifford et al. 1985; John 1990), was expected to vary across dispositions. For dispositions with low agreement, encoder-decoder discrepancies were expected to be high, that is, a strong correlation on one side but not the other or correlations of opposite sign on the two sides of the lens. For dispositions with high agreement, encoder-decoder discrepancies were expected to be low, that is correlations of about the same magnitude and sign on both sides.

The encoders were 60 undergraduates drawn from a psychology department participant pool. Ten all-male and 10 all-female triads were formed into conversational groups, and one group at a time was filmed as it conversed. The participants were given a list of suggested topics, but they were encouraged to converse on any topic they chose. A week or so prior to the conversation, the participants were given Wiggins' (1979) interpersonal adjective scales inventory (IAS). The IAS was chosen to maximize the relevance of selected dispositions to the context. From the top of the circumplex, the IAS scales are ambitious-dominant, gregarious-extraverted, warm-agreeable, unassuming-ingenuous, lazy-submissive, aloof-introverted, cold-quarrelsome, and arrogant-calculating.

The videotapes were then scored using the Seated Kinesic Activity Notation System (SKANS 5.2; Gifford 1994b), in which 38 kinesic and facial behaviors are measured by trained raters in one of three ways: frequency, duration, or time-sampling.

A second sample of participants, 21 unacquainted peers of the encoders (a separate group from the SKANS raters), were shown 5-minute selections from the middle of the conversations over several sessions with the audio track turned off. Each time the tape was played, each decoder was asked to focus on only one of the three participants shown in the tape. The tape was then replayed and the decoders watched another participant. Thus, all 21 decoders viewed all 60 participants. After each tape was shown, each decoder completed a 40-item short version

of the IAS about one encoder. The decoders' task was demanding, so they made their ratings over several sessions. They were paid \$50 for their efforts and offered a prize of \$50 for being the most accurate (defined as coming the closest to the encoder-ratings of the 60 encoder individuals; actually, as noted earlier, a measure of agreement).

8.2 Reliability and data reduction

The measures (encoder assessments, decoder assessments, and SKANS 5.2 measures) were adequately reliable, apart from some nonverbal behaviors that occurred infrequently, were difficult to score due to camera placement, or had low interrater agreement. Some behaviors were combined because they were highly correlated. Thus, the remaining analyses were based on 27 nonverbal behaviors and 8 circumplex dispositions.

8.3 Encoding

Pearson correlation coefficients between the encoder-assessed dispositions and their nonverbal behaviors represent the left, or encoding, half of the lens diagram. Not every significant correlation between a nonverbal behavior cue and a disposition, however, necessarily is a *valid* encoding-decoding link, that is, also significantly links the behavior to decoding.

8.3.1 Threats to the validity of encoding

Three specific threats to the validity or generalizability of an encoding link may be identified. First, the correlation could be influenced by the actions of others in the conversation; a valid encoding link should be empirically attributable to an individual, uncontaminated by group influence, if it is to be considered a valid personality-nonverbal behavior link. Second, correlations may be due to chance; to be valid, an encoding link should have reasonable strength and be part of an ordered pattern of correlations around the interpersonal circle. If a behavior is truly relevant to interpersonal behavior, it should not merely correlate with one disposition on the circle. Its correlations should rise and fall around the interpersonal circle in an ordered manner (Gifford 1991). Third, the possibility of sex differences raises the issue of generalizability of a given putative encoding link to both sexes. A valid link between a disposition and a nonverbal behavior for women may not be valid for men, or vice versa. For example, using most of one's body when gesturing validly signals extraversion for women, but not for men (Lippa 1998).

8.3.2 Identifying valid encoding behaviors

Each of these threats was considered in preliminary analyses (for details, see Gifford 1994a). In all, because of significant group influence or failure to conclusively map onto the interpersonal circle, 19 of the 27 remaining nonverbal behaviors were rejected as not demonstrably valid reflections of interpersonal dispositions. The eight nonverbal behaviors identified as valid encoders of interpersonal circle traits were head orientation, nods, arm wrap, gestures, object manipulation, left leg lean, leg movement, and leg extension. Their significant links ($p < 0.05$) with the eight

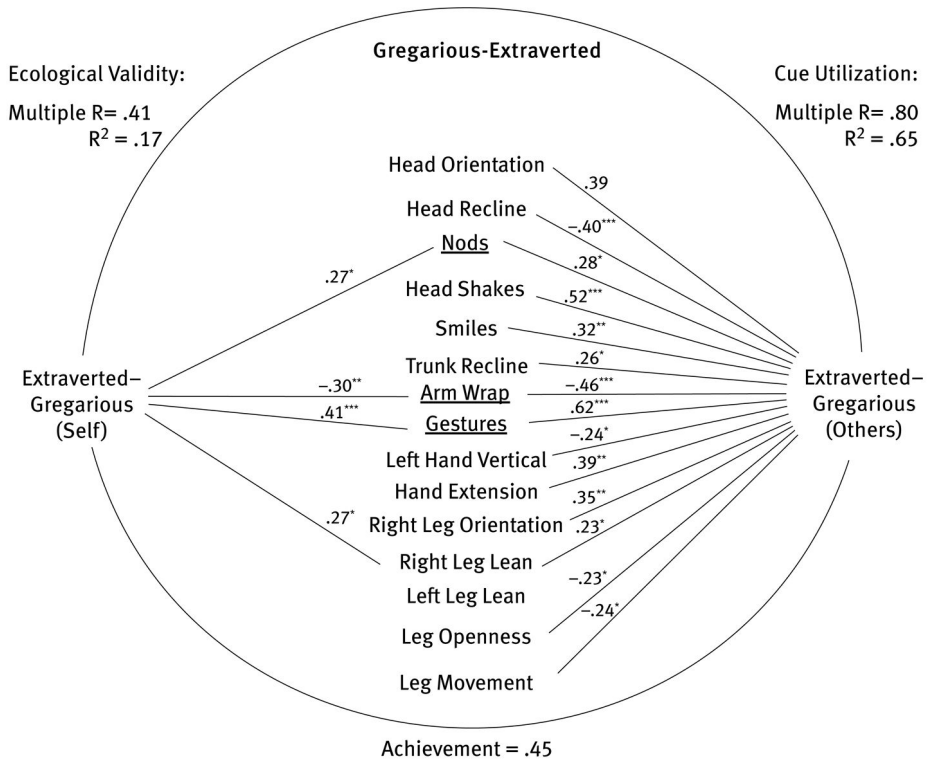


Figure 2: The contextual lens model for gregarious-extraverted. An oval should be imagined around the diagram that would represent the larger social context in which the interaction occurs.

dispositions of the interpersonal circle are displayed in Figure 2 for one typical disposition: gregarious-extraverted [see Gifford (1994a) for the seven lens models describing encoding and decoding for the other seven dispositions].

8.4. Decoding

Correlations between the nonverbal behaviors and the dispositions as inferred by the decoders were computed. All 27 of the nonverbal behaviors were used for this purpose, rather than the subset of eight behaviors used for the encoding half of the study. This was done because the goal on the left half of the lens is to determine which nonverbal behaviors *truly* encode personality (to the best of our methods' abilities), whereas on the right side the goal is to determine which nonverbal behaviors are *believed* by decoders to be cues to personality. This distinction follows from Brunswik's original labels for the two sides of the lens model: ecological *validity* (left half) and cue *utilization* (right half). Significant ($p < 0.05$) cue utilization correlations are displayed on the right half of Figure 2; collectively, they describe the way that typical decoders utilize the cues.

8.5 The strength of encoding and decoding

Next, the magnitude of encoding and decoding was examined. Magnitude was computed as the multiple correlation and percent of variance in each disposition accounted for by the nonverbal behaviors. Only nonverbal behaviors that had shown significant ($p < 0.05$) correlations with the dispositions were considered. Stepwise multiple regression analysis was used for this purpose. Magnitudes to be reported are conservative because, although all variables with significant Pearson correlations were given the opportunity to predict a given disposition, only those that made significant ($p < 0.05$) additional contributions to the equation were included. Figure 2 shows the values of multiple R and R^2 for the encoding and decoding for gregarious-extraverted.

As hypothesized, one general tendency apparent from the results is that decoding is stronger than encoding (see also J. A. Hall et al. 2005; Hartwig and Bond 2011). Beginning at the top of the interpersonal circle and proceeding clockwise, multiple correlations were (encoding followed by decoding): ambitious-dominant 0.54 versus 0.81, extraverted-gregarious 0.41 versus 0.80, warm-agreeable 0.30 versus 0.79, unassuming-ingenuous 0.41 versus 0.74, lazy-submissive 0.62 versus 0.81, aloof-introverted 0.54 versus 0.82, cold-quarrelsome 0.00 versus 0.79, and arrogant-calculating 0.25 versus 0.77. The median magnitude of encoding was 0.41 and the median magnitude of decoding was 0.80. Consistent with this, many more significant decoding than encoding links were found.

8.6 Group versus individual decoding

Despite these findings, however, decoding actually may not be much stronger than encoding. As noted, ratings are based on 21 decoders. Multiple raters almost neces-

sarily increase the reliability of ratings. When ratings are more reliable, correlations involving them are stronger because less error is involved. Stronger correlations are more likely to be statistically significant and therefore to be included in the lens diagrams.

Analyses that corrected for attenuation and estimated the reliability of single decoders (see Gifford 1994a, for details) showed that one typical decoding link shrank from $r = -0.58$ to -0.35 . The matched encoding link for this decoding link was $r = -0.29$, not much less than $r = -0.35$. Thus, decoders as a *group* decode strongly, but researchers who wish to generalize to typical *individual* decoders, would conclude that decoding is not particularly reliable, and this would attenuate the seemingly large magnitude of decoding. One way to overcome the false advantage of aggregated decoder ratings (so as to better estimate the accuracy of “a” decoder is to average the decoders’ individual correlations (using the r -to- z transformation, of course).

Whether researchers examine group decoding or typical individual decoding value depends on the study’s purpose. If it is to understand how decoders (in general, nomothetically) decode, one would use the full decoder sample; if it is to estimate the decoding skill of a single “typical” decoder, the attenuation approach could be used, and if the goal is to understand how one particular decoder decodes (for example, a clinician in training), one could study decoding with an n of 1, or one could use the averaging method mentioned above.

The question for the researcher is, do I wish to learn how and how well decoders in general decode, how and how well a typical single decoder (e.g., a typical human resource officer in a large organization) decodes, or how and how well *this* decoder (for example, a person applying for a job as a human resource officer) decodes?

8.7 Particular encoding and decoding links

Considerable information about particular relations between interpersonal dispositions and nonverbal behaviors is available in Figures 3 to 10 in Gifford (1994a) for readers who are interested, but here only one lens model is presented, as an example, in the interest of saving space.

8.8 Agreement and the nonverbal communication of personality

Agreement is measured as the correlation between encoder-assessments and assessments by decoders, and it is represented in Figures 1 and 2 by the curved line at the bottom. The use of correlations overcomes several of the classic Cronbach (1955) criticisms of accuracy research, such as elevation and differential ele-

vation, which are based on differences between the two scores, which usually are less important than whether they rise and fall together.

Across the eight dispositions in the full study, agreement averaged 0.27 (r - to z -transformed), which is significant ($p < 0.02$), if moderate in magnitude. Agreement ranged from 0.18 (ns) for both lazy-submissive and cold-quarrelsome to 0.45 ($p < 0.001$) for gregarious-extraverted and 0.41 ($p < 0.001$) for aloof-introverted.

The relations between encoding and decoding fall into two categories, each with two forms. First, *matched links* may be identified. One form of matched link occurs when a nonverbal behavior significantly encodes self-assessments and is also used to a significant degree by decoders to decode or infer that encoder assessment. Across the eight dispositions, 14 matched links of this form were found. Matched links are underlined in Figure 2. Another form of matched link occurs when a link is significant on *neither* side of the lens: Decoders are reporting that a given behavior does not encode a given trait and, based on the encoder-assessments, it does not. In this study, 105 such matches occurred.

Second, *mismatched links* may be identified. One form of mismatched link occurs when a nonverbal behavior does encode a self-assessed disposition, but decoders do not utilize that cue. For example, more lazy-submissive persons manipulate objects (e.g., their clothing, pen, paper) more than others do, but decoders do not utilize object manipulation as a cue to lazy-submissive. In this study, six mismatches of this kind occurred across the eight interpersonal dispositions.

The other form of mismatched link occurs when decoders utilize a particular nonverbal cue to form their impression, but that cue does *not* encode that disposition. For example (see Figure 2), decoders believe that more gregarious-extraverted persons orient their heads toward their companions more, but (based on encoder-assessments), this is not so. In this study, 83 mismatches of this kind were observed across the eight dispositions.

Decoders appear to use many more cues to infer encoder-assessed dispositions than were necessary. As noted earlier, however, the greater number and magnitude of decoding links is due partly to psychometric considerations, that is, the superior reliability (but not necessarily validity!) of decoding.

In general, agreement is higher when more matched links are found. The existence of matched links, with their lines going from the disposition to a behavior and from the behavior to the decoder's assessment, clearly suggests that agreement increases when information "flows" via such matched links. Conversely, agreement is lower when many mismatched links occur. The same trend was also demonstrated earlier in a personnel selection context by Gifford et al. (1985).

When information does *not* flow, either encoding has not occurred (no behaviors measured encode the disposition) or the decoder has used cues other than those that the encoding analysis suggests are valid indicators of a disposition. The communication of encoder-assessed personality was quite good (i.e., agreement

was relatively high) for some dispositions. Considering that decoders saw only five minutes of a soundless conversation among individuals they had never met, their decoding of gregarious-extraverted, $r = 0.45$, and aloof-introverted, $r = 0.41$, for example, is quite an “achievement.”

In sum, this exemplar study suggests that (1) the encoding of interpersonal dispositions in nonverbal behavior is moderate (median multiple $R = 0.41$), (2) the decoding of the same interpersonal dispositions is moderate by individual decoders and strong by groups of decoders (median multiple $R = 0.80$), and (3) agreement is low to moderate (mean $r = 0.27$), yet significant ($p < 0.02$). Apart from the specific magnitudes of these links, the combined findings show exactly *how* information appears to flow from the encoder to the decoder, that is, how personality and nonverbal behavior are connected, and how decoders infer (and mis-infer) personality by watching other people. That encoding is at least moderate even after a variety of conservative analytic strategies are employed is an optimistic note in a literature that can be characterized as pessimistic (cf. Bull 1983; Duncan and Fiske 1985; Heslin and Patterson 1982).

8.9 When things go wrong

The flow of information is far from perfect. If it were, we could all know one another's personalities perfectly merely from watching each other. What prevents this? Dispositions that appear to be poorly encoded (a) may be encoded by behaviors that were not included in the study, (b) may not be encoded in nonverbal behavior, or (c) may not have been elicited often in the context of the conversations in this study.

Agreement, as explained earlier, depends on the decoders' appropriate use of ecologically valid cues. For example, in the study just described, decoders believed that 14 nonverbal cues were good indicators of encoder cold-quarrelsomeness, but not one of the 14 cues significantly encoded cold-quarrelsomeness.

9 Implications for everyday social interaction

One important implication from full-lens studies is that when research shows that one set of nonverbal behaviors validly encodes a disposition but decoders believe that different set of behaviors signify that disposition (or that a particular behavior signifies a different disposition), misinterpretation and conflict may result. If person A believes that person B is cold, based on invalid decoding, Person A may well behave toward person B in accordance with this perception, that is, with generally negative responses. The person B consequently may be expected to be unpleasantly mystified by A's actions and may then respond accordingly (that is,

not very positively). Person A may then react to the B's negative reaction negatively, and so on. In this way, innocent mis-inferences from nonverbal behaviors can seriously damage the development of interpersonal relations.

Brunswik's lens model serves as a useful way of conceptualizing social judgment, including the encoding and decoding of nonverbal behavior by encoders and decoders. Besides being intuitively clear, it offers a clear path for empirical demonstrations of how encoding, decoding, agreement, and disagreement about personality operate through nonverbal behavior.

10 Conclusion

Personality and nonverbal behavior are not linked in simple ways. This accounts for the undulations in optimism from the era of physiognomy and early (1930s) scientific efforts, to the lacunae in research until the 1960s, followed by the slough of despond in the early 1980s, and the slow rise of optimism since then.

This chapter focuses on modern refinements of Brunswik's lens model. Progress will be difficult, given the thirteen (or more) complexities, but if researchers are at least careful to consider and describe how their studies deal with the complexities, understanding will grow. This will be a step toward a fuller understanding of both social judgment and the delicate behavioral dance we call nonverbal behavior.

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Ross W. Buck and Stacie R. Powers

14 Encoding and display: a developmental-interactionist model of nonverbal sending accuracy

Abstract: This chapter reviews nonverbal sending accuracy from the viewpoint of a developmental-interactionist model of communication that holds that communication proceeds in two simultaneous streams: one a symbolic stream that is learned, intentional, propositional, and composed of a symbolic code; the other a spontaneous stream that is innate, automatic, nonpropositional, and composed of signs or displays (Buck, 1984). Spontaneous displays are seen to be readouts of motivational-emotional states. This model has been supported by evidence from the emerging field of affective neuroscience. In particular, there is new evidence relating to brain mechanisms of emotion and its display; and to mirror neuron systems that respond directly and immediately to such displays. This evidence supports the notion that a direct, immediate, and embodied process in which self-evident meaning is extracted exists alongside more widely recognized information processing in which meaning is constructed. Moreover, there is evidence that these processes are associated with right- and left-hemisphere responding, respectively. The two streams of spontaneous and symbolic communication interact in every communication situation. As this interaction occurs over the course of development, the model is termed the developmental-interactionist model of communication (Buck and Van Lear, 2002).

Keywords: nonverbal communication, nonverbal sending accuracy, emotion, spontaneous communication, emotional education, cerebral hemispheres, internalizing-externalizing, readout theory, developmental-interactionist theory

This chapter reviews the current status of, evidence for, and implications of a dual-process model of nonverbal sending accuracy that holds that communication proceeds in two simultaneous streams: one learned, intentional, propositional, and composed of symbols; the other innate, automatic, nonpropositional, and composed of signs (Buck 1984). Considerable evidence relevant to this model has come from the emerging field of affective neuroscience, and in particular new evidence relating to brain mechanisms of emotion, left- and right-hemisphere responding, and the communicative functions of mirror neurons. This evidence supports the notion that a direct, immediate, and embodied process in which self-evident meaning is extracted exists alongside the more widely recognized information processing in which meaning is constructed. Importantly, this model does

not consider these two processes to reflect alternative or conflicting approaches to communication. Indeed, these processes are seen to occur simultaneously and to interact in every situation involving communication between complex living beings. As this interaction occurs over the course of development, the model has been termed the *developmental-interactionist* model of communication (Buck and Van Lear 2002).

1 Definitions: sending, receiving, and the communication process

The process of *communication* involves a *sender*, *message*, and *receiver*; so, unlike other phenomena in the behavioral and social sciences, communication is intrinsically dyadic. This chapter focuses upon the “sending” aspect of this process – the process of creating the message—and issues of definition and conceptualization arise immediately. For example, one may ask to what extent is the accurate communication of a message a product of the characteristics of the sender as opposed to the receptivity of a receiver. Certainly a “good sender” may fail to communicate because of a poor receiver, and as we shall see the individual relationship of sender and receiver plays an important role as well. Another issue involves the definition of the message. Communication involves more than an exchange of ideas and propositions. Much communication is emotional, using a complex “body language” that is not always consciously noticed by the senders or receivers involved.

The communication process as outlined in Shannon and Weaver’s *A Mathematical Theory of Communication* (Shannon 1949) was the basis of information theory. In the model, information from a source is *encoded* into a symbolic code, which is *decoded* and put to use by a receiver. In living systems, this process will alter the behavior of the receiver in some respect, and in this chapter we define communication as occurring whenever the behavior of one individual (sender) influences the behavior of another (receiver: Buck 1984). More precisely, the conditional probability that act X2 will be performed by a receiver given that a sender performed X1 is not equal to the probability that the receiver will perform X2 in the absence of X1 (adapted from Wilson 1975: 194). This definition of communication is general, and can be applied to any species including non-vertebrates, insects and even simple microbes.

Many would argue that there is a critical element missing from this definition of communication: the intentionality of the sender. Wiener and colleagues defined communication as necessarily involving a shared symbolic code (Wiener et al. 1972). The sender encodes information into a symbolic proposition, which is decoded by the receiver. Encoding involves some degree of intention on the part of the sender. However, this definition does not consider the possibility that the sender may unintentionally display emotions that the receiver picks up on. The

sender's emotional state is unintentionally displayed, and that display may influence the receiver, altering the receiver's response even though the receiver may not be consciously aware of the influence. For example, if the sender expresses a proposition in a loud versus a soft voice, it can greatly alter the receiver's response. Moreover, it is possible that the sender will modulate the loudness of her voice intentionally, to alter the receiver's reaction. Here the receiver cannot be sure whether the loudness of the voice was a display of the "true feelings" of the sender or whether the sender was "putting on" the voice loudness intentionally.

1.1 Symbolic, spontaneous, and pseudo-spontaneous communication

1.1.1 Symbolic communication

The previous section illustrated three kinds of communication that differ in intentionality on the part of the sender. In the first example, *symbolic communication*, information is encoded intentionally by the sender into symbols comprising a statement or proposition. The proposition is then decoded by the receiver. The most obvious example is a statement in language such as "the tree is green." The sender encodes the statement into the vocabulary and grammar of the English language and the receiver decodes the language to understand the proposition. This requires that both sender and receiver have learned English, that they share the symbols and rules of combination characteristic of the language. It is clearly voluntary and the sender intends to send that particular message. The object identified with the word "tree" differs in different natural languages, including sign language and pantomime (Buck and Van Lear 2002). Thus, the relationship between a symbol and its referent is arbitrary, defined by culture and linguistic convention.

The content of the symbolic communication process is a *proposition*: a statement subject to logical analysis. According to Russell (1903), the simplest sort of logical analysis is the test for truth or falsity, so essentially a proposition can be false. "The tree is green" could be false since the tree could actually be yellow, red, or blue.

1.1.2 Spontaneous communication

The second example in the previous section, involving unintentional communication, is *spontaneous communication*. There is no intention to encode a message on the part of the sender. However, the sender's emotions may be displayed by facial expression, tone of voice, or other aspects of body language. The receiver "picks up" these displays, detecting their meaning automatically and often unconsciously, because of built-in preattunements to the display. The sender is biologically pre-

pared to display the emotional state, and given attention the receiver is biologically preattuned to know its meaning directly. This latter process may involve mirror neuron systems that literally mirror the sender's display in the brain of the receiver and have been held to be the basis of empathy (see for example Pineda 2009).

The sender's display is in no way intentional, and indeed, it is often unconscious on the part of the sender. The display is a *readout* of the internal motivational-emotional state that evolved as an externally accessible aspect of the sender's feelings and desires with the function of sustaining emotional communication, which in turn underlies social organization (Buck 1985; Buck and Powers 2006). The display is associated with the activation of specifiable neurochemical systems that also underlie the subjective experience of emotion, so in essence the display is an external manifestation of the sender's internal feelings and desires, albeit not necessarily an exact manifestation as we shall see. The sender's feelings and desires can therefore be signaled to the receiver via the preattunements involving mirror neuron systems, so in effect the displays and preattunements to the displays co-evolved to support empathy, intuition, and rapport. But the receiver's knowledge of the sender's feelings and desires is not propositional knowledge. If it is consciously experienced at all it is as a gut feeling, a hunch, or "vibes."

The display is not a symbol because its relationship with its referent is natural and not arbitrary. Instead, the display is a *sign* of the emotional state, just as dark clouds are a sign of rain and smoke is a sign of fire. The darkness of the clouds is an externally accessible aspect of their high moisture content; the smoke is an externally accessible sign of fire. If the referent is not there, the display cannot be there by definition, so the content of spontaneous communication cannot be false. It is therefore nonpropositional, not susceptible to logical analysis.

So, we have a display that is an external manifestation of arousal in specific neurochemical systems in the brain of the sender. These systems are also responsible for subjectively experienced feelings and desires. In both cases the state of the relevant neurochemical systems is communicated. Feelings and desires signal the sender, serving functions of self-regulation; and the external displays signal the receiver, serving functions of social organization. The neurochemicals most closely associated with subjective feelings are peptides, chains of amino acids that are direct products of genes, so that, in effect, subjectively experienced feelings and desires can be considered to be *voices of the genes*, usually whispering to the sender but occasionally screaming and shouting (Buck and Ginsburg 1997). The display in turn then may activate mirror neuron systems in the brain of the receiver that may involve peptidergic neurochemical systems analogous to those in the brain of the sender. So, through spontaneous communication there may be a natural and effortless unity between brain states in sender and receiver that, while often unnoticed, have the capability to exert enormous influence on the emotional agenda for human relationships and indeed for social organization itself (Buck and Powers 2006).

Symbolic and spontaneous communication are essentially two simultaneous “streams” of communication, functionally independently but interacting. Both are present and can be attended to in any communicative situation, although ordinarily our focal attention is drawn to the symbolic stream. The spontaneous communication process is perfectly able to do its own thing, as it were, offering sometimes vague but powerful impressions of attraction and repulsion, interest and boredom, dominance and submission, trust and suspicion, nurturance and arousal, pride and scorn, envy and shame, triumph and humiliation. But, there are times when emotions are strongly aroused and the spontaneous communication process is the message of greatest import. Characteristics of spontaneous and symbolic communication are summarized in Table 1.

Table 1: Characteristics of spontaneous and symbolic communication. Adapted from Table 1.1 from R. Buck (1984). *The Communication of Emotion*. New York: Guilford Press. Used with permission.

Characteristics	Symbolic communication	Spontaneous communication
Basis of signal system	Socially shared	Biologically shared
Intentionality	Voluntary: sender intends to send a message	Spontaneous: display is an automatic response
Elements	Symbols: arbitrary relationships with referents	Signs: naturally externally accessible aspect of referent
Content	Propositions: expressions capable of logical analysis	Nonpropositional: motivational-emotional states
Cerebral processing	Left hemisphere	Right hemisphere

1.1.3 The relationship of spontaneous and symbolic communication

As noted, unlike symbolic communication, spontaneous communication is not always conscious to either sender or receiver. It is not unavailable to consciousness, but we tend to ignore these background feelings and desires and the nuances of their display during many of our interactions. Usually, voices of the genes whisper and murmur, not controlling but gently *cajoling*. That is usually the case when things are proceeding as expected and there are no strong emotional stimuli present. In such situations rational cognitive processing and symbolic communication dominate. However, when strong emotions rule, consciousness is dominated by strongly felt, expressed, and received feelings and desires. As these are readouts of genetically-based neurochemical systems, they are not rational. So-called positive and negative emotions can often co-mingle – e.g., panic with excitement, sexual arousal with fear, love with hate.

The relationship of spontaneous and symbolic communication is illustrated in Figure 1. At the right side of the figure, reason and symbolic communication

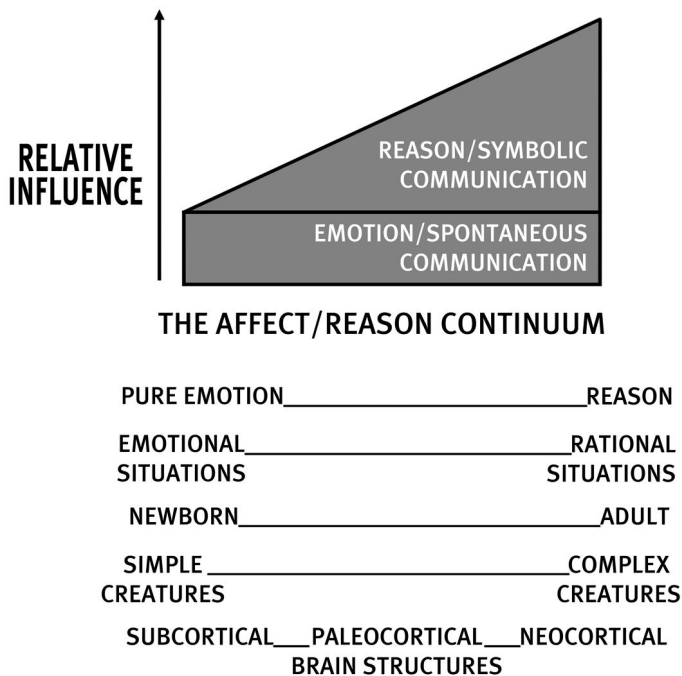


Figure 1: The relationship between symbolic and spontaneous communication

predominate and emotion and spontaneous communication, although present, exert relatively less influence. An example of a situation producing such a mixture is an academic lecture, where the students are concerned with the propositional context of the lecture and not necessarily trying to determine whether the lecturer had a bad night. The propositional content will be on the exam, the lecturer's emotional state will not. However, the emotional state of the lecturer can still affect the communication process. If the lecturer is in top form there is no problem, but if the lecturer really did have a bad night the situation may slide toward the left of the figure and spontaneous communication will exert a greater role.

As one moves to the left, emotion and spontaneous communication have increasingly prominent roles relative to reason and symbolic communication. At the far left emotion and spontaneous communication prevail and reason has virtually no influence. We can see this in situations differing in the relative importance of emotion and reason. In some prominent theories of emotion, emotions do not really exist when there are no challenges and everything proceeds as expected. One investigator suggested that when one is going through an airport, one does

not normally experience emotions unless something unexpected happens, as when one's luggage is lost. If one's luggage is lost, emotions appropriate to that challenge are experienced and expressed. We suggest that emotions exist without challenge and unmet expectations, but they are relatively weak and are typically unnoticed and unexpressed. Passing through the airport, we may appreciate the architecture and experience vague hunger pangs near a restaurant, but these are generally not noticed nor labeled as "emotions." If our luggage is lost, we naturally do feel and express stronger emotions and become more aware of them, perhaps because the arousal of neurochemical systems underlying relevant feelings and desires approaches a threshold of awareness. These may be much stronger if our *child* is lost at the airport with the resulting "irrational" behavior attending spontaneous expression as noted on the left side of Figure 1.

Figure 1 can also illustrate a developmental perspective. For example, the newborn infant comes into the world quite competent in spontaneous communication but not symbolic communication. As the infant grows and learns language, symbolic communication becomes increasingly important to his or her overall communication. In adulthood, symbolic communication normally predominates, but the capacity to experience and express emotion via spontaneous communication continues.

Figure 1 can also illustrate an evolutionary perspective. Ants, bees, and microbes are quite capable of spontaneous communication which forms the basis of their social organization – e.g., quorum sensing in bacteria (Buck 2007). As species evolved and became more complex, behavior became more flexible in the process of *anagenesis* (Gottlieb 1984). In the process, capacities for reason and symbolic communication were amplified. With the evolution of the linguistic competence of human beings, symbolic communication came to dominate spontaneous communication in many situations. Anagenesis was accompanied by the evolution of behavioral control systems from, for example, reflexes on the far left, to fixed action patterns, to drives, to primary affects on the far right (Buck 1988).

1.1.4 Pseudospontaneous communication, charisma, and the control of the display

There is a third type of communication that we call *pseudospontaneous communication* (Buck and Van Lear 2002). In this case, the sender may not freely display her "true feelings," attempting to *control* or manipulate her emotional displays in a manner consistent with and supportive of the symbolic propositional message. For example, if one is angry at a powerful opponent, anger displays may well be suppressed and replaced by unfelt but safer displays. Also, in responding to a suggestion by a powerful partner, a person may put on displays of enthusiasm which are not felt. These displays utilize the same expression apparatus as do spontaneous displays, and in fact displays can be produced intentionally that are

virtually identical to spontaneous displays (Jurgens 1979; Ploog 1981). From the point of view of the sender, this is like symbolic communication in that the production of the display is intentional, but from the viewpoint of the receiver, there may be no apparent difference between these voluntarily produced displays and “real” spontaneous displays.

Voluntary expression initiation allows universal or pancultural emotion displays to be employed in the course of symbolic communication. This can explain the ability of human beings to pose emotional expressions, what Silvan Tomkins termed “an assumed and generally true consensus about what an innate facial response is” (Tomkins 1981: 356). This facility makes it difficult to rely on nonverbal displays to detect deception, as the pseudospontaneous display may be virtually identical to the spontaneous display, particularly with a charismatic sender. There may however, be what Ekman and Friesen (1969) termed nonverbal leakage and cues to deception, if the timing of the expression, micro-momentary expressions, and/or differences in expression in different parts of the face are assessed. Ekman and Friesen (1975) suggested a number of *display management techniques*, including the *qualification* of a felt display with an unfelt display. Often a “social smile” is used to qualify the expression of a negative emotion, as a way of signaling that the sender can deal with the negative emotion. Other techniques include the *modulation* of a felt display to show more or less than what is really felt, and the *falsification* of the display by several means. One type of falsification is *neutralization*, showing nothing when something is actually felt. Maintaining a “poker face” is an example of neutralization. Another sort of falsification is *masking*, where an unfelt emotion is displayed to cover the display of a felt emotion, and another is the *simulation* of an unfelt expression. Display management techniques tend to follow *display rules*, learned and culturally variable rules about when and where specific emotions should properly be displayed. (For further discussion of the face and emotion displays, see Chapter 6, Kappas, Krumhuber, and Küster, this volume, and Chapter 23, Matsumoto and Hwang, this volume.)

The appropriate control of the emotional display on the part of the sender is healthy and, indeed, necessary for effective social functioning, and there is no evidence that this sort of control is stressful, unhealthy, or related to physiological responding. When the display is suppressed, however, different kinds of processes appear to be activated and there is evidence that emotional suppression is dysfunctional, as we shall consider later in this chapter.

1.2 Conclusions

The two streams of symbolic and spontaneous communication, plus pseudospontaneous communication, are illustrated in Figure 2. In the symbolic stream, the sender intentionally encodes propositions into symbols, which are decoded by the

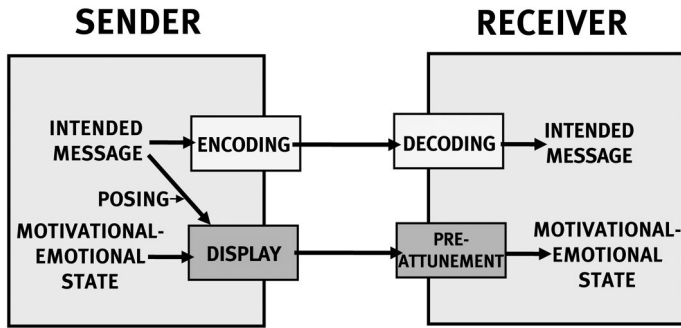


Figure 2: Symbolic, spontaneous and pseudospontaneous communication (posing)

receiver. In the spontaneous stream, the sender automatically displays motivational/emotional states, which function as signs and are “picked up” via preattunements by the receiver, who extracts the motivational/emotional meaning directly as embodied knowledge. The sender is also able to control the display intentionally, and thereby manipulate the receiver’s response to the sender’s motivational/emotional state.

2 Measuring spontaneous expression and communication

2.1 Measuring spontaneous communication accuracy

Because the display can be intentionally enacted, the measurement of spontaneous expression and communication poses a challenge: does a given display reflect the sender’s “true feelings” or the sender’s ability to control and manage the expression? This question is related to the problem of deception detection. As noted, Ekman and Friesen (1969) suggested two ways to detect a sender’s true feelings: through *leakage* in unintended displays such as micro-momentary facial expressions; and through *cues to deception* such as signs of stress associated with suppression. Another strategy is to observe and record displays unobtrusively in “minimally social” situations where pressures to follow display rules are minimized. For example, Eibl-Eibesfeldt (1975) used a camera with a lens that filmed 90 degrees away from where the camera appeared to be pointing, so that he could film natural behavior unobtrusively and compare expressive behavior in different cultures.

2.1.1 The slide-viewing technique

The slide-viewing technique (SVT) is a laboratory procedure that defines spontaneous expression operationally as occurring in a minimally social situation, e.g.,

when a solitary sender views emotionally-loaded stimuli (e.g., color slides) while their facial/gestural expressions are unobtrusively recorded. A number of slide categories have been used to elicit emotional responses, including *Sexual* slides showing nude and seminude men and women, *Scenic* slides showing pleasant landscapes, *Familiar People* slides showing persons known to the sender (including pictures of themselves), *Unpleasant* slides showing scenes such as severe wounds and starving children, and *Unusual* scenes showing strange photographic effects. Senders are asked to view the slide silently (slide period), and then on signal to verbally describe the emotional response the slide evoked (talk period). The image is then removed, and senders rate the feelings elicited by it on multiple scales (e.g., not-at-all to very happy, sad, afraid, angry, surprised, disgusted, and painful; and also pleasant to unpleasant). They are later informed of the camera's presence and asked to consent to the use of the recordings (Buck 2005).

The senders' expressive responses to the images are viewed by judges or receivers, who on each trial guess the type of slide being viewed and rate the sender's feelings on the same scales used by the sender. This yields two measures of communication accuracy: the percent of slides correctly categorized (percent correct measure), and the correlation coefficients between the sender's rating of each emotional feeling and the receiver's rating across the slides (emotion correlation measures). Averaged across senders, these measures assess the receiving ability of the judges; averaged across judges, they assess spontaneous sending accuracy.

Results from studies employing the SVT demonstrated large individual differences in sending accuracy. In American samples, adult women are better senders than men, and good senders are high in extraversion and self esteem. Among preschool children (ages 3 1/2 to 6) there is not a significant sex difference, but sending accuracy was negatively correlated with age in boys but not girls, suggesting that boys learn to inhibit and mask their spontaneous display of these emotions. Sending accuracy was positively correlated with teachers' ratings of being active, extraverted, friendly, dominating, aggressive, expressive, and impulsive; and negatively correlated with ratings of being introverted, responsible, controlled, cooperative, solitary, private, and shy (Buck 2005).

Among both adults and preschoolers, sending accuracy was negatively correlated with the number of skin conductance deflections (SCDs), a measure of autonomic nervous system responding which has been particularly associated with inhibition (Fowles 1980). In the adult samples, men tended to show an *internalizing* pattern of low sending accuracy but high SCD responding, while women show an *externalizing* pattern of high sending accuracy and low SCD response. The internalizing-externalizing patterns were also found in the preschoolers, but were not related to gender.

2.1.2 The segmentation technique

Taken together, the results of these studies suggest that spontaneous sending accuracy as measured by the SVT is related to individual differences in personality and

temperament, and to socialization experiences involving the suppression of the free expression of emotion. Although the SVT can measure spontaneous sending accuracy, it does not by itself specify what facial expressions and gestures are responsible for communication accuracy.

The unitization or segmentation technique, developed by Newton and colleagues (Newton, Engquist, and Bois 1977), offers a simple and flexible way to identify points in the expressive behavior stream that are potentially important in communication. An observer viewing behavior is provided with a button and asked to press the button when “something meaningful” occurs. The behavior stream can then be segmented into high information *consensual points* (CPs) where observers agree that something occurred and low information points where they agree that nothing occurred. Newton has shown that the CPs preserve the essential information, in that a new group of judges can accurately order still photographs taken at those points, and understand what had occurred. When confronted with stills taken at non-CPs, in contrast, judges are confused. Moreover, people appear to naturally pay more attention at CPs: when a ½ second is deleted from the film at CPs and non-CPs, judges instructed to indicate when a deletion occurs identify deletions at CPs 78% of the time, versus 35% at non-CPs.

The segmentation technique was applied to films of facial/gestural expressions taken during the SVT (Buck, Baron, and Barrette 1982; Buck et al. 1980). Judges were instructed about the slide-viewing task and asked to press a button whenever a “meaningful event” occurred in the sender’s behavior. Button presses were recorded along with a timing track on the film that showed when each slide was presented. Results indicated that female senders received more button presses than males in the initial 10-second slide period when the slide was being silently viewed, and there were also more CPs for female than male senders during this period (2.15 versus 1.2). Sex differences in the ensuing talk period when the sender described his/her emotional experience were not significant. The filmed expressions were shown to an additional group of judges who were told when the CPs occurred and asked to indicate whether the sender had made a facial expression at that point in time. Female senders showed a greater proportion of facial expressions than men during both the slide period and the talk period. Thus while silently viewing the slides female senders both showed more CPs, and a greater proportion of those CPs were judged to be facial expressions.

Once CPs are identified, the segmentation technique can be efficiently combined with systems to code facial expressions, such as Ekman and Friesen’s Facial Action Coding System (Powers et al. 2006). The coding techniques can be guided by the segmentation data, so for example expressions only at CPs are coded (Buck 1984).

2.2 Expressiveness versus communication accuracy

The total number of button presses received in the segmentation technique may be considered to be a measure of *expressiveness*, defined as the total amount of nonverbal behavior which may or may not be communicative. Participants diagnosed with psychiatric disorders have been studied in the SVT: behaviorally-disordered children by Goldman (1993) and schizophrenia patients by Easton (1994; see Buck et al. 1998). These studies found the clinical groups to rate their feelings much like comparison groups, but their expressions were rated by others to be relatively inappropriate, in that patients' expressions were rated to be more negative on positive slides and more positive on negative slides, relative to expressions of comparison groups. Also, patients with psychiatric disorders were found to be markedly poorer senders in the SVT relative to comparison groups. However, patients were not necessarily "unexpressive." For example one behaviorally disordered child showed a clear look of disgust at his own picture, even as he rated his feelings as positive. Similarly, segmentation of a sample of the expressions of schizophrenia patients received more button presses than a comparison group that showed higher communication accuracy. These findings suggest the possibility that extremes of expression—either too much or too little expression—may be associated with low communication accuracy. This is of interest when one considers the role of communication accuracy in socio-emotional development.

2.2.1 Communication accuracy and emotional education

Emotion has three aspects. It involves peripheral physiological arousal (*Emotion I*), display (*Emotion II*), and subjectively experienced feelings and desires (*Emotion III*) (Buck 1999). These are illustrated in Figure 3. The social learning process associated with emotion is unique in that these three aspects are differentially accessible to the responder (e.g., a child) and to others (e.g., a parent). Children have direct access to their own feelings and desires, but relatively little access to their own displays. For example, we are often surprised by how we look and sound on television recordings because we normally do not experience these aspects of our own behavior from an external point of view. The parent has access to the child's behavior but cannot know exactly how the child feels. And, neither adult nor child has good access to peripheral physiological responses, like blood pressure, heart rate, or SCDs.

Because of this difference in accessibility, the child must learn to label and understand his or her feelings and desires indirectly, via the responses of others to the child's displays. If a little boy playing with blocks screams and throws a block when they fall down, his mother might say, "Johnny, I know you must be frustrated and angry, but you should not throw things. Go to your room for time out and relax until you feel better." This simple exchange gives Johnny a great

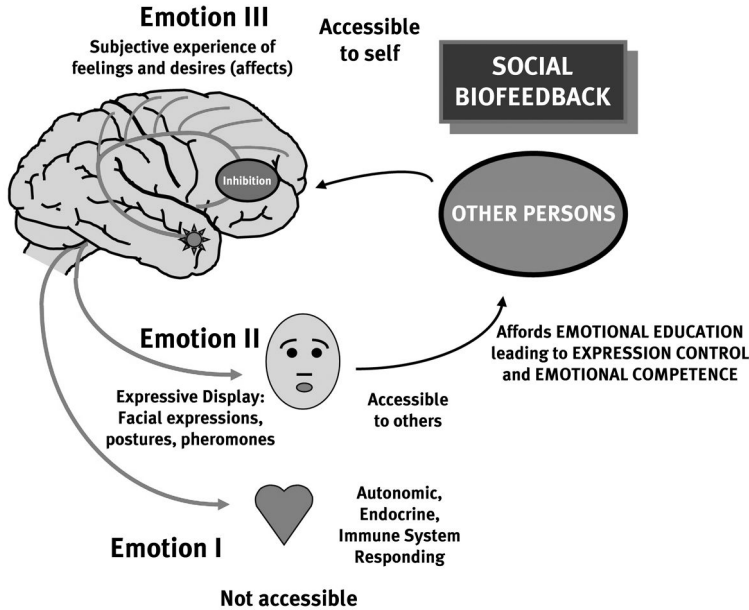


Figure 3: Social biofeedback and emotional education

deal of information about the feelings and desires he is experiencing. They are called “anger” in English, they are caused by frustration, and throwing things when anger occurs is not appropriate, but relaxing is. The feedback received from the other is termed *social biofeedback*, because like a biofeedback device the other is giving the child feedback about a response—the display—which would otherwise be inaccessible to the child (Buck 1988). The result is *emotional education* in which children learn to label, understand, and cope with their feelings and desires. Hopefully the result of emotional education is greater *emotional competence* – i.e., learning appropriate labels, accurately recognizing and understanding emotions, and developing effective coping strategies (Buck 1993). In contrast, a little girl Janie who performs the same behaviors as Johnny might be slapped and told “You are a bad girl!” Emotional education occurs, but here the girl might associate the experience of anger with being “bad,” with being punished, and with being rejected by others. Although she cannot escape the experience of angry feelings, she may learn to deny and suppress them.

Importantly, these social learning experiences do not directly influence Emotion I, peripheral physiological responses, because neither child nor parent has easy access to such responses. The parent cannot punish the child for having physiological responses. However, these responses may be influenced indirectly by the suppression of the display. According to the *suppression hypothesis* (Buck 1993), experiences associated with punishment and rejection tend to be stressful,

eliciting fight-or-flight responses. This may be an origin of the externalizing-internalizing patterns seen in the SVT studies. If a child is allowed to be expressive and appropriately educated emotionally, stress-related physiological responses will be low, resulting in an externalizing pattern. On the other hand, if the display is punished and inhibited, such experiences will tend to be stressful and elicit physiological responding.

It is easy to see where emotional education may go awry. A child may learn to effectively deal with angry feelings but not sadness or fear. When this occurs, the child may show stress-related physiological responses in the situations associated with suppression. Moreover, the child may fail to develop an effective vocabulary for suppressed emotions, a condition termed *alexithymia*, literally “no words for mood” (Sifneos 1973). *Alexithymia* was defined in the context of treating patients with psychosomatic disorders, which are associated with high levels of stress-related physiological responses. A patient like this “tends to minimize affect and emotional involvement... The way to the patient’s inner, private life seems to be blocked up by an impregnable wall” (Nemiah and Sifneos 1970: 155–156). (For further discussion of expression and development, see Chapter 5, Halberstadt, Parker, and Castro, this volume.)

2.2.2 Hyperexpressive versus hypoexpressive alexithymia

This model of emotional education suggests that, all else equal, communication accuracy must be easiest at moderate levels of expressiveness on the part of the sender, as is depicted in Figure 4. If the child is either too low or too high in expressiveness, social biofeedback may be compromised and communication accuracy negatively impacted. In either case, the result may be alexithymia, but for different reasons. Children high in inhibition, either because of punishment during social learning or due to temperament, will tend to be unexpressive, so others will have difficulty knowing how the child actually is feeling and therefore providing accurate and timely social biofeedback. Such children will tend to be low in emotional education and suffer from *hypoexpressive alexithymia*. For children who are abnormally low in inhibition, expression may be high but uncoordinated and confusing, as with the boy who showed a look of disgust at his own picture. Again others will have difficulty knowing how the child actually is feeling and accurate and timely social biofeedback will be lacking, resulting in *hyperexpressive alexithymia*. Children who are moderate in expressiveness will, all else equal, have the best chance of receiving accurate and timely social biofeedback, so they will tend to be highest in emotional education and emotional competence.

As Figure 4 indicates, several other features of personality and temperament can be related to expressiveness and communication accuracy. First, inhibition will be high on the left side of the figure and low on the right. Second, features of the autonomic nervous system fight-or-flight response which reflect inhibition,

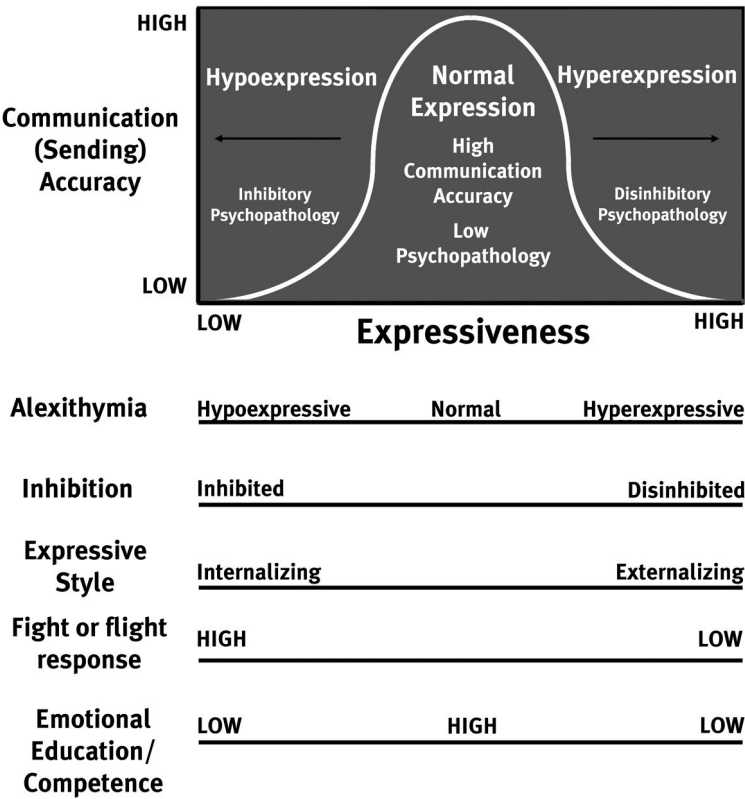


Figure 4: Relationship between expressiveness and sending accuracy

such as SCDs, will be high on the left and low on the right. The left side of the figure is associated with an internalizing pattern of emotional expression and high introversion, while the right side will be associated with an externalizing pattern and high extraversion. We examine the personality and temperament literature relating to these hypothesized patterns later in the chapter. Finally, emotional education and emotional competence will tend to be low at the left and right extremes of Figure 4 and highest in the middle, associated with the highest level of spontaneous emotional communication.

3 Affective neuroscience evidence for the spontaneous/symbolic distinction

3.1 Right versus left hemisphere processes

The spontaneous/symbolic distinction relates to the differences in the cognitive and communication abilities of the right and left hemispheres of the brain. The left hemisphere (LH) is associated with a linear, serial, sequential mode of cognitive processing that lends itself to the articulation and differentiation of concepts, what Tucker (1981) termed *analytic cognition*. Analytic cognition is compatible with reason and language, and indeed it has long been known that the LH is particularly associated with language. Thus, the LH appears to be linked with the intentional, symbolic stream of communication. The right hemisphere (RH), in contrast, is associated with a global and holistic synthesis of information (Werner 1957). Tucker (1981) termed this *syncretic cognition*. The functions of the RH have been more difficult to specify, but there is much evidence that RH responding is particularly involved in emotional communication (Galaburda 1995; Geschwind 1979).

3.1.1 Expressive and receptive aphasia and aprosodia

The earliest evidence of the LH involvement in language was provided by investigations of the effects of LH brain damage on language in the 19th century. Broca found that patients who could comprehend but not express language had lesions in the left anterior part of the cerebral cortex near the motor strip associated with the control of the mouth, tongue, and larynx. This is now known as *Broca's area*, comprising Brodmann areas (BA) 44 and 45 of the cerebral cortex. This condition is termed Broca's or *expressive aphasia*. Wernicke (1874) described patients who could speak but could not comprehend speech, who had lesions in the left posterior cortex near the primary sensory cortex for audition. This, *Wernicke's area*, is part of BA 22, and the condition is known as Wernicke's or *receptive aphasia*.

Speech and language are typically preserved in patients with RH damage, but they often lose the emotional qualities of voice and speak in a monotone, termed *aprosodia* (Ross 1981; 1992). Brain damage to the anterior RH, including BAs 44 and 45, has been associated with an inability to express emotion in the voice, or *expressive aprosodia*, while damage to the posterior RH including BA 22 is associated with an inability to comprehend emotion in the voice, or *receptive aprosodia*.

3.1.2 Brain damage and the SVT

Buck and Duffy (1980) used the SVT to study the communication accuracy of brain-damaged patients. Four groups were included: patients with LH-damage and expressive aphasia (LHD), RH-damage (RHD), Parkinson's disease (PD), and non-

brain-damaged. Patients were filmed while viewing familiar (nurses and hospital workers), scenic-neutral, unpleasant, and unusual slides with no specific verbal instructions other than an invitation to view the slides. College students served as receivers. Results indicated that the LHD and non-brain-damaged patients were significantly more accurate senders than RHD and PD patients. The LHD patients were rated to be the most expressive of the groups. In typical responses, one LHD patient brightened and smiled at a picture of a favorite nurse and uttered a highly prosodic but propositionally meaningless vocalization, and judges viewing without audio tended to guess correctly that the expression was elicited by a familiar slide. In contrast, a RHD patient said “That is our nurse. She is very good to us. We love her very much.” This highly emotional sentiment was however spoken in a monotone without facial expression, and judges viewing could not guess the slide correctly.

The aphasia patients in the Buck and Duffy (1980) study had been tested in verbal ability and also pantomime skills. *Pantomime recognition* was assessed by the examiner pantomiming an action (e.g., drinking from a glass) and the patient being asked to point to an appropriate picture (e.g., a glass, a lock, a hammer). *Pantomime expression* was assessed by the examiner showing the patient the picture, and asking the patient to pantomime using the object. Pantomimic skills were found to be positively and strongly correlated with verbal skills. Buck and Van Lear (2002) performed a meta-analysis of studies of pantomimic and verbal abilities, demonstrating a general pattern of positive relationships between pantomimic and verbal abilities, and suggested that these tasks are similar in that both involve symbolic communication. Communication accuracy as assessed by the SVT, on the other hand, was uncorrelated with both verbal skills and pantomimic abilities, supporting the view that spontaneous communication is a separate stream dissociable from symbolic communication. These results were supported by Borod et al. (1985), who found deficits in rated facial expression and emotional intonation in patients with anterior RHD. Patients with posterior RHD showed deficits in intonation but not facial expression (Borod and Koff 1990).

Figure 5 illustrates the area of brain damage in three expressive aprosodia patients described by Ross (1981). Because anterior RH damage is associated with a loss of both the facial and prosodic spontaneous display, a more comprehensive descriptive term for the symptoms would be “asponantania.”

These results suggesting a link between spontaneous communication and the RH were questioned by Mammucari et al. (1988). Employing Ekman and Friesen’s Facial Action Coding System (FACS) to objectively score facial expression, they did not find significant differences between LHD and RHD groups in response to emotional films. Buck (1990) responded to their critique, noting among other things that the FACS scoring of facial expression does not necessarily get at emotion *communication*. Indeed, as we have seen, hyper-expression can undercut accurate communication. In addition, descriptions of the behavior of LHD patients (e.g.,

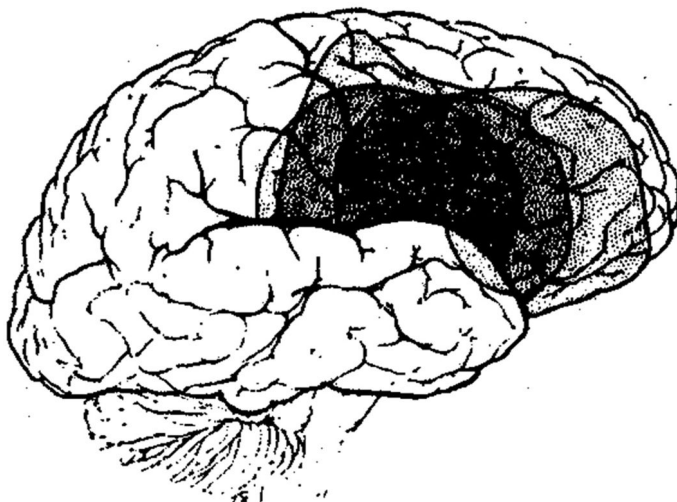


Figure 5: Damage to the right hemisphere; Brodmann areas 44–45 is associated with a lack of facial and vocal expressiveness. Shading identifies areas of damage in three clinical cases of expressive aprosodia (Ross 1981). Figure used by permission.

that they looked away from a negative film more than did RHD patients) suggested that the LHD patients would have shown greater accuracy had the study used a measure of communication.¹

3.1.3 Left- and right hemisphere activation to emotion

This pattern of results suggests that damage confined to BAs 44, 45, and 22 in the LH produces deficits in symbolic communication; and similar damage in the RH produces deficits in spontaneous communication. Other studies have investigated patterns of activation in these RH regions when viewing emotional stimuli. Powers (2009; Powers et al. 2007) presented judges with films taken of senders' expressions to familiar, unpleasant, unusual, and scenic slides while undergoing fMRI. The films of expressions to scenic slides were taken to be neutral, because although senders rate their feelings toward such slides as relatively pleasant, they typically show little expressive reaction. For this reason, the judge's brain response to viewing a sender watching scenic slides could be subtracted from the response to that sender's expression to slides that tended to elicit pleasant, unpleasant, and puzzled expressions. Judges viewed a total of 40 10-second clips including five male and five female senders viewing each of the 4 slide categories. To avoid familiarity effects, a given sender appeared only once. After each clip, the receiver guessed

¹ For discussions of the "selfish gene" critique of communication as manipulation see Buck and Ginsburg 1991; Buck 2002; and Buck 2011.

the type of slide viewed by pressing a button on a response device held in the right hand. This was followed by a blank screen variably timed so as to resist effects of habituation, expectation, and response set. Data analysis was confined to correctly-guessed sequences.

Results indicated that viewing senders responding to all of the emotional slide categories elicited activated areas associated with attention and arousal responses to emotionally salient stimuli, and that much of the activation was right-sided. Interestingly, the expressions of senders viewing familiar and unpleasant slides activated areas of the RH analogous of Broca's (BAs 44 and 45)

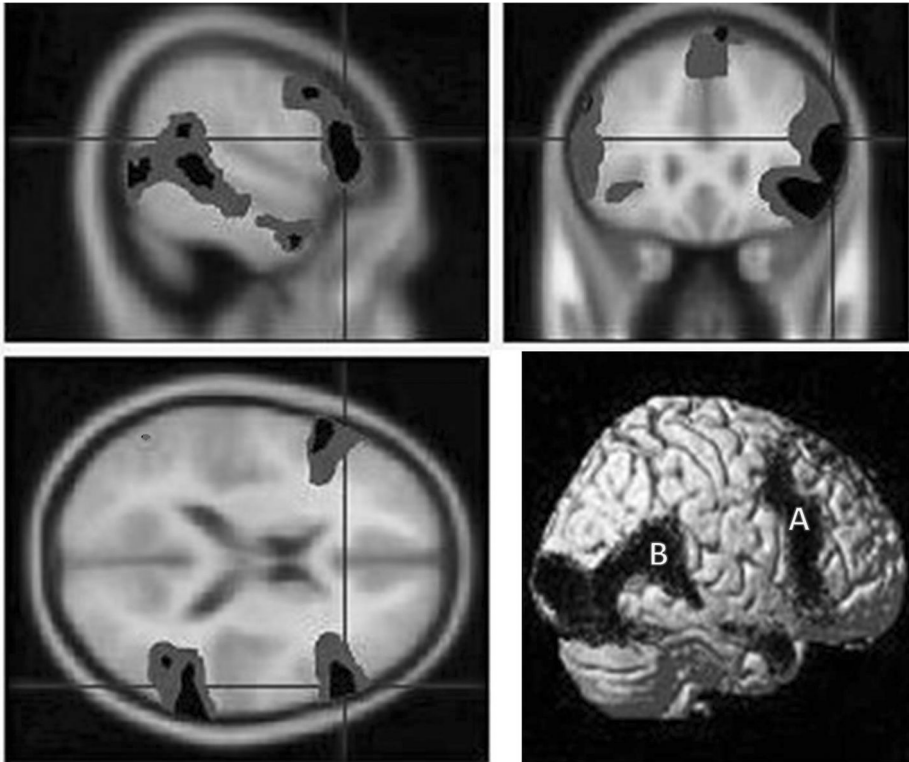


Figure 6: Activation in the right hemisphere to sender viewing picture of familiar person. A = Broca's, B = Wernicke's analog. Crosshairs identify Brodmann area 45

and Wernicke's (BA 22) areas in the LH (Powers 2009: see Figure 6). The fact that these areas are activated by watching spontaneous emotional expression is of considerable interest. These areas have been associated with mirror neuron activity in other research (Lieberman 2007), and this suggests that representations of dynamic spontaneous emotional expression may activate mirror neuron system activity. Note that these are the same RH areas that, when damaged, result in

facial inexpressiveness and aprosodia. The pattern shown in Figure 6, plus converging evidence from other studies, suggests that the RH analogs of Broca's and Wernicke's areas are associated with a stream of spontaneous emotional communication existing alongside the stream of symbolic propositional communication associated with the LH.

3.2 Mirror neurons

If facial expressions and other displays evolved as signs of emotion, it makes sense that there must have been a simultaneous co-evolution of receiving mechanisms that are preattuned to these displays. The evidence of the functioning of mirror neurons (MNs) supports the proposition that these preattunements, in fact, exist. Mirror neurons were discovered when it was observed that a class of neurons was activated both when a monkey performed an action (grasping an object) and when the monkey observed a human experimenter grasping an object (de Pelligrino et al. 1992). Gallese et al. (2004: 397) wrote, "although we do not overtly reproduce the observed action, part of our motor system becomes active 'as if' we were executing that very same action that we are observing." Gazzola et al. (2007) noted that MN systems appear to be responding to the perceived goals and intentions of the action. When an industrial robot was observed to "pick up" an object, MN systems associated with picking up an object were activated even though the kinematics of "picking up" were different in robot and human. Gazzola et al. concluded that "The goal alone, without matching kinematics, is sufficient to activate our mirror neuron system" (2007: 1682).

MN systems are thought to be the basis of the understanding of others' intentions, actions, and also others' emotions: e.g., of empathy (de Waal 2007). In one study, participants were exposed to disgusting odors, then viewed films of others smelling the disgusting or a pleasant odor. Viewing the facial expressions activated one of the same regions of the anterior insula activated when actually smelling the disgusting odors (Wicker et al. 2003). Also, Singer et al. (2004) and Singer (2006) showed that participants' neural responses when they experienced pain personally were comparable to when they observed a loved one present in the same room experience the pain. Gallese et al. (2004: 401) concluded, "social cognition is not only thinking about the contents of someone else's mind... Our brains, and those of other primates, appear to have developed a basic functional mechanism, a mirror mechanism, which gives us an experiential insight into other minds." This activation and resulting experiential insight, we suggest, results from the action of preattunements to displays, that is, from spontaneous communication (Buck and Powers 2010; Powers et al. 2007).

3.3 Conclusions

Taken together, a remarkable convergence of evidence from a variety of perspectives supports a fundamental distinction between spontaneous and symbolic communication. Communication proceeds in two simultaneous streams, one intentional, propositional, learned, and culturally patterned; the other nonintentional, nonpropositional, innate, and pancultural. These are related to LH and RH functioning, respectively. Species have evolved however, such that the latter spontaneous stream can be hijacked, as it were, by intention, allowing the sender to manipulate the receiver through convincing display rules and deception that effectively activate preattunements in the partner via mirror neuron systems.

4 Emotion regulation: Individual differences in nonverbal encoding and display

We saw that expression management techniques allow the multidirectional *control* of the display to fit display rules. Display of one's "true feelings" can be increased or decreased, and unfelt emotions simulated. We also considered the *suppression* of the display and the suppression hypothesis that indicates inhibition of the display is associated with autonomically mediated stress responses, potentially compromising health. Taken together, the control and suppression of the display are central to *emotion regulation*, which is how we try to influence the emotions we have, when we have them, and how we experience and express them (Gross and Levenson 1997). This section discusses individual differences in nonverbal encoding and display that have implications for emotion regulation. Specifically, we consider internalizing and externalizing patterns of response, and the literature on emotional intelligence.

4.1 Internalizing and externalizing

4.1.1 Personality and temperament

There has long been evidence that persons who are overt in emotional responding are less reactive on certain autonomic nervous system measures such as electrodermal responses (e.g., Prideaux 1920). H. E. Jones (1960) used the term "externalizing" to describe a pattern of little overt expression but frequent electrodermal responding, and "internalizing" to describe the opposite. Internalizing/externalizing is relevant to a number of constructs of inhibition/disinhibition studied in research on personality and temperament. These include concepts of approach and withdrawal identified in the New York Longitudinal Study of tem-

perament (e.g., Thomas et al. 1963), concepts of behavioral inhibition and disinhibition studied in the longitudinal research of Jerome Kagan and colleagues (e.g., Kagan et al. 1984; 2007), and constructs of extraversion and introversion (Rothbart 1995).

H. J. Eysenck (1967) developed a three-factor personality theory encompassing concepts of extraversion, introversion, and neuroticism. He related extraversion-introversion to differences in the arousability of the brain's reticular formation (RF). J. A. Gray (1971; 1977) reformulated Eysenck's theory based upon notions of brain reward and punishment systems. He suggested that the organism is motivated to increase activity in the reward system, and that any behavior or stimulus associated with reward tends to increase that activity, resulting in a behavioral activation system (BAS), a positive feedback system that encourages the organism to "home in" on reward. The BAS has been identified with the classic "reward system" identified in animal research: the medial forebrain bundle (MFB), coursing from the brainstem into the forebrain. Conversely, the organism is also motivated to minimize activation of the punishment system, resulting in a behavioral inhibition system (BIS) that puts a brake on any behavior or stimulus associated with such activation. The BIS and BAS interact with the RF, which responds particularly to the arousal qualities and novelty of stimuli as well as the fight-or-flight system associated with the amygdala. Gray suggested that extraversion-introversion is associated with the relative arousability of the BAS and BIS, with extraversion associated with being relatively easy to reward, and introversion with being relatively easy to punish.

Later personality theorists developed several typologies of personality traits – the most dominant being the Big 5, followed by the NEO (neuroticism-extraversion-openness), and several other combinations (Costa and McCrae 1992). However, in all of these scales the most consistent personality trait has been extraversion. Extraversion is also the trait most easily identified by others (John and Robins 1993). Relationships between nonverbal cues and judgment accuracy can be studied via the lens model (Brunswik 1956) that uses concepts of cue validity and cue utilization – i.e., studying the extent to which a cue represents reality, and the extent to which it influences the judgment. In the case of extraversion, there appears to be consistency between reality, cues, and judgment accuracy (Lippa 1998; Riggio and Riggio 2002). A recent study found that expressive cues influenced attributions of the Big Five personality traits, with happy versus negative expressions promoting judgments of extraversion, openness, and agreeableness and low ratings of neuroticism (Hall, Gunnery, and Andrzejewski, 2011). Another study found that judges associated the amount of body movement and its flow with extraversion, agreeableness, and conscientiousness (Koppensteiner and Grammer 2010). (For further reading on personality and nonverbal behavior, see Chapter 13, Gifford, this volume.)

4.1.2 Expressiveness and development

The degree to which an internalizing versus externalizing temperament is open to influence by social learning over the course of development has been a topic of interest. Longitudinal studies by Kagan and colleagues (Kagan 2007; Kagan et al. 2007) identified continuities and discontinuities in expressiveness from childhood to adulthood which shed light on the extent to which inhibition and disinhibition are genetically based. One method involved categorizing children as inhibited or uninhibited early in life (4–24 months) and then testing them in later childhood, adolescence, and adulthood. For example, Schwartz et al. (2003) found that young adults (mean age = 21.8 years) classified as inhibited at age two showed greater fMRI responses in both left and right amygdalae to novel faces than did adults classified as disinhibited, and also greater responses to novel than to familiar faces. This supported the hypotheses that behavioral inhibition/disinhibition is associated with different brain responses to novelty, and that these brain differences are preserved from infancy to early adulthood, constituting a genetically based predisposition or diathesis for inhibited or disinhibited behavior.

On the other hand, there is evidence that social learning plays a role in shaping internalizing/externalizing tendencies, particularly perhaps in children who are not at the temperamental extremes studied by Kagan and colleagues. A series of studies by Eisenberg and colleagues found that mothers influenced the emotion regulation and expressivity of 55–79 month olds (Eisenberg et al 2001). A longitudinal analysis of this cohort found that parental warmth/positive expressivity predicted children's effortful control, which in turn predicted low levels of externalizing problems (Eisenberg et al 2005). Another study also found that children with anxiety disorders often had mothers who spoke less than their children, used fewer positive emotion words, and discouraged emotion discussions more than mothers of nonclinical children (Suveg et al. 2005). Not only might this cause a problem with the ability to accurately send displays of emotion, but with empathy for others' displays as well (Valiente et al. 2004). Interventions aimed at training mothers with post-partum depression to attend more to their babies cues have been successful in fostering increased child expressivity of joy and interest, even though the mothers' depression ratings did not change (Jung et al 2007).

4.1.3 Emotional suppression and health: The suppression hypothesis

Gross and Levenson (1993: 970) defined suppression as “the conscious inhibition of emotional expressive behavior while emotionally aroused.” They found that suppression manipulations were associated with reduced expressive behavior and evidence of increased sympathetic nervous system responding (Gross and Levenson 1997). This is consistent with the internalizing-externalizing results summarized previously, and the suppression hypothesis (Buck 1993).

There is indeed evidence that being a poor sender may have negative health consequences (Traue and Pennebaker 1993). Active inhibition of emotional expression is associated with increased risk of a variety of health problems (Berry and Pennebaker 1993). Interestingly, Pennebaker and colleagues have found that verbal expression can be as effective as spontaneous nonverbal expression in reorganizing the autonomic response to the inhibition of emotion. They have urged that many common expressive therapies (e.g. art, music, cathartic) be used to express experiences both verbally and nonverbally. Reduced emotional expressivity has been linked to faster progression of breast cancer (Tops, van Peer, and Korf 2007), and a study examining body movements in patients with anorexia nervosa, bulimia, and inflammatory bowel disease found that patient groups showed relatively smaller movements, less weight shifts, more isolated use of their body parts, and less strength (Lausberg, von Wietersheim, and Feiereis 1996). Moreover, suppression of anger and inappropriately expressed anger within relationships are associated with depression in women (Sperberg and Stabb 1998), and anger suppression is also associated with increased sensitivity to pain in experimental tasks (Burns, Quartana, and Bruehl 2007).

4.1.4 Expression control: Posing

The voluminous literature on leakage and deception is beyond the range of this review, but there is a more limited and relevant literature on posing, where individuals seek to accurately convey emotions they do not feel at all (for a review of deception and nonverbal behavior, see Chapter 16, Frank and Svetieva, this volume). Research has demonstrated relationships between emotion socialization, posing ability, and mental health that are generally consistent with notions of social biofeedback and emotional education, and are relevant to the diagnosis of emotional disorders. Individuals tend to have deficits in encoding and decoding emotions that have been suppressed within their families. One study found that students from violent homes showed overall deficits in posed encoding of emotions (Hodgins and Belch 2000). Another found that children's ability to pose was related to their mother's ability to produce emotion expressions, and that children of depressed mothers were less able to pose sadness (Arsenio, Segin, and Siegel 2004). The depressed mothers did not have deficits in posing abilities, but they did have deficits in recognizing emotion expressions in others. This may have prevented them from supplying appropriate social biofeedback to their children. Other studies have shown that abuse (Camras et al. 1988) and social anxiety (Melfsen, Osterlow, and Florin 2000) are associated with deficits in children's ability to pose emotion. However, mental health challenges do not always result in posing deficits. Berenbaum (1992) found that adults with major depression were better than healthy controls at posing negative emotions, which he attributed to leakage of an underlying emotional state. (For further reading on

family socialization and nonverbal encoding, see Chapter 5, Halbertstadt, Parker, and Castro, this volume.)

4.2 Encoding and display in emotional intelligence

From the beginnings of the measurement of intelligence in terms of cognitive abilities, there has been recognition of the importance of socioemotional skills in explaining performance outcomes, what E. L. Thorndike (1920) termed social intelligence. Recently, there have been a number of attempts to assess *emotional intelligence (EI)*, which has been defined generally in terms of abilities to perceive, understand, and control emotions in oneself and others (Mayer et al. 2001). It is not possible to detail all the issues here, but there is controversy about the measurement of EI (e.g., Landy 2005) and specific definitions and measures vary. However, it is noteworthy that most EI measures involve self-reports rather than behavioral measures. And, like traditional notions of intelligence, they locate EI in the individual and do not explicitly consider the role of communication or the importance of dyad-level phenomena in understanding performance outcomes relevant to EI.

4.2.1 Emotional intelligence as an individual trait

Many studies have focused on the ability to manage moods and emotions in order to achieve personal or organizational goals (Ciarrochi, Chan, Bajgar 2001; Mikolajczak, Menil, and Luminet 2007). In this case, emotionally intelligent persons should know how to control their display in order to send appropriate messages and thereby increase team performance (Jordan and Troth 2004). For example, an emotionally intelligent leader is able to generate and maintain enthusiasm, confidence, optimism, cooperation, and trust (George 2000). In some cases, emotional adaptability is a key element of job performance, particularly in the service professions (Bar-On et al. 2000).

This research suggests that control is a key aspect of emotional intelligence, yet other studies find that high emotional intelligence is associated with greater sensitivity to mood induction (Petrides and Furnham 2003; Hakanen 2004) which has caused some researchers to urge a separation between emotion perception and emotion regulation in the concept of emotional intelligence (Papousek, Freudenthaler, and Schuler 2008). Some have looked at this discrepancy in the realm of “emotional labor” in the service professions, which require the management of emotion displays. This management may come about in two ways: by focusing on changing behavior – which has been associated with burnout and somatic complaints, or on managing underlying emotions – which has been associated with better physical and mental health outcomes (Hochschild 1983). High trait emo-

tional intelligence individuals tend to choose strategies that result in less burnout and somatic complaints (Mikolajczak, Menil, and Luminet 2007, but also see Johnson and Spector 2007) and are more resilient to negative life events (Armstrong, Galligan, and Critchely 2011). However a study of nonverbal posing ability found that while emotional intelligence was associated with greater emotion posing ability, it did not result in less leakage in a deception task, suggesting that control over one's display was not a necessary element of emotional intelligence (Porter, ten Brinke, Baker, and Wallace 2011).

Trait EI resembles the concept of *charisma* in some respects. We define charisma as involving a sender's ability to "push the emotional buttons" and effectively create an emotional bond with others (Buck and Powers 2011). One theory of charisma has emphasized the ability of a leader to create emotional contagion in his or her followers (Cherulnik et al. 2001). Another study found that leader charisma was positively associated with followers' positive affect and negatively associated with followers' negative affect (Erez et al. 2008). Others have focused exclusively on expressivity (Gross and John 1998; Kring, Smith, and Neale 1994). Gross and John's measure is a hierarchical model that includes the domains of expressive confidence, impulse intensity, positive expressivity, negative expressivity, and masking. Self-reported domains are impulse strength, negative expressivity, and positive expressivity (Gross and John 1997).

4.2.2 Emotional Intelligence in social interaction: Emotional sonar and IFF

The sender's emotional display does not, however, occur in a social vacuum. The sender's expression encourages expressive responses in others, which can function to give the sender cues about the other's emotional state. This is relevant to one of the most important qualities typically ascribed to high EI: the ability to read the emotions of others. A good sender can effectively and efficiently stimulate emotional expression in other persons, and thereby have that emotional information to draw on in making decisions.

Boone and Buck (2004) described this process in terms of *emotional sonar* and *IFF* (identification of friend or foe). In the ecological context of interpersonal exchange, accurate emotional displays work similarly to an active sonar system. The sender's display is received and responded to by a partner, who then reflects the signal back to the sender in the form of social biofeedback as outlined previously. An implication is that good senders carry around with them an emotionally enriched "bubble" of active and accurate emotion sonar wherever they go. This allows them to stimulate expression and therefore read the emotions of others more accurately, and additionally by virtue of the resulting social biofeedback to attain a better understanding of their own feelings and desires. For example, in a round-robin study using strangers, participants who were more sociable and extraverted were judged more accurately (Ambady, Hallahan, and Rosenthal 1995).

By virtue of accurate social biofeedback, such persons therefore are likely to develop the opposite of alexithymia: a relatively complex and differentiated understanding and vocabulary of their own affects. We have termed this emotional competence, but in many respects it is the essence of what is generally understood to be EI.

The related concept of IFF is the ability to distinguish friend from foe. Whereas sonar only looks for a reflection of the signal, IFF challenges the target to respond as friendly or hostile (Boone and Buck 2004). It is critical in determining the trustworthiness of partners in situations involving potential competition. These pseudo-spontaneous expressions follow culturally variable display rules, but may also involve manipulative tactical and strategic considerations on the part of the sender. This is especially relevant in situations similar to Prisoner's Dilemma-type games where competition or cooperation is possible and the ability of a sender to convey trustworthiness is critical. Boone and Buck (2003) noted that sending accuracy contributes to judgments of interpersonal attraction on a par with but independent of physical attractiveness. They hypothesized that sending accuracy functions as a marker for cooperative behavior, or trustworthiness.

Emotional competence or EI resulting from accurate and efficient emotional sonar and IFF may be, in part, an individual trait. But measuring it with self-reports is problematic because our expressive displays are not as accessible to ourselves as they are to interaction partners and objective observers. Partner reports would be preferable. Also, if as we have argued there is a curvilinear relationship between expressiveness and communication accuracy (Figure 4), a simple objective count of expressive behaviors may be misleading. More expression does not necessarily result in more accurate communication. What is important is the sender's accuracy in communicating feelings, which can be measured by procedures such as the SVT.

4.2.3 Emotional intelligence in dyadic context

Although some aspects of emotional competence or EI can be considered to be trait-like, other aspects may be specific to a given dyadic relationship. Put simply, we may be able to effectively communicate emotionally with some persons and not others. Some dyads may be more emotionally competent than others. Indeed, it is possible that persons who may not be all that emotionally competent as individuals might make up an emotionally competent dyad precisely because of their individual peculiarities. Furthermore, EI may be specific to certain types of relationships.

Cronbach pointed out the measurement problems associated with dyadic phenomena in 1955 and, since then, statistical techniques have been developed to parse out the highly correlated concepts associated with dyadic measures (Cronbach 1955; Kenny 1994). Figure 7 shows the possible relationships between self

and partner emotion variables. *Perceived similarity* is the degree to which one sees others as similar to oneself. *Actual similarity* is the shared emotional experience. *Reciprocity* is the extent to which partners perceive each other in the same way.

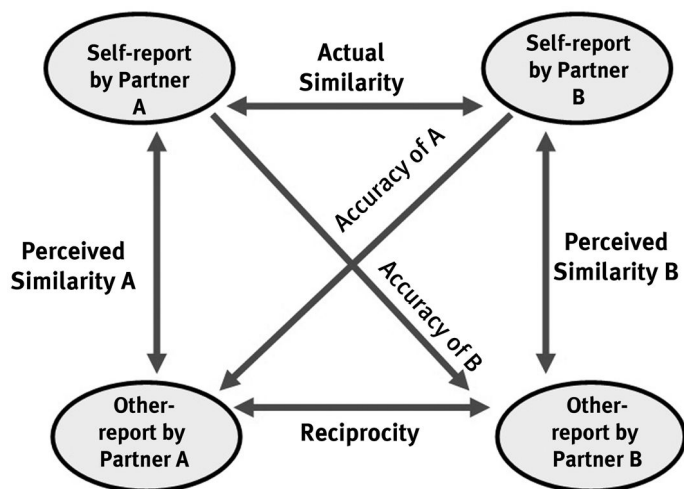


Figure 7: Self-partner correlations: sending accuracy in relational context. Diagram from Neyer, Banse and Asendorpf (1999)

Emotion communication accuracy (noted as accuracy in Figure 7) is the degree to which one is able to accurately predict how one's partner feels, with the partner's self-report as the objective criterion. These constructs, illustrated in Figure 7, follow the analysis of Neyer, Banse, and Asendorpf (1999) in their study of projection (assumed similarity) and empathic accuracy (emotion communication accuracy) in dyadic perception between older twins. The constructs flow from the Actor-Partner Interdependence Model proposed by Kenny (1994) and are based on Cronbach's analysis.

Studies of dyadic sending accuracy can tell us about aspects of the interaction, situation, and receiver that elicit more or less accurate cues in the sender. Thus, senders can have some level of "specific sending accuracy" with certain partners that varies with other partners. The level of acquaintance and history between interaction partners influences accuracy. For example, in a round-robin study, married couples were able to read one another with greater accuracy than strangers (Sabatelli, Buck, and Dreyer 1982; Sabatelli, Buck, and Kenny 1986). Husbands and wives served as senders in the SVT and also received from male and female strangers. The couple's expressions were later judged by male and female strangers, generating a partial round-robin design. A social relations model analysis showed that communication from husband to wife is composed of the following: 22% husband's individual sending accuracy 10%, wife's individual receiving ability, and

68% unique dyadic communication with individual sending and receiving accuracies controlled, reflecting the wife's unique ability to "read" the husband (plus error). Similarly, communication from wife to husband was composed of 48% wife's individual sending accuracy, 10% husband's individual receiving ability, and 51% unique dyadic communication with individual sending and receiving accuracies controlled, reflecting the husband's unique ability to "read" the wife (plus error). Interestingly, dyad quality as assessed by marital complaints was not related to overall communication accuracies, but husbands were happier with wives who were good senders, and wives were happier if they could uniquely read their husbands' expressions.

Research has also examined length of observation as a predictor of accuracy in judging personality. Blackman (1998) found that the longer a judge viewed a video tape of the target, the more accurate the observation was, and accuracy was greater among acquaintances. This was only true for the most visible of the traits, including those related to extraversion. On the other hand, some traits can be accurately judged in only a few seconds using a "thin slice paradigm" (Carney, Colvin, and Hall 2007; Oltmanns 2004).

The emotional competence of dyads may be revealed in part by their interactional synchrony. People tend to synchronize their rhythms and movements when they are feeling rapport within a conversation (Bernieri 1998; Cappella 1990; Levenson and Gottman 1983; Tickle-Degnen and Rosenthal 1990). Temporal coordination is broadly defined as the degree to which two or more individuals adjust their actions in response to those of their partner(s) (Cappella 1997). Here the focus is not simply on the receiver's reaction to the sender, but on the simultaneous mutual influence that people can have on each other as both senders and receivers. This exchange forms the basis of our interactions from the very beginning of life, as shown in studies of mother-infant interaction (Bernieri, Reznick, and Rosenthal 1988; Tronick, Als, and Brazelton 1977; Braten and Trevarthan 2007). (For additional reading on interpersonal synchrony, see Chapter 18, Lakin, this volume.)

The effect of decreased temporal coordination is not as well understood. Hatfield and colleagues (1992) suggested that it disrupts social exchanges, and can foster miscommunication and conflict. Without coordination, we may feel mildly stressed or unpleasant. Lack of synchrony is found in mothers with unrelated infants (Bernieri 1988), depressed people, dyslexic people, and schizophrenia patients (Condon and Ogston 1966). Burgoon and colleagues (1995) reviewed studies where cultural differences between groups contributed to dissynchrony. There may also be a social function to dissynchrony: it may be a way for an infant to communicate "stop" to its mother by turning its head (Tronick, Als and Brazelton 1977). Powers et al. (2011) found that introducing a video feedback delay can disrupt accurate emotional communication under some conditions.

Another potential dyad-level sign of emotional competence is mimicry, which within the stream of temporal coordination can indicate an intuitive understanding

and/or a sharing of feeling. The role of mirror neurons is of interest in the matching and mimicry of facial expressions and body movements of others (Decety and Jackson 2004; Rotondo and Boker 2002). Neuroscientists have tended to emphasize neural motor mimicry's role in learning and empathy (Gallese 2001). However some communication scholars (Bavelas et al. 1988) have argued that muscular motor mimicry primarily serves a communicative function as an external indication of "I am with you," or, "I am like you" (p. 278). Bavelas and colleagues argue that it is not necessary to actually feel the same feeling as a partner, but simply that the partner perceives that the feeling is similarly felt. While this perspective focuses on the micro level, it may result in a shared emotional experience over the course of the interaction.

Finally, levels of intimacy of a dyad are signaled by dyad-level immediacy behaviors, involving cues such as interpersonal spacing, directness of posturing, eye contact, and touching. Argyle and Dean's (1965) equilibrium theory proposes that if individuals have an established level of intimacy in interaction, they will adjust their behavior to perceived changes in that level. For example, strangers compelled to be at close distances with others in a crowded bus or elevator will avoid eye contact. Conversely, if the level of intimacy desired is greater than the current level, it is signaled by reciprocity – e.g., increased proximity by one person is matched by the other.

Through coordination and mimicry of speech, movement, and expression, individuals are able to understand, and perhaps share, similar social experiences. Synchronous nonverbal communication should lead to enhanced emotion communication accuracy. In this sense, accuracy during interaction is not simply a raw perception that implies a good guess based on knowledge of the partner, it is fundamentally intertwined with actual similarity and perceived similarity between partners (Powers et al. 2011).

5 Conclusions

This chapter has presented a developmental-interactionist view of nonverbal encoding and display that is consistent with a convergence of evidence from areas of investigation ranging from basic neuroscience to personality development to interpersonal communication. This evidence supports a fundamental distinction between two simultaneous streams of communication: a symbolic stream that is intentional, propositional, learned, culturally patterned, and related to LH brain functioning; and a spontaneous stream that is nonintentional, nonpropositional, innate, pancultural, and related to RH functioning. Species have evolved such that the spontaneous stream can be controlled to a great extent, allowing senders to effectively manipulate others by activating preattunements based in receivers' mirror neuron systems. Significant individual differences exist in sending accuracy

that relate to emotion regulation, including internalizing and externalizing tendencies associated with the health impacts of emotional suppression, the personality dimension of extraversion, and the concepts of alexithymia, emotional intelligence and charisma. These phenomena do not, however, exist only in the individual sender: they must also be conceptualized as functioning at the dyadic level and in communicative context. Nonverbal sending accuracy has active influences upon the social environment and may be utilized as such by senders, as in emotional sonar and IFF. The consequences of sending accuracy depend in great part upon the responses of receivers.

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Stephen Nowicki and Marshall Duke

15 Accuracy in interpreting nonverbal cues

Abstract: In the present chapter we describe some of the major conceptual and methodological issues inherent in defining receptive accuracy. We point out that researchers often apply the term “accuracy” to a variety of different indices of accuracy without noting the potential differences. In an attempt to clarify the possible conceptual meanings of receptive accuracy we present a framework, first introduced by Minskoff, that suggests that there are at least four major types of accuracy reflecting less to more complexity: discriminative, semantic, utilitarian, and relational. Using the definitions we attempted to classify different tests that have been used to measure receptive accuracy with a special emphasis on the Diagnostic Analysis of Nonverbal Accuracy. We noted that results of past research tended to be most often reported as single scores for facial expressions. We suggested that more might be gained if researchers focused on a broader range of nonverbal modalities and reported patterns of accuracy scores both within and among modalities.

Keywords: receptive accuracy, discrimination, semantic, utilitarian and relational accuracy, pattern analysis, nonverbal communication

Steve Martin, the well known entertainer/comedian, began one of his monologues by saying that he had just finished writing a book entitled “How to make a million dollars and be happy” and he felt sure it would be a best seller. It begins, Martin says, with the sentence “Make a million dollars,” while the rest of the book is about how to spend it to be happy!

If we followed the Steve Martin formula we might have entitled our chapter something like “Define receptive nonverbal accuracy and see how it affects every aspect of life.” The first sentence of our chapter could be “Make a definition of accuracy that everyone accepts,” and the rest of the chapter would describe how we use that definition to study all aspects of people’s personal, social, and business lives. The truth is, as will be seen, that making a million dollars may be easier than arriving at an acceptable definition of receptive nonverbal accuracy!

We know that “accuracy” demands some sort of agreed upon definition that provides criteria that determine whether judgments are correct or incorrect. We also know that most nonverbal research usually includes facial expressions, postures/gestures, proxemics, and vocalics.

The fact that there are a number of nonverbal modalities presents additional problems for defining accuracy. For one thing, we need to know whether the modalities are independent and orthogonal from one another or do they converge

in delivering a communicative message (Fridlund, Ekman, and Oster 1987). The answer to this question has implications for whether the definition of accuracy is similar across modalities or will have to change from one modality to the next. For example, while it may be easy to argue for using the identification of specific emotions as an “accuracy” criterion in faces, it is more difficult to apply it to gestures or personal space.

There has been a recent upsurge of interest into some of what Elfenbein et al. (2010) have referred to as “the intractable questions” surrounding the association between individual differences in accuracy of emotional expression and accuracy of emotional recognition. While this upsurge is a sign that these questions continue to be interesting and important, there may be more than one way to view the source of their intractability. To be sure, as Elfenbein et al. note, there have been vast improvements in technology and methodologies since the “spark of interest during the mid 1960’s to mid 1980’s” and the questions can and should be revisited using these new advances. However, it is also the case that the search for the answer to the questions concerning the association between expressive and receptive accuracy may have been, as Elfenbein and Eisenkraft (2010) have suggested, “more or less abandoned in light of conflicting empirical findings...” However, the lack of research might reflect as much a problem of memory as one of waning interest. In particular, there seems to have been a disconnection between the conceptual foundations of the earlier stages of research on nonverbal accuracy and the more recent work in the area. This disconnect appears to be reflected in the emergence of what Pedhazur and Schmelkin (1991) have termed a “jingle fallacy” in which two variables that are different from one another are called the same thing. In fact, upon a long-view examination of the literature on accuracy, we have come to believe that the word “accuracy” may have fallen prey to the jingle fallacy. This is to say that, although a multitude of theoreticians, educators, and researchers have used the term for decades, they may have forgotten or not paid attention to the fact that it has a variety of meanings. This variety of meanings, we propose, has become one of the main sources of conceptual and empirical disagreements in the field of nonverbal language research. It could be that many of the conflicts about definition, measurement, and development are likely based simply on one researcher’s “accuracy” being different from another researcher’s “accuracy.” Our goal in this chapter, then is to examine the very notion of accuracy itself and in so doing try to clarify the various meanings of the word both theoretically and empirically. Further, we will attempt to apply a multiplistic definition of accuracy which we believe maps onto the variety of tasks researchers have taken in the study of nonverbal accuracy. Finally, through a deeper examination of one form of accuracy, we hope to demonstrate a way in which seeing accuracy as a plural word can help to elucidate some of the ongoing conflicts in the literature.

1 Accuracy is a plural word

In an influential pair of articles in the *Journal of Learning Disabilities*, Esther Minskoff (1980a, 1980b) proposed a conceptualization of an approach to teaching nonverbal communication skills that provided an intriguing resolution to our modern problem of the definition of accuracy. Minskoff argued that there were four steps necessary for the effective use of nonverbal information in a social context. First, a child needed to be able to *discriminate* nonverbal cues. This meant that he or she needed simply to know that one facial expression was different from another. Second, the child needed to understand the *social meanings* of cues like facial expressions, such that a lowered eyes and a turned down mouth meant sadness. Third, these meaningful cues needed to be used by the child in an effort to make sense of *social interactions*, such as a boy realizing that a smile from a young lady meant that she might be open to a friendly relationship-opening: “Hi!” Finally, the child should be able to demonstrate actual *application* of nonverbal cues and signals in ongoing natural social interactions.

Our early work on the measurement and use of nonverbal language was built on the work of Minskoff in that we believed then and believe now that she had put forward a viable stage model for nonverbal efficacy. It appeared to us that Minskoff’s approach set forth a sequence of skills, all of which needed to be mastered if a child or adult were to be able ultimately to function effectively in social/interpersonal settings and situations. The progressive nature of Minskoff’s framework also yielded the conclusion that errors at any one point in the sequence could result in failure or problems at others. Thus, were a child to be unable to discriminate cues, he or she would not be able to establish and maintain effective relationships. However, the same outcome – ineffective social relationships – would be manifest no matter *where* in the four-stage sequence a skill deficit was present. If effective social relationships were an indicator of nonverbal accuracy, then, a problem at any one of the four stages could result in the same outcome. However, the location of the inaccuracy would and could vary anywhere from an inability to discriminate cues at all, through an inability to place accurate meanings on discriminated cues, to an inability to use accurately understood cues, to an inability to understand social situations, to an inability to apply accurately used cues in real life.

How then should nonverbal accuracy be defined? Based on the thinking above, we believe that there are at least four major ways to define accuracy. It is possible that applying the definitions to research efforts may allow us to separate the independent streams of research that previously were grouped together under the concept of “accuracy.” For expository purposes and based upon Minskoff’s stage model for the teaching of nonverbal communication skills, we will briefly describe four types of accuracy: Discriminative Accuracy, Semantic Accuracy, Utilitarian Accuracy, and Relational Accuracy.

1.1 Discriminative Accuracy

Discriminative Accuracy reflects the ability to differentiate nonverbal signs from one another. This is the foundational form of nonverbal accuracy for it is here that children learn most simply that there are different “signs” in their environment – facial expressions that differ, gestures that differ, voice tones that differ, etc. Unless a child sees that facial expressions differ, he or she will never be able to learn that different facial expressions have different meanings. Problems reflecting discriminative inaccuracy will take the form of children’s seeming “not to notice” a stern look on a teacher’s face, or a raising of the voice by an increasingly impatient parent. While it may seem hard to believe that children cannot discriminate differences in nonverbal cues, in early data we collected from a sample of children with significant school and social problems, we observed youngsters who could not identify correctly pairs of faces with different facial expressions as compared with pairs with the same facial expression (Nowicki and Duke 1994). On the expressive side, we made photos of children asked to demonstrate angry faces and then sad faces and found many children whose facial expressions did not look appreciably different to peer-group judges.

The literature focused specifically on Discriminative Accuracy is sparse. We believe that this may be due to an erroneous assumption among researchers that almost everyone can detect differences between facial expressions, voice tones, gestures, and the like. This is an assumption, however, and if it is incorrect, the consequences will have ripples throughout the broader literature on nonverbal communication. Regardless of what level of analysis is applied by researchers – Semantic, Utilitarian, or Relational – a foundational difficulty in simple cue discrimination might be a hidden cause of inaccuracy and social dysfunction. Before assuming that a child or adult *mislabeled* different facial expressions, we must be sure that he or she *sees* different facial expressions.

1.2 Semantic Accuracy

For Minskoff, the second critical skill in nonverbal communication is the ability to label accurately the meanings of cues that are already seen as different. Thus, for example, whereas Discriminative Accuracy ensures that someone sees that different facial expressions of emotion are in fact different, in Semantic Accuracy the person ascribes accurate meanings to each of those expressions. Without Semantic Accuracy, a child might see a pair comprising one angry and one sad face as depicting two angry faces or two sad faces. This would create some difficulty for a child who understands the emotion but does not have the verbal label and much more difficulty for a child who can do neither. The implications of this latter error for social interactions should be clear.

A significant proportion of research on nonverbal accuracy may be placed within the domain of semantic accuracy. Here, we find measures such as the Pictures of Facial Affect (Ekman and Friesen 1976; Matsumoto et al., 2000), the Profile of Nonverbal Sensitivity (PONS, Rosenthal et al. 1979), and the Diagnostic Analysis of Nonverbal Accuracy (DANVA, Nowicki and Duke 1994), and other efforts to assess the ability to label correctly facial expressions, voice tones, gestures, and the like that, on the basis of admittedly varying criteria, have been deemed representative of emotional states or intentions in others. (See also Chapter 7, Patel and Scherer, this volume, for discussion of accuracy of judging vocal cues in particular.) It should be apparent that errors in expressive and/or receptive Semantic Accuracy will result in a variety of social and interpersonal problems. Believing that an angry face is a sad one will lead to ineffective social interactions. Confusing tense pensiveness with silent contentment can alter the course of a loving relationship.

While much empirical research and theorizing regarding nonverbal communication have focused on what we are terming Semantic Accuracy, it is our belief that unless this form of accuracy is seen as just one component of overall nonverbal accuracy rather than its sole or most important determinant, we would be committing a significant error. If a person scores extremely well on tests of Semantic Accuracy this does not mean that his or her social relationships (or anything else ultimately dependent on nonverbal communication skills) will be commensurately as strong. Unless a person learns to accurately apply the perceived meaning of nonverbal cues to ongoing social interactions, Semantic Accuracy would be like being able to catch a baseball one hundred times in a row without dropping it. Unless the skill is seen as one to be applied on the baseball diamond, all one can say is that “this kid sure can catch a ball.” It reflects the difference between knowing what contributes to success and having the skill to actually apply the ability. In the present example, taking the skill to the playing field requires not only knowledge but more ability as well. We call this Utilitarian Accuracy.

1.3 Utilitarian Accuracy

Utilitarian Accuracy is skill in the use of nonverbal knowledge in real life situations. In our baseball analogy, this would mean using basic abilities in fielding and batting in a real game. In social relationships a high level of Utilitarian Accuracy means that a person encodes and decodes nonverbal information during the course of social interactions such that these interactions run smoothly and effectively. For example, a child, Mary, may accurately perceive that her playmate, Dawn, who is sitting alone with her head down during recess, is sad. This would be semantically accurate. However, were Mary to walk over to the Dawn and try to cheer her up or engage her in a game, she would be manifesting Utilitarian Accuracy. It would be expected that people with strong Utilitarian Accuracy skills would

be quite good in short-term social interactions and would be seen as interpersonally “savvy” by others. It would also be the case, however, that high scores on measures of Semantic Accuracy might not fully predict success in short-term social interactions any more than excellence in basic baseball skills would fully predict success on a specific play in a baseball game.

1.4 Relational Accuracy

The fourth form of nonverbal accuracy that we propose is Relational Accuracy. Relational Accuracy differs from Utilitarian Accuracy in that it refers to the ability not only to apply nonverbal knowledge in short-term social interactions such as that of Mary and Dawn on the playground, but to the establishment and maintenance of social relationships over time. To be strong in Relational Accuracy is to know that relationships exist not in a specific moment, but over time, and that the importance of accurately reading and encoding nonverbal information varies according to the nature and level of people’s connections with one another. Specifically, we propose that individuals must know that nonverbal signs present at the beginning stage of a relationship can mean different things than they do in a deeper relationship. Skill in knowing what to say or do as well as what *not* to say or do is critical in developing, strengthening, and maintaining long-term interpersonal relationships. (In large measure this is the goal of all of the other levels of accuracy, but like the skill set in baseball, this level of ability only emerges after much practice of “the fundamentals.”)

Returning to our example of Mary and Dawn, based on Utilitarian Accuracy, Mary’s approaching Dawn and trying to engage her might be a good strategy if Dawn were a new student who just started school that day. However, were it to be the case that Mary and Dawn had been classmates for many years and were Mary to know that sometimes her friend Dawn just needed to have some quiet time, a more highly skilled response to Dawn’s nonverbal display would be to simply go on playing with the other children and wait for Dawn to rejoin the group when she was ready. The point here is that the ultimate form of nonverbal accuracy, the purpose for which we have evolved a set of displays and the ability to read them accurately, lies in the use of nonverbal information to establish and maintain the sorts of long-term connections that help us to survive both individually and as a species.

2 Why is receptive nonverbal accuracy important?

Nonverbal social behavior refers to all those human responses which are not described as overtly manifested in words (either spoken or written) and that convey

meaning (Knapp and Hall 2010). Nonverbal behaviors include facial expressions, paralanguage or prosody, body movement or kinetics, gestures and touching, and proxemics. Nonverbal social skills “include...abilities to encode and decode cues of emotion...to control and regulate emotional displays and ...the management of conversation” (Riggio 1992).

As can be seen by this definition, nonverbal communication includes both the ability to send and to receive nonverbal information. In their meta-analysis of past research focused on the association between these two skills, Elfenbein and Eisenkraft (2010) found that though there was a near-zero correlation for spontaneous, naturalistic, or a combination of display types, there was a significant positive correlation for studies that used intentional communication displays. Building on this set of findings Elfenbein et al. (2010) found further, using a round robin methodology as prescribed by Kenny (1994) and intentional communication of facial expressions, that there was a significant and high correlation between the two abilities.

It is also important to know whether or not nonverbal accuracy is synonymous with general cognitive ability (IQ). Murphy and Hall (2011) meta-analyzed the findings from 38 studies and found a small-to-medium positive effect size that was moderated, among other variables, by whether accuracy was measured via the identification of the target person’s emotions versus the identification of the target person’s intended meaning. They concluded that interpersonal decoding accuracy requires some level of social sophistication and results of this meta-analysis suggest that part of that social sophistication involves the cognitive abilities comprising general intelligence.

Both receptive and expressive abilities are necessary components of the communication process, but in the present chapter we focus on receptive nonverbal skill. While this is only a part of the communicative process, compared to expressive nonverbal skill, there is evidence that receptive nonverbal skills are learned earlier (Ekman and Oster 1982; Feldman and Rimé 1991; Johnson and Myklebust 1967), have yielded more empirical information, and have tests that are more reliable, valid, and easier to administer to a greater numbers of participants (e.g., Rosenthal et al. 1979).

A growing body of empirical research shows that receptive nonverbal processing ability is associated with personal and social adjustment. Regardless of how accuracy of receptive nonverbal cues has been defined and determined, it has been associated with an impressive number and variety of personal and social outcomes.

J. A. Hall, Andrzejewski, and Yopchick (2009) submitted the results of 215 studies to meta-analysis to explore the association of important psychosocial variables like empathy, affiliation, internal locus of control, and social competence, with interpersonal sensitivity as measured by instruments such as the Profile of Nonverbal Sensitivity (PONS; Rosenthal et al. 1979), which asks participants to view video and/or audio clips of a woman and then to use the information gathered to choose

between two options. Significant mean correlations were found for 27 of the 40 categories of psychosocial functioning indicating that interpersonal sensitivity was associated with positive aspects of personality and social functioning.

Consistent with what J. A. Hall, Andrzejewski, and Yopchick (2009) found, lower nonverbal receptive accuracy as measured primarily by tests of Semantic Accuracy has been found to be associated with a variety of indicators of social difficulties including *lower popularity* (Collins and Nowicki 2001), *nonverbal and verbal learning disabilities* (Clark 1992; C. W. Hall et al. 1999), *externalizing problems and conduct disorder* (Cadesky, Mota, and Schachar 2000; Stevens, Charman, and Blair 2001), *depression* (Chen, Tseng, and Huang 2003; Nowicki and Carton 1997), *bipolar disorder* (Brotman et al. 2008), *social anxiety* (Melfsen and Florin 2002; Walker and Nowicki in press), and *Williams Syndrome* (Skwerer et al., in press).

The brief sampling of the abundant research support showing that a variety of receptive nonverbal accuracies are associated with social competence and social adjustment outcomes suggests that accuracy is involved in relating to others in effective ways. Receptive nonverbal accuracy, it seems, may have something significant to do with the process of “getting along with others” and with acquiring, maintaining, and ending relationships effectively (Nowicki, Duke, and van Buren 2008).

As Berscheid and Peplau (1983) stated,

Relationships with others lie at the very core of human existence. Humans are conceived within relationships, born into relationships, and live their lives within relationships with others. Each individual's dependence on other people – for the realization of life itself, for survival during one of the longest gestation periods in the animal kingdom, for food and shelter and aid and comfort throughout the life cycle – is a fundamental fact of the human condition (p. 1).

Our assumption is that one of the most important skills needed to be successful at forming relationships is the ability to accurately identify emotions (and other significant information) in the nonverbal behaviors of others. We are not the first to point this out. The early work of Mehrabian (1968) suggested the importance of nonverbal over verbal “language” in the communication of emotional information crucial for relating successfully to others. Riggio (1986, 1992) pioneered the more recent emphasis on nonverbal accuracy and relationship process by describing the skills necessary for initiating and maintaining interactions with others. A growing body of research supports Riggio's assumption that nonverbal communication skill “plays a critical role in all facets of social life from first encounters with strangers to the development and maintenance of long-term relationships” (1992, p. 10).

To highlight this possibility we offer a relationship model that integrates and extends Riggio's assumption that different social skills are needed for progress from one phase of a relationship to the next, in the hope that it may prove useful in reinterpreting past research findings and focusing future research efforts to understand better the effects of all types of receptive nonverbal accuracy. (For

additional discussion of nonverbal behavior in the context of relationships, see Chapter 19, Guerrero and Wiedemaier, this volume.)

3 A possible relationship framework for understanding receptive nonverbal accuracy

Although there are a number of different ways to describe and conceptualize relationships, most authors agree that they are crucial to our happiness and satisfaction with life (Regan 2011). Beginning with our parents and later with our peers and romantic partners, connecting with others is essential first for surviving physically and later for making friends and life-long intimate relationships (e.g., Ainsworth et al. 1978).

Some scientists believe that the drive to relate and be social may even be innate and programmed into us genetically:

Evolutionary psychology places social interaction and social relationships squarely within the center of the action. In particular, social interactions and relationships surrounding mating, kinship, reciprocal alliances, coalitions, and hierarchies are especially critical, because all appear to have strong consequences for successful survival and reproduction. (Buss and Kendrick 1998, p. 994)

Many relationship theorists would probably agree that close relationships show an orderly progression that may vary in its pattern and speed from initial (simple) to deeper (more complex) interactions as well as in the existence of mechanisms that allow the process to advance or cause it to be impeded. For example in Social Penetration Theory (Altman and Taylor 1973), the mechanism of self-disclosure is highlighted, while in Intimacy Theory (Reis, Clark, and Holmes 2004) responsiveness of partners is seen as the crucial factor. Regardless of the mechanism highlighted it is usually assumed that people who are better at picking up the highlighted aspects of whatever the mechanism may be, be it self-disclosure, responsivity, emotional state or the like, will have better relationship outcomes.

The model we introduce posits that relationships progress through a somewhat orderly sequence of choice, beginning, deepening, and ending phases (Nowicki, Duke, and van Buren 2008). The boundaries of each phase overlap and, though these boundaries are not rigidly defined, the model describes a process from simple to complex and shallow too deep in terms of relating. The model also assumes that progress depends on the use of social skills such as receptive nonverbal ability to help meet the increasingly complex demands that accompany transitions from simple to more complex ways of relating. In this model, a major mechanism that facilitates progress from one phase to the next is social communication. Both verbal and nonverbal social communication are assumed to be necessary for successful relationship movement.

3.1 Relationship stages and the role of accurate receptive nonverbal ability

3.1.1 Choice

At the initial phase of the relationship process the major task is to “pick out” the person with whom to begin the relationship process. Sometimes the “choice” is not really in our control such as when infants are in their relationship with parents or children with teachers, but when we do have some choice, the question is what should we look for in others? Past studies suggest that choosing with whom to begin a relationship can be a surprisingly quick decision based primarily on what is being observed nonverbally. Generally, we look for people who will make us feel at ease and comfortable. Researchers tell us that we look for others who are attractive, who smile, whose tone of voice is nonthreatening, and whose posture is welcoming (e.g., Anderson, Adams, and Plant 2008; Harker and Keltner 2001).

3.1.2 Beginning

Even though forming good and effective relationships may be one of the most important tasks we face throughout our lives, we get relatively little help in making that happen. Most of us have taken classes in written and spoken grammar, history, math and the like, but only a few will have had any formal education in how to connect with others. Of the four relationship phases, the beginning phase is an exception. Through what most of us would call “manners” we have received some training in what to do and what to look for when we first meet someone.

To begin relationships it seems that people first have to notice one another and then to like or be attracted to what they notice (Nowicki and Duke 2002; Regan 2011). Not surprisingly, what makes people noticeable and attractive has been the focus of relationship researchers for decades. Based on their findings it appears that some of the major positive characteristics include physical attractiveness, intelligence, emotional stability, warmth, and empathy (e.g., Eastwick and Finkel 2008; Selfhout et al. 2009).

According to Riggio (1992):

Ability to accurately read these cues is important if the interactants are truly going to understand one another ... it is skill in decoding others' nonverbal cues of emotion that allows interactants to get “in-tune” with one another at an emotional level. The ability to read nonverbal cues sets the stage for higher order emotions and social skills like empathy. By being empathetic interactants may move into the next phase of the relationship process and deepen with one another. (p. 16)

3.1.3 Deepening

Compared to the thousands of interactions we have in our life time an extremely small number of them go on to become deeper friendships and/or romantic rela-

tionships. So the question is what are the processes, events, or behaviors that separate those relationships that go on to deepen from the vast majority that don't? Not as much research has been completed regarding deepening of relationships as there is for their beginnings. (For one exception see Nowicki, Duke, and van Buren 2008, who suggest that complementarity of interpersonal styles using the circumplex model of behavior becomes important in determining depth of relationship. For another exception see Riggio (1992), who suggests emotional regulation as an important skill.) Moreover more research has been focused on romantic as opposed to friendship relationships especially with adults (Heyman et al. 2009; Rhoades, Stanley, and Markman 2010). A majority of the studies have used a "retrospective" methodology in which participants look back over their past relationships to identify factors that may have played a role in deepening their interactions and moved them to become more "intimate." Research using this approach has identified increased contact, discussion of the relationship, tokens of affection, asking for advice from others, and verbal statements of love and caring as being important to making the relationship deeper (Clark, Shaver, and Abraham 1999; Tolhuizen 1989). For example, when looking back over their relationships undergraduate college students mentioned that communication and emotional disclosure, including a broad variety of nonverbal behaviors such as "touching," were useful in making their romantic relationships deeper.

In any case, Riggio (1992) concludes and we agree that nonverbal interaction skills are important in "cementing" and maintaining long-term personal relationships. However, it also seems clear that there is much still to learn about the process of how we go about finding friends or a romantic partner. M. Rothman and Nowicki (2010) and Rosenthal et al. (1979) among others suggest that those who are more accurate in identifying the information in the nonverbal cues of others are more likely to be successful socially, better adjusted, and more likely to impress peers positively. These are characteristics that bode well for the ability to deepen a relationship.

3.1.4 Ending

This is probably the most important yet least investigated phase of relating. When researchers write about endings, it is usually with a negative tone and the use of words like "dissolution, grief, and sadness" (e. g., Harvey and Weber 2002). However, Nowicki and colleagues (Nowicki, Duke, and van Buren 2008) have pointed out that the ending of a relationship is also an important opportunity for the expression of positive feelings and for learning about how one relates. As Kierkegaard (1996) wrote, "Life can only be understood backward. Unfortunately, it must be lived forward." Why is ending and looking back so important? Because it is only when we make ourselves aware of the "life" of our relationship and look back on it that we can examine what we did correctly or incorrectly so that we can use

that knowledge to choose to begin new relationships more effectively. T. S. Eliot (1942) seemed to understand this as well when he wrote, “What we call the beginning is often the end. And to make an end is to make a beginning. The end is where we start from.” Sullivan (1953) was among the first psychiatric theorists to point out that “awareness” of one’s interpersonal behavior, especially its nonverbal aspects, is necessary for learning and change and endings must be dealt with in awareness and energy if we are to learn about ourselves and to move on to better handle whatever comes next in our lives.

3.1.5 Relationships over age: Sullivan’s theory and adult life development

Not only are different receptive nonverbal skills needed to successfully navigate the sequence of phases within a relationship, but they are also necessary for successfully dealing with the relationship changes and requirements at different ages of one’s life. Relationships differ in their quality and importance with age. Certainly most everyone would agree that a two-year-old relates to his or her peers and others differently from a 35-year-old adult and though important at any age, receptive nonverbal accuracy would have differential impact depending on the age of the interactants. However, this is rarely taken into consideration in the study of accuracy of nonverbal processing ability.

The problem is compounded by the fact that we know so little about how accuracies develop and the impact of receptive nonverbal inaccuracies on the lives of the interactants. For example, what are the trajectories of the four major types of accuracy over age and modality? Are they the same or do they differ? More specific to the present chapter, does the impact of accuracy of receptive nonverbal cues change with age? That is, for example, are mistakes in reading emotion in the faces of others more or less important in the relational lives of 10-, 20-, or 50-year-olds? These and many other important questions about the overall impact of accuracy of nonverbal skill across the age span remain unanswered but should be the focus of future research.

Investigators of receptive nonverbal accuracies may want to adopt a developmental perspective whenever they can. While there are any number of possible life-span developmental framework candidates that could be used, we have adopted one that originates from the writings of Harry Stack Sullivan (Sullivan 1953). Sullivan’s theory is especially germane because it emphasizes interpersonal factors including the importance of nonverbal communication in the inability of some to socially adjust. For Sullivan, progress through the developmental stages he describes is characterized by increasingly important and complex relationship competence moving from infancy to childhood to juvenile years to preadolescence to adolescence to adulthood (Nowicki, Duke, and van Buren 2008).

Although Sullivan’s model stops at adulthood, recent writing suggests that developmental change in how we relate continues throughout adulthood. That is,

relationships and the role of nonverbal communication in those relationships may differ depending on whether one is young, middle aged, or older (e.g., Levinson 1978; 1996).

4 Combining the four-phase relationship model and the four types of receptive accuracy into the Relationship Accuracy Framework

The four-phase model of interpersonal relationships is based on the notion that different skills are necessary for successful negotiation of different aspects of interpersonal process. We first introduced a simpler version of this model in 1983 (Duke and Nowicki 1983) and have applied it clinically as well as empirically for the past three decades. The multiplistic accuracy framework introduced in this chapter is a more recent addition to our conceptualization of relationships and relationship success and admittedly requires a thorough empirical evaluation. However, we believe that it takes into account that different relational skills are necessary at different points in a relationship (Riggio 1992) and that different nonverbal skills play a part in the success or failure at each point in the relationship process.

PHASE ACCURACY	Choice Phase	Beginning Phase	Deepening Phase	Ending Phase
Discriminative Accuracy-DA	Does not know that or how people differ	Does not try or tries with random people	Does not get here	Does not get here
Semantic Accuracy-SA	Picks "wrong" people	Non-starts due to wrong interpretation	Moves too quickly or too slowly	Does not understand it's time to go
Utilitarian Accuracy-UA	N/A	Does not apply known nonverbal info	Does not know how to deepen relationships	Does not know how to end
Relational Accuracy-RA	N/A	Can't see long term impact of starting well	Does not know when to deepen	Does not know when to end

Figure 1: The relationship phase/nonverbal accuracy matrix

The Relationship Accuracy Framework depicted in Figure 1 highlights how complex defining accuracy process truly is. The sixteen cells in this framework mean that researchers cannot just talk about "accuracy," but must also delineate

what type of accuracy they want and at what point in the relationship process it is to be measured. The framework becomes even more complicated because it must be applied to different nonverbal modalities. One goal of this approach is to raise awareness of the importance of assessment in determining individual differences in receptive nonverbal accuracy in laying the groundwork for the construction of appropriate interventions to help those whose accuracies are not as high as those of their peers.

5 Issues that have arisen when applying a Semantic Accuracy of receptive nonverbal processing ability

Our own research program has been directed toward establishing the viability of relatively simple tests of Semantic Accuracy in which individuals look at or hear stimulus cues and then choose which of four emotions they believe is being communicated. However, even at this relatively simple level of accuracy incorrect responses can create interpretive problems when a stimulus is inaccurately perceived. Was it missed because of a lack of discriminative skill among the faces or because of a lack of ability to identify specific emotions or perhaps both? The same problem exists for other Semantic Accuracy tests such as the Interpersonal Perception Task or IPT (Costanzo and Archer 1989). In the IPT individuals are shown video scenes of interactions and asked to choose the correct statements about what is transpiring in the scenes. It is assumed that to make a correct response individuals are able to read the simple and complex nonverbal clues that are offered within the scenes and use them to choose the correct response out of those offered. What can be concluded about individuals who make errors here? What informational cues did they fail to read that led them to mistake what was happening in the scene? Was it the facial expressions or the postures or the, gestures tone of voice, or personal space that were misread or were they read accurately but then individuals failed to apply the information appropriately to arrive at the correct answer? As practicing clinical psychologists our focus has always been on understanding and helping those who do not perform as well as their peers especially when it concerns social interactions. We want to know what kind of problems they are having and their source. Are they occurring at the simplest levels of accuracy or at the more complex ones or perhaps both? Assessment of the source of the inaccuracy is crucial because it provides the information that could help guide remediation efforts to improve “social skills.”

Clearly, receptive nonverbal accuracy is a topic that could fill many volumes, but for the remainder of the chapter we would want describe how we have chosen to approach and deal with the problem of receptive nonverbal accuracy. The issues

that we focus on are ones that could arise when applying any definition of accuracy in reading nonverbal cues. Certainly our approach to accuracy is only one among many that could be and have been used appropriately by researchers in this area. As expected of all researchers regardless of their definition of accuracy, our accuracy framework includes a clearly stated definition of accuracy that can be used to guide the development of construct valid measuring instruments to identify accuracy deficits and the building of intervention programs to remediate deficits once they are found.

We now turn our attention to our own approach to the problem of accuracy of receptive nonverbal communication performance. Our definition of accuracy is limited to the ability to identify some of the most common simple emotions such as happy, sad, anger, and fear in the nonverbal communications of others (Baum and Nowicki 1998; Nowicki and Carton 1993; Nowicki, Glanville, and Demertzis 1999; Nowicki and Duke 1994; Pitterman and Nowicki 2004; Rothman and Nowicki 2004). In the pyramid of skills that are theoretically needed to be “emotionally intelligent” (Mayer, Roberts, and Barsade 2008), the identification of simple emotions in the nonverbal cues of others is the most basic ability and provides the foundation for all the higher level socioemotional learning and functioning.

It is important to note here that one certainly can be adept at a simple level of accuracy and still experience any number of socioemotional problems at deeper levels of relating that demand more complex levels of accuracy and skill. However, it is also true that difficulties identifying simple emotions will increase the likelihood of experiencing social difficulties in complex situations. One practical consequence of this fact is that individuals who have difficulty identifying emotions in facial expressions, tones of voice, and postures, which are Semantic Accuracies, may not be able to fully benefit from “social skills” training programs, such as the Skills Streaming Program which focus more on Utilitarian Accuracy. For example, it is common in social skills programs to teach individuals how to respond appropriately when someone is angry. While this certainly is a useful skill, if participants cannot identify whether someone is angry or not, it cannot be applied successfully.

Reducing the definition of receptive nonverbal accuracy to a simple and basic level as we have done does not, unfortunately, eliminate serious conceptual, empirical, and theoretical problems in understanding and using “accuracy.” With that in mind, we now turn our attention to the some of the concerns that have arisen from attempts to apply a Semantic Accuracy definition of receptive nonverbal emotional ability.

5.1 What is the association between the ability to identify and to express nonverbal emotional cues accurately?

Over the past decade, relatively few researchers have reported both the ability to identify (receptive) and to send (expressive) nonverbal emotional cues or have

discussed the extent to which they may be associated (Elfenbein and Eisenkraft 2010). Since few studies include both sending and receiving of nonverbal cues, a significant question is to what degree are they associated? Are we dealing with one general nonverbal communication factor or at least two orthogonal ones?

For an answer to this question we turn to a meta-analysis completed by Elfenbein and Eisenkraft (2010). They reviewed both the theoretical basis for predicting positive or negative associations and the empirical data dedicated to evaluating the association. Theoretically, perhaps the most often used reason for predicting a positive association between the two skills originates in the concept of emotional intelligence (Mayer, Roberts, and Barsade 2008). Similar to the concept of a general or “g” factor that is hypothesized to underlie cognitive intelligence, abilities to identify and express basic emotions nonverbally are proposed in this perspective to be aspects of one general nonverbal communication factor. In contrast, there are theories that presuppose a negative or neutral association between the two nonverbal abilities. A frequently applied theoretical example of this perspective originates in the socialization theory of Halberstadt (1986). She suggests that “When the family environment is low in expressiveness, individuals must become sensitive to the most subtle displays of emotion in order to relate effectively with their family members” (p. 827). The opposite is also likely to be true in families. That is, in high expressive environments, family members do not have to develop effective receptive skills to interact within the family (see also Halberstadt, Denham, and Dunsmore 2001).

Finally, Elfenbein and Eisenkraft suggest the possibility that typical and unintentional receiving and sending skills may not be related to each other but may represent two separate and independent abilities. A plausible theory of this perspective proposes a neurological explanation in which the two skills are assumed to be dissociated from one another because they have distinct neural and independent neural pathways (Borod et al. 1990).

Elfenbein and Eisenkraft surveyed 40 studies that included 1,926 participants. Overall, they found simple correlations ranging from +0.80 to -0.64. More importantly, the meta-analysis showed that significant positive correlations were found only when the emotions were communicated and identified within intentional communication situations and were nonsignificant for spontaneous, naturalistic or a combination of display types.

5.2 How should receptive nonverbal emotion accuracy scores be reported?

Not only do studies on nonverbal communication of emotion rarely evaluate the association between receptive and expressive skills, but of those that focus on receptive ability, many use only adult facial expressions that most often are Cauca-

sian as the main measure of receptive nonverbal accuracy. In such cases, researchers who use simple emotion accuracy definitions tend to report only *total* and not *specific* scores. Reporting accuracy in this manner raises some important research questions that need answering.

5.2.1 Why are other nonverbal modalities such as paralanguage, postures, and the like not included more often?

The emphasis on adult facial expressions suggests that the face may be the most relevant of the possible nonverbal modalities and the extensive use of adult Caucasian faces suggests further that results not only are generalizable across age and modality, but perhaps across race and culture as well (Ekman 1994; Russell 1994). In regards to the generalizability across race and culture, recent work suggests that there may be are “in-group” advantages that are produced when individuals from a culture view or listen to nonverbal cues from their own rather than other races and cultures (e.g., Elfenbein and Ambady 2003; Wickline, Bailey, and Nowicki 2009; see also Chapter 23, Matsumoto and Hwang, this volume). The fact that participants may be less accurate at identifying faces of other racial groups suggests that more conceptual and empirical work is needed for all levels of accuracy.

5.2.2 Even when just one nonverbal modality is used why are not specific emotion accuracy scores reported more frequently?

The reporting of a single accuracy (or error) score suggests that receptive nonverbal accuracy is a single, global ability. As we mentioned above there are theoretical and practical implications of reporting a single score.

Besides researchers not using nonverbal stimuli that allow for identifying emotions that systematically differ in age or race (For exceptions, see Chronaki 2011; Matsumoto et al. 2000; Tseng, Chen, and Huang 2009) they also have failed to use standardized stimuli that reflect systematic differences in the intensity of emotion. Again, this is consistent with the presumption of a single underlying ability that not only cuts across modalities, but also levels of intensity, age, and cultural/racial characteristics.

Not only do researchers sometimes fail to report specific accuracy scores, but they also often fail to report misattribution scores, that is, the erroneous answers given in place of the correct ones. Presentation of “confusion matrices” or other ways of showing patterns of error scores would reveal whether errors were systematic (e.g., all anger) or random (e.g., equally distributed among emotions). This is important because the form that errors take may relate in important ways to types of behavior in a variety of social areas as will be described below.

5.2.3 Is there one-general-ability to read emotions or are there specific, largely separate abilities to read different emotions?

The answer to this question has significant implications for how researchers theorize about nonverbal receptive communication and how they apply their theories to such practical matters as constructing assessment devices to identify inaccuracies and appropriate forms of remediation to eradicate inaccuracies when found.

For example, in terms of theory, if receptive nonverbal emotion accuracy is best conceptualized as a global ability then several assumptions follow. First, individuals would have greater or lesser amounts of that ability and a single score would best reflect that fact. Second, tests of receptive nonverbal accuracy should be constructed to reflect its global nature. Tests of receptive global ability should possess very high internal consistency and high inter-modality and high inter-emotion correlations.

In contrast, if receptive nonverbal accuracy is not best conceptualized as one-general-ability but rather as being composed of a number of separate abilities differing by modality and emotion, then there are different implications. Rather than reporting total accuracy scores, it would be more appropriate to report separate scores for each modality so that patterns of outcomes could be revealed. In fact, from such a theoretical perspective not only should accuracy scores of different modalities be reported but so should the specific emotion accuracies within each of the modalities. This would allow for the development of profiles of accuracy scores across modalities and emotions. Construct validity in this case would not be so focused on developing modality tests that are highly intercorrelated. Rather, validity indices would be assessed by the use of a variety of different profiled accuracy scores that would come from the different modalities and from the different emotions within each modality.

Although there is no comprehensive review of how emotions in general or emotions within modalities correlate with one another, Hall (2001) pointed out that it does not always follow that high internal consistency of items is required to attain satisfactory levels of validity. In her analysis of the PONS she pointed out that its average intercorrelation of items is around 0.03 even though the internal consistency of the full PONS remains high (Rosenthal et al. 1979) and the test has garnered impressive evidence of its validity. Bänziger et al. (2011) point out further that such relationships are possible because internal consistency is determined not only by the number of items, but also by the average correlation among the items. This state of affairs creates a situation in which items that have modest correlations with the criterion can produce increases in validity as the n increases, but decreases in validity when the item intercorrelations decrease. Therefore test constructors may prefer to have a test in which items relate to validity indices that possess many items of this type and are low in intercorrelation.

If typical patterns of accuracies or inaccuracies are found to be associated with various syndromes, then researchers could direct their efforts to finding out if the

patterns resulted from or were maintained the syndrome itself or perhaps even if the deficits in accuracy were somehow involved in causing the syndrome to develop in the first place. To examine these possibilities at the level of simple emotions, investigators can use a scale that measures the ability to identify emotion (e.g., Pictures of Facial Affect, Ekman and Freisen 1976). We've chosen to use a test of which we are most familiar, the DANVA2 (Nowicki and Duke 1994).

5.2.4 Diagnostic Analysis of Nonverbal Accuracy2 (DANVA2)

The DANVA2 consists of adult and child facial expressions, adult and child vocal expressions, and adult postures. All five DANVA2 subtests have been used with a variety of participants differing in age, sex, race, cultural background, intellectual ability, and psychological adjustment (Nowicki 2011). Although the standardized versions of each test consist of 24 stimuli, there are shorter and longer forms available. Each subtest was constructed consistent with the following procedures.

First, each test was constructed independently. This was done because there is little theoretical or empirical agreement on the underlying relationship of separate nonverbal processing skills with one another. Second, stimuli were selected on the basis of a preset percentage (80%) of judges agreeing on the identification of a particular emotion. Of the five general ways to establish a criterion of accuracy for nonverbal processing skill described by Cook (cited in Rosenthal et al. 1979, p. 19), this is the method that most closely reflected the ecological situation individuals face in their daily interactions. Third, a relatively high percentage of inter-judge agreement was used for item selection because a major goal of the DANVA tests was to identify individuals who could not read emotions as well as most people. Fourth, including low as well as high intensity stimuli was important because so much of what happens in everyday social interactions requires the accurate reading of low intensity emotional messages. Fifth, only the basic emotions of happy, sad, angry, and fearful were included because these are the ones that most frequently occur in general life and are assumed to be learned by 10 years of age (Camras and Allison 1985; Custrini and Feldman 1989).

5.2.4.1 DANVA2 construct validity and underlying structure

Reliability and validity evidence for the DANVA2 is reported in the manual (Nowicki 2011). Internal consistency as measured by coefficient alpha ranged from 0.61 for postures to 0.73 for voices and 0.74 for faces. The DANVA2 manual presents validity evidence from over 400 studies in support of the tests' ability to be associated with positive personal and social outcomes.

Further evidence to provide support for the underlying structure of the DANVA is reported in the manual (Nowicki 2011) and, in addition, comes from a study by Ciucci et al. (2011). They administered the DANVA2 adult and child faces and adult

postures to 947 elementary Italian school age children. Although the research evidence suggests that the DANVA2 may be a reliable and valid instrument, researchers have not examined the actual structure of the test (and whether it generalizes to another cultural population). Thus the purpose of their study was to evaluate the DANVA2 using a multi-trait, multi-method covariance matrix (MTMM) approach. Given that the DANVA2 uses multiple measures (or ‘traits’ – that is, anger, happiness, sadness, and fear recognition) obtained by multiple nonverbal channels or methods (child and adult facial expressions and adult postures), it is important to know if the underlying structure reflected the organization of the tests. MTMM is an especially apt way of evaluating construct validity because it provides a rigorous framework for simultaneously examining both convergent and discriminant validity.

Two linear models were tested sequentially: a general confirmatory factor analysis (CFA) model and a correlated uniqueness confirmatory factor analysis model (CU). The models were tested using Mplus 4.0 (Muthén and Muthén, 2006). All the models were evaluated by means of the following overall indices: the chi-square (χ^2) statistic, the Root-Mean-Square Error of Approximation (RMSEA) and the Comparative Fit Index (CFI).

Support was found for (1) an underlying factor structure consistent with the DANVA2’s three separate tests that measure four separate basic emotions, (2) acceptable internal consistency within each independent test and emotion, (3) convergent validity as shown by an association with another established measure of adult faces (the Pictures of Facial Affect, Ekman and Friesen 1976), and (4) criteria related validity as measured by teacher-rated academic achievement and sociometrically assessed popularity. Results suggest that the DANVA2’s adult and child faces and, to a lesser extent, adult postures, possess a viable underlying structure as well as internal consistency and set of construct validity relationships that seem similar to those that were found in United States samples (Nowicki 2011).

5.2.4.2 Unique DANVA2 error profiles for diagnostic groups

If receptive accuracy scores are best conceptualized by total scores, then profiles of abilities are not necessary. People either are high or low in a general ability. However, if accuracy scores are seen as reflecting somewhat independent abilities then they should be reported for each separate modality and emotion so that possible profiles of accuracy could be revealed.

Consistent with this approach, Nowicki and colleagues, along with others (e.g., Cadesky, Mota, and Schachar 2001) have completed studies to see if there are unique patterns of inaccuracies in identifying emotions in facial expressions, para-language, and postures that may differentially characterize diagnostic entities such as social anxiety (Walker and Nowicki in press), schizotypal personality disorder (Wickline et al. in press), autism spectrum disorder (Doody and Bull 2011), and

externalizing behaviors (Ransom and Nowicki 2007). We will describe two examples next.

5.2.4.3 Unique DANVA accuracy profile characterizing conduct disorder

Cadesky, Mota, and Schachar (2000) administered the DANVA facial expressions and voices tests to children diagnosed with attention-deficit/hyperactivity disorder (ADHD), conduct disorder, both ADHD/CD, as well as typical controls (TC). They predicted that the CD and ADHD children would perform worse than the TP children and that, because of the aggressive behavior characterizing the behavior of CD children, their errors would show a bias toward anger that would differentiate them from the ADHD group whose errors would tend to be random because of their inattention and response impulsivity.

As predicted, CD and ADHD children were significantly less accurate at identifying emotions than TC children in both faces and voices. Further analyses revealed, also as predicted, that while the errors of the ADHD children were random in nature, the CD group errors tended to involve *misidentifying* emotions as *anger*. Cadeskey et al. concluded that their results supported the idea that social deficiencies associated with CD may arise from a biased perception of emotion, whereas social problems in ADHD could originate from a failure to attend to the appropriate cues of affect. Of course, causality could not be evaluated with the study design.

5.2.4.4 Unique DANVA accuracy profile characterizing social anxiety

A similar approach was used in a study of socially anxious children completed by Walker and Nowicki (in press). They looked at the ability of children to identify emotions in adult and child facial expressions, adult and child paralinguistic, and adult postures, in socially anxious as compared to ADHD and typical children. Children were administered the DANVA2 as part of the intake procedure at a social skills center.

The authors predicted that both socially anxious and ADHD children would make more errors than typical comparison children but that the socially anxious children would show a systematic pattern of errors involving missing anger that would be related to their social anxiety while ADHD children's errors would be more random. As predicted, socially anxious and ADHD children made more errors than typical children and ADHD children's errors were random while socially anxious children made systematically more errors identifying *anger* and *fear* on child faces and *anger* in adult postures. Misattribution analyses of the errors made to fear and anger stimuli revealed that when socially anxious children missed *anger* they were most likely to mistakenly choose *sad* and when they missed *fear*, they more likely to respond with *happy*.

The pattern of errors made by socially anxious children could create social situations in which they would have a greater chance of being rejected by others. Approaching someone who is thought to be sad but who is, in reality, angry could certainly lead a child to develop feelings of apprehension and anxiety. In contrast to the conduct disordered children in the Cadesky, Mota, and Schachar (2000) study whose problem was reading anger when it was not there, the problem for the socially anxious children was that they did not read it when it was; and in addition, they systematically saw anger cues as being sad ones. While the patterns of errors found by Cadesky et al. and Walker and Nowicki suggest that there may be different patterns of Semantic Accuracies consistent with particular social interaction problems children are experiencing, the findings must be replicated before being accepted.

5.3 Is Semantic Accuracy affected by situational factors?

Of the literally thousands of studies involving accuracy of receptive nonverbal emotion, relatively few have investigated the potential effect of situational factors on accuracy. One such situation occurs when “cognitive overload” may reduce the ability to correctly read the emotional cues as described in the following study.

The study of Semantic Accuracy has typically been done under the assumption that skill in identifying the meanings of nonverbal signs is a stable entity, metaphorically a trait versus a state. However, Shen (1997) demonstrated that the capacity to “read” nonverbal cues accurately can be adversely affected by stress and anxiety such that people who are ordinarily able to read cues accurately experience interference with that capacity.

Shen divided the DANVA voices and faces subtests into three equivalent parts and administered the stimuli to college students under three different conditions. In condition one, participants completed one third of the DANVA stimuli in the usual manner. In condition two they were exposed to a noxious auditory distraction while responding to DANVA Faces. In the third condition, they were exposed to high intensity visual stimulation while responding to the DANVA voices. Shen reported that for both DANVA Voices and DANVA faces, both auditory and visual stress conditions resulted in significant increases in errors for both males and females. His findings suggest strongly that nonverbal accuracy may not be a trait-like variable but might interact with situation in some significant ways. This would be consistent with the experience wherein people who are usually very perceptive seem to miss things when under stress or when fatigued. The jury is still very much out on the phenomenon that Shen found. A number of studies have reported evidence for and against the notion of temporary disruptions of nonverbal perceptivity (e.g., Ambady and Gray 2002; Patterson and Stockbridge 1998; Tracy and Robbins 2008). Clearly, further research is needed in this potentially important area.

Although cognitive overload may negatively impact one's usual ability to accurately identify emotions, it is not clear if increasing motivation will have the opposite effect (Hall et al., 2009). Horgan and Smith (2006), for example, reasoned that women may have an advantage over men because performance on interpersonal sensitivity tests is that such tests are more congruent with women's interpersonal goals. They used the Interpersonal Perception Task-15 (IPT-15) and found that women were relatively less accurate on the IPT-15 when they were led to believe that it measured the ability to do interrogation in the military. Men, on the other hand, were less accurate when they were led to believe that the test was an indicator of judgment used by social workers.

In contrast to the fact that reduced motivation had a negative impact on accuracy of men and women by making the goals gender incongruent, Hall et al. (2009) found that a variety of motivational incentives failed to improve accuracy as measured by interpersonal sensitivity. They conducted 11 experiments through which they evaluated whether monetary incentive, ego motive, forewarning that accuracy would be tested, exhortation to try hard, and, as Horgan and Smith (2006) did above, framing the interpersonal sensitivity test description to suggest that it is relevant to one's own gender. Analyses revealed that none of these attempts to use motivation to increase receptive nonverbal accuracy was successful nor did they have a differential impact on men or women. They concluded that since trying harder did not help nonverbal accuracy, nonverbal accuracy may be based instead on a person's knowledge of the content domain.

5.4 Can deficits in Semantic Accuracy be remediated successfully?

Nonverbal communication, like its verbal counterpart, appears to be a learned organized sign system that develops with age and is essential for social interaction (Ekman and Friesen 1975; Nowicki and Duke 1994). Most would accept that there are significant biological contributions to the acquisition of nonverbal ability skills in the form of pre-wired connections that have evolved phylogenetically because of their usefulness for survival of the individual and that perception of facial expressions, and perhaps tone of voice and postures, are part of this biological apparatus (Harris 1995). In contrast, though the rudimentary aspects of nonverbal communication may be biologically present and required, others suggest that it is primarily cultural and social experiences that shape the learning of this skill (e.g., Saarni 1999).

If the ability to identify emotion in the nonverbal cues of others has a significant learning component then knowing how this skill is learned could be very useful in developing programs to teach it to children and adults, especially those who are less skilled than their peers. The question of exactly what to teach is

complicated by the fact that there is a lack of information about the learning mechanisms and accuracy trajectories of the separate nonverbal modalities and specific emotions over age. Because of this fact, even simple questions may be difficult to answer. Are faces learned before voices? Is anger learned before sadness? Is anger learned before sadness in faces, but perhaps not in voices and postures? While there are some useful research findings (e.g., Halberstadt, Denham, and Dunsmore 1997; Walker-Andrews 1997), there is much more to know more about the development and age trajectories of nonverbal accuracies.

In spite of the lack of knowledge about the “how” and “why” of receptive nonverbal skill acquisition, research/clinicians have found ways to help those who have deficits in accuracy now. For example, Lerner and Levine (2007) found that adolescent students diagnosed with Aspergers Disorder improved their ability to recognize emotion in facial expressions by participating in an intervention program that emphasized drama and play-acting nonverbal skills. Krueger, Ambrosino and Kapsch (2009) had success in improving not only the ability to read emotions in high-risk preschool children but also their academic reading performance by directly teaching children to recognize what facial movements related to which emotions. While the reasons for this improvement in academic matters is a matter of conjecture, explanations include (1) the possibility that many preschool books include a number of illustrations of faces improved ability to read faces helped in the understanding of the words that were presented on the same page and/or (2) that improved ability to read emotions in faces helped children to “read” their teachers better and by improving their relationship with them could learn more effectively.

In our own program, we favor directly teaching individuals how to identify emotion nonverbally. This direct teaching approach is similar to what would be used to help someone who had a deficit in spelling. The exact nature of the deficit, in this case a nonverbal accuracy deficit, is assessed and then “homework” and exercises are instituted to help children learn what they have failed to learn through the usual informal and indirect means that characterize receptive nonverbal accuracy learning. We have developed a direct teaching framework called the R-DANVA that describes a sequence of direct learning that takes the student from *discrimination* to *identification* to *expression*, and finally to *application* of what was learned, paralleling the Discriminative, Semantic, Utilitarian, and Relational accuracies described earlier. It owes much to a traditional intervention framework for remediating verbal learning disabilities (Minskoff 1980a; Minskoff 1980b).

Grinspan, Johnson, and Nowicki (2003) used the R-DANVA as a framework to improve the ability to identify emotion in the facial expressions of children in the third grade. Students with below average scores in identifying emotion were randomly placed in experimental or comparison groups. Students in the intervention group met with experimenters for six half-hour sessions over a four-week period during which they were administered the R-DANVA procedures.

Students in the R-DANVA group significantly improved their ability to identify emotions in DANVA2 facial expressions from pre to post testing while the comparison group showed no change over time. Based on the findings, Grinspan et al. cautiously concluded that such “academically friendly” interventions like the R-DANVA could be effectively used in school settings to improve receptive nonverbal accuracy.

While Krueger et al. (2009) and Grinspan, Johnson, and Nowicki (1999) focused primarily on children whose deficits are assumed to be environmental, Randice-Neuman et al. (2009) developed an intervention that focuses on adults suffering from Acquired Brain Injury (ABI). Participants were individuals who were one-year post injury, between the ages of 18 to 65, and possessed basic communication skills. Those with ABI tend to develop problems with social adjustment after their injury. One of the sources of adjustment difficulties was assumed to be deficits in basic Semantic Accuracy or the ability to identify emotions in facial expressions. Randice-Neuman et al. used two types of intervention both of which included the participants’ own emotional experiences. In the facial affect recognition (FAR) intervention, participants were taught to recognize emotions from facial expressions by attending to important facial features and by understanding their own emotional experiences. The comparison intervention used written stories to teach participants to infer characters’ emotion from social contexts and then relating the story to their own personal experiences. The FAR intervention had a more significant impact on the ability to read emotion in faces and to infer emotions from context compared to the comparison group in which they received training on emotional inference from stories. The authors concluded that training can improve emotion perception in patients with ABI. Although further research is needed, the interventions are clinically practical and show promise for the population with ABI.

6 Conclusion

Researchers have come a long way in their understanding of the importance of receptive nonverbal accuracy as well as also becoming more aware of its complexities. Too often nonverbal behavior has been treated simplistically by the public and at times by researchers as well. To remind researchers that not all accuracies are the same, we introduced a model that suggests four different types of accuracy based on complexity: Discriminative, Semantic, Utilitarian, and Relational. We offered the view that one of the most important functions of receptive nonverbal skill is its role in the initiation and maintenance of relationships. We lamented the lack of information about how any of the accuracies in any of the nonverbal modalities and in any of the emotions develop and change and we urged researchers to turn their attention to gaining this knowledge.

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Mark G. Frank and Elena Svetieva

16 The role of nonverbal communication in detecting and telling lies

Abstract: This chapter outlines the early origins to the modern theories that guide our understanding of lying as a cognitive and emotional process with varying behavioral outcomes. We show that there are no direct correlates of deception, only clues related to emotion, cognition and behavioral control. We outline the basic clues in the face, voice and body and the usefulness of each as a factor of the situation. In looking at the empirical findings on clues to lying we also highlight the importance of standardizing how and what we measure. We discuss the implications for accuracy and training in lie detection by looking at how our ability to judge lies accurately depend on the extent to which telling the lie involves those very same cognitive and emotional processes that are theorized to occur during lying. We conclude that successful lie detection involves shifting our focus to not just the individual, but the interaction and its larger social context.

Keywords: Lying, deception, emotion, cognition, behavior, judgment, nonverbal behavior

1 Introduction

All of us have told a lie at some point in our lives. Diary studies confirm that we admit to telling lies considerably more often than once a lifetime – more on the average 1 to 2 lies per day (DePaulo et al. 1996). Although the majority of lies we report are told to maintain politeness, make others feel better, make ourselves look better, or address some other mundane issue, some are told for more sinister reasons (Nyberg 1993). These include lies to conceal past or plot future criminal activity, or to engage in actions that can harm people in any number of ways. It would seem that as a society, we would like to be able to detect or recognize those lies that are told for antisocial purposes so we can prevent harm to ourselves, friends, and country. In contrast, we may not want to recognize or detect those lies told for prosocial purposes so as to keep our day to day social interactions running smoothly.

Lying involves our abilities to create and invent, which is the cornerstone of our highest achievement as a species. But lying can also serve our lowest inclinations. It is at those low points that behavioral scientists would like to know whether people look, sound, or act different when they tell a lie compared to when they tell the truth. Knowing what a liar looks like, based solely on behavior, in essence

allows us to look into the minds of others, to know what they really think and feel. This has interested people for thousands of years. Note this description of the behaviors of a person who is trying to conceal his or her involvement in poisoning someone, taken from a translation of the ancient Hindu texts circa 900 BCE:

...there are copious directions regarding the manner of detecting a person who gives poison: He does not answer questions, or they are evasive answers; he speaks nonsense, rubs the great toe along the ground, and shivers; his face is discoloured; he rubs the roots of his hair with his fingers; and he tries by every means to leave the house. (Wise 1860: 394)¹

Notice that the writer observes a number of behavioral clues in different behavioral channels that betray the deception of a poisoner: verbal clues in the words (evasion), and nonverbal clues in the voice (no answers, or speaks nonsense), face (discolor), and body (toe along ground, shivers, rubbing hair with fingers, tries to leave). Those channel distinctions still inform our research to this date, and will help guide this chapter – although we will restrict our discussions to just the nonverbal behavioral clues.² Specifically, we will briefly mention the history of research on these nonverbal clues, wrestle with the definitions of lying and the theoretical origins of various nonverbal clues to lying, and address issues in detecting lies from these behavioral clues, including whether one can improve his or her ability to detect lies from nonverbal clues through either training or technology.

1.1 Premodern history

Compared to lay people, scientists have been interested in the behavioral signatures of a lie only since the turn of the last century (e.g., Stern and Stern [1909] 1999). Up until then, the history of the using nonverbal clues to detect a liar ranged from bizarre superstitions to technical practices that might even be familiar to our 21st century eyes. Yet almost all historical accounts of lie catching techniques mention behaviors beyond simply words as the key clues to determining whether a lie has been told. Trovillo's (1939) early synthesis of the history of lie catching describes not only the Hindu Veda account of the poisoner described above, but

1 Trovillo (1939) originally reported this quote, but actually misquoted the passage – although the misquote was minor and did not substantially change its meaning. We have inserted a more complete quote.

2 This does not mean we believe verbal clues are not relevant or useful in the detection of lies. Quite the opposite; in fact, research has shown that verbal behavior – i.e., the words spoken – can reflect various memory or mental effort processes that can distinguish a person describing an event he or she experienced, or inventing an account that he or she has not experienced (e.g., Vrij 2008; Yuille 1989). This also does not mean we believe physiological clues – at least those elements below visible or audible thresholds – are not relevant or useful in lie detection. They are, but they too are beyond the confines of this chapter.

also accounts of how ancient Greek physicians relied upon feeling the pulse of individuals, such that a “tumultuous rhythm” suggested a lie was told (p. 850). In the middle ages, there were some lie detection techniques that were pure superstition—for example, throwing someone into a lake to see if they drown, or putting someone on a balance repeatedly to see if their weight changed. In the middle ages, it was common for individuals in conflict to duel, with the idea being that God would protect the truth teller such that the person killed in the duel must be the liar. Yet other techniques, one could argue, had some physiological underpinnings that drove their reasoning. For example, a person who was suspected of some infraction, and who denied committing the infraction, was to touch a red hot iron nine times with his or her tongue, with the belief that the innocent would not burn their tongues, whereas the guilty would. Whether one got burned seems to us likely due to the presence or absence of normal amounts of saliva in the individual – thus the liar, with dry mouth due to fear, suffers the burn. Similarly, other cultures would request that suspect individuals put grains of rice in their mouths; if innocent, the rice would be sticky or wet; if guilty, the rice would remain dry. Continuing with this salivation theme, other cultures would give the suspected liar bread and cheese, and then ask them to chew and swallow it; the guilty would not be able to swallow, whereas the innocent could (see Trovillo 1939 for a more detailed review).

Although these early records of lie detection methods show a mix of superstition and religion in a time where the stakes were high and the mercy shown to liars was low, these cruel and often paradoxical practices also revealed a rudimentary understanding of how emotion and its physiological manifestations can be a key indicator of that a lie has been told. For example, scientists today report associated physiological phenomena like a dry mouth or quicker pulse with the emotion of fear (e.g., Levenson, Ekman, and Friesen 1992), which is an emotion often felt and reported by liars (Ekman [1985] 2001; Frank and Ekman 1997).

It was only in the late 19th century that more sophisticated technology enabled scientists or law enforcement officers to measure sub visible manifestations of some of these physiological correlates of emotional reactions to lying, such as blood pressure and pulse rate. And for the most part, measuring physiological responses was where the systematic scientific inquiry turned. According to Trovillo (1939), work on *lie detector machines* began in the late 1800s, culminating in the first real standardized lie detector machine in the early 1920s (Larson 1927; Marston 1917; 1921). This work on physiological lie detection continues to this day, but we will leave that trail and return to nonverbal behavior.

1.2 Modern history

Nonverbal behavior related to telling a lie had not received as much study as the machine based techniques in the early part of the 20th century. Despite the absence

of scientific study of nonverbal behavioral clues, it had been assumed throughout the legal system that demeanor (behavior or conduct) could be a very useful source of information for weighing the credibility of witnesses in court. In the US Supreme court case of *Mattox v. United States* (1895), the Court wrote that “...the accused has an opportunity, not only of testing the recollection and sifting the conscience of the witness, but of compelling him to stand face to face with the jury in order that they may look at him, and judge by his demeanor upon the stand and the manner in which he gives his testimony whether he is worthy of belief” (cited in *Coy v. Iowa*, 1988: 1026; *italics added*).

Throughout the 20th century, *Mattox v. United States* drove many evidentiary and procedural rules for courtroom trials to explicitly state that the demeanor of the witness is an important piece of evidence (Wellborn, 1990). These rulings culminated in judges specifically instructing juries to evaluate demeanor of witnesses when assessing the credibility of their testimony. This was reaffirmed and explicitly tied to the 6th Amendment of the US Constitution in the Supreme Court case of *Coy v. Iowa* (1988). Writing for the majority about the importance of witnesses testifying face to face with defendants, US Supreme Court Justice Scalia wrote:

It is always more difficult to tell a lie about a person to his face than behind his back. In the former context, even if the lie is told, it will often be told less convincingly. The Confrontation Clause does not, of course, compel the witness to fix his eyes upon the defendant; he may studiously look elsewhere, but the trier of fact will draw its own conclusions... That face-to-face presence may, unfortunately, upset the truthful rape victim or abused child; but by the same token it may confound and undo the false accuser, or reveal the child coached by a malevolent adult. (1019–1020)

Likely prompted by these pronouncements, scholars close to the legal system began to develop lists of behaviors, based on anecdotal observations, that may indicate someone was lying during interrogation. The first influential compilation of these clues was found in *Lie Detection and Criminal Interrogation* (Inbau 1942), which was soon followed by others which further added and refined the list of nonverbal clues that may indicate a lie was told (e.g., Inbau and Reid 1962).

The social scientists’ interest in nonverbal behavior and lying had not kept pace with that of the jurists/law enforcement community. This seemed to change in the 1960s, a decade which saw a surge in interest about nonverbal communication in general. One pivotal moment came with the publication of Desmond Morris’ *The Naked Ape* (1967), which in 1968 made it to the *New York Times* best seller list for 31 weeks, including 11 as the number one best-selling nonfiction book in the country. Morris’ book was a zoologist’s view of human behavior, including passages in which he pointed out that many human nonverbal behaviors likely have their roots in behavioral analogues found elsewhere in the animal kingdom. Simultaneously, researchers were ramping up their examination of nonverbal communication in more controlled laboratory settings, which included the development of

various nonverbal taxonomies (e.g., Ekman and Friesen 1969a). These taxonomies were then applied to nonverbal communication and lying for the first time in 1969 (Ekman and Friesen 1969b). The next year saw another nonverbal communication book, *Body Language* (Fast 1970), which again made the top 10 in the *New York Times* best seller list. By this time, the laboratory research on nonverbal communication and lying was in full swing and with increased zeal. For example, Mehrabian (1971) put research subjects in situations where they told lies and truths, and he reported that liars showed more negative emotion, smiled more, had more speech errors than truth tellers. He also further fueled research on nonverbal communication by famously asserting that 93% of all human communication was nonverbal (Mehrabian 1972).³ Nonverbal communication was now square in the sights of social scientists who now regularly study its association with lying.

2 Defining a lie

Most scholars use and define the terms lying, deceit, or deception interchangeably. However, we propose that we distinguish deception from lying, as originally suggested by Bok (1978). We define deception as the super-ordinate category, of which we propose that one subcategory is telling a lie. We define *deception* as any action or phenomenon that misleads someone; *lying* is an act whereby someone *intentionally* misleads another, and does so without notifying that person that they will be misleading them (thus similar to Ekman 2001). The words *intentional*, and *prior notification*, are the crucial distinguishing characteristics of a lie. Deception may or may not be an intentional act, whereas a lie is always intentional. Thus a tiger may deceive its prey by having a striped coat that blends into its environment. But the tiger does not wake up each morning, peer into his tiger closet and intentionally select the striped coat over the spotted or solid colored coat. Scientists do not debate whether animals can deceive, but do debate over whether they can lie (e.g., Bergstrom 2009). Likewise, we can be deceived by optical illusions or mistaken identity without any person or object deliberately misleading us.

Scientists, although they may call it deception, deceit, or lying, have generated fairly consistent definitions of the phenomenon. Over the past four decades we have seen it defined as: “The conscious alteration of information a person believes to be true in order to significantly change another’s perceptions from what the deceiver thought they would be without the alteration” (Knapp and Comadena 1979: 271); “...one person intends to mislead another, doing so deliberately, without prior notification of this purpose, and without being explicitly asked to do so by

³ In fairness, Mehrabian was careful in his limiting of the claim that 93% of meaning in communication is carried by nonverbal factors by acknowledging that it applied to a given study. However, it has since become a cultural meme despite his caution.

the target” (Ekman 2001: 28); “...a message knowingly transmitted by a sender to foster a false belief or conclusion by the receiver” (Buller and Burgoon 1996: 205); “a deliberate attempt to mislead others” (DePaulo et al. 2003: 74). Over time we can see that while the definitions become progressively shorter, they all agree on the one important concept – that telling a lie is an intentional act. Note the synonymous terms used to express this intentionality – *conscious* alteration; *intends* to mislead; *knowingly* transmitted; and *deliberate* attempt. Furthermore, people connote and denote this intentionality in common parlance. Thus one would say someone *told* a lie. They don’t exude a lie, they tell it. They do it on purpose, not accidentally. There are other ways that people can provide misleading information – e. g., errors in memory or relaying mistaken information provided by others – but none of those are done on purpose by the individual. The implication of this view is that the liar, by definition, must know the subjective truth (i.e., what they honestly believe to be the truth). The presence of this subjective truth lurking somewhere in the mind of the liar is what will help drive those behavioral differences between liars and truth tellers that we will discuss later.

Another implication of the word *intentional* is that it means someone who presents you with inaccurate information is not necessarily lying. What is important is whether this person believes what they are saying is true; if they truly believe it, then it is *not* a lie, no matter how outlandish (Frank and Ekman 2004a). But if they know the information they told you is inaccurate and/or will mislead you, then what they’ve said is a lie. This issue is at the crux of the public debate over whether various Wall Street brokerage firms committed fraud by lying to their clients about the true investment value of the financial products they tried to sell. If a broker *knew* that he or she was selling toxic financial assets to a client (and was in fact betting his or her own money that these assets would decline in value or fail), then he or she would have lied to this client when they tried to convince him or her to invest in such an asset or product. If a broker truly *believed* the AAA ratings of assets he or she was selling, and truly believed that they would produce a good rate of return for the client, for whatever reason, then he or she did *not* lie. Most experts now agree that many of these financial assets were terrible risks and hence bad investments, so these brokers were certainly mistaken. Whether they lied and would be subject to prosecution for fraud, however, depends on their beliefs at the time.

Ekman (2001) also described conditions in which the way misleading information is presented affects whether that communication is considered a lie. In some situations people expect to be misled, and thus they have *prior notification* that a person will not speak the whole truth. For example, there are those times when people may pay money for others to mislead them, as when buying a movie ticket to watch an actor pretend to be former FBI head J. Edgar Hoover, or to be a superhero who can shoot webs out of his wrists, or to be a 16th century Queen of England. Other situations explicitly or implicitly allow people to not be 100% truth-

ful, for example, bluffing in poker, or even price negotiations. People enter these types of situations ‘on notice’ that they may require the other or themselves to conceal at least part of the truth (e.g., the real price for which one will settle). The latitude for misleading is limited by laws and rules written to articulate those limits – for example, one cannot conceal a known structural flaw in an object for sale without facing criminal or civil penalties.

These definitional distinctions between lying and deception are not just an academic exercise; they have implications for the nonverbal behaviors that can betray a lie. If a person believes they are telling the truth, then for all intents and purposes they will look and behave like a truth teller, independent of the accuracy of the information they present. If the lie they tell is authorized, by social norms or situation (e.g., actors in a play), then some of the physiological and cognitive drivers of the nonverbal behaviors associated with deception may not be elicited; e.g., they may feel less fear about getting caught, or no guilt over telling the lie, or no speech errors or hesitations because their responses were scripted and rehearsed. Thus we can argue that much of the laboratory research on deception underestimates the behavioral displays associated with lying, as usually in all laboratory studies subjects are assigned (and hence authorized) to lie. Furthermore, at times the research protocol further confounds lying and truth telling (Frank 2005). For example, Kraut and Poe (1980) tested customs officers’ lie detection ability on a sample of participants who were actually waiting to board a flight in an airport. They were asked to pretend they were about to embark upon a cross-country flight. Then some were randomly assigned a small bag with white powder and told to pretend they were drug smugglers, after which they were all subjected to a simulated customs interview. Of course this created a situation in which some of the truth tellers were now liars, as not all of them were in fact taking cross country flights. This may be why that study did not show many significant behavioral differences between the liars and truth tellers.

For this chapter we will be addressing the research associated with lying, not deception in general, and thus all the nonverbal behaviors we discuss are dependent upon the individual *knowing* they are misleading someone.

3 Origins of nonverbal clues to lying

All researchers who have studied nonverbal clues to lying have acknowledged that there is no Pinocchio response when we tell a lie. That means that there is no behavioral clue or combination of clues – be they nonverbal or not – that occur only when we tell a lie (Zuckerman, DePaulo, and Rosenthal 1981). This does not mean that there are no nonverbal signs or signals associated with lying. There are. It is just that scientists have discovered that none of them is exclusive to lying, and all of them can occur for reasons unrelated to lying. Thus the fictional Pinoc-

chio's nose did not grow when he was angry at Geppetto, or nervous about missing an appointment, or sad at not becoming a real boy. Likewise, there is no behavioral sign or signal whose absence indicates the truth (Ekman 2001).

The basic finding on nonverbal clues to lying, based on the most recent comprehensive meta-analysis of all published research studies, concluded that liars tend to behave in ways that make them appear *more tense* and *less forthcoming* than truth tellers (DePaulo et al. 2003). Theoretically, tension and reticence make sense given that all human expressive behavior is generated either by emotional reactions or cognitive activity (corresponding to appearing tense and less forthcoming, respectively). Emotional reactivity in lying refers to a) the behaviors associated with feelings caused by the act of lying itself; or b) or attempts to falsify or conceal feelings felt, and/or c) the behaviors that result from these processes (DePaulo, Stone, and Lassiter 1985; DePaulo et al. 2003; Ekman 2001; Ekman and Frank 1993; Vrij 2008; Zuckerman, DePaulo, and Rosenthal 1981). Cognitive activity in lying refers to a) the behaviors associated with the extra mental effort and dexterity it takes to fabricate a story and to maintain it; b) the behaviors associated with memory recollection that suggest a person actually experienced an event and is not fabricating an account (Yuille 1989). Virtually all scientists agree that emotions and cognition are the main underpinnings for all behavioral clues to lying (e.g., DePaulo et al. 2003; Ekman and Friesen 1969b; Hocking and Leathers 1980; Knapp and Comadena 1979; Mehrabian 1971; Zuckerman, DePaulo, and Rosenthal 1981). Cross cutting and interacting with both these areas is a third source of behavioral clues to lying that suggest management or control of either emotion or cognitive clues.

Table 1 represents a reconfiguration of the statistically significant effect sizes for various behaviors reported by either the DePaulo et al. (2003) or the Sporer and Schwandt (2006; 2007) meta-analytic studies. Effect sizes represent the strength of the finding for that behavior to be associated with lying (expressed in standard deviation units on a normal curve). Although all these results listed in the table are statistically significant, they vary in their strength of relationship from small effects to strong effects. As a guide to interpret this table, we suggest the reader abide by Cohen's (1988) assessment that effect sizes around 0.2 represent a small effect, 0.5 a medium effect, and 0.8 or higher a strong effect.

The effect sizes are placed in the columns representing suspected theoretical origins of the particular clues. When the origins are not clear, we erred on the side of inclusion by placing the effect size into all columns in which one could make an argument for its origination.

Although the basic origin categories of emotional, cognitive, or control were initially drawn out by Zuckerman, DePaulo, and Rosenthal (1981), they were not seen as competing explanations or approaches to understanding behavioral clues to lying (c.f. Vrij 2008). We can certainly argue, as shown in Table 1, that we can debate the origins of each behavioral clue, including whether it occurs at the

Table 1: Statistically significant effect sizes (d) for specific nonverbal behavioral clue, by channel, suspected theoretical origin, and the number of studies that measured the clue (adapted from DePaulo et al. 2003; and Sporer and Schwandt 2006, 2007).

		Suspected Theoretical Origin			
Channel	Nonverbal Behavioral Clue	Cognition	Emotion	Control	# Studies
Paralinguistic					
	Verbal and vocal involvement	−0.21	−0.21		High
	Response latency	0.18			High
	Speech errors	0.12			High
	Vocal tension		0.26		High
	Frequency, pitch		0.21		High
	Word and phrase repetition	0.21		0.21	Medium
	Speaking time	−0.35		−0.35	Medium
	Subset of non-ah	0.38			Low
Face					
	Nervous, tense		0.27		High
	Facial pleasantness		−0.12		High
	Pupil dilation	0.39	0.39		Medium
	Chin raise			0.25	Medium
	Presses lips			0.16	Medium
	Pupillary changes	0.90	0.90		Low
	Genuine smile		−0.70		Low
	Intensity of facial expression		−0.32	−0.32	Low
Body					
	Illustrators	−0.14		−0.14	High
	Fidgeting, undifferentiated		0.16		High
	Nodding			−0.18	High
	Foot and leg movements			−0.13	High
	Hand & arm movements	−0.36		−0.36	Low
	Indifferent			0.59	Low
	Direct orientation			−0.20	Low

Note: A positive number means an increase in behavior for lying, negative means decrease for lying. More than 6 studies constitutes a *high* number, 3–5 studies constitutes *medium*, and 1–2 constitutes *low*.

confluence of both emotional and cognitive processes, abetted by control actions, but we – and virtually all other scientists in this field – believe it is an error to try to argue that all behavioral clues are *either* emotion or cognitive based. The relative amount of emotion or cognition driving behaviors in any particular lie situation will likely be driven by the situation; for example, if it is not a strong fear-inducing situation, then emotion-based clues will diminish. In contrast, if the lie involves minimal cognitive effort – speaking one word replies – then the cognitive effort based clues will diminish. By analogy, we humans need both water and food, and one can ask when it is better to have water compared to food, but unless one has

both, eventually one will die. Thus it would be an error to see them as competing approaches to the essentials of human survival.

3.1 Cognitive origins

People report that they often tell lies without much contemplation, almost reflexively, as when they respond “good” to the question “how’s it going?” (DePaulo et al. 1996). However, in other situations when a liar is questioned, he or she must come up with an alibi, adjust it to any new pieces of evidence presented, and try to speak his or her story in a way that looks natural and does not arouse suspicion. Balancing all these tasks requires much more mental effort than telling the unadorned truth. The liar must keep the truth concealed, cover actions, remember the false alibis, create and describe events that have not happened, or portray events in a way that allows multiple interpretations so as to confuse the lie catcher. On top of all this, the liar even has to monitor the interviewer to determine whether the interviewer believes the story (e.g., Buller and Burgoon 1996). All this adds significantly to the cognitive processing load of a liar (e.g., Vrij 2008). Additional mental effort is not solely the domain of the outright liar, however; a person who must tell an uncomfortable truth to another or answer a complicated question will likely also engage in additional mental effort to develop the proper and polite phrasing. These “put-upon” truth tellers, by facing the same pressures and burden on their cognitive processing capacities as the liars, may appear behaviorally similar to liars.

We also note that another cognitive aspect of lying involves human memory. Truth tellers will typically draw from their narrative memory of a given event; liars have to invent or conceal some aspect of that memory (Yuille 1989). There appear to be some documented qualitative and quantitative differences in accounts generated from an individual’s narrative memory, depending upon whether the person is simply recalling the event as best as he or she can, or whether the person is inventing aspects of that account. These behavioral clue differences tend to appear in the word (verbal) choices made by people, and is studied in work more broadly referred to as statement validity analysis (e.g., Colwell 2007; Köhnken 1989; Porter and Yuille 1996; Smith 2001; Undeutsch 1967; Yuille 1989). Given the verbal nature of those clues, we will not address them further but suffice it to say they are useful, albeit not perfect, discriminators of truth and lie (like all approaches to lie detection; see review by Vrij 2008).

3.1.1 Nonverbal expression of enhanced cognitive load

This higher cognitive load, and resultant extra mental effort can manifest itself in all three of the basic nonverbal channels (face, body, and voice – but in this case,

limiting the voice to just paralinguistic information). Regarding clues in the paralinguistic channel, this higher cognitive load results in longer speech delays (latencies), more speech errors, more pauses or filled pauses (non-ah speech disturbances; Kasl and Mahl 1965), and apparent lower involvement in the voice. Table 1 shows the cognitive load variables that do distinguish liars and truth tellers across different deception studies.

Regarding clues in the body channel, Table 1 shows fewer significant meta-analytic results than in the paralinguistic channel. The main finding is that of a reduction in illustrators (which are hand/arm and facial movements that accompany speech; Efron 1941), as well as hand/arm movements in general. However, this reduction in movement may be due to the liar trying to control his or her body movement as much as it is due to the cognitive load (Caso et al 2006; Ekman 1972). It could also be both processes working synergistically. After all, scientists note that when people are engaged in higher mental effort their movements tend to restrict (e.g., Bagley and Manelis 1979). Scientists also know if we ask people not to move, they can for the most part do that on command. What Table 1 highlights is that not nearly as many of our purported cognitive origin clues show a link to reduced body movements as compared to a link to altered paralinguistic information.

A similar conclusion befits the face channel and its expression of cognitive load clues. In fact, it seems that only pupil measurements differentiate liars and truth tellers. This is not surprising, given the almost 40 years of research showing a link between pupil dilation and cognitive processing (Hess and Polt 1964). However, scientists also know that pupillary responses can be driven by emotional information (Janisse 1974). And, as we will describe later when describing the face, pupils are innervated by two different brain areas – one presumed to be associated with emotional processing, and the other with cognitive processing, and thus may serve two masters (Szabadi and Bradshaw 1996).

3.1.2 Moderators of nonverbal expression of cognitive load

As one can imagine, not all lies require the same amount of cognitive processing. For example, a person who has to lie or tell the truth by speaking a one-word response – yes or no – will not tax his or her mental capacity nearly as much as when he or she has to tell a lie whilst engaged in a 20 minute long political talk show format (where one has to pretend to be the Soviet Ambassador as in Druckman, Rozelle, and Baxter 1982). In fact, one of the recent meta-analyses have shown that the cognitive load clue of response latency has the strongest relationship to telling a lie when the individual has a short (compared to longer) preparation time, has to lie about feelings and facts (compared to just facts), has higher motivation to lie successfully (compared to lower motivation) and is telling an unsanctioned (compared to sanctioned) lie (Sporer and Schwandt 2006). It is easy

to conceive of how these particular moderators would raise the cognitive load required to lie successfully. Knapp and Comadena (1979) argued this point when they stated that researchers should examine and compare behavioral clues to deception only in similar lie situations. This would seem to be particularly true for cognitive based clues, as they seem most beholden to those characteristics of any given interpersonal situation that will likely enhance or mitigate the difference in cognitive processing between truth and lie telling (see Frank 2005, for a brief methodological review).

We can take that logic one step further and predict that by deliberately manipulating these or any other moderator of cognitive load, scientists may create deception situations that differentially affect liars who are already closer to their limit loads on cognitive capacity compared to the truth tellers (Frank 2005). This will have the effect of augmenting the gap between liars and truth tellers in their cognitive based clues to lying. Recent research has demonstrated that techniques as varied as forced eye contact (Vrij et al. 2010), drawing from memory (Vrij et al. 2009), telling an alibi backward (Colwell 2007; Vrij et al. 2008), and so forth have in fact produced stronger behavioral clue differences between liars and truth tellers.

3.2 Emotional origins

In the first major review of the behavioral literature on lying, Zuckerman, DePaulo, and Rosenthal (1981) actually used two categories to conceptualize of behavioral clues originating from emotional responses – what they called the *arousal* and the *affective* approaches. Regarding the *affective* approach, they developed a rationale guiding how guilt and anxiety and ‘duping delight’ might manifest themselves in verbal and nonverbal clues to lying. They contrasted that to the *arousal* approach, which would cause changes in eye blinks, pupil dilation, and so forth. It is common in social science research to use this general term *arousal* to describe autonomic nervous system activation (something shared with emotional reactions). It is also the term of choice for polygraph research (e.g., Raskin and Podlesny 1978). We would like to argue that these two concepts should not be seen as separate approaches. Arousal is often a theoretically slippery term in the lie detection literature (Frank 2005). For example in different studies arousal has meant things as variable as an orienting response (e.g., deTurck and Miller 1985), to a full blown emotional expression of fear (e.g., Frank 1989), to some indeterminate point in between (e.g., Buller and Burgoon 1994; see also discussion by Waid and Orne 1982). Arousal in the physiological lie detection literature has also been used to describe physiological states as different as stress, anxiety, embarrassment, and even anger (Steinbrook 1992). In contrast, the ‘basic’ human emotions, such as anger, contempt, disgust, fear, happiness, sadness/distress, or surprise have some

basic core relational meaning (Ekman 1993; Lazarus 1991), and their associated facial expressions have a clear cross-cultural meaning to observers (Ekman 2003; but also see Russell 1994, and responses by Ekman 1994 and Izard 1994). Research has also demonstrated that these emotions also produce different patterns of autonomic nervous system activity (Ekman, Levenson, and Friesen 1983; Levenson et al. 1992), central nervous system activity (Davidson et al. 1990), brain pattern response (Whalen et al. 2004), and voice tonal patterns (Scherer 1984; Sauter et al. 2010). These differences appear to be consistent across cultures, suggesting that these emotions are hard wired and ‘universal’ to all human beings (e.g., Darwin [1872] 1998; Ekman 1984; Izard 1977).

What this means is that rather than a dichotomous arousal versus affect approach, the unified term *emotional* approach is inherently more precise than *arousal*, and at least equally as precise as *affect* in terms of what it actually means theoretically, what it does physiologically and nonverbally, and what behaviors it predicts empirically.

3.2.1 Nonverbal expression of emotion

Darwin (1998) first suggested that emotions tend to manifest themselves through reliable, measureable changes in the facial expression and voice tone, and to a lesser extent, the body. Conversely, research has shown that these manifestations can be reliable indicators that an emotion has been aroused, and this has been confirmed through such diverse measures as blood pressure, heart rate, skin conductance, skin temperature, P300 brain waves, brain region oxygen uptake, electromyographic readings of the face, and participant self-report ratings (see review by Matsumoto et al 2008). The face and the voice are by no means the only clues that an emotion has been aroused. Research has also found emotion expression differences in the playing of musical notes (Clynes 1992), gait (Montepare et al. 1987), and other body movements (de Gelder 2006). However, the vast majority of the work on nonverbal communication and emotion has focused on the face, and to a lesser extent the voice.

Lies have been purported to generate a number of different emotional reactions, ranging from the excitement and pleasure of “pulling the wool over someone’s eyes” (duping delight) to fear of getting caught, to feelings of guilt, or to feelings of distress, disgust, or contempt (Ekman 2001; Frank and Ekman 1997). These emotions are generated by our cultural beliefs that lying is one of the worst things one can do, and by telling a lie we activate our emotional systems to correspond to the fear or distress at getting caught, pleasure at telling the lie, feeling guilty, and so forth (Zuckerman, DePaulo, and Rosenthal 1981). People can also lie about what they feel; for example, someone might pretend to like a friend’s favorite politician when in fact this person is disgusted by that politician. In this case, the emotion of disgust is what the person really feels and tries to conceal; the traces

of that disgust that may 'leak' out would be the clue to the ground truth (called a *leakage clue* by Ekman and Friesen 1969b). Ekman and Friesen 1969b differentiated leakage clues from the emotional signals caused as a reaction to telling a lie, which they called *deception clues*.

However, not all lies will generate emotions. Diary studies have shown that many lies are spoken easily and without much fear of getting caught, often for self-presentational reasons (DePaulo et al. 1996). Interestingly, these sorts of lies are similar to the day to day arrangement of truth designed to enhance people's self-image (DePaulo et al. 2003), requiring the cognitive processes that are familiar and less taxing than a more novel situation, as found when telling lies to cover a serious transgression. Thus we would predict that emotion based clues would be less likely to discriminate liars and truth tellers in these everyday, low stakes self-enhancement situations than in those more rare, high stakes situations such as criminal behavior or infidelity that have life-altering implications (Frank and Ekman 1997).

Although much of people's facial expression repertoire is learned like language, displayed under conscious control, and has meanings that are culturally specific and/or rely on context for proper interpretation (e.g., Ekman 1989; Fridlund 1994; Ortony and Turner 1990), there are a limited number of distinct facial expressions of emotion that appear to be biologically wired, produced involuntarily, and whose meanings are similar across all cultures (e.g., Ekman 2003). This idea that some facial expressions are universal to our species was originally proposed by Darwin (1998), and later elaborated by others (e.g., Ekman 1994; Izard 1994; Plutchik 1994). Darwin's (1998) rationale was that social animals, such as humans, must communicate these emotions to others in the group because emotions express imminent behavior, such as striking out in anger, fleeing in fear, and other action tendencies (e.g., Frijda 1986). Thus the same signal in the brain that causes one to have an increased heart rate when frightened also sends a signal to the face to express that fear – which is shown by a raising and drawing together of the eyebrows, raising of the upper eye lid, and stretching of the mouth backwards (Ekman 2003).

Neuroanatomical research demonstrates that facial expressions can be both biologically driven, as in the case of some of the emotions, and socially learned, as in the case of deliberately posed facial expressions. As with the research on pupil dilation described earlier, there appear to be two distinct neural pathways that mediate facial expressions, each one originating in a different area of the brain (see review by Rinn 1984). The pyramidal motor system drives the voluntary facial actions, and originates in the cortical motor strip whereas the extrapyramidal motor system drives the more involuntary, emotional facial actions, and originates in the subcortical areas of the brain (Meihlke 1973; Myers 1976; Tschiasny 1953). Relatively speaking, these extrapyramidal motor actions appear to be less under the deliberate control of people. In fact, studies have shown that individuals asked

to suppress certain elements of a facial expression when in deception situations typically could not (Hurley and Frank 2011).

The involuntary nature of emotions, along with their resultant facial expression and vocal tone, means they will often *leak* out in the nonverbal behavior despite the liar's intention to conceal them. As such these emotional signals are involuntary products of the actual emotion, where behavioral intentions are expressed in the face and voice and body (Ekman 2003). Therefore, to the extent a liar feels fear of getting caught or other emotions, he or she is more likely to leak signs of these emotions in their faces, voices, and bodies. In the case of fear, these signs may include traces of the facial expression of fear, raised voice tone, increased manipulators (formerly called 'adaptors', these are actions where one part of the body touches, or manipulates another part of the body or another object; Ekman and Friesen 1969a), sweat, and body orientation more conducive to escape or avoidance. Ekman and Friesen (1969b) proposed a *leakage hierarchy* that ordered the different behavioral channels in terms of how much they are likely to leak clues to deception. Although their original work was based on lies concerning concealed emotions, they originally suggested that the body was the least controllable and the most likely to leak, followed by the voice tone, face, and then the words chosen by the liar. However, since the advent of better facial coding systems and videotaped analysis, which enabled Ekman (2001) and collaborators to note very brief, less than 1/2 second long, facial expressions of emotion missed in real time (called micromomentary expressions by Haggard and Isaacs 1966; relabeled and theoretically elaborated as micro-expressions by Ekman and Friesen 1969b), Ekman (2001) has updated the order such that the most leaky channel is the face, as shown by facial expressions of emotion (micro or macro; Frank and Ekman 1997), followed by the vocal tone (higher pitch in fear; Streeter et al. 1977), and then in the body (increased manipulators, nervous leg movements, etc.; Ekman 2001; Ekman et al. 1991), and finally the words, which are voluntarily expressed.

Note that if a lie situation does not generate strong emotions, these emotion-based signals will likely not exist (Frank and Ekman 1997). Also note that if the lie situation elicits strong levels of fear independent of lying – as in torture – then again we would not expect signs of fear to predict lying as we could assume they would be demonstrated equally by truth tellers. But if there is a scenario in which the stakes are high for getting caught, but the interview and other potential sources of fear are reduced – e.g., the interrogator builds rapport and is kind to the subject – then signs of emotions such as fear could show a significant relationship to lying (e.g., Frank and Ekman 1997; Frank and Ekman, 2004b; Frank et al. 2012; Matsumoto et al. 2011). Finally, negative emotions can also be a clue to truthfulness, as truth tellers used more anger words and were subjectively rated as being angrier than liars (Hatz and Bourgeois 2010).

As shown in Table 1, meta-analytic studies suggest that liars do appear more nervous than truth tellers, with less facial pleasantness, and fewer genuine smiles

(i.e., smiles driven by positive emotion that feature both the lip actions of smiling along with crinkling of the muscles that surround the eye; Ekman 1989) (DePaulo et al. 2003; Sporer and Schwandt 2006, 2007). If the lie itself is about emotions – e.g., telling someone that one feels calm, when in fact one is nervous – the research shows that signs of the truly felt emotion appear in the face and voice despite attempts to conceal it, although these signs are often subtle and brief (Ekman and Friesen 1969b; Ekman, Friesen, and O’Sullivan 1988; Frank and Ekman 1997; Frank and Ekman, 2004b; Frank et al. 2012; Porter and ten Brinke 2008).

Emotions during lying can also be manifested through the voice and body. There is a literature looking at ‘stress’ in the voice that occurs with lying. This stress is likely the emotion of fear, but it may also include a dose of vocal control that may produce micromomentary tremors in the voice (Lippold 1971). Regardless, technological approaches to measuring these vocal signs of lying have not been impressive, with the highest accuracies for distinguishing truth from lies being around 62% (with guessing being 50%; Hollien and Harnsberger 2006; Hopkins et al. 2005). It also seems that the higher accuracy is obtained with longer speech samples because studies that had liars and truth tellers utter only yes/no responses tended to show detectability not much better than chance (e.g., Horvath 1978). However, the meta-analyses consistently show that vocal involvement, tension, and pitch changes are correlated with lying (DePaulo et al. 2003; Sporer and Schwandt 2006).

Emotions have been implicated in producing various body clues to lying, although the meta-analyses really only show undifferentiated fidgeting as the only reliable body clue (DePaulo et al. 2003). This is interesting in that manipulators (referred to as self-fidgeting in DePaulo et al. 2003) such as putting the hand over one’s mouth, or touching one’s nose or face, have in the past been referred to as ‘red flag’ indicators of deception (Inbau, Reid, and Buckley 1986). One study even suggested that a nose touch was a ‘tell tale’ give away lie sign for former President Clinton (Hirsch and Wolf 2001). However, current research has suggested that manipulators or self-adaptors are not very good indicators of lying (DePaulo et al. 2003).

3.2.2 Moderators of nonverbal expression of emotion

Clearly the stakes associated with deception are going to moderate the ability of emotion-based clues to separate liars and truth tellers. For example DePaulo et al (2003) found that emotion-based clues such as nervousness or tension or increased voice pitch tend not to predict lying under conditions where the liars have no motivation to succeed, but did in fact become significant predictors when there were stronger motivations to succeed. Likewise Sporer and Schwandt (2006; 2007) found that lies about feelings and facts, and told under higher motivation, featured

voice pitch increases, whereas lies about only facts or under low motivation did not.

Thus, if a deception situation has low stakes, or is a situation that does not elicit an emotion, we would not expect any emotional signals to discriminate liars and truth tellers (Frank and Ekman 1997). Given the ethical constraints of doing truly high stakes research in the laboratory, we believe that emotion-based clues to lying are underrepresented in the research literature (Frank 2005). This is not an error or flaw in the research literature, because not all lies told actually generate much emotion (e.g., DePaulo et al. 1996). It only becomes an error when scholars decide to apply meta-analyses like DePaulo et al. (2003) to every lie situation, including those found in real-life law enforcement situations, where the stakes are far beyond what we could produce ethically in a laboratory. There have been a handful of studies that have examined real-life liars/truth tellers, but much of that work suffers from poor technical quality video materials made available to the researchers so they are not amenable to doing close emotional clue research (see section 5.9 for more detailed critique of how this affects accuracy for judging liars and truth tellers from behavior alone). Besides stakes, there may be other factors that can elicit or dampen emotions; for example, DePaulo et al (2003) raised the idea of the relevance of the lie toward someone's identity as being more likely to elicit diagnostic clues, along with motivation, and whether a transgression occurred.

3.3 Behavioral control origins

Knapp, Hart, and Dennis (1974) first suggested that the acts of managing clues to lying may ironically become clues themselves. Zuckerman, DePaulo, and Rosenthal (1981) called these attempted control clues, and relatedly Buller and Burgoon (1996) called these strategic clues. We will refer to them as behavioral control clues. What makes these clues interesting is that unlike the cognitive and emotional clues, which typically suggest the presence or increase in some behavioral clue associated with lying, this family of behavioral clues seems more likely to suggest the absence or decrease of particular behavioral clues associated with lying.

The likely origins of such clues are the fact that people, and cultures, have strong beliefs that certain behaviors are associated with telling a lie, with participants from 75 other countries apparently quite able to list out clues they believe are associated with lying (Global Research Team 2006). Regardless of the fact approximately half of these clues are not confirmed empirically (DePaulo, Stone, and Lassiter, 1985; Zuckerman and Driver 1985), each individual has at least some notion of what they believe a liar to look like, and will take steps to try to conceal such behaviors. For example, although the most prevalent belief internationally about lying is that liars will avert their gaze (Global Research Team 2006), gaze

aversion did not make our Table 1 as a reliable, meta-analytic predictor of deception. This is likely because gaze aversion is a readily controllable action, and children learn early on the need to control their eye action to be believed – particularly when challenged by parents and teachers to “look me in the eye and tell me you didn’t break that window.” Recent research confirms this. Gaze aversion is a diagnostic clue for lying in 7–9 year olds, but not in 15 year olds, and that as knowledge of this clue increases with age, its usefulness as a clue to lying decreases (McCarthy and Lee 2009). Thus it appears that as children learn a clue to lying, they develop a strategy to conceal or mask it. We believe that this same principle will likely apply to any other potential clues believed to be associated with lying, regardless of whether it is actually associated with lying.

3.3.1 Nonverbal expression of behavioral control clues

Liars likely will attempt to control any clue that they believe might be associated with lying in order to create an impression of truthfulness and, as originally suggested by Knapp et al (1974), this control may produce overcompensation such that we would expect the manifestation of some behavioral clues to be reduced in liars compared to truth tellers. For example, another popular clue believed to be associated with lying is an increase in body movements, including posture shifts (Global Research Team 2006). As a result of this belief, liars may try to reduce their body movements, posture shifts, head and arm movements, and so forth.

The meta-analyses (see Table 1) suggest that this is in fact the case. Liars reduce their illustrator gestures, hand and arm movements, their head nodding, their foot and leg movements, as well as maintaining a less direct orientation facing their interviewers. Liars also keep their stories short, and tend to repeat words and phrases (DePaulo et al. 2003; Sporer and Schwandt 2006). Within the facial channel, liars show more actions previously associated with facial control such as pressed lips and a raised chin (e.g., Ekman 2003; Matsumoto and Willingham 2006). Liars also show a general reduction in intensity of their facial expression.

3.3.2 Moderators

Behavioral control clues are likely moderated by experience, emotion, and even cognitive load. If the liar is fully engaged in creating a false statement, weighing it for plausibility and monitoring the lie catcher to see if he or she believes the lie, this activity can reduce the number of resources available to control other aspects of behavior, thus reducing some of the behavioral control clues. However, these clues are likely synergistic with the amount of cognitive load required to tell any particular lie, and the amount of emotion elicited by the stakes involved for successful or unsuccessful lying. For example, research has shown that the emotion

of fear, if strong enough, can elicit a freezing response (Gozzi et al. 2010; Lang, Davis, and Ohman 2000). If one presumes this freezing response is involuntary, then a liar would not have to deliberately execute any behavioral control in very high stakes situations as his or her emotional system would take care of that all by itself.

3.4 Synthesis and critique

We need to remind the reader that the three drivers behind the behavioral clues found to be associated with lying are all indirect markers at best, given the lack of a direct Pinocchio response. One thing we can note from Table 1 is that these significant predictors of lying, based upon comprehensive meta-analyses, seem to have preferred channels of expression that are consistent with their general nonverbal communicative function. For example, of the 10 significant meta-analytic behavioral clues purported to originate in our cognitive processes through mental effort, six of them are found in the paralinguistic channel. In parallel, of the 10 significant meta-analytic behavioral clues purported to originate in the emotional system, six appear in the facial channel. Likewise, of the 11 significant meta-analytic behavioral clues purported to originate in behavioral control processes, six appear in the body. Thus over half of each of these significant behavioral clues appear within the behavioral channel most attuned to their expression. This is consistent with the leakage hierarchy idea of Ekman and Friesen (1969b), who argued the face is least controllable due to its primacy in emotion, the voice next regarding its primacy in cognition, and lesser relation to emotion, and finally the body regarding its ability to amplify or de-amplify emotions and cognitions, thus being ideally positioned to conceal or control these emotions and thoughts.

A second issue involves the level of measurement of each nonverbal variable. We have addressed the cognitive load, emotion, and behavioral control variables at a number of different levels. Some studies involve investigating behavior at the most elemental *physical* units of measurement, such as logging the movements in the hands, feet, arms, legs, torso, head, eyebrows, lips, eyelids, or counting eye-blinks, measuring pupil dilation, fundamental frequency, amplitude, jitter in the voice, or counting words, number of pauses, response latency, or time spent talking in the speech. Other studies investigate behavior at the most elemental *psychological meaning* level. Although many are composites of the physical units described above, they have their own types and patterns of movements to which researchers have identified empirical or conceptual reasons for examining them as distinct units. Some of these variables include manipulators (also called adaptors, which involve touching, rubbing, etc., of various body parts), illustrators (gestures which accompany speech to help keep the rhythm of the speech, emphasize a word, show direction of thought, etc.), or emblems (gestures that have a speech

equivalent, such as a head nod meaning “yes”; see Ekman, Friesen, and Scherer 1976), particular emotions represented in the facial expressions (e.g., Ekman, Friesen, and O’Sullivan 1988; Porter and ten Brinke 2008), emotions expressed in the voice (Scherer 1984), or other composite speech measures such as speech rate and speech errors. Others have simply measured at a more global, abstract, or *impressionistic* level, such as when researchers measure composites of psychological level variables to produce impressions of immediacy, cognitive complexity, cooperativeness, or even plausibility (Frank 2005). This at times might have implications for obtaining reliable measurements of such characteristics. For example, we raised earlier the issues of arousal, and how that can mean many very different actions. Thus, two studies measuring arousal may produce entirely different results, as researchers may be dealing with entirely different phenomena. Similarly, most lie detection researchers who measure the smile rarely define it, but invariably measure it reliably (inter-coder reliabilities usually surpassing 0.90; Frank 2003) – despite the fact that research shows that the specific type of smile shown can be an important lie clue (Ekman et al. 1988). Regardless, the absence of agreed upon levels of measurement works against finding consistent patterns across studies, thus reinforcing the over-conservative nature of the meta-analytic work.

A third issue with the nonverbal communication and lying research area also involves the measurement of these behaviors, but in a different way. Researchers have shown that how one measures behaviors matters. Some behaviors when measured as frequency counts do not predict lying, whereas when measured as durations within the behavioral sequence they do predict lying (e.g., head movements, adaptors, and illustrators; Sporer and Schwandt 2007). Thus how researchers measure each behavior is important, and the field has paid less attention to that compared to issues like measuring variables as a within subject change in baseline versus a between subject cross condition comparison (Frank 2005).

The final issue within the field is locating the various behavioral clues within the behavioral sequence to identify when it does or does not contradict other behaviors or statements. For example, nervousness can be a predictor of deception. But what if the potential lie story is one where the individual is describing an upcoming surgery where he or she will receive a giant needle injection into the eyeball? Most of us would appear a bit nervous telling that story. But if instead the story was about describing one’s best friend, then the nervousness would not quite fit that story. Thus a facial expression of disgust that accompanies the comment “I like you” is more likely to predict that a person is lying than a facial expression of disgust that accompanies the comment “I don’t like you at all” (Frank 2005). Likewise, there are body gestures that have clear meanings called emblems (e.g., nodding head yes, shrugging shoulders meaning “I don’t know”; Efron 1941). Meta-analytic studies have shown pretty clearly that these gestures do not predict deception. However, when they are analyzed and time synched with the spoken

word, research shows that liars are much more likely than truth tellers to show an emblem that contradicts the spoken word, as when nodding “yes” but speaking “no” (Svetieva 2010).

4 Broader theoretical issues

The analysis of nonverbal clues to lying is best understood as a theoretical insight into human cognition, human memory, human emotion, and human behavioral management, independent of lying. Not surprisingly, there are remarkably few theories of human deception and lying that meet proper scientific criteria as theories. This is likely due to the fact that there is not a unique response that occurs only when we lie. Thus what is left are other theories, derived to explain the core emotional, cognitive, or control phenomena, that are then shoe-horned into understanding lying. For example, Darwinian evolution of social communication explains why some emotion clues might be present when someone tells a lie. But, as noted in earlier diary studies (DePaulo et al. 1996), not all lies elicit emotions. Thus a theory of lying that tries to integrate the presence of emotion clues is likely better off dialing back to Darwin’s theory as the basis for predicting how that particular situation might elicit an emotion, as well as how that emotion might appear.

There have been attempts to develop theoretical frameworks to predict which nonverbal behavioral clues may or may not be present when lying, but they end up being theories about situations. For example Buller and Burgoon’s (1996) *interpersonal deception theory* (IDT) attempts to capture the interactive nature of lying in interpersonal situations. We agree with many of the central premises of this theory – e.g., that there are back and forth exchanges between the liar and target, and the liar will adjust his or her behaviors depending upon the reaction from the target. However, we believe that this happens in all human interaction, and that truth tellers will report managing their behaviors as often as liars (Vasilyeva and Frank 2006). The real concerns are whether one can make clear predictions as to what and how the behaviors may change, and why they change; without that, we have to ask whether it meets the criteria of a theory (see DePaulo, Ansfield, and Bell 1996; Levine and McCornack 1996; Stiff 1996).

Regardless, we think that the effort to try to capture the structural features of different lie situations is correct. Every situation has its own demand on cognitive effort, memory, emotion elicitation, and socially acceptable behavioral display rules. The extent to which each situation can be articulated is the degree to which it can be studied, and predictions rendered. And this takes us full circle back to Knapp and Comadena’s (1979) original argument for the importance of moderating variables such that we just might need to have different predictions for which behavioral clues betray lying for different interpersonal situations. This mistake

still happens, where scientists will discount contextual demands and lump together all lie detection studies (and in this case exclude those studies involving lies about emotion) to argue that behavioral clues are only weakly related to lying (Hartwig and Bond 2011). Hence it is essential for researchers to articulate what those structural features are so as to enable scholars to know how far to generalize the result of any given lie detection experiment (Frank 2005). This not only has implications for real-life security situations, but will of course affect studies that examine how well we can detect lies from behavior as well.

5 Judging lies from nonverbal clues

The general research literature suggests that most people detect lies from behavior at levels not much better than guessing (Bond and DePaulo 2006). The average person is around 54% accurate, and tends to be more accurate spotting truths (61%) than lies (47%). This result applies to lay people, and, surprisingly, to professionals whom we entrust to catch liars (police, customs officials, judges, etc). Given that there is no Pinocchio response, researchers can predict that lie catchers will never be perfect. Ekman (2001) has argued that the only way to know with 100% certainty whether someone is lying is to have unimpeachable, corroborating evidence. In other words, when it comes to lie detecting, evidence trumps behavior. In fact, Park et al. (2002) have shown that most people cite corroborating evidence (or confessions), rather than the behavioral display of a liar, as being the means by which they recalled catching liars in their own lives.

However, much like research on nonverbal behavioral clues to lying, there are a number of variables that moderate accuracy in judging lies from demeanor. These typically orbit around the aspects of the lies and truths that are told, the actual presentation of the judgment task, aspects of the judgment decision-making, aspects of the judgment situation, and aspects of the lie catchers themselves. All these factors have implications not only for accuracy in judging lying from behavior, but also for efforts to train people to be better lie catchers.

5.1 Aspects of the truths and lies being told

The presence or absence of diagnostic clues to lying in a sample of liars and truth tellers will, of course, affect the accuracy of a lie catcher. For example, if the liars and truth tellers do not have any behavioral clues that distinguish them, we cannot imagine how any judge could be much more accurate than chance without a predictive clue. A surprisingly large number of studies in this area do not, in fact, verify whether or not there are such clues prior to subjecting these materials to a group of lie catchers (unlike Ekman and O'Sullivan 1991; Frank and Feeley 2003).

However, many of these studies are proof of principle studies and thus are not required to identify specific lie clues for validity. Despite this, research has shown that there do appear to be various moderating variables that can affect lie detection accuracy.

5.1.1 Stakes

As we described earlier, one very important aspect of a lie is the stakes involved. High stakes are more likely to generate some types of nonverbal clues because they engage the emotional system. Meta-analytic studies have shown that emotion based clues like higher voice pitch and less facial pleasantness, are better at discriminating liars and truth tellers under high motivation (DePaulo et al. 2003; Sporer and Schwandt 2006). Previously DePaulo, Lanier, and Davis (1983) documented the motivation impairment effect, which suggested that when liars or truth tellers were more motivated to succeed, they tended to be more accurately detected. This phenomenon, across other studies in which motivation was manipulated within the study, was further confirmed in the judgment meta-analysis of Bond and DePaulo (2006). However, when comparing motivation across studies (i.e., not manipulated within a given study), Bond and DePaulo (2006) did not find more motivated liars or truth tellers to be better detected than the less motivated ones.

This picture gets a bit muddier when professional lie catchers are considered. O'Sullivan et al. (2009) analyzed all the published studies on law enforcement officers' abilities to detect lies, and separated the studies into those in which the stimulus liars and truth tellers were in a high stakes situation, and those in which they were in low stakes situations. They found that law enforcement officers were significantly more accurate distinguishing truths from lies in the 13 published high stakes studies (67%) compared to the 18 published low stakes studies (55%; effect size $d = 1.22$). In contrast, Bond and DePaulo's (2006) analysis of all the published studies featuring experts such as law enforcement officers found a raw detection accuracy of 55% for experts compared to 53% for non-experts, which although a statistically significant difference, was not on the magnitude of the O'Sullivan et al. (2009) results. The likely reason for this difference was that unlike Bond and DePaulo (2006), O'Sullivan et al. (2009) looked at the interaction of expertise and stakes. O'Sullivan et al. (2009) argued that professional lie catchers deal almost exclusively with high stakes lies, thus showing them low stakes lies deprives them of the sorts of clues that they see and interpret on the job, which affects their detection ability.

5.1.2 Preparation time

The preparation time allotted for the lie is important; if additional preparation time allows for more thoughtful processing of an alibi on the part of the liar, then

the reduction in time pressure would likely lower the cognitive load. Sporer and Schwandt (2006) found that preparation time does seem to make a difference. With more preparation time liars have slower speech rates and shorter response latencies than those who have to lie more spontaneously. However, Bond and DePaulo's (2006) meta-analysis did not find any overall accuracy differences for judging prepared versus unprepared liars and truth tellers.

5.2 Aspects of the liars

The characteristics of the individuals being judged, be they personality or other skill sets, have been examined in a number of studies.

5.2.1 Sex

Research has found, for the most part, that sex of the judge or sex of the liar does not affect lie detection accuracy (e.g., Aamodt and Custer 2006; Anderson, DePaulo, and Ansfield 2002), despite women generally being better readers of non-verbal behaviors than men (Hall 1990).

5.2.2 Age

Although it would seem apparent that younger children would be more easily detected when telling lies compared to older children or adults (e.g., Feldman, Jenkins, and Popoola 1979), all ages are often shown to be detected at greater than chance accuracy (Aamodt and Custer 2006; Vrij et al. 2006). However, other studies have shown that adults have a difficult time judging children's lies (e.g., Leach et al. 2004; Lewis 1989). These disparate findings for judging children may be moderated by two factors; first, judgment accuracy may be an interaction across age. Edelstein et al. (2006) found that the adult judges were significantly more accurate judging the lies told by children, but the truths told by adults. Second, relevant experience dealing with children may be important, as the amount of such experience a lie catcher had was positively correlated with his or her accuracy in judging children's truths and lies (Crossman and Lewis 2006).

5.2.3 Psychopathy

Psychopaths are believed to be harder to detect than normal populations, and apparently they do show behavioral displays when lying that are different from non-psychopaths such as speaking faster, and increased rates of head movements and blinking (e.g., Klaver, Lee, and Hart 2007).

5.2.4 General demeanor

Finally, there are some characteristics that make individuals appear to others as consistently honest or dishonest, regardless of actual veracity (called the *demeanor bias* by Zuckerman, DePaulo, and Rosenthal 1979). In fact, a recent meta-analysis has suggested that the demeanor of the liars and truth tellers accounts for an overwhelming amount of the variance associated with lie detection accuracy (Bond and DePaulo 2008; Levine 2010). Furthermore, direct manipulations of the link between demeanor and actual veracity strongly supported this demeanor bias (Levine et al 2011). One factor that likely contributes to the demeanor bias is social competence, where those adolescents with lower social competence were more readily detected than those with higher social competence (Feldman, Tomasian, and Coats 2004). Another is the fact that, at least in high stakes situations, the liars and truth tellers' verbal and nonverbal behaviors are consistent across different lies (Frank and Ekman 2004b).

5.3 Aspects of the judgment situation

Scientists have examined many other purported factors of the judgment situation to assess its role in lie detection accuracy, such as whether the lie catcher is familiar with the target, whether the lie catcher is interacting with the target, and the lie catcher's level of involvement with the judgment task.

5.3.1 Familiarity

Familiarity studies typically examine the differences in lie detection accuracy between strangers versus people who know each other or are in close relationships (e.g., McCornack and Levine 1990). In this sense familiarity not only fails to enhance accuracy (Buller, Strzyzewski, and Comstock 1991; McCornack and Parks 1986), but can directly hinder it, as when strangers are judged more accurately (at least from voice information only; Millar and Millar 1995).

5.3.2 Presence of baseline information

Familiarity studies also examine the role of baseline information on judgment accuracy, where judges are given a sample of honest behavior prior to being shown an unknown truth or lie behavioral sample, which is then judged. A meta-analysis of studies that allowed baselines showed that a baseline sample did significantly improve accuracy, but not much in a practical sense (55% v 53%; Bond and DePaulo 2006). However, we hasten to add that a baseline sample should be relevant and feature as many characteristics as the unknown truth or lie segment as possible (known as a comparable baseline or truth; Vrij and Mann 2001). Indeed, the amount of information that is optimal to improve judgments may be curvilinear.

ear, with too little information being inadequate for judgment, and too much information overwhelming the lie catcher (e.g., Brandt, Miller, and Hocking 1980).

5.3.3 Face to face presence

Judgment studies have also compared the accuracy of judges when they are face to face with the potential liar, versus when they passively observe a videotape. The meta-analysis found that lie catchers were significantly more accurate when they were *not* interacting with the liar/truth teller, although the typical accuracy differences were not practically large (54% vs. 53%; Bond and DePaulo 2006). Again, this may be due to the cognitive load on the interacting lie catchers, who have to remember their questions and goals, monitor and judge the behavior of their partners, and even deal with their own additional emotions elicited by the presence of the potential liar; in contrast, the passive observers of videotape simply have to watch and judge.

5.3.4 Presence of differing behavioral channel information

From the time Ekman and Friesen (1974) showed separate facial close ups and full body shots of liars and truth tellers as an empirical test of their leakage hierarchy (Ekman and Friesen 1969b), scientists have used research designs that have separated communication behavior into its constituent channels to try to ascertain whether there is any useful information within each channel that may facilitate lie detection. Originally Ekman and Friesen (1969b) predicted that lie catchers would be more accurate judging bodies, compared to faces, and found support for that idea (Ekman and Friesen 1974). Since that time, Bond and DePaulo (2006) analyzed as many cases as they could find of studies that did similar channel breakdowns, and they reported 53 studies in which the lie catcher judged lies from only the face ($k = 15$), only the body ($k = 9$), and the face plus the body ($k = 29$). Although not overly impressive, the greatest detection accuracy was achieved when the lie catchers saw both face and body channels.

5.3.5 Mediation of information

Studies have also compared the media through which the materials are presented to lie catchers as another way to compare the role of different behavioral channels on accuracy. Typically studies show an audiovisual presentation (sound plus the video of the behavior), but a smaller number of studies examine just the visual presentation (video without audio) or play just the audio (without any video). Some show the transcripts of the liars' statements, but that work is typically used to examine verbal clues. Regardless, Bond and DePaulo (2006) reported significant differences between media presentations. They found lie catchers are most accu-

rate when they have both the audio and visual information (around 54%), followed by audio alone (around 53%), and poorest when they have only the visual information (around 50%).

5.4 Aspects of the judgment decision-making

The process by which people make their judgments of truths and lies has received attention as well, where scientists have manipulated elements of the decision-making process to assess its effect on accuracy.

5.4.1 Suspicion

Research has found that suspicious judges are not much better at lie detecting than non-suspicious judges, and through their suspicion can in fact make the liar/truth teller appear more honest (reviewed by Levine and McCornack 1996). Levine and McCornack (2001) labeled this phenomenon whereby the liar/truth teller who is probed appears more truthful as the *probing effect*. There is some controversy over why this effect occurs, with some researchers arguing that liars/truth tellers adjust their behaviors to appear more truthful in response to the probes (e.g., Buller and Burgoon 1996; Buller, Stiff, and Burgoon 1996), whereas others argue that rather than changing the behavior of the liar/truth teller, this effect instead is caused by a basic cognitive judgment heuristic (Levine and McCornack 2001).

5.4.2 Specific clues compared to global judgments

Other work on cognitive heuristics has compared lie catchers who are allowed to apply their more global or “gut” judgments to those judgments based on specific diagnostic lie clues. These studies find that judgments based on specific verbal and nonverbal clues improves lie detection accuracy (Feeley and deTurck 1995; Fiedler and Walka 1993). In fact, other factors may enter into heuristic decision making—for example, individuals are judged to be more deceptive if they are violating nonverbal expectations (Bond et al. 1992; Levine et al. 2000). Moreover, in general, people tend to apply a “when in doubt, judge truth” strategy, called the *truth bias* (McCornack and Levine 1990) or *veracity effect* (Levine, Park, and McCornack 1999). This finding is supplemented by the continual and routine finding that judges show higher accuracy on the truthful judgments compared to the lie judgments on their lie detection tests (e.g., averaging 61% accuracy on truths, versus 47% accuracy for lies; Bond and DePaulo 2006). This finding is robust enough that Levine and colleagues have shown that the proportion of lies and truths in a given lie detection test can predict the ultimate overall accuracy of the test (Levine et al. 2006). Not everyone succumbs to the truth bias/veracity effect, however. Some groups, like inmates (Bond et al. 2005; Hartwig et al. 2004) and some police offi-

cers (Meissner and Kassin 2002), show the opposite pattern (a lie bias; Knapp 2007).

5.4.3 Indirect judgments

A related information processing issue involves asking lie catchers to not make truth or lie judgments *per se*, but instead to make more indirect judgments such as rating the liars/truth tellers on ambivalence (DePaulo et al. 1982). This indirect measure approach tends to show improved accuracy in predicting who is lying or truthful. Another indirect measure, the confidence in one's judgment, was associated with accuracy when judging truthful items in a lie detection test, but not deceptive items (DePaulo et al. 1997). Yet another indirect measure was to ask lie catchers to judge whether someone had to think hard, thus capitalizing on the behavioral clues associated with the increased cognitive load faced by liars. These data showed a decrease in accuracy compared to judging truth or lie (Vrij, Edward, and Bull 2001).⁴ In contrast, Slowe and Frank (2012) asked lie catchers to judge confidence/shyness – to capitalize on the additional cognitive load; and nervous/relaxed – to capitalize in the increased emotional reactivity to lying – and found significant improvements in accuracy, but only when these indirect judgments occurred alone. If a truth/lie judgment preceded these indirect judgments, then they did not improve accuracy, likely due to the capacity of the truth/lie judgment to shift lie catchers into the previously identified semi-inaccurate beliefs about deceptive behavior (e.g., DePaulo, Stone, and Lassiter 1985). Thus it seems indirect measures can in fact be helpful in judging truths and lies.

5.4.4 Group decisions

Lastly, decision making processes can affect lie detection judgments as a function of whether individuals make judgments alone or as part of the group. These data show that 3 to 6 person groups do not outperform individuals, although the groups tend to be more confident in their abilities (Park, Levine, Harms, and Ferrara 2002). However, when 6 person groups were instead run as juries who would judge 'testimony' by liars and truth tellers who told high stakes lies, they were overall more accurate than 6 person groups who did not deliberate over their judgments. But this accuracy improvement was due only to increased accuracy on judging lies, not truths (Frank, Feeley, Paolantonio, and Servoss 2004).

⁴ This study erroneously reported the opposite effect, that is, that indirect measures were associated with improved accuracy. But the table means definitively show superiority for direct measures (lie vs. truth), and we have not found a published erratum to those data.

5.5 Aspects of the lie catcher

As mentioned above, there are no reliable sex differences in lie detection ability (e.g., Aamodt and Custer 2006). Moreover, most professionals are not any more accurate than laypeople, although some professionals outperform lay people when they are asked to judge high stakes lies (O'Sullivan et al. 2009). There are considerable limitations studying professionals, particularly when trying to recreate in the lab conditions that these professionals face in their day to day jobs (Frank 2005).

5.5.1 Abilities related to life experiences

There is some debate as to whether individuals differ in their inherent ability to spot lies. Researchers know that some groups, particularly in law enforcement, do well (67% accuracy) spotting high stakes lies and truths (but only high stakes lies and truths). Moreover, children who have been physically abused, and raised in institutions, tend to be better at distinguishing lies and truths (62% accuracy; Bugental et al. 2001), and likewise those individuals with left hemisphere brain damage (who develop enhanced nonverbal skills as a result of not being able to process speech) also outperformed matched control groups (60% accuracy overall, 73% accuracy when judging items with facial clues to lying; Etcoff et al. 2000).

5.5.2 Abilities related to some inherent ability

There is also data suggesting that lie detection performance can be stable, where individuals who perform well in distinguishing truths and lies in one high stakes lie situation are equally good in a second high stakes lie situation (Frank and Ekman 1997). O'Sullivan and Ekman (2004) took this further, and found some individuals, whom they term *wizards*, routinely performed at 80% accuracy or higher when judging truths and lies. O'Sullivan (2007) proposed that this ability emerged through some combination of natural ability, and on the job experience. However, critics have argued that because these wizards were given three tests, a certain percentage of the sample should score very high by chance alone (e.g., Bond and DePaulo 2008; Bond and Uysal 2007). O'Sullivan (2008) countered that the critics were applying statistical models, when, in fact, performance models were the proper comparison – she argued that a golfer like Tiger Woods may be statistically unlikely, but his consistent excellent performance (at least up until a few years ago) was not a statistical fluke.

5.5.3 Abilities related to other perceptual skills

One of the skills associated with lie catching ability (in high stakes situations) is the ability to detect micro-expressions of emotion (Ekman and O'Sullivan 1991;

Frank and Ekman 1997; Frank and Hurley 2012; Warren, Schertler, and Bull 2008). However, these correlations tend to be in the 0.27 to 0.40 range, suggesting that there are other skills or abilities relevant to accurate lie detection than just the ability to detect micro-expressions (Frank and Ekman 1997).

5.6 Aspects of the social interaction

One neglected area of research in lie detecting from nonverbal and verbal behavior is the interaction between interviewer and participant (Frank 2005). But some research has shown that a number of techniques can push the behavioral clue patterns shown by liars and truth tellers further apart. For example, Vrij, his colleagues, and others have shown that techniques designed to raise the cognitive load can exacerbate the differences between liars and truth tellers. This can be done by using techniques such as asking participants to look them in the eye (Vrij et al. 2010), tell the story backward (Vrij et al. 2008), withholding evidence until the participant has committed to his or her alibi (Hartwig et al. 2006), asking more strategic questions such as asking what a witness would say (Levine, Shaw, and Shulman 2010), asking unanticipated questions (Vrij et al. 2009) or even asking participants to draw what happened (Vrij et al. 2009). However, we must express some caution, as the improvement in accuracy with these techniques, although statistically significant compared to the non-interventions, usually did not raise deception detection accuracy much over the typically reported 54%. Other techniques may improve accuracy by lowering the emotions felt by truth tellers, such as delaying the directly accusatory question (Vrij 2006), or building rapport with the participant (Frank, Yarbrough, and Ekman 2006; Hurley, Frank, and Kozey 2012). Thus, rather than simply being passive observers of nonverbal behavior, the lie catcher can, in fact, pry open the gap through techniques designed to capitalize on the cognitive, emotional, and control origins of lies clues described earlier.

5.7 Training

Given the finding that the average person cannot detect lies from behavior much better than a guess, it begs the question as to whether people could be trained to improve their abilities to detect lies. A meta-analysis of all the lie detection training studies did find that despite a number of substantial flaws in the training protocols and materials – such as training on materials that have not verified whether any behavioral clues distinguish liars and truth tellers, training sessions lasting mere minutes, and so forth – there did appear to be a significant effect for training (Frank and Feeley 2003). This meta-analysis even included a study where trainees were taught to look for behavioral clues that were discredited by science, yet often

taught in real police training programs (which showed training reduced accuracy by 10%; Kassir and Fong 1999). The overall effect for training therefore is likely underestimated. Training however can also exhibit a type of placebo effect wherein trainees taught on any clues to deceit, be they genuine or bogus, show improvements of around 4% (Levine et al. 2005). However, a more recent meta-analysis of training studies showed stronger effects for training on nonverbal clues and lie detection accuracy (O'Sullivan, Frank, and Hurley 2010) perhaps because the more recent training studies have addressed some of the inadequacies identified in earlier training studies.

5.8 Technology

There are a number of technological devices in development that are designed to better detect the nonverbal elements of behavior, and apply those to lying. For example, Tsiamirz et al. (2007) analyzed facial heat and deception using thermographic infrared detection. Barlett et al. (2012) used a computer based system called the Computer Expression Recognition Tool (CERT; Bartlett et al. 2006) that automatically detects individual facial muscle movements and found they could distinguish true expressions of pain from falsified expressions at rates approaching 90% accuracy (compared to the 50% accuracy of untrained and unaided human judges). Others have used blob analysis of movements (Xia, Wang, and Huang 2007), or other motion profiles based on blob analysis (Michael et al. 2010) to show slightly higher accuracy rates than unaided lie catchers.

5.9 Synthesis and summary

Taken together, the research suggests substantial limits on our ability to judge lies and truths from nonverbal clues. Nonetheless the published studies showing higher accuracy rates than the typical 54% (as reported by Bond and DePaulo 2006) suggest that this middling accuracy rate may not always be the case. We have outlined some of those individual, situational, and cognitive processing factors – e.g., stakes, focus on clues, and other aspects of the liars, judgment process, and situation – that can result in higher accuracies. A more overarching model that encompasses the different stages of the judgment process may better help us understand accuracy, and when and where research designs may in fact underestimate accuracy.

The model we applied to deception detection judgments in previous work (O'Sullivan et al. 2009) is the Realistic Accuracy Model (RAM) for personality judgments (Funder 1999). We believe it captures the key elements for accuracy in lie detection judgments just as well as it did for its original target of personality judg-

ments. The RAM posits that four conditions need to be met before one can truly assess accuracy in a judgment (be it personality or lie detection). The first condition posits that the individual being judged must display behaviors *relevant* to a trait, or in the case of lying relevant to a person's truthfulness. The high stakes associated with the lies found in law enforcement situations stimulates the production of emotion and its associated behaviors that are apparently relevant (e.g., Frank and Ekman 1997), or the type and style of questions may stimulate the production of the relevant cognitive based clues (e.g., Vrij 2006). A surprising number of published studies on lie detection have not verified whether or not the stimulus materials feature any diagnostic clues whatsoever (cf. Ekman and O'Sullivan 1991). Previous behavioral work has found that visible behavioral clues can distinguish liars from truth tellers at rates greater than 80% (Ekman et al. 1988; Frank and Ekman 1997; Vrij et al. 2000), thus it is reasonable to expect we might be able to see lie catchers reach those levels. But this is dependent upon the second condition of the RAM which posits that these sorts of behaviors must be *available* to the judge. If the observer is too far away to see facial expressions of emotion, or too far away to hear inconsistent statements or inappropriate breaths or sighs, the *relevant* information is not *available* to observers, thereby limiting the ability to make an accurate assessment (Frank 2005). We have noted earlier that much of the 'real world' police interview video is shot from such a far distance that one cannot see subtle facial movements even if exhibited by the suspect; thus a potentially relevant clue like a micro-expression of fear or contempt would not be available. It would then be an error to conclude that facial expressions are a useful clue in these sorts of videos if they are not *available* (cf. Mann, Vrij, and Bull 2004). The third condition posits that the judge must actually *detect* these diagnostic behaviors. If the judge is not looking in the right place – e.g., staring at leg movements when the facial expression of fear is diagnostic, or looking for eye contact when in fact the increased speech latency is diagnostic – he or she will likely not detect the clue (e.g., Ekman and O'Sullivan 1991; Frank and Hurley 2012). The fourth condition posits that these behaviors must not merely be detected; they must be adequately utilized and *interpreted* by the judge (e.g., O'Sullivan and Ekman 2004). For high lie detection accuracy, minimum criteria for all four conditions of this model must be met. And, these conditions must be met as per the structural features of the particular lie situation one wishes to understand (e.g., Knapp and Comadena 1979). Thus, let's look at a police interrogation type situation. First, a lie scenario must have stakes high enough to generate cognitive, emotional, and behavioral control clues on the part of the liars, which would produce behavioral clues more *relevant* to lies told in real world criminal scenarios. Second, the videos being judged must be clear enough that the size of the facial image, or quality of the voice recording, or the presence of body behavior replicates that seen in the type of face-to-face communication found in actual interactions, or at least allows the behavioral signals to be visible (Frank 2005). Third, the

judges must *detect* these clues, and fourth they must properly *interpret* them. An appropriate lie scenario meets the first condition, appropriate video and audio recording captures the second, and particular skills of the judges captures the third and fourth. Until we articulate all four elements, we think the behavioral research findings will tend to underestimate our abilities to detect lies from truths. What we do not know is by how much, although we can suppose safely that lie detection from behavior will never be perfect given the absence of a perfectly diagnostic clue.

6 Conclusion

It is clear that there are no tell-tale signs of lying in nonverbal behavior. Moreover, there is no overarching theory to explain the presence or absence of all possible clues that may be associated with lying. There are theories to explain the underlying substrate of these clues associated with lying – theories associated with mental processing, memory, emotions, and behavioral coping and control. What those nonverbal behaviors that are associated with lying tell us most accurately is whether the person is engaged in heavy mental effort; or recalling an event they truly experienced; or feeling the emotion of fear, anger, happiness, or distress; or trying to manage those behaviors. Lying is therefore always a second-order inference from behavioral clues.

There are still many methodological limitations in the examination of nonverbal clues to lying. The main limit is suggested by the way in which behavioral clues are associated with situations. Thus any meta-analysis that combines all the studies, examining lies told in very different situations, will likely produce a much more conservative estimate of the effect sizes – as each lie, and lie situation, will vary in its press on a liar's cognitive, emotional, and control capacities. The only way to improve accuracy is to take the specific contexts into consideration, and then compare the behavior to the context to determine whether that fits. Thus the person who nods yes while saying no; the person who says they like another while showing disgust; the person who shows long speech latencies when asked simply to describe what they did moments ago, likely improves the interpretation of those clues, but that too is not a guarantee. People can think, feel, and manage their behaviors for reasons too numerous to mention, and many of them have nothing to do with lying. Most people are much better served understanding that, and should exercise caution when applying their lie detection skills based solely on someone's demeanor.

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V Focus on the dyad

Miles L. Patterson

17 Toward a systems approach to nonverbal interaction

Abstract: This chapter discusses a new systems approach to nonverbal interaction. This approach is an attempt to integrate a range of factors and processes into a single model that represents both partners in a dyadic exchange. To set the context for this systems approach, the chapter begins with a discussion of the evolution and limitations of theories of nonverbal interaction. In contrast to the earlier theories, the systems approach enlists a dyadic framework that emphasizes the importance of settings and goals in influencing the course of interactions. Interaction partners are pragmatic, simultaneously behaving and making social judgments in the service of conscious and unconscious goals. The dominance of automatic processes in both interactive behavior and social judgments is emphasized, while recognizing that controlled processes are also conditionally possible. Thus, this systems model provides a new and more comprehensive approach to conceptualizing nonverbal interaction.

Keywords: nonverbal behavior, systems approach, interaction, theories, automaticity

Nonverbal communication is a complex, highly efficient, and adaptive means of relating to our social worlds. The pervasive nature of nonverbal communication is evident wherever visual, vocal, tactile, and olfactory information affects judgments and/or subsequent behavior. In the context of mediated communication, including television, the Internet, and radio, nonverbal cues are critical in forming opinions and changing behavior, whether the content is commercial advertising, political messages, entertainment, or the simple reporting of news. Furthermore, much of this happens automatically, with receivers having little or no insight into how their perceptions and judgments are affected. As a result, nonverbal communication is a particularly powerful source of influence in mediated communication (Patterson 2011a: Chapter 1).

The dynamic and functional nature of nonverbal communication is best illustrated in our face-to-face contacts with others. Speculation about the role and impact of nonverbal behavior in social settings has been present for centuries in philosophy, science, and literature (Knapp 2006). The development of concentrated empirical research on nonverbal behavior is, however, a relatively recent phenomenon, growing rapidly from the 1950s through the present day. An important part of this extensive research addresses the give-and-take of nonverbal communication between individuals in face-to-face encounters. That is, how do pat-

terns of nonverbal interaction develop and what are the factors affecting these patterns? As the volume and complexity of empirical research on nonverbal exchange grew, theories explaining the underlying mediating processes also evolved (Patterson 2006). In spite of these developments, existing theories generally lack a comprehensive and explicitly interactive structure that adequately represents the interdependent nature of dyadic exchange. The purpose of the present chapter is to provide a systems framework for dyadic nonverbal interaction. In particular, the systems approach outlined here is framed in the context of the social setting and represented, not at the individual level, but at the dyadic level. Because this approach necessarily builds on earlier research, it is useful to examine how different components and processes of this system emerged as theories evolved over time.

1 Early theories

The primary focus of early theories was on reactive behavioral adjustments in interactions. That is, how does one person behave in response to a specific pattern initiated by a partner? The first approach, Argyle and Dean's (1965) *equilibrium theory*, proposed that the overall level of intimacy or involvement between partners was reflected in a small set of behaviors, including distance, gaze, smiling, and verbal intimacy (self-disclosure). In general, as the underlying intimacy in a relationship increased, the comfortable level of involvement between interactants also increased. In any given interaction, there was pressure to maintain a balance, or equilibrium, between relationship intimacy and its behavioral expression. Too much or too little behavioral involvement precipitated compensatory adjustments, serving to restore the equilibrium. For example, if one person approached more closely than the relationship warranted, the partner might compensate by turning away and avoiding eye contact.

Although there was considerable support for equilibrium theory across a number of empirical studies (Patterson 1973), the theory could not easily explain the occasional contrasting pattern of behavioral adjustment – reciprocation. That is, sometimes the increased (or decreased) behavioral involvement by one person precipitated reciprocity, not compensation, from the partner. For example, a close approach and increased gaze by one person might lead to a smile and hug from the partner. In response to this limitation, several different affect-based theories provided explanations for both compensation and reciprocation in nonverbal interactions (e.g., Burgoon 1978; Cappella and Greene 1982; Patterson 1976). In each of these theories, arousal played a critical role in determining affective responses to a partner's change in nonverbal involvement. Specifically, when one person substantially changed his/her nonverbal involvement or violated a partner's expectancies, the partner experienced arousal. Arousal, in turn, determined affect,

either directly (Cappella and Greene 1982), or through a labeling or attribution process (Burgoon 1978; Patterson 1976). Common to all of those theories was the prediction that negative affect precipitated compensation, whereas positive affect precipitated reciprocation. Thus, a close approach and touch from a stranger might increase arousal and result in negative affect. The negative affect, in turn, leads to compensation, for example, turning away and increasing distance from the stranger. In contrast, a similar close approach and touch from a loved one might also increase arousal but, in this case, precipitate positive affect. In turn, the positive affect leads to reciprocation, for example, smiling at and hugging the loved one.

All of these theories were limited in two important ways. First, they were all reactive in nature. That is, they started with a given pattern of nonverbal involvement from a partner and then predicted the subsequent behavioral adjustments. Thus, all of the theories were mute about the initiation of the partner's behavior. Second, the early theories were all affect driven. Although these theories differed in just how individuals arrived at a particular affective state following a partner's behavior, the common prediction across the theories was that negative affect (e.g., anxiety or fear) precipitated compensation while positive affect (e.g., liking or love) precipitated reciprocation. Nevertheless, sometimes there is inconsistency between affect and interpersonal behavior and people manage their behavior to achieve particular goals, independent of their affect (e.g., Ickes et al. 1982). Thus, affect does not necessarily determine behavior.

2 Functional approach

In response to the limitations of the early theories, a functional approach was advanced, one that provided an emphasis on the wide-ranging utility of nonverbal communication in social settings (Patterson 1982, 1983). Although people do react to their partners' behavior, they also initiate particular patterns of nonverbal behavior in the pursuit of goals. Affect still plays a role in both the initiation of, and reaction to, partners' nonverbal behavior, but interpersonal goals are often more important than affect per se. For example, relationship intimacy and affect are sometimes less important in determining nonverbal involvement than are goals of exercising influence and impression management.

The functional model also recognized that biology, culture, gender, and personality combine to shape habitual patterns of interaction. These factors will be discussed in more detail later, but at this point it is important, first, to appreciate that these factors constitute the "baggage" that each of us brings to social settings. That is, these determinants affect both the functions directing interaction and the modal patterns of nonverbal involvement shown. Because the functional model emphasizes that individuals both initiate behavior and react to the behavior of

their partners, the theory moved away from simply predicting reactive patterns of compensation or reciprocation (Patterson 1982, 1983). Instead, a different kind of outcome metric was proposed for the functional model – the stability of nonverbal exchange. When the perceived function of a given interaction is shared by the partners, interactions tend to proceed in a relatively stable and predictable manner. Stability might be characterized by increased synchrony as partners behave in unison with minimal latencies between one person's action and the partner's reaction. In addition, stable interaction sequences are more likely to include reciprocity of behavioral involvement. As partners' similarity in culture and personality increases, so do the shared expectancies and behavioral predispositions, leading to increased stability of nonverbal exchange. When individuals, however, perceive instability in the interaction, arousal and cognitive-affective processes mediate the subsequent behavioral adjustments and facilitate stability in the interaction. An interesting application and extension of the functional model can be seen in the effects of social stigma on the dynamic changes in nonverbal behavior in inter-group interactions (Hebl and Dovidio 2005).

The functional emphasis took a somewhat different form in the interaction adaptation theory (IAT) (Burgoon et al. 1998; Burgoon, Stern, and Dillman 1995). IAT proposed that a person's dominant behavioral predisposition with a particular partner was shaped by biological drives and needs, experience, individual characteristics, and expectancies about the partner. Although a person's behavioral predisposition predicted the initial level of nonverbal involvement, the course of interaction was also dependent on the partner's actual behavior. Subsequent adjustments over time served to minimize the discrepancy between partners' initial behavior patterns and preserve the stability of the interaction. The particular patterns of behavioral adjustments, that is, compensation or reciprocation, were the product of the degree and valence of the discrepancy between the initial patterns.

Thus, the functional approach recognized the practical utility of nonverbal behavior, not only in the reactive adjustments of the early theories, but also in initiating interactions. Particularly important here was the role of goals, not just affect, in determining behavior patterns. In addition, the functional approach integrated a set of antecedent factors – biology, culture, gender, and personality – as basic determinants directing the course of nonverbal interactions.

3 Integrating behavior and social judgments

Common to the early theories and the functional approach was explaining behavior patterns in terms of specific affective and cognitive mediating processes. Although these covert mediators were enlisted to explain interactive behavior, the primary focus of these theories was clearly on *behavior*, that is, the encoding

or sending of nonverbal communication. As these theories of nonverbal interaction were evolving, research and theory in social cognition were rapidly expanding (Fiske and Taylor 1991; Kunda 1999). This work, characteristic of the “cognitive revolution” in psychology, provided new perspectives on the old issues of person perception and social judgment. Particularly important was the distinction between the traditional emphasis on the controlled processing and the emerging dominance of automatic processing in forming impressions. For example, Bargh (1989, 1990) argued that automatic social judgments were the norm, not the exception, in forming impressions. Gilbert and his colleagues also emphasized the primacy of automatic processing, but they proposed that controlled processes might also be engaged to modify the initial automatic judgments (Gilbert and Krull 1988; Gilbert, Pelham, and Krull 1988). This correction was possible, however, only when perceivers were motivated and had the necessary cognitive resources to make a correction. Furthermore, these inevitable, automatic judgments were not arbitrary, but rather pragmatic and adaptive in nature (Fiske 1992; McArthur and Baron 1983).

Just as the theories of nonverbal interaction were focused on the behavioral, or sending, side of interaction, the social perception theories were focused on the judgment, or receiving, side of interaction. In effect, each approach addressed only part of the coordinated sending and receiving in interactions. A comprehensive approach to nonverbal interaction requires integrating the social behavior and social judgment sides of communication into a single framework. The parallel process model, the next stage in the evolution of theories, frames the encoding and decoding processes of nonverbal communication in a single system, driven by a common set of determinants and mediating processes.

4 Parallel process model

The parallel process model emphasizes the interdependence between the sending and receiving sides of nonverbal communication (Patterson 1995, 2001). There are, of course, a number of factors affecting the course of interactions and the specific processes mediating behavior and social judgments. First, the determinants on the left side of Figure 1, borrowed from the functional model (Patterson 1982, 1983), identify the most important factors shaping habitual patterns in the sending and receiving of nonverbal communication.

4.1 Determinants

The effects of biology, culture, gender, and personality are manifested in individual predispositions for consistencies in behavior and social judgments (see also Patter-

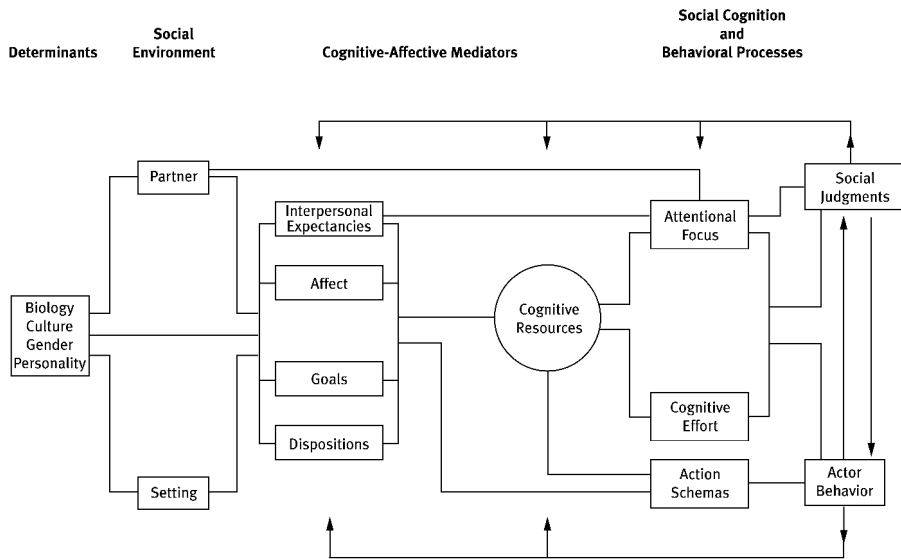


Figure 1: The parallel process model of nonverbal communication.

son 2011a: Chapter 4). The following section provides some examples of how these determinants constrain our habitual patterns of nonverbal communication. First, the effects of biology are the result of natural selection in shaping adaptive, hard-wired patterns of communicating with others (Buck and Powers 2006). For example, males' and females' preferred appearance characteristics in potential mates are generally consistent across culture and seem to facilitate reproduction and survival of offspring (Floyd 2006). In addition, the positive, nurturing response to the baby face appearance of infants is advantageous to their survival (Zebrowitz 1997: Chapter 4). Sensitivity to facial expressions as signals of interpersonal intent may also be the product of natural selection (Fridlund 1994; Fridlund and Russell 2006). That is, the hard-wired expressive behavior and the complementary sensitivity to such expressions facilitate adaptive, goal-oriented interactions.

Next, culture provides an important moderating influence on the communalities shaped by biology. Even though there is considerable universality in expressive reactions, differences across culture are also evident (Elfenbein and Ambady 2002; Matsumoto 2006; Russell 1994). Several basic dimensions of culture play a role in cross-cultural differences in communication (Hofstede 1980, 2001). Particularly important is the individualism-collectivism dimension. People in collectivistic cultures are generally more inhibited in the expression of negative affect in social situations than are those from individualistic cultures (Matsumoto 2006). Cultural differences even affect attention to and recognition of strangers. Specifically, in one of our studies, pedestrians in the United States smiled, nodded, and greeted a passing stranger much more frequently than did pedestrians in Japan (Patterson

et al. 2007). (For further discussion of cultural differences in nonverbal behavior, see Chapter 23, Matsumoto and Hwang, this volume.)

Sex differences in nonverbal communication are the likely product of both biology (the hardwired patterns) and culture (societal norms). For example, compared to men, women are generally more sensitive in reading the nonverbal cues of others and are also more expressive and more easily read by others (see Hall 1984, 2006). In addition, in same-sex interactions, women are more comfortable than men are with closer distances, higher levels of gaze, and occasional touch (Hall 1984, 2006). Finally, individual differences in personality also affect habitual patterns of nonverbal communication. Particularly important are a set of nominally-distinct, but practically-related, traits, including social anxiety, introversion-extraversion, and affiliation that reflect a broader social approach-avoidance dimension. In general, non-anxious, extraverted, and high-affiliation individuals prefer higher levels of nonverbal involvement (closer distances, more gaze, greater expressiveness) with partners than do socially anxious, introverted, and low-affiliation individuals (Patterson 1983: Chapter 8; Patterson and Ritts 1997). (For further discussion of gender differences in nonverbal communication, see Chapter 21, Hall and Gunnery, this volume; for more on personality and nonverbal communication, see Chapter 13, Gifford, this volume.)

4.2 Dynamics of parallel processes

The cumulative effect of the determinants influences not only our choice of settings and partners, but also our expectancies, affect, goals, and predispositions in interactions. Particularly important are goals because they are the cognitive representations of desired states for which people strive (Berger, Knowlton, and Abrahams 1996). Specific goals are, in fact, a reflection of the functional basis of nonverbal communication (Patterson 2011a). The parallel processes are illustrated in the right side of the Figure 1, with the social judgment track on the top and the behavioral track on the bottom operating simultaneously in interactions.

Much of what happens in these two interdependent tracks occurs automatically and outside of awareness. For example, on the social judgment side, simply noticing an out-group person can activate a stereotypic judgment (Bargh 1989; Hebl and Dovidio 2005). More generally, the automaticity and relative accuracy of a wide range of pragmatic judgments have been documented in numerous studies of thin slices of behavior (Ambady and Rosenthal 1992; Ambady, Bernieri, and Richeson 2001; Carney, Colvin, and Hall 2007). In a similar fashion, on the behavioral side, automatic patterns selected over the course of evolution constitute rapid, adaptive reactions in social settings. For example, facial expressions signal a person's intended course of action and facilitate coordination with partners (Fridlund 1994; Fridlund and Russell 2006). Other behavioral patterns, such as making a

good impression, may be learned over time and these scripted routines can be activated with little or no cognitive effort (Bargh and Chartrand 1999; Bargh et al. 2001; Vallacher and Wegner 1987).

Although specific goals guide the operation of both the social judgment and behavioral tracks, individuals need not be consciously aware of the goals they are pursuing. Sometimes goals are triggered automatically and outside of awareness by the social environment (Bargh 1997). Particular goals, however, direct not only an actor's behavior, but also the kinds of judgments made about the partner. For example, an actor implementing a "make a good impression" goal is focused more on metaperspective judgments (e.g., what does she think of me?) than on direct perspective judgments (e.g., what kind of person is she?). The conditional focus on particular kinds of judgments is another example of the interdependence of the social judgment and behavioral sides of nonverbal communication.

Automaticity dominates in both the social judgment and behavioral tracks, but sometimes controlled processes are also adaptive. When controlled processing is necessary, the availability of cognitive resources and some degree of motivation are required to apply cognitive effort in re-evaluating judgments or in modifying behavior (Gilbert and Krull 1988). Because a common pool of cognitive resources is necessarily limited, resources applied in any specific activity are not available for use elsewhere. As a result, when cognitive resources are depleted, the probability of automatic behaviors and judgments increases even more.

The tension between automatic and controlled processes of social behavior was the focus of two conceptually similar theories. First, Metcalfe and Mischel's (1999) "hot/cool system analysis" describes the conflicting processes involved in the delay of gratification. The hot system develops early and is simple, reflexive, and emotional in nature, whereas the "cool" system develops later and is complex, reflective, and cognitive in nature. Strack and Deutsch (2004) proposed a similar contrast between impulsive and reflective processes as determinants of social behavior. The predictions of both of these theories are consistent with the dynamics of the parallel process model. Specifically, when cognitive resources are substantially reduced, the probability of automatic actions increases and the probability of controlled or effortful actions decreases.

Feedback from social judgments and behavior can lead to adjustments in expectancies, affect, dispositions, and even the goals themselves (see Figure 1). The feedback processes are particularly important in the case of failing to achieve specific goals. Unless appropriate automatic adjustments are accessible, the subsequent recycling through the parallel processes may require additional cognitive resources and effort to activate the controlled processes. When repeated adjustments in social judgments and behavior are unsuccessful in meeting goals, the interaction is likely to terminate more quickly. Over time and across interactions, the cumulative effects of previous interactions affect subsequent goals, expectancies, affect, and dispositions. In turn, these residual effects shape emerging patterns of parallel behavioral and social judgment processes.

5 A systems approach

The parallel process model captures more of the complexity of nonverbal interaction than earlier theories did. In particular, the dynamic relationship between the sending and receiving sides of nonverbal communication is emphasized and the balance between automatic and controlled processes in both the sending and receiving tracks is highlighted. The specification of the parallel tracks and their complementary automatic and controlled processes are important elements in building a systems approach to nonverbal interaction. Nevertheless, the parallel process model lacks an explicit dyadic focus within a broader systems framework. Let's take a closer look at the new elements of this systems approach and, later, see how they operate in an integrated framework.

5.1 Dyadic perspective

Recognizing the interactive nature of dyadic exchanges and actually representing it in a model are two different issues. The parallel process model, like many other models, flows from left to right with the determinants or precipitating factors represented on the left side of a figure. Covert processes or mediating mechanisms are located more centrally in the model, whereas the outcomes resulting from the mediating process are located on the right side of the figure. Feedback loops link the outcomes back to a subsequent iteration of changes in the mediators. Thus, there is a unidirectional flow from left to right, supplemented with feedback loops affecting later interactions. Although it is assumed that the representation of one person's side of the interaction is comparable to that of the partner, only one side of the interaction is represented.

So, how do we represent the parallel social judgment and behavioral tracks in a dyadic framework? Underlying this dyadic representation is the recognition that the appearance and behavior of each person provides the sensory input for the partner's receiving side of nonverbal communication. In other words, the appearance and behavior of each person precipitate the perceptual and cognitive processes in the partner that mediate subsequent behavioral adjustments. In effect, one person's parallel sending and receiving tracks fit in a complementary fashion with the partner's sending and receiving and receiving tracks. The core of these dyadic parallel processes is illustrated in Figure 2.

The processes represented in Figure 2 and their relationships to the broader context of the systems model will be discussed at length later. Nevertheless, some elaboration is warranted at this point. Each person brings to an interaction some set of perceptual and cognitive predispositions (e.g., attitudes, expectancies, and biases) along with appearance cues and behavior. The perceptual and cognitive predispositions provide a kind of filter for the incoming information from the part-

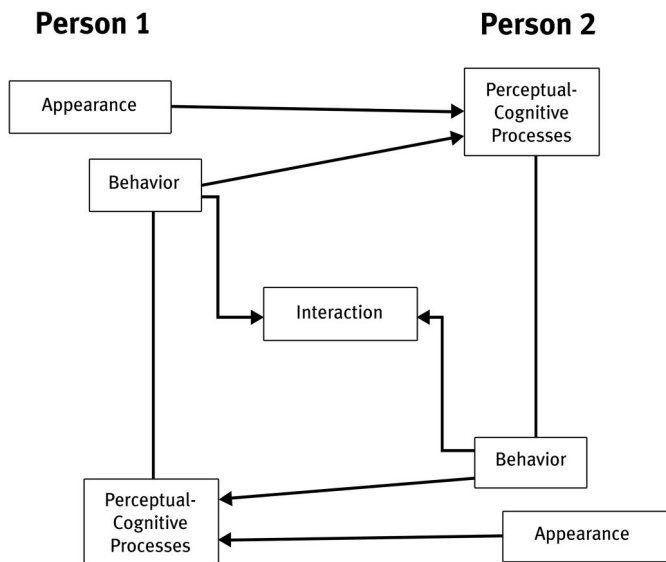


Figure 2: Core dyadic parallel processes.

ner's appearance and behavior. The registering and processing of this information, in turn, affects a person's subsequent changes in behavior. The link between the perceptual-cognitive processes and behavior *within* each person is, however, bidirectional, as indicated by the absence of a directional arrow between them. Thus, one person's perceptual-cognitive processes affect his/her subsequent behavior, but the resulting behavior also affects the perceptual-cognitive processes. It should be emphasized, however, that the interaction itself is behavioral, as reflected in the arrows on each side linking behavior to interaction.

5.2 Settings matter

For several decades, the cognitive focus in psychology has emphasized the dynamics of covert mental processes, while commonly neglecting the impact of the social and physical environment. This represented a distinct change from an earlier appreciation of the critical role of the environment on social behavior and judgment (e.g., Brunswik 1955; Lewin 1939). In making a case for resurrecting a socio-ecological approach to psychology, Oishi and Graham (2010) identified several different dimensions, including economic systems, political systems, religious systems, climates, and geography as critical components in a socio-ecological perspective in psychology. Although all of these dimensions undoubtedly have some distal effect on nonverbal communication, a more limited ecological factor – the

setting of an interaction – has a more proximate effect on the course of nonverbal interactions.

The concept of a *behavior setting* from ecological psychology (Barker 1968; Wicker 1979) is particularly useful in framing the context of interactions. In general, a behavior setting is a bounded geographical area in which human and non-human components interact in a coordinated fashion to facilitate an ordered series of events over a limited period of time (Wicker 1979: Chapter 1). Examples of a behavior setting would include a business meeting, a happy hour at a local bar, a church service, or an office visit with a physician. In each of these cases, there are individual actors, a particular physical environment with associated social norms, and a program of events that unfold in a relatively predictable manner. The same individual might be an actor in each of these settings, but his behavior would be very different across the settings. And if he acted “happy hour” at the church service, he might be invited out of church. Thus, behavior settings provide very considerable constraints on how most individuals behave most of the time.

There are other pressures that increase the homogeneity of behavior within settings. First, individuals select settings and settings select individuals (Wicker 1979). For example, Snyder and Ickes (1985) discussed social behavior from an interactionist perspective, with personality characteristics affecting both the choice of environments and the initiation of different kinds of activities. Of course, other dimensions, including attitudes, personal interests, social class, ethnicity, and experience can affect the choice of settings too. In turn, some settings, such as expensive country clubs, may be quite exclusive, whereas other settings, such as local libraries, may be open to anyone who is interested in using them. Because individuals select settings and settings select individuals, people in a particular setting are likely to have more in common with one another than would people sampled from a range of different settings. In general, this greater similarity across individuals within a setting increases the likelihood that interactions will be more predictable and stable.

In addition to the social norms shared among individuals in a setting, interactions are also constrained by the physical design of a setting. For example, the type of furniture and its arrangement may facilitate more open and engaging interaction or discourage it (Altman 1975).

Years ago when I started a term as chairperson of the psychology department, the office had a very large desk at one end of a long, narrow room, with a single chair opposite my chair. I decided to add a small round table with four chairs at the other end of the room. I invited most visitors to sit at the round table and take an adjacent seat. This was more comfortable and informal than the option of having the visitor sit directly opposite me at the desk. A few colleagues, in their first visits, even volunteered that they liked the new arrangement better than the old one. This arrangement was also convenient if material had to be shared and read than if we had to read it across the large desk. There were, however, a few occa-

sions when I anticipated a difficult interaction and my tactics were very different. Very deliberately, I would motion for the visitor to sit across from me at the large desk. This provided me greater leverage in controlling the interaction by directing the visitor to a subordinate position directly opposite me. In similar ways, the design and arrangement of furniture in behavior settings broadly affect the course of interactions and patterns of nonverbal communication.

5.3 Perception is sufficient

Early theories of nonverbal interaction assumed that some degree of conscious thought mediated behavioral adjustments to a partner's change in behavior. In contrast, the parallel process model posited both controlled and automatic processes in nonverbal interactions (Patterson 1995). Around the same time, evidence for the automaticity of behavior was growing (e.g., Bargh 1997; Bargh, Chen, and Burrows 1996). Chartrand and Bargh (1999) proposed a simple, two-stage process for the automaticity of behavior. The first stage involved the automatic perceptual categorization and interpretation of the environmental stimuli. This might be triggered by some feature of the immediate environment or by the appearance or behavior of another person, but the perception occurs without effort and conscious control. In the second stage, the perceptual activation precipitated behavior, again without conscious control or effort.

An important example of this “perception-behavior expressway” (Dijksterhuis and Bargh 2001) in interactions is behavioral mimicry. Across a wide range of situations and specific behaviors, there is considerable evidence that people subtly mimic the behavior of their partners without conscious awareness (Chartrand and Bargh 1999; Lakin 2006; Lakin, this volume; Lakin et al. 2003). It seems likely that this automatic mimicry was selected over the course of evolution because it was adaptive for our social species (Dijksterhuis and Bargh 2001). That is, behavioral mimicry provided the “social glue” that facilitates affiliation and interdependence (Lakin et al. 2003). For example, we tend to like others more who mimic us and we are more influenced by them. This was demonstrated even in a virtual reality experiment in which avatars were programmed to mimic the subjects' head movements. Subjects who were in the mimicking condition liked the avatar more than those who were in the control condition (Bailenson and Yee 2005). Thus, the simple and immediate perception of a partner's behavior, without any cognitive elaboration, is sufficient to precipitate a behavioral response.

6 A systems approach

In this section, the elements discussed in the last section are integrated into a broader systems framework for nonverbal interaction. The discussion here is an

abbreviated overview, but a more comprehensive and detailed discussion of the systems model is available elsewhere (Patterson 2011a, 2011b). A starting point in this systems model is the focus on the basic determinants influencing the course of nonverbal communication. These factors, including biology, culture, gender, and personality, represented earlier in the functional and parallel process models, affect habitual patterns of behavior and social judgments in interactions. For example, our biological hardwiring has been shaped over the course of evolution to favor specific behaviors and judgments that facilitate survival and reproduction, including mate selection, the nurturing of offspring, and cooperation and competition (Floyd 2006; Fridlund and Russell 2006). In a similar fashion, culture, gender, and personality all contribute to the sending and receiving of stable and functional nonverbal signals. The net effect of these determinants is a set of relatively stable predispositions affecting nonverbal interactions. In particular, the determinants affect the attitudes, feelings, expectancies, and goals that constrain particular patterns on both the behavioral and social judgment tracks of nonverbal communication, along with our choice of settings. The interdependence between goals and settings is particularly important. Let's start there and see how selected elements of this system relate to one another and to the course of nonverbal interaction. The core processes in the systems model are illustrated in Figure 3.

6.1 Goals-settings link

We are not usually in particular settings by pure chance. That is, we routinely select settings, whether consciously or unconsciously, in the pursuit of specific goals. For example, in a given day, Becky might stop for coffee at Starbucks on the way to work and then go to her office for most of the day. Noontime might be punctuated by a quick meal with co-workers at a nearby fast-food restaurant. On the way home, she might stop at the local grocery and, after dinner, go for a walk in her neighborhood. Each of these events happens in a specific setting selected to obtain particular goals. Sometimes the goals directing these choices may be deliberate, but often such goals may be activated and implemented without conscious awareness (Bargh et al. 2001). People select settings, but settings also select people (Wicker 1979). So Becky is not likely to frequent a senior men's golf league or be welcome to walk in an exclusive, gated community some distance from her modest neighborhood. As a result, most of the time, we find ourselves in settings with people who are relatively similar to us (compared to a random sample of the population) pursuing relatively similar goals. The similarity across people and goals increases the likelihood that people will share similar expectancies about others in the setting, reflected in the link between settings and perceptual-cognitive processes in Figure 3.

It is also important to appreciate that individuals can have multiple goals in a particular setting. Berger (1997: Chapter 2) suggests that people are typically con-

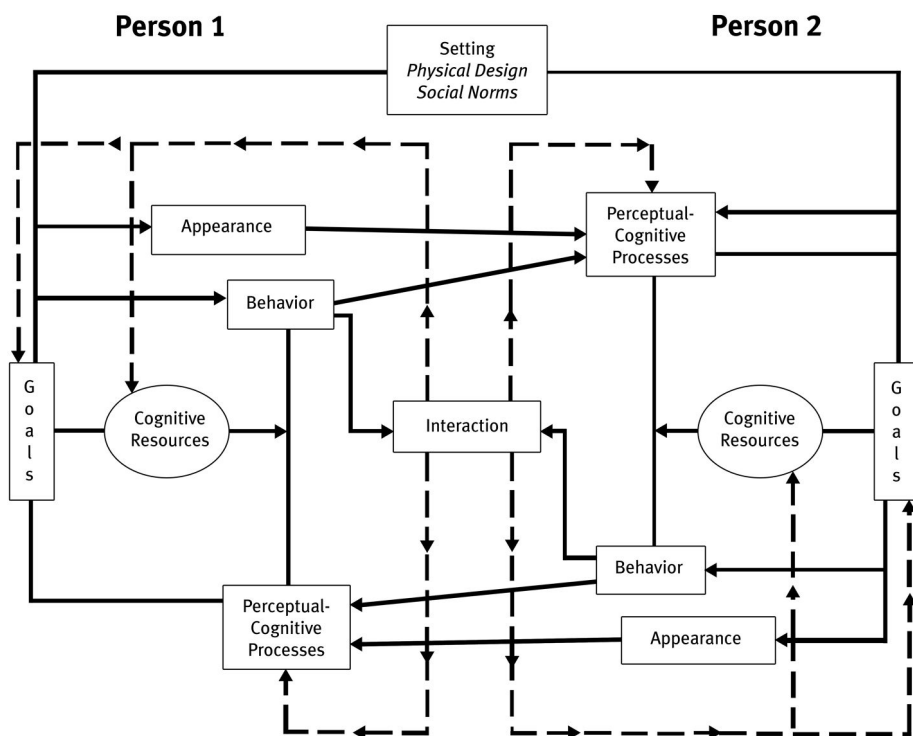


Figure 3: Systems model of dyadic nonverbal interaction.

strained by the meta-goals of *efficiency* and *appropriateness* in communicating with others. The meta-goal of efficiency is consistent with Fiske and Taylor's (1995: Chapters 4–7) characterization of perceivers as “cognitive misers,” trying to minimize effort in making judgments of others. Of course, efficiency is facilitated not only by automatic processes on the receiving side of nonverbal communication, but also on the sending side. Appropriateness is reflected in people generally following social norms and customs in interacting with others, in order to avoid calling undue negative attention to themselves (Berger 1997: Chapter 2). In addition, individuals may also have multiple specific goals, for example, wanting to be liked by a partner, but also trying to influence the partner to a particular course of action.

Within a specific setting, the physical features and design of the setting can facilitate the achievement of particular goals, a circumstance that Wicker (1979: Chapter 1) terms “synomorphy.” Consider the contrast between a traditional classroom with several rows of desks facing the front of the room and instructor and a seminar conducted around a large table. The arrangement of the traditional classroom directs the students’ attention toward the instructor and makes it more difficult for students to interact with one another, whereas the seminar arrangement

increases the opportunity for students to interact with one another and the instructor. Of course, there are other differences between the two settings, including class size, proximity to others, the social norms, and even setting-selection criteria. Furthermore, aspects of the physical and social environment can prime subsequent behaviors and social judgments. There are different explanations for the manner in which primes are activated and have their effects (Bargh 2006; Loersch and Payne 2011), but when setting stimuli prime social judgments and behavior, synomorphy increases. That is, the design and arrangement features of the setting not only physically constrain behavioral options, but they also prime behaviors consistent with the setting agenda. Finally, in those instances where individuals do enter settings without clear explicit or implicit goals, the features of physical and social environments can also prime goals consistent with the setting. Thus, the reciprocal relationship between goals and settings increases shared expectations and more predictable patterns of behavior.

6.2 Perception, cognition, and behavior

The interdependence between goals and settings sets the context for dyadic interaction. Obviously, in face-to-face interactions partners meet on the common ground of a specific setting. Let's take a closer look at the components immediately preceding the interaction phase in the middle of Figure 3. First, the perceptual-cognitive processes that each person brings to the setting include attitudes, expectancies, and even perceptual biases. In the case of perceptual biases, for example, someone who is prejudiced toward a particular out-group may have a lower threshold for perceiving anger in the facial expression of an out-group individual than would someone who is not prejudiced (Hugenberg and Bodenhausen 2003). As a result, individuals are already predisposed to process incoming information in a particular way.

Each person brings specific appearance features and behavior to the interaction setting. Like the perceptual-cognitive processes, appearance is affected directly by the basic determinants first and by the goals and settings next. There are, of course, practical limits to what people can do with manipulating their appearance, depending on their motivation and financial resources. Nevertheless, most people pay some attention to grooming and their choice of clothing as they anticipate moving into different settings with different goals. Habitual patterns of behavior are similarly affected first by the determinants and then later by goals and settings.

An example of how appearance and behavior might be affected by these various influences may be seen in the case of impression management (Patterson 2011a: Chapter 9). Basic appearance characteristics are, at least partially, a product of genes (biology) and culture. Of course, nutrition, exercise, age, and environmental influences also affect physical appearance. The resulting stable physical fea-

tures, however, can be modified in the short term to facilitate a particular goal, such as impression management. So a person interviewing for a middle-management job is likely to be much more careful in grooming and in selecting appropriate attire than in simply going to the grocery store. Behavior management is also likely and, of course, people differ in their skill in self-presentation. For example, high self-monitoring individuals are better at impression management than low are low self-monitors (Snyder 1987).

Although the perceptual-cognitive processes and behavior typically operate on automatic, controlled processing is also possible when there are adequate cognitive resources and some motivation to apply them. This is reflected in the link between cognitive resources and both perceptual-cognitive processes and behavior in Figure 3. When people are distracted, tired, or worried about various problems, cognitive resources are diminished. With the decreased availability of cognitive resources, the probability of automaticity in the sending and receiving tracks of nonverbal communication increases. Although cognitive resources are sometimes required in correcting social judgments or in monitoring and managing behavior, automatic processes are usually adaptive (Bargh and Chartrand 1999). Furthermore, sometimes thinking too much decreases accuracy in judgments (Patterson and Stockbridge 1998; Wilson and Schooler 1991) and disrupts well learned behavioral routines (Vallacher and Wegner 1987).

Thus, the basic elements that each person brings to an interaction are specific perceptual-cognitive processes, physical appearance, and behavior. These components are the proximal effect of goals and setting constraints and the distal effect of the determinants. Although social judgments and behavior primarily operate on automatic as a result of their direct link to perception, controlled processes are also possible. Controlled processing of social judgments and controlled monitoring and management of behavior may be activated when there are adequate cognitive resources and some motivation to apply them.

6.3 Interactions are behavioral

Although the perceptual-cognitive processes are critical components in this model and basic to the give-and-take between people, interactions are behavioral. This is reflected in the links on each side of Figure 3 from “behavior” to “interaction.” No matter what people think or feel, behavior is what each person contributes to an interaction. This does not mean that thoughts and feelings are unimportant, but rather that thoughts and feelings of others are only known through behavior. For example, a friend may tell you that she is happy to see you (verbal behavior); she may smile as she gives you a warm hug (nonverbal behavior); or she may do both. A silent, catatonic friend who might “feel” glad to see you provides no information about how she feels because there is no behavior change. Thus, mutual behavior

patterns, reflecting the sequential coordination of behavior between two people in the interaction stage of the model, represent a higher order of organization than each person's contributing behavior.

An operational definition of the start of an interaction is difficult but, in general, it involves a noticeable behavioral adjustment to the close presence of the other person. Thus, glancing at a person who is 20 m away would probably not constitute an "interaction." On the other hand, one might recognize this person at 20 m, call to him, and get a greeting or wave in return. This would be an interaction, brief though it is. More commonly an interaction might be started with one person smiling, extending an open hand in greeting, and initiating a comment. Sometimes these scripted routines might be initiated simultaneously by both parties.

It is also important to appreciate that interactions do not require verbal exchanges. Goffman (1963: 33–35) proposed a distinction between *focused interactions* that involve some type of conversational exchange and *unfocused interactions* in which people share a common presence, but have no expectation of talking to one another. Unfocused interactions are common in a wide range of social settings, including standing in line at a grocery store, sharing an elevator ride with a stranger, or choosing a seat in a half-filled waiting room. In some cases, such as passing a pedestrian approaching on the sidewalk, an interaction takes only a few seconds. In these situations, people interact by making subtle nonverbal adjustments to the close presence of others (Patterson 2008).

6.3.1 Automatic and controlled sequences

Much of what happens in interactions operates automatically. Particularly important here are the interdependent effects of settings and goals. As a result of self-selection and setting-selection, the predispositions of people in a common setting are more similar to one another than are those across different settings. People in the same setting are also more likely to share similar goals that are facilitated within a particular setting. Next, settings have specific physical design characteristics and social norms that further shape the behavioral options. In addition, the setting characteristics prime specific scripts or behavioral routines. Thus, the combination of these situational factors considerably limits the practical range of behaviors and facilitates the coordination that is common in most interactions.

Automaticity in interactive behavior is possible because the simple perception of a partner's behavior change is sufficient to activate a behavioral response without the application of mediating cognitive resources, that is, the perception-behavior expressway (Dijksterhuis and Bargh 2001). This is the process that facilitates the behavioral mimicry and interactional synchrony common across a wide range of situations and behaviors (Chapter 18, Lakin, this volume). Some sequences may be asymmetrical in which each person follows a distinctive pattern, but one that

is complementary to the partner. For example, sometimes dominant behavior by one person precipitates submissive behavior in a partner (Tiedens and Fragale 2003). This sort of exchange might happen with partners of unequal status, such as physician-patient or supervisor-subordinate interactions.

The perception-behavior link is also reflected in the reaction to a partner's expressive behavior. For example, a partner's smile is not simply a sign of happiness, but a signal of wanting to cooperate. In contrast, an "angry" expression is primarily a threat signal. Thus, the automatic perception of a partner's expressive behavior provides the information necessary to make an adaptive behavioral response. According to Fridlund's (1994) behavioral ecology view of facial expressions, the automatic reading of and reaction to these different intention signals has been selected over the course of evolution, another instance of an adaptive, biologically hardwired pattern.

Other interaction sequences may be at least partly controlled. That is, one or both parties may engage cognitive resources in behavior management and monitoring. In such a case, the link from perception to behavior is mediated by the application of cognitive resources (see Figure 3). Again, this is possible only when there are adequate cognitive resources and motivation to apply them. Cognitive resources may also be applied in meta-perspective judgments of the controlled behavior. For example, was my partner impressed by my behavior or did she see through my actions? Controlled interaction sequences are more likely when the consequences are more important and when individuals judge that they cannot afford to "be themselves." Another circumstance precipitating controlled behavior is the unexpected behavior from a partner that may require additional thought and deliberation in managing subsequent behavior. Of course, interactions may be a mix of automatic and controlled sequences.

6.3.2 Interaction outcomes

The primary factors determining the course of interaction are stability of the interaction sequence and the success of partners' achieving their goals. To the extent that the interactive behavior is stable and the goals of the partners are being met, the interaction will tend to proceed on automatic. Thus, the primary feedback link in such a stable sequence is simply through the continuous perceptual processes necessary to coordinate interactive behavior (see the feedback links in Figure 3 from Interaction back to Perceptual-Cognitive Processes, then on to Behavior, and finally to Interaction again). For example, reciprocating a partner's smile or mimicking a postural change requires only that such changes are first perceived. This kind of behavioral mimicry may be facilitated by the simultaneous activation of mirror neurons with the initiation of behavior by one person and its perception by the partner (Rizzolatti and Craighero 2004). Any subsequent, automatic behavioral adjustments provide new perceptual feedback that continues the interaction cycle.

Of course, this represents only a slice of the continuous sending and receiving processes in interaction.

The automaticity of this cycle is disrupted by instability. Instability is the product of one or both parties behaving in an unexpected or unusual manner, and may be either positive or negative in nature. For example, the unexpected friendliness of the partner, or the opposite, in the form of exaggerated avoidance, registers quickly. Failure to achieve implicit or explicit goals also derails automatic sequences. The recognition of instability or the failure to achieve goals may be evident to one person or to both parties in an interaction. Under either of these circumstances, cognitive resources might be applied to the receiving side in interpreting the new information, to the sending side in managing behavior, or to both sides. Of course, the availability of adequate cognitive resources and some motivation to apply them are also necessary. Because cognitive resources are limited, however, and applying resources either to the sending or receiving side of communication means that fewer resources are available to apply to the other side. Balancing the application of available cognitive resources is even more complicated in conversations where considerable effort may also be applied in encoding or decoding the verbal messages. For example, if cognitive resources are applied to understanding a complex conversation topic, then fewer cognitive resources are available for behavior management and controlled social judgments. Nevertheless, because the automatic behavior and judgment processes are usually adaptive, the decreased availability of cognitive is not necessarily a disadvantage in focused interactions.

Finally, the residual effects of particular interaction sequences are relevant for a re-assessment of goals, as indicated by the feedback arrow from interaction to goals in Figure 3. Quickly achieving interpersonal goals facilitates shorter interactions, but it may also lead to the activation, either consciously or unconsciously, of new goals that sustain the interaction. That is, a new goal primes modifications both in the perceptual-cognitive processes and in behavior, as the interaction continues. The failure to achieve interpersonal goals may lead to the termination of an interaction or, if a person is sufficiently motivated, to perseverance and a likely change in behavioral tactics. In such a case, the continued pursuit of a goal increases the probability of applying available cognitive effort in behavior and social judgments. In general, the combination of the setting agenda and the stability and goal status of interactions determines the time course of interpersonal exchanges. Although it is not specifically represented in Figure 3, the residual effects of a specific interaction can prime subsequent goals, choice of settings, perceptual-cognitive processes, and behavior patterns in subsequent interactions as the system is activated anew.

7 Conclusion

This systems approach to nonverbal interaction is an attempt to integrate a range of factors and processes into a single model that represents both partners in a

dyadic exchange. First, an examination of the evolution of theories of nonverbal interaction provided several features central to the foundation of the systems model. Specifically, among the elements of the earlier theories that merited inclusion in a systems model were the following characteristics: (1) a focus on patterns, not isolated components, of behavior; (2) attention to the simultaneous sending (behavioral) and receiving (social judgment) processes; (3) the dominance of automatic processes, complemented by conditional controlled processes; (4) the effects of biology, culture, gender, and personality in shaping the sending and receiving sides of nonverbal interaction; and (5) the importance of conscious and unconscious goals in nonverbal interactions.

Although these elements from the earlier theories provided a foundation, other features were critical to the systems model. First, the recognition that each person's appearance and behavior provided the input for the partner's receiving side of nonverbal interaction facilitated the representation of a dyadic perspective in the model. Second, the pervasive role of settings was highlighted and the reciprocal relationship between goals and settings was identified in directing the course of nonverbal interactions. Third, the sufficiency of perception alone in precipitating automatic judgments and behaviors was emphasized. Nevertheless, the dominant automatic processes can also be supplemented by controlled judgments and behaviors, provided there are adequate cognitive resources and some motivation to apply the effort.

In contrast to the early theories that specified directional outcomes in the form of compensation or reciprocation in behavior, the systems model focused on the stability of the nonverbal exchange. In general, to the extent that there is greater similarity in partners' perceptual, cognitive, and behavioral predispositions and goals, the probability of stable nonverbal interactions increases. Stable interactions are likely to be characterized by reciprocation (e.g., behavioral mimicry) and automaticity in behavior. In contrast, unstable interactions are likely to be characterized by compensation and some degree of controlled behavior and social judgments, provided there is some motivation to apply available cognitive resources.

In summary, the purpose of this model is to provide a broad, integrative representation for dyadic interactions. Particularly important are the interdependent influences of goals and settings in directing individuals' simultaneous behavioral and social judgment processes. Interaction partners are pragmatic, behaving and making social judgments in the service of conscious and unconscious goals. The dominance of automatic processes in both interactive behavior and social judgments is emphasized, while recognizing that controlled processes are also conditionally possible. This systems model provides a new and more comprehensive approach to conceptualizing nonverbal interaction. Nevertheless, future research will determine its ultimate utility and its place in the evolution of new theories.

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18 Behavioral mimicry and interpersonal synchrony

Abstract: The past two decades have revealed increased attention to the processes involved in interpersonal coordination, specifically behavioral mimicry and interactional synchrony. The fundamental human tendency to mimic or synchronize with others facilitates the development of liking and rapport, increases prosocial and cooperative thinking and behavior, and generally smoothes the social interactions that are the basis for our everyday lives. This chapter reviews both historical and recent research in both literatures, focusing specifically on precursors, variables that increase the likelihood that people will engage in these behaviors, and consequences, the downstream aftermath of these behaviors having occurred. Commonalities and discrepancies between these two phenomena are also discussed. Despite the fact that these types of interpersonal coordination are often happening without conscious awareness or intention, they clearly serve important goals, and are therefore likely to continue to generate substantial research interest in the near future.

Keywords: Interpersonal coordination, behavioral mimicry, imitation, interactional synchrony, rhythmic behavior, affiliation, empathy, prosociality, automaticity, nonverbal behavior

I recently received an email from a college student who was concerned because he noticed that he would often engage in the same behaviors as his peers, even though he didn't consciously realize he was doing so until after the imitation had happened. He wondered whether this behavior was normal, and as a diligent student, began to search the internet for information. Fortunately for him, his diligence paid off and he was able to allay his fears; he discovered that there is actually a very large literature detailing this phenomenon, along with related precursors and consequences. Fortunately for all of us, the literature on behavioral mimicry, and its close cousin interactional synchrony, has given us all insight into the importance of social connections, and just how ready we are, both physiologically and psychologically, to establish bonds with other people.

1 Working definitions

Because the literatures on behavioral mimicry and interactional synchrony have grown exponentially within the past several years, this review will not be able to

cover all of the nuances associated with these topics. Given the rate at which new articles are being published, it is also not entirely clear what aspects of these phenomena are going to be critical to our understanding of each of them individually or the relationship between them. Therefore, I will begin by proposing some working definitions, which are historically based, but then note some variations on these definitions that seem like they either are, or will be, important as our knowledge about these topics continues to grow. These issues will be revisited toward the end of this chapter, along with some unanswered questions and directions for future research.

Historically, both behavioral matching (which I will call behavioral mimicry) and interactional synchrony have been described as different facets of interpersonal coordination (Bernieri and Rosenthal 1991; see also Bernieri et al. 1994). Interpersonal coordination occurs whenever behaviors by two or more interaction partners appear to be nonrandom. In other words, behaviors are patterned such that there is some synchronization between them; they either appear similar or identical in form, or they occur at roughly or exactly the same time. Interpersonal coordination also occurs in situations that involve turn-taking (e.g., maintaining conversational flow, navigating any traffic-filled driving experience), where it is imperative to have a smooth, synchronous flow to behaviors in order for the interaction to be successful. Interpersonal coordination is a fundamental characteristic of a successful social life and almost always serves to facilitate and regulate the numerous social interactions we have on a daily basis (Chartrand and van Baaren 2009; Lakin et al. 2003; Marsh, Richardson, and Schmidt 2009). It is quite clear that we would not be able to function in our complex social environments if we were not able to effectively coordinate our behaviors with those of our interaction partners (Dijksterhuis 2005; Dijksterhuis and Bargh 2001; Knoblich and Sebanz 2006). Interpersonal coordination has been defined as one of the hallmarks of relationships characterized by rapport between interaction partners (Tickle-Degnen 2006; Tickle-Degnen and Rosenthal 1987). Its inarguable importance has been made even more salient recently as researchers have demonstrated that a deficit in this area (as well as deficits in intrapersonal coordination) is one of the main characteristics of autism spectrum and other developmental disorders (Dapretto et al. 2006; Fournier et al. 2010; Helt et al. 2010; Rogers and Williams 2006), and problematic for patients with brain injuries (e.g., McDonald et al. 2011).

One facet of interpersonal coordination is behavioral mimicry, which occurs when the identical behavior is engaged in by two or more people at a particular moment in time. While not always the case, it is typically assessed by looking to see whether people are engaging in the same or very similar behavior at a given point in time or whether a presented behavior is repeated by an interaction partner within a very short window of time (typically not longer than 5–10 seconds). For example, research has explored people's tendencies to mimic behaviors such as yawning (Helt et al. 2010; Provine 1986), body posture (LaFrance 1982; Tia et al.

2011; Tiedens and Fragale 2003), face touching (Chartrand and Bargh 1999; Lakin and Chartrand 2003; Yabar et al. 2006; Stel, van Baaren et al. 2010), foot shaking (Chartrand and Bargh 1999; Lakin, Chartrand, and Arkin 2008), food consumption (Herrmann et al. 2011; Johnston 2002; Tanner et al. 2008), pen playing (Stel, van Baaren et al. 2010; van Baaren et al. 2006), coloring (van Leeuwen, Veling et al. 2009), handshake angle and speed (Bailenson and Yee 2007), co-speech gestures (Holler and Wilkin 2011), and a variety of health-related behaviors (e.g., smoking; Harakeh et al. 2007; taking the stairs rather than an escalator; Webb, Eves and Smith 2011). Other research has explored more minute behaviors (e.g., finger tapping; van Leeuwen, van Baaren et al. 2009), including impossible movements (e.g., a finger movement that appeared to cross a physical barrier; Liepelt and Brass 2010). Recently, some have even argued that stimulus compatibility effects (e.g., faster response times when opening your hand when someone else opens her hand as opposed to when she closes her hand; Brass, Bekkering, and Prinz 2001; Leighton et al. 2010) should be defined as automatic imitation (Heyes 2011).

Interactional synchrony refers to situations in which people have coordinated their movements (which may or may not be identical or similar) to coincide with those of others in either timing or rhythm. Because interactional synchrony involves, by definition, more than one person, it requires some anticipation of what another person's behaviors will be so that movement can be coordinated (and is therefore sometimes called joint action; Knoblich, Butterfill, and Sebanz 2011; Knoblich and Sebanz 2008; Sebanz, Bekkering, and Knoblich 2006; Sebanz and Knoblich 2009). Many scholars have discussed the difficulty associated with this anticipation, and research using a dynamical systems approach has enumerated some of the ways in which successful anticipation can happen (e.g., Marsh et al. 2009; Schmidt and Richardson 2008). Timing is also a critical component of interactional synchrony, and there are two types of coordination that can occur: in-phase and anti-phase (Schmidt, Carello, and Turvey 1990; Schmidt and Richardson 2008). In-phase coordination (i.e., symmetric coordination) happens when behaviors are similar in form and timing (e.g., two people walking together who both put their right foot forward at the same time), whereas anti-phase coordination happens when behaviors are similar in form but opposite in timing (e.g., two people walking together, one who puts her right foot forward at the same time as the other puts her left foot forward). Both in-phase and anti-phase coordination represent stable interactional synchrony.

Like the literature on behavioral mimicry, research on interpersonal synchrony has also explored a vast array of phenomena that could be synchronized. These include gross motor movements, such as leg movements when walking (van Ulzen et al. 2008) or sitting (Schmidt et al. 1990), body posture sway when conversing (Shockley, Santana, and Fowler 2003; Varlet et al. 2010), clapping (Neda et al. 2000), pendulum swinging (Richardson, Marsh, and Schmidt 2005), rocking chair movement (Richardson et al. 2007), waving (Lakens 2010), finger tapping (Oullier

et al. 2008), and various types of music making (e.g., piano playing; Keller, Knoblich, and Repp 2007) and dancing (Kirschner and Tomasello 2010). Others have focused on more minute kinds of behavioral outputs (e.g., eye movements; Richardson and Dale 2005).

To some degree, the distinctions between behavioral mimicry and interactional synchrony are arbitrary (an issue I will return to later): Both typically involve exhibitions of identical or very similar behaviors, and both involve behaviors that occur at exactly the same time or very close in time. And as the reviews below will demonstrate, the consequences of engaging in both behavioral mimicry and interactional synchrony are often similar (although exploring the consequences of interactional synchrony has been a relatively new area of research). However, the subtle distinctions between these two phenomena have been discussed in these literatures (particularly the issue of timing), and it remains to be seen how important these distinctions will be as these literatures continue to develop.

Although I will use these historical definitions in the reviews that follow, it is also useful to note that there are a number of variations on my basic definitions that have been noted and explored, most of which are outside of the scope of the present chapter. For example, mimicry occurs in a variety of different ways. People mimic both the facial expressions (Bavelas et al. 1986; Dimberg, Thunberg, and Elmeheed 2000; Lundqvist and Dimberg 1995) and emotional reactions (Hatfield, Cacioppo, and Rapson 1994; Hatfield, Rapson, and Le 2009; Hawk, Fischer, and Van Kleef 2011; Huntsinger et al. 2009; Neumann and Strack 2000) of interaction partners, even from an exceptionally young age (Meltzoff and Moore 1983; Termine and Izard 1988). People are also likely to mimic various verbal characteristics of their partners: accents (Giles, Coupland, and Coupland 1991), tone of voice (Smith et al. 2012), linguistic style (Ireland and Pennebaker 2010; Niederhoffer and Pennebaker 2002), syntax (Levelt and Kelter 1982), and speech rate (Webb 1969). Of course, all of these phenomena could be considered behavioral at some level, but the review that follows will tend to focus on mimicry between people of more gross motor behaviors (regardless of whether or not those behaviors are valenced) and facial expressions (rather than the emotional information they often represent).

Variations on the definition of interactional synchrony have also been noted. Certainly there is a large literature on the importance of self-synchrony for intrapersonal functioning (e.g., Condon and Ogston 1966; Fournier et al. 2010; Teger 2007). Although I will not review this literature here, it is important to note that development of an intrapersonal rhythm (sometimes called integrated behavior) is probably a prerequisite to developing a shared rhythm with an interaction partner. This literature has also explored synchrony between different aspects of people's social experiences: Synchronized behaviors occur to both one's own and others' verbal output (Anshel and Kipper 1988; Chui 2005; Condon and Sander 1974; Woodall and Burgoon 1981), as well as to various types of visual or auditory stimuli (Hove, Spivey, and Krumhansl 2010; Repp and Penel 2002, 2004). Just as with the litera-

ture on behavioral mimicry, all of these phenomena could be considered behavioral to some degree, but I will focus more on synchrony between two people that involves gross motor movements.

Finally, yet another important issue that is relevant to both the behavioral mimicry and interactional synchrony literatures relates to the consciousness and intentionality of this interpersonal coordination (Lakin 2006). Coordinating our behaviors with those of other people either in form or in timing could certainly happen consciously or deliberately (Gambetta 2005; Jones 1965; Jones and Pittman 1982), but unconscious coordination – that is, coordination without conscious awareness, intention, or effort (Dijksterhuis and Bargh 2001; Chartrand, Maddux, and Lakin 2005) – is also a ubiquitous phenomenon. I will revisit the issue of consciousness and intentionality at the end of this chapter.

2 Review of behavioral mimicry literature

There are a number of extremely thorough and relatively recent reviews of the behavioral mimicry literature (Chartrand and van Baaren 2009; Chartrand and Dalton 2009; van Baaren et al. 2009; Chartrand and Lakin 2013). I will briefly review some selected historical work in this area to provide context for the newest findings, but interested readers should consult these reviews for detailed information.

Early work on behavioral mimicry primarily focused on interactions between people who were known to each other. Children and parents (Bernieri, Reznick, and Rosenthal 1988), clients and therapists (Charney 1966; Maurer and Tindall 1983; Schefflen 1964), and students and teachers (Bernieri 1988; LaFrance 1979; LaFrance and Broadbent 1976) were all found to exhibit significant levels of behavior matching, with increases often happening over the course of an interaction (e.g., Charney 1966).

Some current research has explored behavioral mimicry among known interactants as well (e.g., Jones 2007), but most recent experimental work has explored behavioral mimicry between complete strangers. In a typical situation, participants interact with a confederate who engages in a particular nonverbal behavior. The participant is recorded or observed surreptitiously to determine the extent to which he or she adopts the confederate's nonverbal behavior. How much mimicry occurs is sometimes compared to a baseline situation to control for participants' initial tendencies to engage in the behavior in question. In this paradigm, mimicry serves as a dependent measure. Mimicry can also serve as an independent variable by instructing a confederate to mimic the nonverbal behaviors of the participant for a specified amount of time, or by instructing participants to mimic the behaviors of another person.

Using the mimicry-as-dependent-variable paradigm, Chartrand and Bargh (1999) demonstrated that participants engaged in more foot shaking when they

were with a foot-shaking confederate than a face-touching confederate, and more face touching when they were with a face-touching confederate than a foot-shaking confederate. This behavioral mimicry occurred despite the fact that (1) the participant and confederates were unknown to each other, (2) confederates did not engage in any particular welcoming or affiliate behaviors, and (3) participants had no knowledge of the confederates' behaviors or the fact that their behaviors had changed as a result of interacting with the confederates. Chartrand and Bargh termed this phenomenon the *chameleon effect*; just as chameleons change their color to blend in with their environment, humans change their behaviors to blend in with their social environments (see also Chartrand et al. 2005 and Lakin et al. 2003). This work set the stage for subsequent research to explore both the precursors to, and consequences of, our chameleon-like tendencies.

2.1 Precursors

Although people often engage in automatic behavioral mimicry (as the student noted at the beginning of this chapter discovered), there are circumstances and variables that make people even more likely to become social chameleons.

2.1.1 Liking and rapport

First and foremost, given the connections between behavioral mimicry and rapport (Tickle-Degnen 2006), it is not surprising that pre-existing rapport and the desire to create rapport both increase behavioral mimicry. In a direct comparison, participants were more likely to mimic the facial expressions of likeable confederates compared to unlikeable confederates and friends compared to strangers (McIntosh 2006; see also Likowski et al. 2008). Stel, van Baaren et al. (2010) manipulated participants' *a priori* liking for a confederate by presenting him as honest and open or dishonest and not open. They replicated McIntosh's earlier findings: Participants were more likely to mimic the likeable confederate's face-touching and pen-playing behaviors than the behaviors of the dislikeable confederate. Interestingly, disliking did not decrease mimicry below that which was observed in a control (no information) condition, although some work has demonstrated that less behavioral mimicry (compared to relevant control conditions) occurs when people do not like their interaction partner because he or she is stigmatized (Johnston 2002) or a member of an outgroup (Yabar et al. 2006).

A goal to affiliate or create rapport has a similar effect on behavioral mimicry. Lakin and Chartrand (2003) primed participants with a conscious or an unconscious affiliation goal and then recorded their behavior while they watched a videotaped confederate who subtly and consistently touched her face. In the conscious affiliation goal condition, participants were told that they were going to interact

with this person and complete a task for which it would be beneficial to get along with her. In the unconscious affiliation goal condition, participants were subliminally primed with affiliative words (e.g., *affiliate*, *friend*, *together*). Regardless of the priming method, both groups of participants engaged in more face-touching behaviors than did participants in a control (no goal) condition. There was no difference in behavioral mimicry between the participants who had the conscious goal and those who had the unconscious goal.

Recently, Leighton et al. (2010) generalized this finding to a stimulus compatibility measure of behavioral mimicry. Participants were primed with prosocial words (similar to those used by Lakin and Chartrand 2003) or antisocial words (e.g., *rebel*, *alone*, *single*) and then asked to complete a stimulus compatibility task. They performed a specified hand-opening or hand-closing movement while watching a hand on a computer screen open or close, and reaction times to initiating movement were recorded. The authors argued that automatic behavioral mimicry occurs to the extent that participants are faster to make their own movement when watching a congruent movement than an incongruent movement (Heyes 2011). In this case, the automatic imitation effect was greater when participants had been primed with prosocial, affiliative words than when primed with antisocial words (but see Cook and Bird 2011, for an exception).

Additional work using more typical measures of behavioral mimicry also confirmed the link between the desire to affiliate and increases in behavioral mimicry. A second study by Lakin and Chartrand (2003) demonstrated that an unfulfilled affiliation goal (i.e., a primed affiliation goal that could not be pursued in a first interaction because of the unfriendliness of the confederate) was particularly likely to lead to increases in behavioral foot-shaking mimicry with a novel interaction partner. Cheng and Chartrand (2003) explored whether high self-monitors, who change their behaviors as a result of affiliative cues in their social context, would mimic the foot-shaking and face-touching behaviors of a peer more than a non-peer (and more than low self-monitors in either situation; see also Estow, Jamieson, and Yates 2007), and Yabar et al. (2006) and Bourgeois and Hess (2008) investigated whether outgroup members' face-touching behaviors and facial expressions would be mimicked less than those of ingroup members. Incidental similarities (e.g., having the same first name; Guéguen and Martin 2009) and shared opinions (Van Swol and Drury 2011a) have also been hypothesized to increase behavioral mimicry, as well as interacting with a partner who expresses stereotype-consistent information (presumably because stereotype use affirms shared bonds and creates an affiliative context; Castelli et al. 2009). Finally, Lakin et al. (2008; see also Lakin and Chartrand 2005, in press; and Over and Carpenter 2009) utilized a social exclusion experience as a motivation to affiliate, and hypothesized that people who had recently experienced exclusion, especially if that exclusion occurred by a group to which the participant should belong (i.e., an ingroup), would be particularly motivated to affiliate, via foot-shaking mimicry, with a subsequent interaction

partner. In all of these paradigms, the results confirmed the hypotheses, providing further support for the idea that a desire to affiliate, even if more sensitized in some groups of people because of personality variables or recent experiences, leads to increases in behavioral mimicry.

2.1.2 Prosociality

A number of variables that affect mimicry could be loosely grouped into the category of prosociality, or increased interest in understanding and relating to other people. For example, individuals who are dispositionally empathic, particularly those who are high in perspective taking, were more likely to mimic a partner's face-touching and foot-shaking behaviors than those who were low in perspective taking (Chartrand and Bargh 1999). Subsequent research extended this work to mimicry of facial muscles; high empathy participants were more likely to mimic the facial expressions of both angry and happy faces, even at short exposure times (Sonnby-Borgstrom 2002; see also Sonnby-Borgstrom, Jonsson, and Svensson 2003).

People who have an interdependent self-construal, relative to those who have a more independent self-construal, also focus on the self as it relates to other people (e.g., as a sibling, a friend, a colleague, etc.; Markus and Kitayama 1991). Van Baaren, Maddux et al. (2003) therefore predicted that those who have an independent self-construal activated, either temporarily via priming or permanently via cultural transmission, would be less likely to mimic the behaviors of an interaction partner. Their results supported this hypothesis; participants primed with an independent self were less likely to mimic the pen-playing behaviors of a confederate than participants primed with an interdependent self, and American participants were less likely to mimic the face-touching behaviors of a confederate than Japanese participants (regardless of the ethnicity of the confederate). A field-dependent cognitive style, whereby one integrates objects and their context, has similar effects; both individual differences in and an inducement of field dependence resulted in more behavioral mimicry of face touching, lip moving, and foot shaking by participants than those who were either dispositionally or situationally field independent (van Baaren, Horgan et al. 2004).

Situations in which people's optimal distinctiveness has been threatened also increase behavioral mimicry. Because people must necessarily balance their desire to belong and be accepted by others with their desire to be distinct and unique (at least in independent cultures; Brewer 1991), feeling too distinct should motivate people to find ways to bond with others to restore their optimal balance. Mimicking others can serve this function: When participants were told that they had a very unusual personality type at their university, they subsequently mimicked the behaviors of a fellow student more than participants who were told that they had a personality type that was more common amongst their peers (Uldall, Hall, and Chartrand 2008).

Interestingly, how much behavioral mimicry occurs also appears to be dependent on the number of actors who are both observing and producing the behavior. Tsai, Sebanz, and Knoblich (2011) hypothesized that groups would mimic the behaviors of other groups more than the behaviors of individuals. They utilized a stimulus compatibility measure similar to that of Leighton et al. (2010), but they also introduced a numerical compatibility manipulation. Participants completed the task with a confederate; a numerical compatible trial occurred when participants saw two actors engage in a finger-moving behavior and both the participant and the confederate had to engage in that behavior, whereas a numerical incompatible trial occurred when participants saw two actors engage in a behavior and only the participant had to engage in that behavior. As hypothesized, the results indicated that groups were faster to respond with the appropriate behavior (the automatic mimicry effect outlined by Heyes 2011) when it was performed by a group, and individuals were faster to respond when the appropriate behavior was performed by a single individual. In other words, groups mimic groups more than individuals, and individuals mimic individuals more than groups.

2.1.3 Mood and emotion

Mood and emotion are other variables that have been related to behavioral mimicry effects. After discovering a positive correlation between mood and mimicry, van Baaren et al. (2006) experimentally tested this idea by inducing participants to experience either a positive or negative mood by watching a media clip. Participants then watched two experimenters for a second task, one who played with a pen and one who did not. Results revealed that participants in a positive mood mimicked the experimenter's pen-playing behaviors more than participants who were in a negative mood. Likowski, Weyers et al. (2011) recently replicated this finding with facial expressions; happy participants mimicked happy, sad, neutral, and angry facial expressions, whereas sad participants showed less facial mimicry to all types of facial expressions.

In both van Baaren et al. (2006) and Likowski, Weyers et al. (2011), participants were induced to feel either happy or sad. Social anxiety is more chronic negative affect, but is similarly related to behavioral mimicry. Women high in social anxiety were less likely to mimic the head movements of a computer avatar who delivered a speech than women low in social anxiety (Vrijnsen, Lange, Becker et al. 2010).

One exception to the link between positive affect and increases in mimicry occurs when a person experiences guilt. Martin, Guéguen, and Fischer-Lokou (2010) had a confederate who was carrying a stack of papers and other items bump into participants. Guilt was caused (or not caused) by varying how the confederate responded; in the guilt conditions, the confederate blamed the participant for the collision, whereas in the no guilt conditions, the confederate accepted responsibility and blamed herself. Participants were then surreptitiously recorded while

watching a videotape of a young woman who touched and rubbed her face. Guilty participants mimicked these behaviors more than non-guilty participants, and this effect was mediated by the degree of guilt felt within the guilty condition. Because the guilt experienced in this situation could not be addressed directly (i.e., the confederate left the situation after delivering her prepared comment), it was presumed that participants mimicked in the next interaction as a way to affiliate and make amends for their earlier problematic behavior.

2.1.4 Executive functioning

Recent research has further supported the idea that imitating the behaviors of others is a default tendency, which occurs regardless of the extent to which people are cognitively busy with other kinds of tasks. Van Leeuwen, van Baaren et al. (2009) asked participants to engage in a finger movement when presented with a finger movement or a spatial cue (i.e., “X”) on a computer screen. Half the participants completed this task under conditions of working memory load, whereas the other half did not. The results indicated that participants were faster to respond to the finger movement than the spatial cue when they were experiencing working memory load. In other words, behavioral imitation was facilitated by load on working memory, suggesting that working memory is needed if one wishes to control this automatic tendency.

2.1.5 Relationship status

Relationship status is yet another variable that can affect amount of mimicry. Because mimicry is related to rapport and affiliation, it is not surprising that people are more likely to mimic the coloring behaviors of attractive people (both males and females, van Leeuwen, Veling et al. 2009) and that behavioral mimicry can be used as one strategy to indicate interest to potential mates (Guéguen 2009; van Straaten et al. 2008). What is more interesting is that people’s relationship status seems to moderate these effects. Karremans and Verwijmeren (2008) had both male and female participants who were either in a relationship or not interact with an attractive opposite-sex confederate. During the interaction, which lasted about four minutes, the confederate rubbed his or her face regularly; the interaction was videotaped and later coded to determine the extent to which participants mimicked the face-rubbing behavior. Participants who were currently in a relationship mimicked the attractive confederates’ behaviors less than participants who were available, and relationship closeness negatively correlated with amount of mimicry. Participants apparently “shielded” their current relationships by avoiding mimicry of an attractive alternative partner.

2.2 Consequences

The number of precursors to behavioral mimicry effects is dwarfed only by the number of consequences of this ubiquitous tendency.

2.2.1 Liking and empathy

Most of the factors that increase behavioral mimicry (reviewed in the previous section) can be related to affiliation and rapport in some way. Therefore, the most obvious consequence of mimicking the behaviors of others is the creation of similarity, which leads to the development of liking, rapport, and empathy (Byrne 1971). Early work on behavioral mimicry, which was primarily correlational, revealed that there was a strong positive association between posture sharing and self-reported feelings of rapport. For example, increases in postural mimicry over the course of a therapy session correlated with increases in rapport between the client and the therapist (Charney 1966; see also Schefflen 1964), and classrooms in which teachers and students exhibited shared behaviors (e.g., postures or arm positions) were also characterized by greater rapport (Bernieri 1988; LaFrance and Broadbent 1976). Bavelas and her colleagues argued that mimicking the behaviors of others serves a communicative function; because mimicry of an expression of pain was more likely when people could make eye contact with the person who exhibited the expression, they argued that mimicry communicated shared feelings and understanding with the interaction partner, a defining feature of empathy (Bavelas et al. 1986; see Holler and Wilkin 2011; Ramanathan and McGill 2008; and Wang, Newport, and Hamilton 2010; for more recent replications of the effect of eye contact on mimicry).

Chartrand and Bargh (1999) explored the link between mimicry and liking experimentally by instructing a confederate to either mimic or not mimic participants' behaviors; participants who were mimicked reported more liking for the confederate, and reported that the interaction was smoother and more harmonious. Confederates in behavioral mimicry studies often report more liking for participants who mimic them as well (e.g., Lakin and Chartrand 2003). Given how imperative it would have been (and is) for humans to bond with interaction partners (Lakin and Chartrand in press; Lakin et al. 2003), the link between mimicry and liking would have been an important tool for people to use when feeling excluded (Lakin et al. 2008). In further support of this idea, Kouzakova, van Baaren et al. (2010) recently demonstrated that when people are not mimicked during an interpersonal encounter, cortisol levels increase as a physiological stress reaction to the implied rejection. They have also shown that a lack of mimicry by a complete stranger increases evaluations of close relationship partners, presumably because not being mimicked simulates a mild social exclusion experience (Kouzakova, Karremans et al. 2010).

Postural similarity and behavioral mimicry are also related to feelings of empathy. Maurer and Tindall (1983) found that mimicked adolescents thought that their school counselor was more empathic than those who were not mimicked, and Stel, Vonk et al. (2011) found that mimicry results in both affective and cognitive empathic reactions. However, the extent to which mimicry leads to empathy depends on how “real” the mimicked emotions are thought to be. Stel and Vonk (2009) instructed participants to mimic the angry and sad facial expressions of a character on a popular television show; participants who mimicked reported that they experienced the same emotions as the character, but only participants who assumed that the emotions were real reported being able to take the perspective of that person.

These effects of mimicry on liking were recently replicated in an applied context (Sanchez-Burks, Bartel, and Blount 2009). Experienced Latino and Anglo managers and professionals were interviewed by a confederate who either did or did not mimic their behaviors, and measures of both anxiety and interview performance were collected. Based on the objective measures of performance that Sanchez-Burks et al. analyzed (which included variables such as body language and interpersonal skills), interview performance was better and anxiety decreased when participants were mimicked, although this effect existed primarily for Latino participants (who were hypothesized to be more culturally sensitive to interpersonal cues).

Interestingly, the creation of liking and empathy that results from being mimicked is not unique to being mimicked; the mimicker also experiences affective benefits from mimicking the behaviors of an interaction partner. Compared to people who were told not to mimic their interaction partner’s behaviors, participants told to mimic those behaviors became more affectively tuned and reported feeling more close to the mimickee, and reported the interaction as more smooth (Stel and Vonk, 2010).

There are several caveats to the finding that mimicry creates liking that have been noted. Stel, Blascovich et al. (2010) instructed people to intentionally mimic the behaviors of a disliked interaction partner and found that, in this case, mimicry did not lead to an increase in liking. Mimicry also did not lead to liking when people were instructed to mimic a non-affiliative facial expression (i.e., anger; van der Velde, Stapel, and Gordijn 2010) or when people mimic the facial expressions of outgroup members (van der Schalk et al. 2011), and mimicry appears to be less related to liking when people have a proself mindset as opposed to a prosocial mindset (Stel, Rispens et al. 2011), are dispositionally high in social anxiety (Vrijssen, Lange, Dotsch et al. 2010), or have recently been reminded of money (Liu, Vohs, and Smeesters 2011). A theoretically related finding was observed when people were mimicked by an outgroup member; mimicry by an outgroup member resulted in less liking than lack of mimicry by an outgroup member and mimicry by an ingroup member (Likowski, Schubert et al. 2011).

To reap the positive consequences of mimicry, it is also important to make sure that one mimics the “right” people. Recent work found that mimicking someone unfriendly might actually backfire in terms of other people’s views about the mimicker’s social competence; when people observed someone who mimicked an unfriendly partner’s behaviors, they rated the mimicker as less socially competent than both those who mimicked a friendly partner and those who did not mimic at all (Winkielman et al. 2011).

2.2.2 Prosociality

Just as a prosocial mindset makes people more likely to mimic, mimicry also causes people to become more prosocial.

2.2.2.1 Helping behavior

Mimicry often leads people to display a range of helpful behaviors, directed towards both the person who did the mimicking and others more generally. For example, people whose orders were verbally mimicked by a waitperson ultimately tipped that person more than people whose orders were not repeated (van Baaren, Holland et al. 2003). When participants’ nonverbal behaviors were mimicked, they were more likely to pick up something dropped by the experimenter (who did the mimicking) or by a fellow participant (who was unrelated to the mimicking) (van Baaren, Holland et al. 2004), to donate money to a worthy philanthropic cause (Stel, van Baaren and Vonk 2008; van Baaren, Holland et al. 2004) or to help a stranded person (Fischer-Lokou, Martin, and Guéguen 2011), and to volunteer to complete a long and arduous survey (Ashton-James et al. 2007) or a lengthy essay critique (Guéguen, Martin, and Meineri 2011). These types of effects, which have been generalized to mimickers as well (Stel et al. 2008), appear to be mediated by feelings of empathic concern (Stel et al. 2008).

2.2.2.2 Interdependence and feelings of closeness

Interdependence causes increases in behavioral mimicry (van Baaren, Maddux et al. 2003), but behavioral mimicry also leads people to have more interdependent self-construals. Mimicked participants generated more interdependent descriptors when completing the Twenty Statements Test, reported more feelings of closeness to others in general, and chose to sit closer to a (hypothetical) other participant whose belongings were left on a chair (Ashton-James et al. 2007). Mimickers also report greater interdependence (Redeker, Stel and Mastop 2011). These feelings of closeness to others have real-world consequences as well: Mimicked participants reported more support for left-wing principles and parties, an effect that was mediated by prosocial feelings toward others (Stel and Harinck 2011).

Another way to operationalize feelings of closeness relates to how trusting people are of their interaction partners. Being mimicked leads to increases in a variety of types of trusting behavior. Mimicked participants are more willing than non-mimicked participants to share personal information with strangers, even potentially embarrassing intimate information (Guéguen et al. in press). Mimicry also facilitates successful negotiations; Maddux, Mullen, and Galinsky (2008) instructed negotiators to mimic the behaviors of their partners or not, and then assessed the impact of this manipulation on negotiation outcomes. Mimickers had higher individual and dyadic gains in their interactions and an increased propensity to come to an agreement when making a difficult decision with others; interpersonal trust mediated this relationship (see also Swaab, Maddux, and Sinaceur 2011).

2.2.3 Understanding emotions

Because of the link between empathy and mimicry, mimicking the behaviors of others also facilitates emotion recognition. When participants were unable to mimic the facial expressions depicted in photographs because of instructions to avoid all facial movements, they were slower to identify the presented emotions than participants in a control condition who were instructed to keep their shoulders from moving (and were therefore able to mimic as they naturally would; Stel and van Knippenberg 2008; see also Oberman, Winkielman, and Ramachandran 2007). Similarly, affective judgments appear to only be affected by subliminally presented affective cues to the extent that those cues can be mimicked (Feroni and Semin 2011). A surprising unintended consequence of the link between mimicry and emotion detection has also been discovered: Compared to non-mimickers, mimickers were less able to determine when an interaction partner was telling the truth, presumably because their mimicry interfered with their objectivity and made it difficult to assess their partner's true emotions (Stel, van Dijk, and Olivier 2009; see also Maringer et al. 2011).

2.2.4 Reducing prejudice

The link between behavioral mimicry and empathy and liking also leads to another interesting consequence: prejudice reduction. Inzlicht, Gutsell, and Legault (2012) asked participants to watch a video in which an ingroup or outgroup member reached for a glass and drank some water multiple times. Participants were asked to mimic the behaviors of the confederate or not before completing measures of both implicit and explicit prejudice. The results indicated that mimicking an outgroup member's behaviors significantly reduced both implicit and explicit prejudice compared to mimicry of the ingroup member. In other words, although people are less likely to spontaneously mimic the behaviors of outgroup members (Heider and Skowronski 2011), when it does happen, this mimicry reduces bias.

2.2.5 Cognitive processing and executive functioning

Evidence that behavioral mimicry can make people think and act prosocially has already been reviewed. But being mimicked has the power to change the way that people think in a variety of other ways as well. Being field dependent makes mimicry more likely, but the reverse is also true: When participants were mimicked, compared to when they were not mimicked, they became more field dependent, as evidenced by their ability to better recall the positions of objects in a complex memory task (van Baaren, Horgan et al. 2004). The link between mimicry and processing style has been conceptually replicated with a more general assimilative mindset; mimicked participants saw more similarities between two loosely related pictures (van Baaren et al. 2009). Both mimicry and lack of mimicry also serve as cues for creative thinking, albeit different types. Being mimicked increases convergent thinking, presumably because the mimicry signals a need for interpersonal cooperation and causes more field dependence and assimilative thinking, whereas not being mimicked increases divergent thinking, presumably because the lack of mimicry signals a need for individual innovation and independence (Ashton-James and Chartrand 2009). Finally, mimicry affects self-focus, as evidenced by increases in both private and public self-consciousness after being mimicked (Guéguen 2011).

Although behavioral mimicry happens automatically, this review clearly demonstrates that it is also sensitive to situational contexts and demands. Thus, there are a number of ways in which mimicry, or lack of mimicry, affects executive functioning. For example, Leander, Chartrand, and Wood (2011) hypothesized that because mimicry leads to an affiliative mindset, individuals who are mimicked might be more likely to conform to stereotypic expectancies. In four studies, they demonstrated that this was the case; women and African-American men both exhibited lower math performance in conditions where they were mimicked than did groups to whom the stereotype was not relevant. This effect was more likely when participants believed that others held stereotypic expectancies and when mimicry happened in an affiliative context.

Another example occurs when exploring the effects of mimicry on self-regulation. As reviewed earlier, mimicry smoothes social interaction and makes it easier and more harmonious (Chartrand and Bargh 1999). The ease associated with an interaction where mimicry occurs translates into having more regulatory resources available for subsequent tasks. Participants who were mimicked (and therefore had an easy, low-maintenance interaction) had improved task performance when completing a later task that required attention and persistence (Finkel et al. 2006) and consumed fewer cookies (Dalton, Chartrand, and Finkel 2010) compared to participants who were not mimicked.

Dalton et al. (2010) subsequently argued that these effects occurred because behavioral mimicry is a schema-driven process; just as people organize relevant information about how to interact with others into schemas, people might also incorporate learned information and rules governing behavioral mimicry into a

schema that can then be deployed unconsciously when situations warrant its use. In support of this theory, Dalton et al. demonstrated that it is not just high-maintenance interactions characterized by lack of mimicry that affect subsequent performance, it is actually any type of interaction that is schema inconsistent. For example, behavioral mimicry is anti-normative in cross-race interactions (Heider and Skowronski 2011), so mimicry in this circumstance is schema inconsistent, and thus taxing to self-regulatory resources. On the other hand, mimicry is schema consistent in same-race interactions and therefore less taxing. A similar argument could be made in situations in which people do not mimic high-status partners and mimic partners who have low status. In both cases, the behavioral coordination (or lack thereof) is anti-normative. The data of Dalton et al. (2010) support the idea that any type of schema-inconsistent interaction involving mimicry affects subsequent self-regulatory ability.

2.2.6 Persuasion and consumer behavior

The prosocial feelings that mimicry engenders can also lead to increases in persuasion and changes in consumer behavior. Van Swol (2003) had a confederate mimic the behaviors of a participant while trying to change his or her opinion on a predetermined topic. Participants later reported that the imitating confederate was more knowledgeable and persuasive, even though they did not ultimately change their opinion about the topic (see also Van Swol and Drury 2011b). However, Bailenson and Yee (2005) were able to detect effects of mimicry on actual persuasion; when a computer avatar mimicked participants' head movements, participants liked the mimicking agent more and were more persuaded by its arguments.

If persuasion is affected by mimicry, consumer behavior should follow. And it does. Tanner et al. (2008) had facilitators mimic the behaviors of participants while introducing them to a new sports drink product; those who were mimicked reported more enjoyment of the product and a greater likelihood to purchase it than those who were not mimicked. In a follow-up study, this effect was demonstrated to be even stronger when the facilitator was openly invested in the product, presumably because the mimicry by the facilitator put participants in a prosocial mindset whereby they wanted to help the facilitator who needed it most. Jacob et al. (2011) recently replicated this effect in an applied context (see also Herrmann et al. 2011). When salespeople mimicked the verbal and nonverbal behaviors of their patrons, the customers were more likely to purchase a product (specifically the product that was recommended by the salesclerk) and both the clerk and the store were evaluated more positively. Interestingly, these effects are also not unique to being mimicked: When people were told to mimic the behaviors of a model presenting a product in a television commercial, they subsequently evaluated the product more favorably and reported greater behavioral intentions to purchase the product than participants who did not engage in this mimicry behavior (Stel, Mastop, and Strick 2011).

3 Review of interactional synchrony literature

As the preceding review of the behavioral mimicry literature suggests, there is a large and increasingly detailed body of work illustrating the various precursors and consequences of mimicking and being mimicked by others. It has been only recently that there has been a resurgence of interest in the topic of interactional synchrony, and thus, there is less literature to review concerning its precursors and consequences.

3.1 Precursors

3.1.1 Visual contact

Given the importance of timing and anticipation of other's movements to interactional synchrony, it is not surprising that visual information is a critical precursor to the development of synchronous behaviors. Schmidt and O'Brien (1997) asked participants to swing a pendulum hanging from their wrist while either looking forward or looking at the other person's pendulum. Synchronous swinging was more common when participants were looking at their partner's pendulum, even though this coordination occurred unintentionally (see also Schmidt et al. 2007). Richardson et al. (2005) subsequently replicated this finding; even in a more realistic situation (i.e., solving a puzzle task), participants who saw each other's pendulum swinging were more likely to exhibit unintentional interpersonal entrainment. Interestingly, whether participants could talk to one another or not did not affect observed synchrony (see also Shockley et al. 2003).

Synchronous pendulum swinging is not the only behavior dependent on eye contact. The importance of visual information has been generalized to rocking in rocking chairs (Richardson et al. 2007), tapping movements (Oullier et al. 2008), and body posture sway (Varlet et al. 2010). When Richardson et al. (2007) asked participants to rock in a rocking chair at their preferred tempos, the individuals became synchronous only when looking at each other. The same is true for body posture; head, hip, and ankle movements were more in sync when participants were visually coupled than when they were not (Varlet et al. 2010). Visual information was also necessary for participants to synchronize their finger-tapping movements; when both participants had their eyes open and were looking at their partner's finger, spontaneous in-phase synchronized tapping occurred. This effect persisted even after participants closed their eyes again, suggesting that memory also plays an important role in the synchronization process (Oullier et al. 2008).

3.1.2 Rapport

As demonstrated in the behavioral mimicry literature, pre-existing rapport also increases interactional synchrony. Early work on interactional synchrony focused

on relationships between known interactants, where rapport would be expected to exist. For example, Bernieri et al. (1988) found that synchrony was rated much higher when mothers were interacting with their own infants than when mothers were shown to be interacting with an unfamiliar infant. Many researchers followed the lead of Bernieri and his colleagues and explored the existence of synchrony in child-parent interactions (e.g., de Mendonça et al. 2011; Feldman 2007a). This research has been an important contributor to understanding the role that interactional synchrony plays in the development of self-regulatory ability and the capacity for empathy (see Feldman 2007b; Harrist and Waugh 2002; or Reyna and Pickler 2009, for reviews of this research, and below for further discussion of the consequences of interactional synchrony).

Bernieri (1988) also explored synchrony within teacher-student relationships and found that synchrony was greater in “true” interactions (where teachers were interacting with their students in real time) than in pseudo-interactions (where teachers and students appeared to be interacting, but clips were compiled from different time points during the interaction). Similar findings have been demonstrated in therapist-client interactions; true interactions are more synchronous than pseudo-interactions (Ramseyer and Tschacher 2011). These findings support the idea that nonverbal behavior synchrony is a critical component to the therapeutic process (Hall, Harrigan, and Rosenthal 1995; Koss and Rosenthal 1997; Ramseyer and Tschacher 2006).

Positive relationships of other sorts are also characterized by more interpersonal synchrony. Julien et al. (2000) demonstrated that satisfied marriage partners exhibited more synchrony of nonverbal openness behaviors (e.g., body openness, body position, gaze engagement) than dissatisfied couples. Even strangers who completed an experiment together demonstrated more synchrony if the interaction began well. Participants who were forced to wait for a tardy confederate were less likely to, quite literally, fall into step (i.e., exhibit in-phase coordination) with the confederate than participants who interacted with a confederate who arrived on time and therefore engendered positive feelings because she did not keep the participant waiting (Miles, Griffiths et al. 2010).

One recent finding is worthy of special note. Miles et al. (2011) explored the role of ingroup/outgroup status and interactional synchrony. Although one might predict, consistent with the behavioral mimicry literature, that one would be more likely to synchronize behaviors with an ingroup member, Miles et al. (2011) found exactly the opposite; synchronous behavior was more likely when participants saw the behaviors of a member of a different minimal group. However, all participants showed more synchronous behavior than in the baseline condition, so really, the increased synchrony that was observed when participants interacted with an outgroup member was additional coordination as opposed to decreased coordination with ingroup members. More importantly, participants were told that they were going to interact with the person they observed later. This may have been a strong

situational cue suggesting that participants needed to get along with this person despite their outgroup status (see also Lakin and Chartrand 2003); synchronous behavior might have served this goal.

3.1.3 A caveat

There has clearly been less research exploring the precursors of interactional synchrony than behavioral mimicry. Yet, there is every reason to believe that some of the same factors that were related to the tendency to mimic others' behaviors will also be shown to make interpersonal synchrony more likely. But because synchrony involves both coordination with and anticipation of others' movements, it is also likely that behaving in sync with others is more complicated than simply imitating their behaviors, and may therefore take longer to develop. Some research has confirmed this idea: Interpersonal action synchronization was less accurate when children were asked to synchronize their drumming with other children, whereas accuracy was greatest when adults were asked to synchronize with other adults (Kleinspehn-Ammerlahn et al. 2011).

3.2 Consequences

3.2.1 Liking and empathy

Hove and Risen (2009) were the first to test experimentally the link between synchronous behavior and the development of liking. Compared to conditions where participants tapped alone or asynchronously with an experimenter, those who tapped synchronously reported more liking for the experimenter. Hove and Risen ensured that the liking for the experimenter that occurred post-synchrony was a result of interpersonal synchrony rather than just experiencing synchrony as well; when participants tapped in synchrony with a metronome, even in the presence of the experimenter, the experimenter was not liked more.

Judgments of people who exhibit synchrony parallel the affiliative findings of Hove and Risen (2009). When participants saw or heard the footsteps of synchronous or asynchronous walkers, those who were in sync (in-phase or anti-phase) were attributed the highest levels of rapport (Miles, Nind, and Macrae 2009). Entitativity, or the degree to which individuals are perceived to be a cohesive unit, also follows synchronous behavior; stick figures and humans waving in synchrony, regardless of whether it was in-phase or anti-phase, were rated as being higher in entitativity than those waving asynchronously (Lakens 2010). Moreover, the relationship between synchronous behavior and perceived entitativity appears to be linear (Lakens 2010). These findings were subsequently generalized to feelings of rapport by Lakens and Stel (2011). They also showed that when people believed that synchrony was spontaneous, rather than a result of instructions, more entita-

tivity and rapport were attributed to the interaction partners. In other words, spontaneous synchrony represents meaningful information about the degree to which other people have bonded.

3.2.2 Prosociality

Synchronous behavior also affects the extent to which people act and think prosocially.

3.2.2.1 Helping behavior

Wilermuth and Heath (2009) explored the extent to which behaving synchronously with a small group of interaction partners would promote cooperation in collective good dilemmas. In their first study, participants walked around campus synchronously or at their own pace. Those who walked in sync felt more connected to their partners and trusted their partners more. There were behavioral implications as well; those who walked in sync were more likely to give a trusting response during a group economic exercise. Their second and third studies incorporated a different type of synchrony manipulation; participants sang, or sang and moved, in sync with their partners before completing the group economic exercise. Again, those who behaved synchronously cooperated with their partners more than those who did not, even when behaving selfishly would have been in their best personal interests.

Kirschner and Tomasello (2010) conceptually replicated this effect. In their study, four-year-old children were asked to behave synchronously (with voice and with steps) or not with the experimenter and one other child. The children then had the opportunity to help the other child, who dropped marbles on the floor, and to cooperate with the other child to complete a joint activity that was easier to complete together than alone. The children who engaged in joint music making (i.e., singing and dancing) were more likely to behave prosocially than those who did not engage in the synchronous activity (see also Harmon-Jones, Schmeichel, and Slator 2011).

One explanation for these observed increases in cooperative ability after experiencing a synchronous experience with a partner could be that synchrony improves perceptual sensitivity to the behaviors of others, which would then increase actual ability to complete collaborative tasks. Valdesolo, Ouyang, and DeSteno (2010) explored this idea. Their participants rocked in rocking chairs in sync or at their own pace for a minute and a half, completed a measure of perceptual sensitivity, and then completed a joint-action labyrinth task. The synchronous rocking experience increased perceptions of similarity and feelings of connectedness with the partner, and both perceptual sensitivity and performance on the joint task. However, only perceptual sensitivity mediated the effect of synchrony on performance.

Another possible explanation was offered by Valdesolo and DeSteno (2011). Because helping behavior is often related to feelings of compassion and empathy, Valdesolo and DeSteno hypothesized that participants who had experienced synchronous behavior with a victim of a moral transgression would feel more compassion for this person and therefore behave altruistically (i.e., engage in costly helping behavior). Their results supported this hypothesis; when participants witnessed a fairness transgression against someone with whom they had previously synchronized their tapping behavior (as compared to against someone with whom they had not synchronized), they experienced more compassion for this person, were more likely to help the victim, and helped for a significantly longer period of time. Compassion mediated the synchrony-helping link, whereas liking for the victim was not related to compassion or helping.

3.2.2.2 Feelings of closeness

Recent research has also indicated that synchronous experiences can blur the boundaries between self and other, making people feel closer to those with whom they have experienced synchrony (Paladino et al. 2010). Using a multisensory stimulation procedure, participants' cheeks were brushed with a small paintbrush either in synchrony or in asynchrony with brushing on the cheek of a person shown in a video. Paladino et al. hypothesized that this synchronous experience would cause participants' representation of their own physical bodies to overlap with the representation of the body of the person in the video, which would then facilitate merging of other aspects of their experiences (e.g., inner states). This was exactly what happened: Participants reported more bodily overlap, more attraction, and more inclusion of the other in the self with the synchronously-stimulated person compared to the asynchronously-stimulated person (see also Mazzurega et al. 2011). Behaviorally, more conformity with the synchronously stimulated person occurred also. Importantly, these positive effects persist even when the synchronously stimulated person was a member of an outgroup (Schubert et al. 2011). Although the methodology utilized in this work is slightly different than that used by the other research reviewed in this section, I have included it here because it is the first work that suggests that synchrony experiences can also directly affect self-other overlap.

3.2.3 Cognition and memory

To date, only two papers have explored the consequences of synchrony for cognitive processes and memory. Macrae et al. (2008) had an experimenter engage in an in-phase, an anti-phase, or no synchronous movement with participants. During this movement task, the participants heard the experimenter read aloud a list of words that ostensibly served as irrelevant distractions. When participants' memory

for these words was assessed, they were best able to recall the distracting words after an in-phase synchronous experience with the experimenter. Surprisingly, they were also better able to recall details about the appearance of the experimenter. Miles, Nind et al. (2010) conceptually replicated this effect. In their study, participants who engaged in an in-phase synchronous arm movement with a confederate did not demonstrate the typical self-memory advantage; participants in the in-phase synchrony condition had equally good memory for both self and other (non-social) information (i.e., country names that were said out loud by self or partner during the movement task), whereas the participants in the anti-phase synchrony condition exhibited better memory for information related to the self. Miles, Macrae and their colleagues suggest that these effects emerge because in-phase synchrony promotes the development of an attentional connection between interactants.

4 Commonalities and discrepancies

As the preceding reviews illustrate, the literature on behavioral mimicry is already quite large (and continuing to grow), and the literature on the precursors and consequences of interactional synchrony is burgeoning. To date, these literatures reveal a number of commonalities, as well as some important discrepancies. Of course, the discrepancies offer some fodder for future research in these areas.

4.1 Commonalities

There is clearly extensive overlap between the precursors and the consequences of behavioral mimicry and interactional synchrony. They are both very important to successful interpersonal interactions, and they are both very related to liking, rapport, affiliation, and prosociality. In fact, the findings seem to be identical in both literatures: behavioral mimicry and interactional synchrony are more likely to occur in cases where we have positive feelings for others, and positive feelings are the inevitable consequence of mimicking and experiencing synchrony. (I was only able to note one inconsistency between the two literatures in this regard [Miles et al., 2011], which probably is not an inconsistency when methodological factors are considered.) One could even argue that interactional synchrony might be more strongly related to affiliation than behavioral mimicry because it typically involves both behavioral overlap and more precise timing similarities, but this is a question that awaits further exploration.

Given that both mimicry and synchrony have been argued to be facets of interpersonal coordination (e.g., Bernieri and Rosenthal 1991), the degree of precursor and consequence overlap is not surprising. However, what has been more surprising to some has been the newest work detailing the biological bases for both phe-

nomena. Although it has been argued for quite some time that behavioral mimicry, imitation, and interpersonal coordination more broadly, might have been important “tools” used by our ancestors for survival in an increasingly complex social world (Iacoboni 2008; Lakin et al. 2003; Rizzolatti and Craighero 2004), it has only been recently that the biology underlying our ability to coordinate with others has been illuminated.

A thorough review of the neurological underpinnings associated with behavioral mimicry and interactional synchrony is well outside of the scope of the present chapter. There are a number of recent review papers and special editions of journals that can be consulted for more detail (Chartrand and van Baaren 2009; Heyes 2011; Hurley 2008; Iacoboni 2009; Keysers and Fadiga 2008; Knoblich et al. 2011; Rizzolatti and Craighero 2004), but a short note here is warranted to illustrate that this is yet another commonality between the behavioral mimicry and interactional synchrony literatures.

William James (1890) was one of the first to hypothesize a link between observing or thinking about a behavior and producing that same behavior (his so-called ideomotor principle). Although he most likely did not appreciate the complexities associated with this hypothesis, or the fact that this link would later be argued to be direct rather than involve cognition (i.e., the common-coding hypothesis, Prinz 1997), this principle began to receive much research attention a century after James’s original writing (e.g., see Dijksterhuis and Bargh 2001 for a review of the social cognitive consequences of such a link). But it was not until the discovery of mirror neurons that people began to understand the physiological process through which the ideomotor principle and the common-coding hypothesis could be facilitated.

Mirror neurons are neurons that become active both when executing an action and when perceiving corresponding actions performed by others. In other words, these neurons increase their activity regardless of whether people are producing a particular behavior themselves or simply observing someone else produce that particular behavior: The neurons mirror the brain activation patterns of our partners. Originally discovered in macaque monkeys (Rizzolatti et al. 1996), these specialized cells were later discovered in humans as well (Iacoboni et al. 1999). The mental simulation of others people’s actions that mirror neurons allow is certainly important for learning, but it is also thought to be a critical process in understanding others and developing a theory of mind and empathy (Decety 2011; Iacoboni 2009; Keysers and Fadiga 2008).

Largely because of the mirror neuron system, specific brain regions have been associated with both behavioral mimicry (e.g., Kuhn, Muller, van Baaren et al. 2010; Kuhn, Muller, van der Leij et al. 2011; Platek, Mohamed, and Gallup 2005) and interactional synchrony (e.g., Dumas et al. 2010; Tognoli et al. 2007). Complementary approaches to the link between perception and action (as represented by the mirror neuron system) have also been proposed to explain facets of interper-

sonal coordination: the dynamical systems model (Marsh et al. 2009; Schmidt and Richardson 2008), the shared circuits model (Hurley, 2008), and the associative sequence learning model (for a review, see Iacoboni 2009). While some of these models make different predictions about the process through which interpersonal coordination happens, most agree that there must be some basic neural architecture that provides a physiological system that facilitates coordination. Mirror neurons certainly fulfill this role (even if experience and learning is important to the process), and it remains to be seen whether some other viable alternative exists.

4.2 Discrepancies

As the working definitions that I have used throughout this chapter and the literatures I have reviewed illustrate, the biggest difference between behavioral mimicry and interactional synchrony is the importance of timing: The timing of behavior is inherently important when thinking about interactional synchrony, but most behavioral mimicry researchers have been less fastidious about this issue (to put it politely). Imitation, by definition, must occur after some delay; typically people have coded a behavior as imitative if it occurs anywhere between immediately after the behavior of the partner up to 10 seconds later (e.g., Stel et al. 2008). Whether this is an appropriate amount of delay to still be called behavioral mimicry is an open question. Alternatively, some have had a confederate engage in a nonverbal behavior continuously and then compared participants' tendencies to engage in that behavior when with the confederate to a baseline time period (typically when the participants are alone; e.g., Chartrand and Bargh 1999; Lakin and Chartrand 2003). This approach completely ignores the issue of timing. Interpersonal synchrony, on the other hand, requires prediction and anticipation so behaviors can occur synchronously (Sebanz et al. 2006). The timing of behavior has therefore been critical, and the methodologies that have been used to study interpersonal synchrony have therefore been more detailed and precise with regard to this variable.

Another difference between the two literatures is focus. While the behavioral mimicry literature has taken a rather broad view of imitation and focused on global issues associated with causes and consequences, the interactional synchrony literature has taken the more focused route of exploring processes and details. For example, researchers who study behavioral mimicry have very rarely focused on the importance of variables like eye contact, despite the fact that it is a (likely) critical precursor to imitative behavior (for one exception, see the early work of Bavelas and her colleagues; see Bavelas 2007 for a review). On the other hand, many researchers have noted and elaborated on the important role that visual contact plays in interactional synchrony behaviors (see the earlier review of this work). These different levels of analysis have led to correspondingly different levels of information about the specifics of each phenomenon.

5 Unanswered questions and future directions

Behavioral mimicry and interactional synchrony have captured the attention of many scientists, and this review only begins to uncover some of the fascinating (and challenging) questions that will need to be addressed as we move forward with our understanding of these phenomena. Beyond the points that have already been raised, I will outline a few other questions or issues that seem to be deserving of future research attention in this section.

First, serious attention needs to be paid to methodological issues. Part of the difficulty in conducting research on nonverbal behavior is that it is inherently messy: There is much noise that must be waded through before getting to the heart of what is being studied, and this noise is compounded when thinking about dyadic interactions rather than focusing on individual processes (Hall 2010). This noise has caused particular difficulty when thinking about timing in the behavioral mimicry literature (see above), and determining more generally whether imitation or synchrony is even happening (or whether it might be a result of chance or coincidence). Consequently, many different methodologies are used to study these phenomena, and there is not always consistency among them. Two examples from the behavioral mimicry literature will illustrate this point.

Recently, arguments have been made that stimulus compatibility effects should be defined as automatic behavioral imitation (e.g., Heyes 2011). In other words, behavioral mimicry is not just producing an identical behavior to that of another person after some short delay in time, it could also be simple temporal facilitation of a congruent behavioral response compared to an incongruent behavioral response. However, stimulus compatibility measures are fundamentally different than other measures of behavioral imitation: time is the dependent variable rather than behavior itself, and, unlike other measures of behavioral mimicry, there is a correct response to be made upon presentation of a stimulus. Will stimulus compatibility measures have the same precursors and consequences as other measures of behavioral mimicry? Are these measures functionally equivalent? There is some evidence to suggest that this is the case (Leighton et al. 2010), but it is still rather preliminary at this point.

Another methodological issue that most have danced around until now has been the role of consciousness in behavioral mimicry and interactional synchrony effects. As the earlier review reveals, two approaches have been taken: some have allowed mimicry and synchrony to emerge spontaneously and be measured as output (these phenomena then serve as dependent variables), while others have manipulated mimicry and synchrony by having a confederate behave or telling participants to behave in this way (these phenomena then serve as independent variables). There is certainly validity to each approach, especially considering the specific research questions that are being explored. But these approaches differ with regard to intentionality. Are there differences between conscious and uncon-

scious behavioral mimicry? Between conscious and unconscious synchrony (i.e., planned versus emergent coordination, Knoblich et al. 2011)? If so, what are these differences? A related issue concerns the difficulty associated with determining whether observed mimicry or synchrony is truly unconscious: Determining whether someone is completely unaware of a behavior is surprisingly challenging. Researchers are just starting to explore and grapple with these issues; the resolutions promise to have both basic (e.g., what is the best way to ensure that nonconscious behavior is being studied?) and applied (e.g., can people be taught to synchronize, and would this intentional synchronization ever be as effective as when it emerges spontaneously?) implications.

Second, there are interesting specific questions that could be addressed in both of these literatures as well. For example, because research has only recently begun to explore the precursors and consequences of interpersonal synchrony, future work will no doubt continue to elaborate on both causes and outcomes of this aspect of interpersonal coordination. The valence of behaviors that could be mimicked or synchronized will also be an interesting avenue to explore. Many of the behaviors that have been explored to date in both of these literatures have been relatively neutral (e.g., foot shaking, tapping). It remains to be seen whether people will also mimic or synchronize behaviors that are valenced or behaviors that occur in contexts that are valenced (e.g., in the midst of a heated argument). It will be especially interesting to explore negative behaviors in these contexts (e.g., frowning), and the consequences of coordinating, which is typically positive, in a more negative way (see Smith et al. 2012 for one example of negative effects on performance associated with mimicry of a negative tone of voice).

Anti-mimicry and anti-synchrony also represent important avenues for future research. Although people have used these terms sporadically, it is not clear exactly what these phenomena would be. While anti-mimicry might be doing the opposite behaviors of someone (as opposed to just not mimicking), not all behaviors have clear opposites, and it is not clear whether engaging in an opposite behavior has consequences that are different from just not engaging in the same behavior (for one example of where this is the case, see Tiedens and Fragale 2003). It also remains to be seen whether something that might be called “anti-synchrony” exists, as this seems to be inherently difficult to define: Given that anti-phase synchrony (essentially doing the opposite behavior of an interaction partner at the same time) is a stable form of synchrony, it seems to be the case that people are either in sync (in-phase or anti-phase) or not. Regardless, these are interesting questions, along with the conceptually-related question of whether there can ever be too much mimicry or synchrony (and if so, what are the consequences?).

Finally, what seems most clear from this review is that there has been much neglect associated with merging the literatures on behavioral mimicry and interactional synchrony. Although everyone agrees that both are important to interpersonal functioning, it remains unclear exactly how they are related to each other.

Are behavioral mimicry and interactional synchrony really two separate phenomena as I have described them here? Is behavioral mimicry just a special case of synchrony where there is a slight time delay between exhibition of one's own and another's behavior (i.e., anticipation of the other's behavior is not relevant)? The lack of connection between these literatures and their associated details could be an inevitable consequence of both literatures being relatively new. It could also be the case that the literatures are large and growing rapidly, which makes them difficult to mesh coherently at the moment. This difficulty is exacerbated by the fact that there are people from many different vantage points who are conducting cutting-edge research on these topics: social, cognitive, and ecological psychologists; neuroscientists; communication scientists; etc. We all have our work cut out for us.

6 Conclusion

At the beginning of this chapter, I shared the story of a young man who was concerned about his tendency to imitate and synchronize his behaviors with those of other people. Ironically, based on what we know about behavioral mimicry and interactional synchrony, he should have been more concerned if he did *not* engage in this fundamental human tendency. Future research will no doubt continue to reveal the important role it plays in all of our social experiences.

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19 Nonverbal intimacy: affectionate communication, positive involvement behavior, and flirtation

Abstract: In this chapter, intimacy is conceptualized as a product of interpersonal interaction that can involve affectionate communication, positive involvement, or flirtation. Affectionate communication reflects feelings of warmth and fondness. According to the tripartite model of affectionate behavior, people generally communicate affection using behaviors that are: (a) direct and verbal, such as saying “I love you”; (b) direct and nonverbal, such as hugging or smiling; and (c) indirect and nonverbal, such as providing social support. Affection exchange theory provides further insight into when and why people use affectionate communication. Positive involvement behaviors communicate attention and interest, as well as warmth and positivity. Several theories help explain reciprocity and compensation of positive involvement behavior. Four of these theories— expectancy violations theory, discrepancy arousal theory, cognitive valence theory, and interaction adaptation theory – are reviewed here. Finally, flirtatious behaviors communicate romantic and sexual interest, and are distinct from other intimacy cues because they are more ambiguous and playful. Examples include coy smiles, raised eyebrows, hair tosses, head tilts, and baby talk. Flirtation has been studied as a courtship cue and a relational maintenance behavior. All three types of intimate behavior – affectionate communication, positive involvement, and flirtation – reflect the type of relationship two people share.

Keywords: affection, affectionate communication, courtship, flirtation, immediacy, intimacy, nonverbal, positive involvement, relational maintenance, relationships

Intimacy is one of the most fundamental messages that nonverbal behavior communicates. Leary’s (1957) early work on the interpersonal circumplex model suggested that the characteristics that define social relations can be arranged in a circular format anchored by two axes – a vertical axis related to power and a horizontal axis related to intimacy. Kiesler (1983) labeled the endpoints of these axes as dominant to submissive (for power) and hostile to friendly (for intimacy). Other researchers have defined the horizontal axis more broadly as related to concepts such as solidarity, warmth, love, affection, communion, and emotional closeness (Hall, Coats, and Smith LeBeau 2005; Horowitz 2004; Wiggins 2003). Although some scholars have conceptualized the horizontal dimension of the circumplex model as primarily reflecting personality characteristics (e.g., Kiesler 1983; Locke

2006), others regard it as a key component underlying messages. For example, based on an extensive review and empirical examination, Burgoon and Hale (1984, 1987) identified several fundamental themes of relational communication, the most central of which were intimacy and power.

In this chapter, intimacy is conceptualized as an umbrella concept that encompasses several classes of behavior, including affectionate communication, positive involvement, and flirtation. Research in each of these areas is reviewed, including discussions of theories, stage models, and specific behaviors associated with each type of communication.

1 Conceptualizing intimacy in relation to nonverbal behavior

Despite its importance, researchers have yet to reach a consensual definition of the term intimacy, with Prager (2000) lamenting that intimacy is often studied under different names, making it challenging to consolidate and advance the literature in this area. Acitelli and Duck (1987) noted that intimacy is like the proverbial elephant; if a group of blindfolded people touched different parts of an elephant, they would come to various conclusions about what they were feeling. When defining intimacy, scholars have focused on emotional experiences such as love or interpersonal warmth, on the closeness and interdependence that constitute an intimate relationship, or on behaviors that reflect intimacy, such as self-disclosure, nonverbal involvement, expressiveness, supportive behavior, sexual behavior, and physical closeness (Helgeson, Shaver, and Dyer 1987; Monsour 1992; Prager 1995). The diversity of these definitions suggests that intimacy is best viewed as a superordinate concept that encompasses many different behaviors and feelings. In line with this perspective, some scholars have defined intimacy broadly as product of interaction rather than as a specific set of behaviors or emotions (Andersen, Guerrero, and Jones 2006; Prager 2000; Reis and Shaver 1988).

Viewing intimacy as a superordinate concept that is the product of interaction helps synthesize the emotional, relational, and behavioral aspects of intimacy. Indeed, interaction is the thread that weaves these aspects of intimacy together. Andersen, Guerrero, and Jones (2006) argued that interaction is at the heart of intimacy processes because: (a) intimate interactions provide the basis for developing and maintaining close relationships, and (b) emotional experiences and behavioral expressions of intimacy occur most often within the context of interpersonal interaction. Based on this reasoning, *intimacy* can be defined as a product of interpersonal interaction that includes cognitions, emotions, and behaviors that promote or enhance feelings of closeness. Because this chapter is concerned with nonverbal communication, the focus here is on behavior related to intimacy. Non-

verbal communication plays a special role in creating and enhancing intimacy because it is often perceived as a spontaneous expression of one's internal thoughts and feelings (Prager 2000) and it can increase the physical as well as the psychological closeness between people (Andersen 1985).

The idea that intimacy is a type of interaction is also consistent with research by Burgoon and her colleagues (e.g., Burgoon and Hale 1984, 1987; Burgoon and Le Poire 1999), who defined intimacy as a fundamental theme of relational communication. According to this view, people routinely make judgments about the intimacy level of particular interactions. These judgments are based on verbal and nonverbal messages that reflect how people regard each other, their relationships, and themselves within their relationships (Burgoon and Hale 1984).

Nonverbal scholars have identified global judgments of behavior as well as specific behaviors that are correlated with the broader perception that an interaction is intimate. Global judgments refer to the overall impression that people have based on the totality of behaviors present in an interaction. For example, behaviors may be viewed as more or less involved, positive, and affectionate. When interactions are rated as highly involved, positive, and affectionate, they tend to be perceived as intimate (Burgoon and Hale 1987; Burgoon and Le Poire 1999). Specific nonverbal behaviors such as relaxed laughter, smiling, nodding, touch, direct body orientation, and vocal expressiveness are associated with global judgments of positive involvement and affection, as well as with the broader construct of intimacy (Burgoon and Le Poire 1999; Coker and Burgoon 1987). Thus, intimacy and behaviors related to intimacy can be organized into a hierarchical structure with intimacy as the superordinate concept at the top of the hierarchy, global behavioral judgments in the middle of the hierarchy, and specific behaviors at the bottom of the hierarchy.

This chapter focuses on three global behaviors at the middle of this hierarchy – affectionate communication, positive involvement behavior, and flirtation – as well as the specific behaviors associated with each of these. Research by Burgoon and colleagues suggests that involvement behavior and affectionate communication are separate but related global indicators of intimacy across various types of relationships (Burgoon and Hale 1987; Coker and Burgoon 1987). In romantic relationships, flirtatious behavior has also been cast as a subset of a larger set of behaviors that signal intimacy (Egland, Spitzberg, and Zormeier 1996; Prager 1995).

Although there is overlap between affectionate communication, positive involvement, and flirtatious behavior, each of these global behaviors highlights a different aspect of intimate interactions. Affectionate interaction reflects feelings of warmth and fondness that characterize various types of close relationships; positive involvement showcases how intimacy is related to approach behaviors that signal both physical and psychological closeness; and flirtatious behavior communicates romantic and sexual interest. As such, the specific behaviors associated with each of these global behaviors may help differentiate how intimacy is commu-

nicated in romantic versus non-romantic relationships, as well as how romantic couples communicate intimacy with and without also communicating romantic and sexual interest. These three global behaviors (i.e., affectionate communication, positive involvement, and flirtation) have all received considerable scholarly attention, allowing researchers to move beyond simply looking at nonverbal behaviors reflective of intimacy and to start examining patterns of behaviors that are embedded within broader sequences of intimate interaction.

2 Affectionate communication

Since the mid-20th century, scholars have regarded affection and affectionate communication as critical components of the human experience. *Affection* has been defined as feelings of fondness and caring that develop for someone over time (Floyd and Morman 1998). Affection has also been defined as a basic human need that is fulfilled through interaction with others. Schutz (1958), for example, believed that affection, inclusion, and control are the three most fundamental human needs, all of which can only be met by engaging in social interaction. Prager and Buhrmester (1998) echoed this sentiment, noting that close, supportive relationships are necessary for meeting needs related to intimacy and affection. *Affectionate communication* is behavior that portrays feelings of fondness and positive regard (Floyd 2006). It is this external manifestation of affection that allows people's needs to be met.

2.1 Types of affectionate communication

Like the research on intimacy, scholarship on affectionate communication is often clouded by definitional issues, such as scholars studying the same types of behaviors under different names. Research by Floyd (2006) and colleagues has started to untangle some of these conceptual difficulties by focusing on a specific set of behaviors that are typically perceived as affectionate. Specifically, Floyd and Morman (1998) proposed a tripartite model of affectionate behavior that includes: direct verbal behavior, direct nonverbal behavior, and indirect nonverbal behavior.

The distinction between direct versus indirect behavior is important because it reflects how likely behaviors are to be decoded as affectionate based on a *social meaning model* of nonverbal behavior (Burgoon and Newton 1991). According to the social meaning model, within particular social groups or cultures, certain nonverbal behaviors tend to be associated with specific meanings. For example, smiles and hugs are usually seen as signs of affection. This does not mean that these behaviors only have one meaning no matter what the context is. Indeed, Stamp and Knapp (1990) argued that meanings are negotiated between senders and receivers

depending on the context in which they occur. What the social meaning model does predict, however, is that people tend to readily associate certain messages with particular sets of behaviors. In Floyd and Morman's (1998) tripartite model of affectionate behavior, direct behaviors are those that are typically perceived to have social meanings connected to affection and therefore constitute relatively overt and unambiguous messages of affection.

Examples of verbal behaviors that are directly affectionate are saying "I love you" or "I care about you a lot." Although these behaviors are not always perceived as (or meant to be perceived as) affectionate (e.g., "I love you" can be said in a sarcastic manner or a person may sound frustrated when saying "I care about you A LOT"), in most situations, and especially in the context of established relationships, research suggests that these types of verbal statements are typically interpreted as fairly unambiguous forms of affectionate communication.

2.1.1 Affectionate behaviors that are direct and nonverbal

Many nonverbal behaviors also send relatively unambiguous messages of affection, especially when they are considered in context. Certain forms of touch have social meanings related to affection. Studies by Burgoon (1991) and Lee and Guerrero (2001) demonstrated that among various forms of non-sexual touch, touching someone's face or putting an arm around someone's waist are perceived as especially affectionate and intimate. Floyd (1999) found that although hugs are generally perceived as affectionate, criss-cross hugs (which involve each person having an arm around the other person's upper back and waist) are decoded as reflecting particularly high levels of affection. A diary study by Jones and Yarbrough (1985) suggests that certain forms of touch, such as squeezing someone's arm when excited or happy, and placing one's hand on someone's shoulder, almost always convey affection. Jones and Yarbrough also identified several forms of touch that communicate togetherness and inclusion, such as sitting with shoulders or knees touching, hugging, and holding hands.

According to Jones and Yarbrough, the intimacy level associated with touch is also connected to the degree to which the body part being touch is considered to be vulnerable or non-vulnerable. Touch to non-vulnerable body parts, which in the U.S. includes the hands, arms, elbows, shoulders, and upper back, is less intimate than touch to more vulnerable body parts, such as the face, thigh, and waist. Moreover, touch to vulnerable body areas rarely occurs outside of close relationships. Jones and Yarbrough also noted that longer, more sustained touches are usually perceived as more affectionate than shorter touches. (For additional discussion of touch and intimacy, see Chapter 11, Andersen, Gannon, and Kalchik, this volume.)

Certain kinesic and vocalic cues also send unambiguous messages of affection. Studies by Burgoon and colleagues have shown that eye contact and smiling are

commonly decoded as communicating intimacy and affection (Burgoon et al. 1984; Burgoon, Coker, and Coker 1986; Burgoon and Le Poire 1999). Palmer and Simmons (1995) found that smiling and eye contact (along with illustrator gestures) are also encoded as ways of expressing liking. In terms of the voice, Floyd and Ray (2003) conducted a study to try to determine what vocal features are decoded as communicating affection. They brought unacquainted students into a research laboratory in groups of three. The students were randomly assigned to be either the participant, the confederate (who was asked to act as if she or he either liked or disliked the participant), or the observer. Students in the participant role decoded women as more affectionate when they spoke in a relatively high-pitched voice, and men as more affectionate when they spoke in a relatively low-pitched voice. However, students in the observer role rated both women and men as more affectionate when they used higher pitched voices.

2.1.2 Affectionate behaviors that are indirect and nonverbal

Other nonverbal behaviors convey affection more indirectly. In other words, they involve engaging in an action that can be construed to be affectionate under some circumstances but not others. In terms of the social meaning model, the meanings associated with these behaviors are more variable. Morman and Floyd (1999) described two main kinds of indirect affectionate behavior: idiomatic expressions and supportive behavior.

Idioms are secret signals that relational partners develop for communicating with one another. For instance, if a wife is feeling especially affectionate toward her husband while he is telling a story to dinner guests, she might tap his arm three times under the table. Because of their relational history, he will understand what the three taps mean, but even if seen, the meaning would be ambiguous to their guests. Thus, idiomatic behaviors can send unambiguous messages of affection to one's partner, even though they may not be commonly interpreted as affectionate by other people. Support behaviors, which involve giving someone assistance or comfort, can also be interpreted various ways. For example, activities such as washing someone's car, proofreading someone's report, or babysitting someone's child can be affectionate behaviors or they can reflect other motives, such as fulfilling an obligation or even trying to manipulate someone.

2.2 Affection exchange theory

This tripartite classification of affectionate behaviors as direct-verbal, direct-nonverbal, and indirect-nonverbal is part of a larger theory called *affection exchange theory* (Floyd 2001, 2002, 2006). One of the key ideas guiding this theory is that affectionate communication is adaptive and therefore facilitates survival. One of

the reasons affectionate communication is adaptive is that it helps people develop and maintain relationships with people who provide them with valuable resources. In particular, people are likely to show affection to those who serve evolutionary needs related to viability and fertility. Viability is related to survival, whereas fertility is related to procreation and the motivation to pass on one's genes. Thus, people are motivated to show affection to relatives and mates with whom they share genes or have offspring, respectively. Based on principles from evolutionary psychology, affectionate exchange theory also suggests that individuals are motivated to express affection to a variety of relatives, including nieces, nephews, cousins, and siblings, with whom they share genetic material. Research has generally supported these ideas. For example, Floyd and Morr (2003) found that people report communicating more affection to their spouses than their siblings, and more affection to their siblings than their siblings-in-law. Importantly, these differences could not be completely explained by the levels of emotional or relational closeness that characterized these relationships. Other studies have shown that fathers show more affection to biological and adopted sons compared to stepsons (Floyd and Morman 2001), which may reflect the combined influence of genetic relatedness and emotional closeness.

Affectionate communication is also adaptive for a second reason: People who give and receive affectionate communication tend to be judged to be better potential parents and partners, which make them attractive as mates. Rane and Draper (1995) had participants read scenarios depicting men and women either using or not using affectionate touch with young children. The participants rated those using affectionate touch higher in goodness and social acceptance. Other research has shown that individuals who have secure attachments to others tend to display more affection and involvement in their interactions with romantic partners (Guerero 1996; Tucker and Anders 1998).

Finally, affectionate communication is adaptive because individuals who give and receive high levels of affection tend to be physically and mentally healthier. Giving and receiving affectionate communication can feel good both physically and psychologically. At a physical level, researchers have shown that the exchange of affection can produce increases in hormones such as β -endorphins, dopamine, oxytocin, and prolactin, which are all related to feeling good (Floyd, Mikkelsen, and Hesse 2007), as well as decreases in adrenal hormones associated with stress (Floyd et al. 2005). Other health benefits include lower blood pressure and blood sugar (Floyd, Hesse, and Haynes 2007), lower cholesterol (Floyd et al. 2009; Floyd, Mikkelsen, Hesse, and Pauley 2007), lower heart rate (Floyd, Mikkelsen, Tafoya et al. 2007), and healthy changes in cortisol (Floyd and Riforgiate 2008). At a psychological level, people who report giving and receiving relatively high levels of affection tend to report that they are happy and confident, have high self-esteem, and are less stressed or depressed (Floyd 2002; Floyd et al. 2005). This research demonstrates that the physical and psychological benefits of affectionate communication extend beyond childhood and reach across the lifespan.

Of course, not all affectionate behavior is welcome. According to affection exchange theory, people vary in their optimal tolerance levels for affectionate communication. Thus, some people desire a lot of affectionate communication, whereas other people do not need very much. When people give and receive affectionate communication at a level that is close to their optimal tolerance level, they are likely to reap psychological and physical benefits. However, if the level of affectionate communication is too high or low compared to the optimal level, aversive reactions such as stress or depression are likely. Of course, tolerance levels often vary based on the type of relationship people share. Affectionate touch from a stranger is often deemed unwelcome and inappropriate, leading to negative reactions, whereas affectionate touch from a loved one usually leads to positive reactions. Indeed, Floyd (2006) noted that there is a *paradox of affection* because even though affectionate behavior is usually intended and perceived as a signal of liking and relational closeness, if used by the wrong person at the wrong time, it can lead to disliking and relationship de-escalation, or can prevent a new relationship from developing.

3 Positive involvement

Positive involvement behaviors are a key component of intimate interactions (Andersen, Guerrero, and Jones 2006; Prager 2000). People communicate positive involvement when they use both involvement and positivity cues (Andersen, Guerrero, and Jones 2006). Involvement behaviors, such as close distancing, forward lean, gaze, touch, and direct body orientation (i.e., sitting or standing with bodies toward one another), communicate interest, attention, and engagement in an interaction (Dillard, Solomon, and Palmer 1999; Patterson 1983). Positivity cues, such as smiling and vocal warmth, communicate prosocial emotions. The combination of involvement and positivity cues (aka positive involvement behavior) promotes feelings of closeness, leading people to rate an interaction as more affectionate and intimate when positive involvement cues are present (Coker and Burgoon 1987).

The terms *positive involvement* and *immediacy* are sometimes used interchangeably. For example, some scholars define immediacy as approach behavior that increases stimulation, communicates interpersonal warmth and liking, and reduces the physical and psychological distance between people (e.g., Andersen 1985; Andersen, Gannon, and Kalchick, Chapter 11, this volume; Mehrabian 1981), and is therefore similar to Prager's (2000) concept of positive involvement. In contrast, other scholars have argued that involvement is a broader construct than immediacy or intimacy (Patterson 1983), with immediacy primarily reflecting the intensity level of an interaction (Dillard, Solomon, and Palmer 1999) and intimacy representing the intersection of involvement and positive affect (Andersen, Guerrero, and Jones 2006). Similarly, Burgoon and Newton (1991) provided empirical

support for the proposition that two independent dimensions – involvement and affect – underlie the meanings that people attach to behavior. Their data also suggested that five components comprise involvement: immediacy, expressiveness, altercentrism (i.e., being focused on the partner), composure, and smooth interaction management (Burgoon and Newton 1991).

Regardless of which term is used, scholars agree that behaviors that reflect involvement and positive affect help promote and sustain intimate interaction. Moreover, different positive involvement (or immediacy) cues may be used to communicate intimacy in various types of relationships. For example, Guerrero (1997) had individuals interact with three different partners – a same-sex friend, an opposite-sex friend, and a romantic partner – to determine if there are differences in positive involvement as a function of relationship type. She found that people tended to use closer distances, more touch, and more gaze with romantic partners than friends. In contrast, people tended to use more nodding and vocal interest with their friends than their romantic partners. Interactions with same-sex friends were distinguished by the most postural congruence. Next, we discuss haptic, proxemic, kinesic, vocal, and chronemic cues that have been identified as communicating positive involvement or immediacy.

3.1 Proxemic and haptic cues

As the term “closeness” suggests, people communicate involvement and intimacy when they engage in behaviors that decrease the physical distance between them. Not surprisingly, dyads who touch or use small conversational distances are rated as much more intimate than are dyads who do not touch or use large conversational distances (Patterson 1983). Indeed, many scholars have noted that close proxemic distancing and positive forms of touch are among the most direct and powerful means of communicating intimacy and liking, if not the most powerful means (Andersen and Guerrero 1998; Burgoon et al. 1984; Pisano, Wall, and Foster 1986; Thayer 1986). Pioneering research by Hall (1966) suggested that people’s most intimate interactions in the United States occur within conversational distances of 0 to 18 inches. This proxemic “intimate zone” is typically reserved for interaction with trusted partners, such as close friends, family members, and romantic partners. People can also decrease the physical distance between them by communicating at eye level, directing their bodies or faces toward one another, and leaning forward (Andersen, Guerrero, and Jones 2006).

3.2 Kinesic cues

Gaze, smiling, body positioning, nodding, and kinesic animation are all commonly identified as involvement or immediacy cues. Increased gaze is related to liking,

friendliness, and interpersonal warmth, whereas averted or decreased gaze is related to disliking and hostility (e.g., Burgoon et al. 1984; Le Poire and Burgoon 1994; Palmer and Simmons 1993). Of course, gaze can also serve a number of other functions, including communicating intimidation, credibility, and submission (see Adams, Nelson, and Purring, Chapter 9, this volume). However, when used alongside behaviors such as smiling, close proximity, and vocal warmth, gaze is likely to be interpreted as communicating intimacy and liking. Smiling is also typically interpreted as communicating friendliness and positive emotional feelings such as liking (Kraut and Johnston 1979; Palmer and Simmons 1995). In some cases, smiling can also prompt an emotional contagion effect, which means that one person's smile can prompt a smile in another person, which can then make both people feel happier (Hatfield, Cacioppo, and Rapson 1994), thereby promoting an atmosphere more conducive to intimate interaction. In computer-mediated interaction, smiling emoticons are associated with affection and immediacy (Walther, Loh, and Granka 2005) (see also Burgoon and Walther, Chapter 24, this volume).

People also position their bodies (often unconsciously) in ways that promote involvement and intimate interaction (Palmer and Simmons 1995). Postural congruence, which involves sitting or standing in a position similar to one's partner, can reflect as well as promote intimacy (Burgoon, Stern, and Dillman 1995). For example, if two people match strides when walking or cross their legs the same way when talking, their similar body positioning signals that they are in sync (see also Lakin, Chapter 18, this volume). Open body positions, such as having one's arms at the sides of one's body (rather than across one's body), show that a person is relaxed and open to listening to the partner. Head nods can also signal openness and agreement, as well as liking (Coker and Burgoon 1987; Palmer and Simmons 1995). Finally, when people are perceived as highly involved in an interaction, they tend to be more facially animated and to use more gestures (Coker and Burgoon 1987). When this animation is paired with the expression of positive emotion, powerful messages of intimacy and affection can result (Andersen and Guerrero 1998).

3.3 Vocalics

Animation also plays a key role in how voices are interpreted. When people are vocally expressive, they tend to be rated as more involved and immediate and are perceived to like their partner more (Beebe 1980; Mehrabian 1981). One study compared voices of high school students when talking to same-sex students whom they either liked or did not like. The students had more lively voices when interacting with those whom they liked (Maxwell, Cook, and Burr 1985). Studies have also shown that people rate voices that are expressive, moderately relaxed, resonant, warm, rhythmic, and punctuated with relaxed laughter as reflecting intimacy and interpersonal closeness (Coker and Burgoon 1987; McAdams, Jackson, and Kirshnit

1984). In some cases, soft voices draw people together or occur, at least in part, because people are sitting or standing close together. Finally, silences can also reflect a comfortable intimacy where people are relaxed or content, and therefore do not feel any need to talk (Burgoon, Guerrero, and Floyd 2011). (Further information on the voice and emotion can be found in Patel and Scherer, Chapter 7, this volume.)

3.4 Chronemics

Chronemic cues, which refer to the way people structure, use, and perceive time, can also help promote intimacy. Being on time, staying up late to help someone, and spending a lot of time together can all communicate intimacy and affection. Indeed, Egland et al. (1997) found that spending time with someone is one of the primary ways that people communicate relational closeness. This finding appears to apply to both face-to-face and computer-mediated contexts: Henderson and Gilding (2004) found that people associate intimacy with spending a lot of time communicating online with someone. Conversely, delays in responding to emails or text messages can be construed as communicating a lack of closeness and intimacy, especially in developing relationships (Rintel and Pittam 1997).

Walther and Tidwell (1995) also showed that the time of day can make a difference in how messages are interpreted. In their experiment they varied when email messages were sent (day vs. night) and how long it took the recipient to respond. When the email message was about social issues (e.g., gossip, planning a time to visit), the time of day the message was sent and length of time it took for the recipient to respond interacted to predict how affectionate people rated the email exchange. When social messages were sent during the day, a slower reply was perceived as more intimate and affectionate than a faster reply. The reverse was true for nighttime messages, with faster replies rated as more intimate than slower replies. Walther (2002) later explained this by saying that: “Perhaps we prefer people to take their time to get back to us socially during a busy day, but after hours, we are flattered if they drop what they are doing to reply to us as fast as they can” (246). Walther also noted that in close, committed relationships, such as marriages, longer response times often reflect intimacy. Chronemic rules and norms are relaxed because partners have already established intimacy and know that they will have ample time together. In new relationships, however, an immediate reply may be necessary to establish that one is interested in developing a relationship.

3.5 Theories predicting patterns of involvement behavior

Four communication theories in particular have been advanced to help scholars better understand how people respond to changes in positive involvement during

interpersonal interaction: expectancy violations theory, discrepancy arousal theory, cognitive valence theory, and interaction adaptation theory. These theories belong to a larger family of theories that focus on how people adapt to one another's communication, including equilibrium theory (Argyle and Dean 1965), communication accommodation theory (Giles et al. 1987; Shepard, Giles, and Le Poire 2001), and the parallel process model (Patterson 2001; Patterson, Chapter 17, this volume), among others.

The four theories discussed here have all been applied primarily to involvement or immediacy behaviors, and all predict patterns of reciprocity and compensation. *Reciprocity* occurs when one person responds to another person's behavior with a similar behavior. So a receiver might respond to a touch on the hand by smiling, or to a frown by pulling away. In the first case, a positive involvement cue is met with another positive involvement cue; in the second case, a negative behavior is met with another negative behavior. *Compensation*, in contrast, occurs when one person responds to another person's behavior with a dissimilar behavior. A smile might be met with a frown, in which case the receiver is compensating by decreasing the intimacy level of the interaction. People also compensate in an attempt to increase the intimacy level of an interaction, such as one person smiling and asking "What's wrong?" when the other person looks angry or upset. Each of the theories reviewed next attempts to explain when and why patterns of reciprocity and compensation occur. These theories also describe how people regulate the level of intimacy in their interactions.

3.5.1 Expectancy violations theory

This theory was originally designed to examine how people respond to violations of interpersonal space (Burgoon 1978) but was later expanded to include how people react to a variety of nonverbal involvement behaviors (Burgoon and Hale 1988). The theory starts with the premise that people hold expectations about behavior. These expectations can be predictive or prescriptive. *Predictive expectancies* are based largely on what is known about a person. So if Olivia considers Sophie to be shy and reserved when meeting men, she would be surprised if Sophie walked up to an attractive stranger and started flirting with him. *Prescriptive expectancies*, on the other hand, are based largely on social and cultural rules. For example, in the U.S., receiving a hug rather than handshake at the beginning of a formal job interview would be a violation of expectancies because such behavior is not in accordance with social and cultural norms. As these examples suggest, personal characteristics (such as knowing someone's personality) and contextual factors (such as culture and situation) influence expectancies as well as what constitutes an expectancy violation. Relational characteristics, such as relationship history and type of relationship, also affect expectations.

Most of the time sequences of behavior unfold without expectations being violated. Thus, when expectations are violated, communicators notice and try to

make sense of what has occurred. According to expectancy violations theory, people consider the valence of the behavior and the reward value of the communicator when trying to understand expectancy violations and deciding (often in a split-second) how to respond to them. Valence refers to whether the behavior is perceived as positive or negative in relation to expected behavior. Sometimes the unexpected behavior is better than the expected behavior. For example, Jen might expect her husband, Preston, to be happy when she tells him that she received a promotion, but she might not expect him to be so excited that he hugs her and swings her around in the air. In this case, valence is likely to be positive. In contrast, when the unexpected behavior is worse than the expected behavior (e.g., Preston frowns and says “That’s great” in a monotone voice), valence is negative.

Sometimes, however, the valence of a violation is not so clear. Imagine that Jen does not particularly like being picked up and swung around by her husband, or anyone else, yet she is happy that Preston is excited for her and realizes that this is just his way of showing intimacy. In a case such as this, when the unexpected behavior is not automatically regarded as positive or negative, the reward value of the communicator is also considered. Reward value refers to the extent to which the person who violated expectations is regarded favorably or unfavorably. Characteristics such as being socially attractive, physically attractive, and having high status contribute to reward value. When the person who violated expectations is perceived as highly rewarding, her or his behavior is more likely to be judged positively. So Jen may respond to her husband’s exuberant display by smiling and appreciating that he is so happy for her. However, if a rival from work acted the same way, she would likely respond negatively, perhaps by frowning and pulling away.

As these examples illustrate, valence and reward value work together to predict patterns of reciprocity and compensation following changes in involvement behavior. Research that has examined responses to involvement behavior using experimental methods (e.g., Burgoon, Olney, and Coker 1987; Burgoon, Le Poire, and Rosenthal 1995; Guerrero, Jones, and Burgoon 2000; Hale and Burgoon 1984) supports four general patterns based on the combination of valence and reward value. First, receivers reciprocate when rewarding partners engage in higher levels of positive involvement behavior than expected. This makes sense because receivers are likely to desire high levels of intimacy with rewarding partners. Second, receivers reciprocate when unrewarding partners engage in lower levels of positive involvement than expected. Such behavior likely makes the sender seem even more unrewarding, leading to negative reciprocity. Third, receivers are likely to compensate when an unrewarding person engages in unexpectedly high levels of positive involvement, presumably because they want to adjust the intimacy level downward. Finally, receivers are likely to compensate initially when a rewarding person engages in behavior that is less intimate than expected because they want to keep the intimacy level relatively high. Of course, if the sender persists on engaging in

negative or low intimacy behaviors, the receiver is likely to get frustrated, abandon attempts to restore intimacy, and eventually reciprocate the sender's negative behavior or engage in a mix of reciprocal and compensatory behavior. Research testing expectancy violations theory has also shown that rewarding communicators can engage in expectancy violations (either positive or negative) with less penalty and more benefits than can unrewarding communicators. If unrewarding communicators wish to be regarded more favorably, research suggests that they should engage in expectancy-confirming behavior rather than behavior that violates expectations either negatively or positively.

3.5.2 Discrepancy arousal theory

Discrepancy arousal theory (Cappella and Greene 1982, 1984) provides a somewhat different explanation for why people reciprocate or compensate when partners change their level of nonverbal involvement. Specifically, the theory focuses on causal links between (a) discrepancy levels and arousal change; (b) degree of arousal change and affective response; and (c) affective responses and behavioral responses.

According to the first of these causal links, the more a sender's behavior is discrepant from expectations, the more a receiver experiences arousal change. *Discrepancy level* captures the difference between expected behavior and what actually occurs. As in expectancy violations theory, expectations about behavior are theorized to be based upon personal preferences, past experiences, social norms, and the situation (Cappella and Greene 1982). There is a range of expected behavior that Cappella and Greene refer to as the *acceptance region*. When behaviors fall clearly within this acceptance region there is no discrepancy and no arousal change. Behaviors that fall near the edges of the acceptance region are moderately discrepant and produce a moderate level of arousal change. Finally, behaviors that fall clearly outside of the acceptance range are highly discrepant and produce high levels of arousal change. Thus, discrepancy arousal theory predicts that the extent to which a sender's behavior is discrepant from expectations is monotonically related to the level of arousal change a receiver experiences.

The next causal link specifies that the degree of arousal change is associated with the receiver's affective response. Moderate increases in arousal are predicted to produce positive emotional reactions, including joy, contentment, and happy surprise. High increases in arousal, on the other hand, are predicted to promote negative emotional reactions, such as discomfort, annoyance, or anger. By extension, this means that moderately discrepant behavior is theorized to lead to moderate arousal change and positive affective reactions, whereas highly discrepant behavior is theorized to lead to high arousal change and negative affective reactions. So if Preston's behavior is moderately discrepant, discrepancy arousal theory would predict that Jen would feel positive emotions such as joy and excitement in

response to his exuberant behavior. But if Preston's behavior falls outside of the acceptance region, then the theory would predict that Jen would experience negative emotions such as discomfort and annoyance.

The last causal link focuses on how affect is associated with behavior. Specifically, when receivers experience positive emotion, discrepancy arousal theory predicts that they will increase their use of involvement behavior. On the other hand, when receivers experience negative emotion, they are theorized to decrease their use of involvement behavior. This last link in the chain of reactions leads to four general patterns. First, if a sender engages in behavior that is somewhat more involved than expected, but still falls within the acceptance region, the receiver will feel positive affect and reciprocate by engaging in similarly intimate behaviors (e.g., Jen smiles and hugs Preston as he swings her around). Second, if a sender engages in behavior that is much more intimate than expected (such that it falls outside of the acceptance region), the receiver will feel negative affect and compensate by decreasing intimacy (e.g., Jen pulls away from Preston). Third, if a sender engages in behavior that is much less involved than expected, the receiver is theorized to feel negative affect and to decrease involvement (e.g., Preston frowns and looks away; Jen frowns back and withdraws). Finally, if a sender engages in behavior that is somewhat less involved than expected, the receiver will still feel positive affect and reciprocate. Imagine that Preston smiles when he hears Jen's good news. Although Jen expected him to have a stronger reaction, she still feels positive affect and reciprocates by smiling back. Of these four predictions, this last one that has received the least support from the extant literature, as indicated by Burgoon, Stern, and Dillman's (1995) review of the literature on patterns of nonverbal adaptation. Indeed, according to expectancy violations theory, Jen would likely regard Preston's smile as a negative expectancy violation because she expected a more enthusiastic response. If that was the case, rather than feeling positive affect, Jen would likely experience negative emotions such as disappointment or sadness.

Other research has supported some of the causal links suggested by discrepancy arousal theory. In one experiment, Le Poire and Burgoon (1994) found that small increases in involvement change were associated with positive affect. However, their data failed to support the proposed connections between level of involvement and arousal change, leading them to wonder whether affective valence may be a better predictor of reciprocity and compensation than arousal change. However, Andersen et al. (1998) showed that people experience higher levels of arousal change in response to large versus moderate increases in nonverbal involvement, which is consistent with discrepancy arousal theory. Andersen et al. also found that moderate increases in nonverbal involvement tended to be reciprocated, whereas more substantial increases in nonverbal involvement tended to be met with a mix of reciprocal and compensatory responses (e.g., smiling but using blocking behaviors).

3.5.3 Cognitive valence theory

Andersen (1985, 1998) developed cognitive valence theory to explain patterns of reciprocity and compensation in response to increases in positive involvement (a.k.a. immediacy). The theory specifies that both arousal and cognition play important roles in determining how people respond to increased nonverbal involvement. The theory begins with the assumption that the receiver must perceive a change in the sender's behavior. If the receiver does not notice an increase in positive involvement, then no response is necessary. In contrast, when receivers do notice an increase in involvement behavior, Andersen theorizes that they will experience some level of arousal change. If arousal change is low, then the theory specifies that receivers will not change their behavior. When receivers experience a high degree of arousal change, cognitive valence theory suggests that they will engage in fight or flight behaviors in an effort to reduce their arousal. Notice that this prediction is similar to that of discrepancy arousal theory in that very high levels of arousal are predicted to be associated with negative emotions such as discomfort and fear. Most of the time, however, Andersen (1998) believes that receivers experience a moderate degree of arousal change in response to increased positive involvement. In this case, Andersen theorizes that the receiver's response is contingent on six cognitive schemata that help determine whether the increased involvement is valenced positively or negatively. These cognitive schemata are: culture, personal traits, interpersonal valence, the relationship, the situation, and temporary states (Andersen 1985, 1998).

Culture includes all of the norms and rules that guide behavior within a given society or group. For example, people touch more and stand closer to one another in some cultures than others, which has led scholars to differentiate between high and low contact cultures (Hall 1969). If a sender increases positive involvement through touch in a high contact culture, the receiver's response may be more positive than it would be in a low contact culture. (Chapter 23, Matsumoto and Hwang, this volume, also discusses culture and nonverbal communication.)

Personal traits include personality variables such as how extroverted or shy someone is, as well as certain demographic variables such as a person's gender and religious beliefs. Certainly, these variables can influence how people respond to increased levels of positive involvement; for instance, a shy person is likely to react differently than an extroverted person when an attractive acquaintance increases behaviors such as smiling and eye contact. (See also Chapter 13, Gifford, and Chapter 21, Hall and Gunnery, both this volume, for further discussion of personality and gender respectively.)

The third cognitive schema, interpersonal valence, focuses on perceptions of the sender. People respond differently to those whom they perceive as powerful versus powerless, friendly versus unfriendly, and attractive versus unattractive, just to name a few variables related to interpersonal valence. Thus, if the acquaintance mentioned above is perceived to be unattractive rather than attractive, the

receiver will be less likely to respond positively. Instead of smiling back, the receiver might turn away and frown. Notice that the construct of interpersonal valence in cognitive valence theory is similar to the construct of reward value in expectancy violations theory.

According to Andersen (1993; Wertin and Andersen 1996), the relationship is a particularly important determinant of people's responses to increased involvement. Relationship variables include the type of relationship that people share (e.g., stranger, coworkers, lovers) as well as the stage and characteristics of the relationship. Obviously, increases in positive involvement, such as closer distancing and touch, are more expected and acceptable in certain types of relationships than others. Some research also suggests that people more readily reciprocate certain involvement behaviors in established relationships. For example, Guerrero and Andersen (1994) demonstrated that although married couples do not touch as much in public settings as seriously dating couples, they are more likely to reciprocate their partner's level of touch. Individuals are also more likely to reciprocate a partner's increased immediacy if they are in a satisfying versus dissatisfying relationship (Manusov 1995).

The situation also helps determine how receivers respond to increases in nonverbal involvement. Formal situations often require less positive involvement than more informal situations, which may lead receivers to perceive increased positive involvement more negatively in formal than informal situations. Similarly, people are likely to respond differently in public versus private settings. For example, people who dislike public displays of affection might react negatively when their partner tries to kiss them in front of a group of friends, but positively when they are home alone.

Finally, temporary states include physical and emotional states such as being in a good (or bad) mood, having a headache, and feeling tired. These states can influence how people respond to increases in positive involvement. Being in a bad mood, having a headache, or being tired can all lead people to temporarily have a lower threshold for nonverbal involvement behavior from others. Behaviors that are usually welcomed may be regarded as too arousing given the receiver's state of mind. On the other hand, when people are happy, excited, and feel good physically, they are likely to be open to, and even to encourage, increased nonverbal involvement from others.

According to cognitive valence theory, these cognitive schemata are in place before any increases in nonverbal involvement occur, acting as a screen or filter that help people quickly interpret and respond to increased involvement, often without much conscious processing. Andersen (1993, 1998) theorized that when receivers evaluate all six of these cognitive schemata positively, they will reciprocate the sender's level of involvement (perhaps by engaging in similar behaviors such as smiling and moving closer to their partner), and they will also feel more attracted to and closer to the partner. In contrast, when even one of the cognitive

schemata are valenced negatively, Andersen (1993, 1998) predicted that negative outcomes, including compensation, avoidance or hostility, and decreased relational closeness, will occur. Some scholars (e.g., Burgoon, Stern, and Dillman 1995; Guerrero, Alberts, and Heisterkamp 2001) have challenged the idea that all six schemata must be valenced positively for positive outcomes to occur. To support this challenge, these scholars cite research showing that reciprocity is a more common response than compensation, and provide commonsense examples, such as a mother reciprocating a child's smile and kiss even though she is tired and has a slight headache. Andersen et al.'s (1998) study also suggests that when people evaluate the cognitive valencers variously (e.g., they evaluate some positively and others negatively), they might engage in a mixed response – for example smiling but moving a little farther away. In line with cognitive valence theory, Andersen et al. (1998) found that people experienced more negative arousal and defensiveness when a cross-sex friend increased positive involvement greatly rather than moderately, and that people generally reciprocated moderate increases in involvement.

3.5.4 Interaction adaption theory

Burgoon and colleagues (e.g., Burgoon, Dillman, and Stern 1993) developed interaction adaptation theory to be a more comprehensive explanation of patterns of nonverbal adaptation than expectancy violations theory and cognitive valence theory. According to the theory, three elements, which are collectively called RED, play critical roles in predicting how people respond to changes in nonverbal involvement: requirements (R), expectations (E), and desires (D). The R element refers to what is required to meet and cope with biological and emotional factors such as having a headache, feeling tired, or being excited (Miczo, Miczo, and Burgoon, 2008). The E element refers to expectations, including both prescriptive norms and predictive expectations that are based on knowledge of someone. Finally, the D element refers to what people desire based on their personal preferences and goals. These three elements form a composite, the RED, which defines an individual's *interaction position*. For example, Annemarie's interaction position is likely to be oriented toward intimate interaction if she is in a good mood and expects and desires to spend some quality time with her husband, Carlos. The interaction position will then predict how she will respond to Carlos' behavior. If he engages in positive involvement behavior, she is likely to reciprocate, but if he engages in avoidant behavior, she is likely to compensate in an effort to get Carlos to change his behavior and meet her needs.

Thus, in interaction adaptation theory, the match (or mismatch) between a receiver's interaction position and a sender's actual behavior predicts patterns of nonverbal adaptation (Burgoon, Stern, and Dillman 1995; Miczo, Miczo, and Burgoon 2008). When the sender's behavior meets or exceeds what the receiver

requires, expects, and desires, there is a match, leading to reciprocity. However, when the sender's behavior fails to meet the receiver's requirements, expectations, and desires, there is a mismatch and some compensation is likely. In intimate relationships, positive involvement behaviors are generally consistent with a receiver's interaction position, whereas negative involvement behaviors (e.g., yelling, frowning, giving dirty looks) and low involvement behaviors (e.g., facing away, sitting apart, ignoring) are generally inconsistent with a receiver's interaction position.

Interaction adaptation theory was built on a foundation of research from expectancy violations theory, which demonstrated that the E element does indeed influence how people respond to changes in a partner's level of nonverbal involvement (e.g., Burgoon, Le Poire, and Rosenthal 1995). Other studies have looked more specifically at how the D element influences patterns of reciprocity and compensation. For instance, Guerrero and Burgoon (1996) examined the D element as related to attachment styles. They were particularly interested in whether individuals with preoccupied versus dismissive attachment styles would vary in their responses to changes in a partner's level of positive involvement because these two styles are associated with different desires and preferences for intimate behavior. Specifically, preoccupied individuals desire high levels of intimacy from their partners, whereas dismissive individuals prefer lower levels of intimacy. Based on the D factor, then, principles from interaction adaptation theory suggest that preoccupied individuals would reciprocate increases in positive involvement and compensate for decreases in positive involvement. The opposite pattern should hold for dismissive individuals who would be likely to reciprocate decreased positive involvement and compensate for increased positive involvement.

Guerrero and Burgoon (1996) tested these predictions by bringing individuals who scored highly in dismissiveness and preoccupation into a research laboratory and having their partners (unbeknownst to them) either increase or decrease their level of positive involvement. In support of interaction adaptation theory, preoccupied individuals tended to compensate for decreased nonverbal involvement whereas dismissive individuals tended to reciprocate decreased nonverbal involvement. Guerrero and Burgoon also found that although both preoccupied and dismissive individuals reciprocated increased nonverbal involvement, this effect was much more pronounced for preoccupied individuals compared to dismissive individuals. Thus, high levels of positive involvement were reciprocated in close relationships regardless of attachment style, but the most robust reciprocity effects occurred when receivers were characterized by a strong desire for intimacy.

A study comparing dyads from the same versus different cultures also examined the role that the D element plays in predicting patterns of reciprocity and compensation (Burgoon et al. 1996). In this study, senders were instructed to change the degree to which they appeared responsive and engaged during an interaction with someone from the same or a different culture. An overall pattern of

reciprocity emerged, with receivers becoming more responsive and engaged in the high-responsivity condition, and less responsive and engaged in the low-responsivity condition. Interestingly, though, receivers in the low-responsivity condition were slower to decrease nonverbal involvement if they were from a different culture rather than from the same culture as the sender. In terms of the D element, Burgoon and her colleagues found that individuals who indicated that it was important to create a supportive climate when interacting with others tended to display more approach behavior, whereas those who were more concerned about managing arousal and anxiety displayed more avoidant behavior.

A study by Floyd and Burgoon (1999) took this research a step further by testing the combined effects of the D and E. Dyads participated in a “get acquainted” task in which receivers were primed to expect that senders would either like or dislike them (the E element) and were also instructed to try and make the sender either like or dislike them (the D element). Half of the senders then engaged in positive involvement behavior toward the receiver, whereas the other half engaged in low involvement behavior. Consistent with interaction adaptation theory, Floyd and Burgoon found that receivers tended to reciprocate when their interaction position was consistent with the sender’s behavior. In other words, receivers who expected and wanted the sender to engage in positive involvement behavior reflective of liking tended to reciprocate increased involvement. Similarly, receivers who expected and wanted their partners to engage in low involvement behavior reflective of disliking tended to reciprocate decreased involvement. Perhaps more interestingly, Floyd and Burgoon demonstrated that when desires and expectations were in conflict (e.g., receivers were told to try and make a sender who dislikes them like them or a sender who likes them dislike them), the D element predicted the receivers’ behavior better than the E element. For example, if receivers were told to try and make a sender who disliked them like them, they were more likely to compensate if the sender used low involvement behavior and reciprocate if the sender used positive involvement behavior. More work is necessary to determine whether the D element is more important than the E element in other situations as well.

3.6 Summary

These four theories and the empirical work testing them lead to several important conclusions regarding the exchange of nonverbal involvement behavior. All of the theories highlight the importance of *patterns* of nonverbal involvement. It is not enough for one person to engage in these behaviors. For intimacy to develop and for relationships to stay close, both partners must engage in nonverbal involvement behavior. These theories also show that the relationship provides a context for interpreting and responding to changes in involvement behavior. Indeed, people

actively respond to changes in nonverbal involvement in ways that reflect the intimacy level they desire in their relationships. Thus, if high intimacy levels are desired, people more readily reciprocate when their partner engages in especially high levels of involvement, and are more likely to compensate when their partner engages in especially low levels of involvement. There is, however, also a natural pull toward reciprocity regardless of the intimacy level that is desired. This helps explain why research has shown that even in close relationships, people reciprocate their partners' negative or low involvement behaviors if initial attempts to compensate fail.

The four theories reviewed above each forward somewhat different lists of factors that influence how people respond to changes in their partner's level of nonverbal involvement. More research is necessary to determine how these factors work together. For example, the studies cited above suggest that the relationship and interpersonal valence (or rewardingness) are especially important predictors of how people respond to changes in nonverbal behavior. Other research suggests that the valence of the nonverbal behavior, especially in relation to what was expected, is the most important determinant of people's responses to changes in nonverbal involvement. In Floyd and Burgoon's (1999) study, desires were more predictive than expectations, but this finding has yet to be replicated in other contexts. Researchers also need to test various combinations of Andersen's (1993, 1998) six cognitive schemata to determine which have the most predictive value as well as to test whether all six must be valenced positively for people to reciprocate increases in nonverbal involvement. Another direction for future research is to incorporate more emotion into these theories, especially since studies have shown that changes in arousal level may not be as predictive of responses to involvement change as affective valence.

Finally, all of these theories need to do a better job accounting for mixed responses to involvement change, such as the blend of reciprocity and compensation found in Andersen et al.'s (1998) study on cross-sex friendships. Mixed responses can easily be explained by each of the theories. They may occur when rewardingness and valence are at odds, such as would be the case when an unrewarding person engages in unexpectedly positive behavior (expectancy violations theory); when a behavior outside of the acceptance region produces some positive emotion (discrepancy arousal theory); when some cognitive schemata are valenced positively but others are valenced negatively (cognitive valence theory); and when elements in the RED predict different patterns (interaction adaptation theory). While these details still need to be worked out, at this point it is clear that people respond to changes in nonverbal involvement in ways that reflect the intimacy level in their relationships, and that patterns of reciprocity and compensation can help promote, sustain, or derail intimacy in relationships.

4 Flirtatious behavior

As the theories reviewed thus far suggest, how people exchange messages of affection and positive involvement is a key determinant of the type of relationship that people share. Messages of affection and positive involvement help people develop and maintain a variety of relationships, including friendships and family relationships. For romantic (or potentially romantic) relationships, there is another ingredient in the recipe for intimacy— behaviors that signal romance and sexual interest, which are commonly referred to as flirtatious behavior. Flirtatious behaviors, which help differentiate romantic relationships from other types of intimate relationships, occur during courtship and beyond. Some research also suggests that the theories discussed above can be applied to flirtatious behavior. For example, Andersen et al.'s (1998) study on responses to increased nonverbal involvement in cross-sex friendships included some behaviors that could be classified as flirtatious. Just as various types of close relationships may be developed and maintained through the reciprocity of positive involvement, the romantic component in dating and marital romantic relationships may be initiated and sustained through the enactment and reciprocation of flirtatious behavior. Some of these behaviors are described next.

4.1 Specific flirtatious behaviors

Several attempts have been made to catalog the full range of possible behaviors that can be labeled as “flirting” (see Koeppel et al. 1993; Moore 2002; Perper and Weis 1987). Some scholars have used the term *flirting* to describe a specific set of behaviors, many nonverbal, that are enacted with the purpose of signaling romantic and sexual interest (Abrahams 1994; Eglund, Spitzberg, and Zormeier 1996; Metts and Spitzberg 1996; Silver 1994; Silver and Spitzberg 1992). At the beginning stages of relationships, flirtatious behaviors are often characterized by ambiguity. This ambiguity allows interactants a “way out” if the target of the flirtatious overtures does not feel the same way; signaling romantic or sexual interest can be interpreted as a threatening endeavor and as such, ambiguity allows for a more subtle approach (Koeppel, Montagne-Miller, O'Hair, and Cody 1993; Sabini and Silver 1982). As relationships become more established, flirtatious behavior often becomes more direct, although an element of ambiguity and shyness often remains. Indeed, the somewhat timid and ambiguous nature of flirtation helps separate it from similar kinesic, oculesic, haptic, proxemic, and vocalic behavior that conveys affection and positive involvement without showing sexual or romantic interest.

4.1.1 Kinesic cues

The use of one's body, or kinesics, plays a dominant role in signaling romantic and sexual interest. Flirtatious cues employing the body include maintaining an

open stance (e.g., arms at side instead of crossed over the chest) as well as facing another person with either the full body or the head and shoulders (Argyle 1988; Givens 2005; Grammer, Kruck, and Magnusson 1998). Furthermore, the body is perceived to be exhibiting more flirtation when upright and relaxed as opposed to slouching or leaning, and flirting parties tend to “suck in” the stomach, push out the chest, and hold the head high (Grammer, Kruck, and Magnusson 1998; Grammer et al. 2000; Schwartz, Foa, and Foa 1983). The position of one’s legs can also denote flirting; crossing the legs and pointing the feet towards another is perceived as more flirtatious than pointing the legs and feet away (Givens 2005; Muehlenhard et al. 1986; Schlefen 1965). Hair flips, head tosses, and leans are other kinesic cues that signal romantic or sexual interest (Givens 2005; Moore 2002, 2010).

In addition to the body, one’s face is a canvas on which a portrait of sexual interest is often painted. Raised eyebrows and a coy smile are both indicators of romantic and/or sexual interest (Coker and Burgoon 1987; Moore 2002). A coy smile signals a willingness to engage, but once it is noticed as such by a receiver, the coy person backs off, often by smiling less, looking away, or turning one’s head to signal shyness or embarrassment. Sometimes these compensatory moves are followed by a renewed attempt at a shy smile. For women in particular, licking or puckering one’s lips is another nonverbal behavior related to flirting (Moore 2002). See Chapter 21, Hall and Gunnery, this volume, for more discussion of gender differences in nonverbal cues associated with flirting.) Finally, people are often facially expressive when interacting with or trying to get attention from a person to whom they are romantically interested (Maxwell, Cook, and Burr 1985).

4.1.2 Oculestic cues

Although scholars often categorize eye behavior as a kinesic cue, eye behavior has also been studied under the term *oculesics*. Many nonverbal behaviors are deemed “flirtatious” when they are extended and elongated; this is certainly the case for eye contact, with long meaningful glances and mutual gaze used to signal romantic and sexual interest (Abbey and Melby 1986; Coker and Burgoon 1987; Moore and Butler 1989). The longer two people gaze at one another, the more likely it is perceived that they are attracted to, and potentially like, one another (Kleinke, Meeker, and LaFong 1974). As mentioned previously, flirting is often ambiguous in nature. As such, eye contact is often darting, fleeting, and room-encompassing so as not to arouse suspicion in the target (Moore 2002), especially in the beginning stages of relationships. Similar to the coy smile, once the receiver recognizes that he or she is being looked at, the flirting person may look away for a few seconds and then shyly look back again. Research also suggests that men are much more likely to approach women who have gazed back at them compared to women who have not (Moore 1985).

4.1.3 Haptic cues

Haptic behavior, or touch, is one of the most common and consistently utilized flirtation cues (Jesser 1978; Moore 2010). Studies have shown that the location of touch is a clear indicator of the level of flirtatiousness and comfort between relational partners (Abbey and Melby 1986). Touches to the forearm, wrist, lower back and shoulder are perceived as less flirtatious than those to the legs, neck, and face (Muehlenhard, et al. 1986; Sigal et al. 1988), which is consistent with research reported previously on vulnerable versus non-vulnerable body parts. In general, touch to more vulnerable body parts conveys stronger messages of intimacy, whether intimacy is in the form of affection or sexual interest. In addition to touching another, self-touch, such as smoothing or adjusting one's clothing or hair (generally lumped together into a category termed *preening*) also acts to signal one's presence to another (Givens 1978; Schlefen 1968).

4.1.4 Proxemic cues

Proxemics denote the use of physical space and distance around interactants. Not surprisingly, flirting dyads often display shorter distances between one another (Kleinke 1972). This can be accomplished a variety of ways. In addition to simply sitting or standing next to the interested party, leans, both to the side and forward, are often employed to close the distance gap and build intimacy (Grammer 1990; Moore 2010; Moore and Butler 1989; Muehlenhard et al. 1986). When men initiate flirtation, they often take up more or maximize their use of the physical space around them to signal to their target that they are interested (Moore and Butler 1989).

4.1.5 Vocalic cues

Vocalics represent the use of voice as a nonverbal marker. Flirting dyads are more likely to display increased levels of laughter, use a variety of warm tones and pitches, and speak more quickly with one another compared to non-flirting dyads (Coker and Burgoon 1987; Grammer 1990; Muehlenhard et al. 1986). Furthermore, flirting dyads have fewer pauses when conversing with one another, and engage in a breadth of conversational topics (Coker and Burgoon 1987). Laughter is a particularly prominent signaler for men when they are flirting, and are interested, in a target (Simpson, Gangestad, and Biek 1993). Research by Anolli and Ciceri (2002) demonstrated that men's voices may also vary depending on whether they are flirting to trying to get a women's attention or whether they are flirting with a women whom they have already established contact. According to this research, men use an *exhibitionist voice* when they are first trying to get a women's attention. This voice is high-pitched, loud, and fast. However, after a man has secured a women's attention and starts conversing with her, his voice becomes softer and

slower. Anolli and Ciceri demonstrated that men who followed this vocalic pattern tended to be more successful during the courtship process.

4.1.6 Macro cues

In addition to the primary nonverbal codes, several studies (Given 1978; Grammer, Kruck, and Magnusson 1998; Muehlenhard et al. 1986; Schlefen 1965) have demonstrated that matching or synchronization is common between flirting interactants. That is, flirting parties often match the body positioning, lean style, vocal range and volume and amount of laughter of their partner, which shows that patterns of matching or reciprocity are common for flirtatious behaviors as well as positive involvement behaviors (see also Chapter 18, Lakin, this volume). Cunningham and Barbee (2008) observed that dancing may be a dating ritual precisely because it allows people to get physically close while also testing their ability to be in sync with one another. Attentiveness, wherein a person appears to be focused, engaged, and interested in what an interaction partner is doing and saying, is another common macro flirting cue (Muehlenhard et al. 1986) that is related to nonverbal involvement (Coker and Burgoon 1987). Finally, environmental cues, such as low lighting and soft music, can create or enhance intimacy, as can exciting environments (Burgoon, Guerrero, and Floyd 2011).

When laypeople picture people engaging in these types of flirtatious behavior, they often think of initial interactions between strangers or acquaintances who are attracted to one another. However, flirtatious behavior is not limited to the beginning stages of relationships. Partners in long-term relationships also flirt with one another using many of the behaviors mentioned here. Indeed, flirtatious behaviors can serve as a way for couples to bond and sustain intimacy long after their first sexual encounter. Most of the research, however, has examined flirtatious behavior within the context of courtship, as discussed next.

4.2 Flirtation in the courtship process

Although dating and marital partners often flirt with one another throughout the course of their relationships, courtship is usually the time when intimacy is first cultivated, with partners learning what intimacy cues are successful with their potential partner, and which ones are less so. Courtship is characterized by various forms of intimacy expressions, including nonverbal behaviors. How intimacy is enacted and experienced, however, largely depends on understanding courtship as a process, stage, or relational point.

Conceptualizing courtship as a macro-level relational process is not a clear, straightforward task. Given the rise of the hookup and friends-with-benefit culture among college-age students, some scholars challenge whether or not courtship is

a concept that even exists within popular vernacular (Bogle 2008; Glenn and Marquardt 2001; Sessions-Stepp 2007). However, when the lens of focus is placed outside of the college campus, courtship is clearly still the primary vehicle through which close romantic relationships are initiated. And college students who are in close, romantic relationships still report going through the courtship process, even though courtship looks different today than it did 20 years ago.

Courtship, then, is generally defined as the process couples go through as they pursue a romantic relationship, often concluding with sexual involvement and becoming an exclusive couple, although some scholars see courtship as extending toward marriage or other legally binding romantic relationships (Cate and Lloyd 1992; Moore 2010). Much of the research in this area has focused on identifying behaviors that occur at different stages of the courtship process. Stages of courtship are equally as varied in number, ranging from 12 (Morris 1971) to 24 (Birdwhistell 1970), settling somewhere around four to five. Pioneers of courtship research such as Schlegel (1965) and Givens (1978) proposed a five-step process: Attention, recognition, interaction, arousal, and sexual resolution; these stages have been modified by others (see Cunningham and Barbee, 2008) but are conceptually very similar. We now consider each of these stages in turn.

4.2.1 Attention

In the *attention* phase, a person notices another, characterizes that person as attractive, and attempts to (via nonverbal communication) send signals of interest toward her or him. This awareness is driven largely by the forces of physical, romantic, and sexual attraction. A confident, upright posture as well as expressive features such as raised eyebrows, large smiles, and sustained eye contact have all been found to increase felt attraction in others (Cunningham and Barbee 2008). Of course, coy smiles and gaze can also characterize the attention stage. As noted previously, behavior is often ambiguous and timid during the initial stages of courtship because people want to save face if their advances are rejected (Givens 1978; Schlegel 1965). Together, this mix of nonverbal behaviors communicates a safe, friendly and warm disposition which invites another to approach (Fletcher et al. 2004).

4.2.2 Recognition

In the second stage, *recognition*, the targeted other responds favorably or unfavorably to the attention-seeking requests of the other. These responses from the target let the other know whether or not they are welcomed to approach, or whether or not the communication is welcomed. This decision process is driven largely by nonverbal feedback because, given the increased proximity between many flirting partners at this stage, verbal permission is less likely to occur. Because of cultural

scripts, men are often in the position of awaiting positive solicitation acceptance from a female and thus, much research has examined the ways in which women achieve such solicitation.

Extensive work by Moore (1985, 1995; Moore and Butler 1989) indicates that women employ room-encompassing glances, playing with and/or flipping their hair, smiling, as well as laughing. Moore's work points to a strong correlation between the display of such nonverbal solicitation techniques and a male's likelihood to approach. The likelihood of a male approach can be problematic, however, as men tend to overestimate the flirtatiousness of women's behavior generally, leading to unwanted approaches (Abbey 1982). Although work focusing on men's nonverbal behavior in this stage is scant, it largely points to a man's role of interpreting the intensity of a woman's nonverbal solicitation behaviors and matching it. For example, a man should appear to be as unthreatening as possible if he detects nervousness in the woman; this can be achieved through lowering the shoulders, making appeasing gestures, and tilting the head (Givens 2005).

4.2.3 Interaction and sexual arousal

Interaction and *sexual arousal*, the third and fourth stages, respectively, both center on signaling to others that the two interactants are, at least temporarily, a "couple." This is achieved through various forms of nonverbal behavior including increased touch between the partners ranging from the small of the back to the forearms, the thigh and legs, and to a lesser extent the face and neck; softer, warmer vocalic tones, which may verge on whispers; decreased proximity so as to better facilitate the haptic and vocalic behaviors mentioned above; and particularly in the sexual arousal phase, more skin is revealed through the shifting of clothing (Cunningham and Barbee 2008).

4.2.4 Resolution

The final stage, *resolution*, is characterized by Givens (1978) as sexual interaction in the form of intercourse. Many scholars regard sexual contact to be an important part of intimacy in romantic relationships (Prager 1995; Prager, 2002). Indeed, when people are asked what intimacy means to them, they often mention sexual activity as a special form of intimacy (e.g., Helgeson et al. 1987). Prager (1995) argued that sexual activity allows romantic partners to "share personal, private aspects of the self that are not known to other kinds of intimate partners, such as family members and close friends" (p. 82).

While the exact moments when these stages of courtship begin and end are not concretized, they do generally follow in the aforementioned order. The courtship process, however, is characterized less by the stages and more by the actions and behaviors enacted within this larger dance. The moves within the courtship dance are primarily nonverbal in nature (Moore 2010; Noller 2006).

4.3 Flirtation as relational maintenance

Although many scholars have situated flirtation within the courtship process, flirting can occur across all stages of a romantic relationship. Henningsen's (2004) research on motivations for flirting identified, among others, a *relational* motivation, wherein flirting is used to intensify an existing relationship or promote its development. The relational motivation was the most often cited, leading Henningsen to conclude that flirtation is more than simply the signaling of sexual interest. This is not an isolated finding. Tolhuizen (1989) came to a similar conclusion after investigating the various ways people intensify relationships; courtship signals (i.e., flirting) was one of the most-often reported among the participants. Tolhuizen, unlike Henningsen (2004), asked participants to identify *how* they would utilize various nonverbal courtship signals to intensify their relationship. Participants reported employing "more casual touching" with their partners as well as increasing physical distance and "playing hard to get" (p. 421). Participants noted that these last two tactics were often performed with the hope that the partner would "get the message" and pursue the relationship further.

The use of flirtation as a relational maintenance strategy is not limited to dating dyads. More established couples, such as those who are married, also employ these strategies. Consistent with the literature on relational maintenance (e.g., Stafford and Canary 1991; Stafford, Dainton, and Hass 2000), research by Frisby (2009) revealed that married couples use flirting to assure their partner about their feelings, communicate positivity, and manage conflict more effectively. Flirting assured spouses of a continued felt attraction for one another, with many reporting that the flirting affirmed that they want to be with one another for more than the legal bind between them. In the maintenance literature, positivity refers to being cheerful and optimistic, as well as making one's partner feel good (Stafford and Canary 1991). Similarly, flirting can involve positivity behavior such as being expressive and complimentary. In Frisby's study, flirting made spouses feel good about themselves. Finally, many couples mentioned flirting as an effective way to end a conflict, cool a heated conversation, or help the couple refocus on a larger issue.

Givens (2005) also mentioned the powerful role that flirtatious cues play in relational maintenance. Established couples who engage in "nonsexual touching" (p. 215) such as hand-holding and hugging stimulate feelings of attachment and intimacy. Furthermore, Givens noted that couples can employ warm or seductive tones which are likely to be reciprocated because of the tendency for couples to match vocal qualities such as pitch. This tendency, which is discussed in *communication accommodation theory* (see Giles et al. 1987; Shepard, Giles, and Le Poire 2001), builds mutual trust, intimacy, and affection between relational partners (Gregory and Webster 1996; Gregory, Dagan, and Webster 1997). The importance of flirting within a marriage should not be overlooked, and is summarized by one of

Frisby's (2009: 58) interviewed husbands, who quipped: "Without flirting, I guess it wouldn't be a marriage, there wouldn't be that closeness, you know? A missing connection."

5 Conclusion

Whether two people are spouses, dating partners, friends, or relatives, nonverbal behavior is a critical ingredient in the recipe for a close and happy relationship. Intimacy is created and sustained through interaction that includes a variety of nonverbal behaviors. This chapter has focused on research related to three types of global behavior that fall under the intimacy umbrella: affectionate communication, positive involvement behavior, and flirtatious behavior.

Although some of the specific behaviors that fall under these three types of global behavior are similar, there are also some distinct differences. Idiomatic expressions and supportive behaviors are considered to be forms of affectionate communication under some circumstances, but they do not qualify as positive involvement behaviors. Positive involvement behavior includes a myriad of specific cues, such as direct body orientation, smiling, vocal animation, and forward lean, all of which focus on approaching and sustaining interaction with others through increased sensory stimulation and decreased psychological and physical distance. Some flirtatious behaviors, such as forward lean and close distancing, overlap with positive involvement, but flirtatious behavior is distinct because it is often ambiguous. Coy smiles, shy glances, raised eyebrows, head tilts, hair tosses, lip puckering, self-touch, and preening are all distinctly flirtatious behaviors that help people develop and maintain a type of romantic and/or sexual intimacy that is unique to certain types of relationships. In contrast, most of the behaviors discussed as examples of affectionate communication and positive involvement are used in a variety of intimate relationships, including friendships and family relationships. Similarly, sexual touch is reserved for relationships characterized by romantic and/or sexual intimacy, whereas touch to vulnerable (but not sexual) parts of the body, such as the face and waist, communicates intimacy in various types of close relationships.

Of course, intimacy is not created by one person alone. Research on patterns of reciprocity and compensation, as well as work on flirtation sequences during courtship, has helped scholars understand the dyadic nature of intimate interaction. People notice and sometimes monitor the level of intimacy in a given interaction. When the intimacy level is deemed too low, people make adjustments to try to increase intimacy to a more desired and comfortable level. Similarly, if the intimacy level is perceived to be too high, people are likely to compensate by decreasing their use of positive involvement cues. In the case of courtship, people use ambiguous cues as a way of saving face if their advances are rejected. Future

research will undoubtedly continue to unravel the mysteries of intimacy, including how patterns of nonverbal behavior unfold over time to help partners develop, intensify, and maintain personal relationships.

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20 Power, dominance, and persuasion

Abstract: The goal of this chapter is to bring together several strands of research that focus on the role of nonverbal behavior in ‘verticality’, namely power, dominance, and persuasion. After having clarified the terminology, we provide an overview of research findings pertaining to the expression and perception of verticality, using the Brunswikian lens model as an organizing theoretical framework. As we point out, research notably shows that the number of nonverbal cues used by perceivers to infer verticality clearly exceeds the number of nonverbal behaviors related to actual differences of power or dominance. However, even if perceivers use more nonverbal cues than those actually related to verticality, their perceptions can still be accurate. In the second part of the chapter, we refine the analysis by including moderating effects of individual characteristics such as gender, personality, and cultural background on the expression and perception of power, dominance, and persuasion. In closing the chapter, we synthesize the main findings and point out the need for the field to go beyond cross-sectional designs and to test more systematically for causal influences in future studies.

Keywords: power, dominance, persuasion, verticality, social influence, control, nonverbal behavior, gender, personality, cultural background

“When two persons interact, they continually negotiate two major relationship issues: how friendly or hostile they will be with each other, and how much in charge or control each will be during their transactions” (Kiesler and Auerbach 2003: 1712). Social interactions can be mapped onto two main dimensions that are perpendicular to each other: the *affiliation* dimension – also called the horizontal dimension (Hall, Coats, and Smith LeBeau 2005), which is characterized by friendliness and warmth on the one end of the dimension and by hostility and aggression on the other end; and the *control* dimension – also called the vertical dimension – which relates to differences in power, dominance, and influence among two or more social interaction partners (Kiesler and Auerbach 2003; Moskowitz 1993; Tiedens and Jimenez 2003; Wiggins 1979).

The vertical dimension of social interactions is present in nearly every social context. We live in a hierarchically organized society in which a member of the parliament is considered a higher status person than a janitor. We are confronted with hierarchies at our workplace when interacting with superiors, peers, and subordinates. Even among friends and family members the power dimension often plays a role. Not all hierarchies are explicit such as they appear in a company’s

organizational chart. Many hierarchies are more subtle, for instance as when an individual succeeds in convincing his or her group of friends to go watch a particular movie.

The vertical or hierarchy dimension affects how we relate to others and it thus greatly impacts on real world outcomes. As an example, the status difference between an airplane captain and the other cockpit members (first officers and flight engineers) can entail ineffective communication leading to human error and ultimately to catastrophe. When an airplane crashes because the higher power position of the captain does not encourage the crew members to voice their concerns or observations about flight irregularities, the hierarchical relationship can contribute to disaster.

To maximize effective communication among members possessing different levels of power or status, not only the verbal content of a message is important but also the way the information is conveyed nonverbally. In the present chapter, we will focus on how the vertical dimension is linked to nonverbal behavior. We will review the expressed nonverbal behavior of people who differ on the vertical dimension and the perception of verticality based on the observation of people's nonverbal behavior. We will also discuss whether people are accurate in judging others' power and dominance. We will present the nonverbal behaviors that are associated with persuasion and we will talk about how nonverbal dominance affects interpersonal relationships and interactions. Finally, we will review individual characteristics that have been shown to moderate the expression or perception of power and dominance.

1 Definition of the terms used to describe the vertical dimension

We focus on the interpersonal or dyadic aspect of the vertical dimension (verticality), by which we mean interpersonal differences in *power* and *dominance* and their manifestations among two or more social interaction partners (Schmid Mast 2010). We will use *power* as an umbrella term encompassing structural power (see below), status, leadership, and authority, and define it as the extent to which an individual exerts control or influence over another person (Schmid Mast, Jonas, and Hall 2009). We will use *dominance* as a term describing the behavior of someone who has power or who seeks power (Schmid Mast 2010).

Although individual terms are used inconsistently in the literature, some uses are more common than others in a given context. As an example, to describe the power an individual has because he or she possesses a certain function or position within a hierarchy (e.g., first officer), the term power or *structural power* is commonly used (Ellyson and Dovidio 1985). The power an individual possesses because of being a member of a specific social group is usually called *social power* or *status*

(Pratto et al. 1994; Sidanius et al. 2004). As an example of the latter, women generally possess less status than men. Status is also used sometimes to describe an individual's earned respect within a group.

Dominance – which describes the behavior of someone who has power or who seeks power (Schmid Mast 2010) – can be specific to a situation or can be an enduring characteristic of the person. In the latter case, one usually uses the term *personality dominance* (Ellyson and Dovidio 1985). We apply the term dominance behavior to any behavior *aiming at* gaining or maintaining influence over others. Note, however, that some authors (e.g., Burgoon, Buller, and Woodall 1996) reserve the term dominance behavior for behavior associated with *success* in establishing control or influence over others. Moreover, there are a number of behaviors that are generally understood as dominance behaviors such as extended amounts of speaking time in social interactions (Schmid Mast 2002) or interruptions (Ferguson 1977; Goldberg 1990) because they are either more likely to be expressed by high ranking individuals or because people generally consider them as indicative of high status or dominant individuals.

We use the term *persuasion* to describe a process by which a person exerts control or influence over another by means of communication (O'Keefe 2002). The term persuasive communication refers to a process by which someone succeeds in or *aims at* altering another person's attitudes or behaviors. Persuasive communication can be seen as a form of power (when successful, i.e., when resulting in persuasion), or as a form of dominance (when persuasion is only intended but not, or not yet, achieved).

2 Verticality and nonverbal behavior

The Brunswikian lens model (Brunswik 1956) is a useful framework to discuss how the vertical dimension is expressed in nonverbal behavior and how different nonverbal behaviors are perceived to be related to verticality. In the lens model, there are two perspectives, the one of the target who possesses some sort of actual power or dominance (i.e., structural power, status, personality dominance) and the one of the perceiver who observes the nonverbal behavior of the target and interprets it with respect to actual power and dominance.

As an example, individuals who differ in organizational status participate in a business meeting and show differences in nonverbal behavior. The high status person might take much of the speaking time and he or she might approach others more closely. This describes the link between a person's actual power and his or her nonverbal behavior, reviewed in more detail in the section *The expression of verticality*. If a new employee joins the meeting without prior knowledge of the organizational status of each person, the new employee typically observes the nonverbal behavior of each of the people present in the meeting and tries to infer the

relative status of each person. This relation will be reviewed in the section on *The perception of verticality*. Whether or not such inferences are accurate is a different question altogether. To illustrate, if the new employee observes that one person in the meeting talks much more than all the others and that this person is also looked at by the others for extended periods of time, the new employee might infer that the observed person is the superior of the others. If the observed person really is the superior of the others, the employee's assessment corresponds to this fact and is thus accurate. Accuracy will be discussed in the section on *Accuracy and verticality*.

2.1 The expression of verticality

How do people who are high on the vertical dimension – e.g., because they occupy a high status position or because they possess a dominant personality – use non-verbal behaviors? A meta-analysis (Hall, Coats, and Smith LeBeau 2005) summarized studies linking nonverbal behavior to different definitions of verticality: structural power (e.g., rank in an organization), socio-economic status, assigned status (e.g., in a laboratory experiment), or personality dominance. This meta-analysis showed that high power individuals (or more precisely: those high in verticality of any type), compared to low power ones, have more open body positions (arms and legs), maintain closer interpersonal distance (when sitting or standing next to someone), speak more loudly, and interrupt others more often. Noteworthy, *no* differences in smiling and in the amount of gazing between high and low power individuals emerged. There is no evidence either that high and low power individuals differ with respect to the following nonverbal behaviors: raised/lowered eyebrows, nodding, self-touch, hand and arm gestures, postural relaxation, overlaps, pausing and latency to speak, back-channel responses, laughter, speech errors, and rate of speech.

Several studies show that high power individuals are more likely than low power individuals to stare directly and unwaveringly at others and that they usually break eye contact last (Burgoon et al. 1996). High power individuals show more *visual dominance* (Exline, Ellyson, and Long 1975), which is the ratio of the percentage of looking while speaking to the percentage of looking while listening. In other words, when speaking, high power individuals look at the interaction partner a higher percentage of the time and when they listen to the low power interaction partner, they tend to look away a higher percentage of the time. High power individuals are less likely than their counterparts to initiate formal touches (like handshaking), but they are more likely to initiate informal touch (like touching the other's arm or shoulder) (Hall 1996). People high in personality dominance perform less object manipulation than people low in personality dominance (Gifford 1994), maybe because they are more relaxed and less anxious. Finally, a meta-

analysis showed that high power individuals talk more in interactions than do low power individuals (Schmid Mast 2002).

It has to be noted that verticality can take on many different forms (e.g., being a superior, a teacher, a politician, having a dominant personality, influencing one's friends) which do not all have to be related to a specific nonverbal behavior in the same way. As an example, the operationalization of verticality is a moderator of the association between power and voice loudness in the above-mentioned meta-analysis: People high in personality dominance speak more loudly than people low in personality dominance, but white collar workers, although higher in verticality than blue collar workers, speak more softly than the latter.

Also, verticality can be associated with many different proximal states (e.g., social motives and emotional states), which in turn typically influence nonverbal behavior. In other words, predictions about the verticality-nonverbal behavior link may not be very informative for specific interactions (Hall et al. 2005). To illustrate, people in high power positions may experience positive emotions (proximal state) more than people in low power positions because powerful people usually are admired and praised more than are powerless people. So, if high power individuals approach others more closely than low power individuals do, it is possible that they do this because of their positive affect rather than because of their high power. Future research will face the difficult challenge of testing if power still has predictive validity with respect to a person's nonverbal behavior when proximal states are controlled for.

2.2 The perception of verticality

There is a striking contrast between the nonverbal cues that characterize people with actual high power and high dominance, and the nonverbal cues people use to infer the power and dominance in others. While only a very limited number of nonverbal behaviors are indicative of actual power and dominance (Hall, Coats, and Smith LeBeau 2005), many more cues are used by perceivers to infer them. We will now review those nonverbal cues related to *perceived* power or dominance.

Different research paradigms have been used by researchers to study perceivers' perception of a target's power or dominance: schematic faces, photographs of facial cues (e.g., smiling versus non-smiling, direct vs. averted gaze), photographs of naturalistic interactions, video clips of interactions, or face-to-face interactions. Hall, Coats, and Smith LeBeau's (2005) meta-analysis revealed that many nonverbal behaviors were perceived as indicators of power or dominance: looking at the other more, being more facially expressive, smiling less, lowering the eyebrows more, nodding more, touching the other more, less self-touch (e.g., touching one's nose, lips, other hand, or face less often), making more hand and arm gestures, shifting one's position more frequently, showing less bodily relaxation (e.g., having

an upright position), and standing closer to the other. Voice related cues were also important: speaking more loudly, varying one's tone of voice more, speaking in a lower voice (independently of gender), speaking faster but with a more relaxed tone of voice (although there were cultural differences), interrupting the other more, pausing less and hesitating less, making fewer speech errors and fewer filled pauses (e.g., "uh"), laughing more often, and interrupting the other more.

The visual dominance ratio – i.e., looking relatively more while speaking than while listening (Exline et al. 1975) – has also been related to perceived dominance. It has been shown that the more a person watches an interaction partner he or she talks to, the more powerful this person is perceived, and that the more a person watches his or her interaction partner when listening to the interaction partner, the *less* powerful this person is perceived (Dovidio and Ellyson 1982).

According to the authors of the above-cited meta-analysis (Hall et al. 2005), stereotypes may explain why there are many fewer behaviors actually related to verticality than behaviors that are perceived as indicators of verticality. Indeed, when trying to infer a person's power or dominance, people use nonverbal cues they stereotypically associate with power and dominance. That people have clear beliefs about the nonverbal expression of verticality has been documented in the literature (Carney, Hall, and Smith LeBeau 2005). People believe that high power individuals, as compared to low power ones, look at others more and engage in more visual dominance (i.e., looking while speaking but not while listening), touch others more and "invade" their space more often, touch themselves less (e.g., arms, chin), are more expressive and expansive, have more erect postures and do more forward lean. People also expect differences in emotional displays between high and low power individuals: They think that high power individuals show anger and disgust more often than low power individuals, and that high power individuals show fear and sadness less often (Carney, Hall, and Smith LeBeau 2005). These explicit beliefs are very similar to the behaviors that people perceive as dominant or as indicative of power. People thus seem fairly conscious about the behaviors on which they rely when forming an impression about a person's power or dominance.

2.3 Accuracy and verticality

Since there is a discrepancy between the nonverbal behavior associated with verticality and the nonverbal behaviors perceived as signs of verticality, one might ask whether perceivers are accurate in judging signs of power in others. The answer is yes and research shows that people are able to correctly detect who is the superior and who is the subordinate in photographs (Barnes and Sternberg 1989). Also, the status of university employees can be assessed accurately based on photographs of two employees of differing status interacting (Schmid Mast and Hall 2004). Similarly, observers are above chance level when inferring the socio-economic status of individuals on the basis of 1 min video excerpts (Kraus and Keltner 2009).

Personality dominance seems to be perceived relatively accurately as well. People are able to accurately detect an expresser's assertiveness based on 1 min video-taped interaction excerpts (Schmid Mast et al. 2003). Similarly, a study using the Social Dominance Orientation (SDO) Scale (Pratto et al. 1994), which measures the extent to which an individual prefers social groups to differ in status and thus endorses a social hierarchy, shows that people are generally able to accurately detect the level of a target's SDO from a 30 sec silent video excerpt, especially when the targets are men (Yeagley, Morling, and Nelson 2006).

Research on actual and perceived power shows that even when people use non-diagnostic cues (i.e., cues that are not related to *actual* differences along the vertical dimension) to infer power in others (Hall, Coats, and Smith LeBeau 2005), yet their inferences can still be correct (e.g., Barnes and Sternberg 1989; Schmid Mast and Hall 2004). One reason for this apparent paradox may be that perceivers use different or additional nonverbal cues that are indicative of actual power to infer power but that the researchers did not assess those cues. Any given study necessarily measures a limited number of nonverbal behaviors, while the list of behaviors potentially related to power is endless. Relevant cues may thus not have been assessed by the researchers although they are available to perceivers for their inferences.

Alternatively, observers might use a more Gestalt-like impression to assess a target's power which could be a complex combination of different nonverbal cues (i.e., behavioral composites). Research linking verticality to nonverbal behavior has generally studied single nonverbal cues separately. However, some cues may show no relation to power when studied in isolation, but may reveal an influence if studied together. Such simultaneous behaviors or patterns of cues are called "behavioral composites" (Hall, Coats, and Smith LeBeau 2005; Knapp and Hall 2010; Richmond and McCroskey 1987). It has been shown, for instance, that the behavioral composite of eye contact, smiling, vocal expressiveness, hand gestures, bodily relaxation, direct orientation, and close physical distance is related to actual assertiveness, while these behaviors are not related, or not as strongly, to assertiveness when considered individually (Prisbell 1985). In a similar way, the behavioral composite of touching, pointing at the other, invading space, and standing over the other has been related to perceived dominance, while these behaviors are not as strongly related to perceived dominance when considered individually (Henley and Harmon 1985). Not many studies have examined behavioral composites to date, which might be considered as a shortcoming of existing research.

However, Hall, Coats, and Smith LeBeau's (2005) meta-analysis showed that the correlation between perceived and actual effect sizes regarding the link between verticality and nonverbal behavior were fairly substantial across cues. Perceived verticality revealed bigger magnitudes, which might be because stereotypes regarding the links between verticality and nonverbal behavior are stronger than reality, but the pattern of magnitudes across cues suggests sensitivity in the

perceivers (i.e., good match between perceptions and actuality in the correlation sense). In other words, it seems that perceivers have a rather good sense of the pattern between verticality and nonverbal behavior, although they exaggerate its magnitude.

Regarding the link between power and nonverbal accuracy, an additional question can be asked: Is it the high or the low power individuals who are more nonverbally accurate? On one hand, low power people might be more interpersonally accurate than high power people because the former are more motivated to correctly read the nonverbal signs of their superior (e.g., in order to detect signs of approval or disapproval) (Fiske and Dépret 1996; Goodwin et al. 2000). On the other hand, for successful leadership, it seems important to allocate the right task to the right person at the right time, and, to do so, a superior can profit from being able to correctly read the (nonverbal) signs of his or her subordinates. Research shows that effective leadership is positively related to individual consideration (Bass et al. 2003) and emotional intelligence (Caruso and Salovey 2004), both related to sensitivity to the nonverbal cues emitted by others. Moreover, there is accumulating evidence that high power people are more accurate at detecting others' emotions and thoughts than low power people are (Schmid Mast, Jonas, and Hall 2009).

3 Nonverbal behavior and persuasion

Persuasion as communication through which a person exerts control or influence over another is an important means to create and maintain verticality. As an example, a politician generally needs persuasive communication to convince his or her voters to reelect him or her. We will focus here on the nonverbal correlates of persuasive communication.

It seems that for persuasion, nonverbal communication has less impact than verbal communication (Burgoon 1985; Burgoon, Birk, and Pfau 1990; Petty and Cacioppo 1986; Schmid Mast 2010). Nevertheless, research shows that the verbal content of a speech is not the only contributing factor to the persuasiveness of a speaker. Nonverbal behavior of the speaker also plays an important role. According to the Elaboration Likelihood Model of Persuasion (ELM) (Petty and Cacioppo 1986), the lower the motivation to consciously process information (e.g., because of small stakes or low interest) or the lower the cognitive resources of the perceiver (e.g., because of little knowledge or intelligence), the more important the speaker's nonverbal behavior becomes in the persuasive process. The person using persuasive communication is called the speaker or the source. Research demonstrates that the nonverbal behavior of the source affects how credible the source is perceived, which in turn affects how persuasive the message is (Burgoon et al. 1990). As an example, speech rate of the source has shown to affect a message's effective-

ness in terms of persuasion: Faster speech rate increases the credibility, perceived expertise, and confidence in the source, which augment a message's effectiveness, thus persuasion (Brown 1980).

Research investigating the effect of nonverbal behavior on persuasion has shown that people who are more persuasive make longer eye contact (Burgoon, Birk, and Pfau 1990; LaCrosse 1975; Maslow, Yoselson, and London 1971; McGovern 1977; Mehrabian and Williams 1969; Timney and London 1973; Young and Beier 1977), smile more (Burgoon, Birk, and Pfau 1990), are more facially expressive (Burgoon, Birk, and Pfau 1990; Edinger and Patterson 1983; Forbes and Jackson 1980; Mehrabian and Williams 1969), make more affirmative head nods (Mehrabian and Williams 1969), gesture more (Edinger and Patterson 1983; Forbes and Jackson 1980; Mehrabian and Williams 1969), use fewer adaptor behaviors (e.g., scratching, rubbing one's hands) (Mehrabian and Williams 1969), more object-adaptors (e.g., playing with a pen) (Burgoon, Birk, and Pfau 1990), lean backwards less, stay closer to their interaction partner, are moderately relaxed (Mehrabian and Williams 1969), have less postural rigidity (Maslow et al. 1971), and perform more random body movements (Burgoon, Birk, and Pfau 1990; Young and Beier 1977).

People who are more persuasive also touch others more. Many studies show that touch (most commonly operationalized through a brief touch on the other's hand, arm, or shoulder) positively influences the probability for the recipients to comply with a request or to follow advice given by the person who touches them (Hertenstein 2011). For instance, it has been shown that people who are touched by a confederate while being asked to sign a petition sign more often than people who are not touched (Willis and Hamm 1980). Also, restaurant clients who are touched by the waiter follow more often the waiter's suggestion than clients who are not (Guéguen, Jacob, and Boulbry 2007). In the same vein, patients who are touched by their physicians follow the physician's recommendations regarding the medication more than patients who are not (Guéguen, Meneiri, and Charles-Sire 2010).

Vocal and paralinguistic characteristics are also associated with persuasion: People who are more persuasive answer more quickly, make less pauses, their speech is more fluent (Burgoon, Birk, and Pfau 1990; Erickson et al. 1978; Hollandsworth et al. 1979), and they speak at a faster rate (Apple, Streeter, and Krauss 1979; Mehrabian and Williams 1969; Miller et al. 1976). Interestingly, a highly dominant nonverbal behavior (operationalized by the authors as loud voice, angry tone, pointing at the other, constant eye contact, and stern facial expression) seem to reduce a communicator's ability to persuade to the same extent as a submissive nonverbal behavior (operationalized as a soft, pleading voice with many hesitations and stumbles, slumped posture, nervous hand gestures, and averted gaze) does. This is in comparison with a more moderate form of dominance (operationalized as moderate voice volume, firm tone of voice, few hesitations, rapid rate of speech, upright posture, calm hand gestures, and a moderately high amount of

eye contact) (Carli, LaFleur, and Lowber 1995). In other words, too much or too little dominance may be equally detrimental to a communicator's persuasiveness.

Associations between specific nonverbal behavior cues and persuasion are sometimes difficult to interpret. For instance, why do affirmative head nods relate to persuasion? To understand some associations, it is necessary to know intermediate perceptions, i.e., how specific behaviors relate to certain perceptions, and how these perceptions then lead to persuasion. These intermediate perceptions are called "proximal percepts" by some authors (e.g., Burgoon, Birk, and Pfau 1990). Burgoon, Birk, and Pfau (1990) demonstrated that persuasion is associated with the proximal percepts of the speaker's competence, sociability, character (perceived honesty and caring), composure (calm), and dynamism, which were measured with the scale of McCroskey, Holdridge, and Toomb (1974). Perceived competence was positively influenced by speech fluency, by pitch variety, by smiling/facial pleasantness, and by facial expressiveness. Perceived sociability was positively influenced by speech fluency, pitch variety, eye contact, smiling/facial pleasantness, facial expressiveness, illustrator gestures, body tension, and random trunk and limb movement. Perceived character (honesty and caring) was positively influenced by vocalic pleasantness cues (voice quality), eye contact, smiling, and facial expressiveness. Perceived composure was positively influenced by speech fluency and smiling. Perceived dynamism was not influenced by any of the investigated behaviors.

Note, however, that – with the exception of studies on touch – most of the existing research in this field uses a correlational approach, which does not allow for causal inferences and implies the risk of confounds. Does looking at the interaction partner have a direct influence on one's persuasiveness or is it the case, for instance, that people who are more persuasive are generally more self-confident and therefore look at others more easily? Future research will have to use experimental designs and manipulate the source's nonverbal behavior in order to answer this question. Furthermore, potential interaction effects between the verbal and the nonverbal content on a speaker's persuasiveness have generally been neglected.

Research on persuasion nevertheless shows that nonverbal behavior can affect persuasion. Although the effects of nonverbal behavior on persuasion are most likely not direct (they depend on proximal percepts), they affect the outcome of a social interaction in that a change of a person's attitudes or beliefs is entailed. A nonverbal behavior that is linked to persuasion can be seen as a dominance behavior (because it aims at influencing a person's internal states). In this sense, the attitude change as a result of persuasive nonverbal communication can be seen as an outcome of nonverbal dominance. Besides attitude change, there are other outcomes of nonverbal dominance; we will review some of them now.

4 Nonverbal dominance and social interaction outcomes

We have previously seen that there is a long list of nonverbal behaviors observers use to infer the power of their social interaction partners. We could therefore call these behaviors nonverbal dominance behaviors because they evoke the perception of dominance in the observer. When confronted with an individual who displays nonverbal dominance, many different aspects of the outcome of this social interaction can be affected. The extent to which a social interaction partner shows nonverbal dominance will affect how much we like him or her and how we evaluate him or her, among other aspects. We cannot provide a comprehensive literature review of outcome effects of nonverbal dominance but we will provide some illustrative examples.

Research on perceived attractiveness has shown that the expression of nonverbal dominance (operationalized by the researchers through a relaxed, asymmetrical posture, backward leaning, high rate of gesturing, low rates of head nodding) increased the perceived attractiveness of men but that it had no influence on the perceived attractiveness of women (Sadalla, Kenrick, and Vershure 1987) (note that postural relaxation has not emerged as an expression of dominance in the meta-analysis of Hall, Coats, and Smith LeBeau 2005). Nevertheless, depending on how nonverbal dominance is operationalized, it can also have negative implications for romantic relationships. Nonverbal dominance expressed through negative and intrusive touch of the partner and not allowing the partner to touch or sort cards in a task was related to poorer romantic relationship quality (defined as the presence of partner aggression and verbal argument) (Ostrov and Collins 2007).

Liking of an interaction partner depends on the complementarity between the interaction partners' respective dominance behavior: In a study where nonverbal dominance was manipulated by posture (i.e. postural expansion for high dominance and postural constriction for low dominance), participants who displayed complementarity in nonverbal behavior (i.e., a high dominant individual facing a low dominant individual) liked each other more than individuals who were constrained to mimic each other's nonverbal behavior (i.e., individuals who were both high dominant or both low dominant) (Tiedens and Fragale 2003).

Nonverbal dominance not only affects the way we relate to others (romantic interest, relationship quality, and liking) but also how we evaluate them. As an example, nonverbal dominance (loud and angry voice, knitted brows, glaring stare, muscle tension, and pointing gestures) in leaders, as compared to a more neutral behavior (well moderated tone of voice, moderate eye contact, relaxed facial expressions, and normal upright posture) led to lower evaluations of competence and leadership (Driskell and Salas 2005).

In the field of physician-patient communication, physician nonverbal dominance (e.g., talking more, adopting a dominant tone of voice) has been related to

lower patient satisfaction (Bertakis, Roter, and Putnam 1991; Burgoon et al. 1987; Hall et al. 1994), and especially when nonverbal dominance is expressed by female physicians (Schmid Mast, Hall, and Roter 2008). However, patients tolerate more physician dominance when the physician-patient relationship is good (Kaplan, Greenfield, and Ware 1989; Kiesler and Auerbach 2003).

These examples show that nonverbal dominance can have both positive and negative effects on social interaction outcomes. It has to be noted, however, that the operationalization of nonverbal dominance varies importantly from one study to another in terms of which nonverbal behaviors are investigated and in terms of how intensely the nonverbal behavior is expressed. Moreover, the effects of nonverbal dominance on social interaction outcomes might not be linear. Maybe a nonverbal behavior that is *moderately* dominant (e.g., a superior who behaves in a self-assured way) produces better effects than a nonverbal behavior that is either very low or very high in dominance (e.g., a superior who is either very submissive or very authoritarian).

5 Individual characteristics related to verticality

Although research has identified many nonverbal behaviors that are related to power, dominance, and persuasion, individual characteristics clearly affect the expression and perception of verticality. In this section, we will review the role of gender, personality, and cultural background. One needs to keep in mind that there are other individual characteristics that can affect the verticality-nonverbal behavior link and that individual characteristics are not the only moderators between nonverbal behavior and verticality. For instance, nonverbal dominance of the interaction partner affects an individual's own dominance reactions. Two individuals interacting with each other generally achieve contrast in their dominance behaviors: If A behaves in a high dominant way, B is likely to behave in a less dominant way (Sadler et al. 2009; Schmid Mast, Hall, and Roter 2008; Tiedens and Fragale 2003). Interactional and situational characteristics must be taken into account as well when studying expressed and perceived verticality.

5.1 Gender

Research shows that men endorse hierarchies more than women do (Pratto, Stallworth, and Sidanius 1997; Schmid Mast 2005). In interactions, men behave more dominantly than women, are more competitive, are more motivated to become leaders, and actually emerge more often as leaders (Eagly et al. 1994; Golub and Maxwell Canty 1982; Hegelstrom and Griffith 1992; Megargee 1969). Male leaders also behave more dominantly than female leaders (Eagly and Johnson 1990) and

men use more direct techniques of influence than women (Bjorkqvist, Lagerspetz, and Kaukiainen 1992). Research in the field of social influence also shows that men are more influential than women (e.g., on the decisions taken in groups after verbal persuasion attempts), even if there are many moderators of this influence (Carli 2001).

According to certain authors (e.g. Henley 1977), existing gender differences in nonverbal behavior are explained by gender differences in power. However, research in the field of nonverbal behavior does not fully support the idea that men behave more dominantly than women. Although some nonverbal behaviors related to actual power are shown more often by men than by women (men use more expansive body positions, they speak in a louder voice, they speak more, and they interrupt others more frequently) (Hall 2006), there are a number of nonverbal behaviors related to actual power that are shown more often by women than by men. For instance, women have more expressive faces and stand at closer interpersonal distances (Hall 2006), both behaviors generally expressed more by high as compared to low power individuals. It seems that the relation between power, gender, and nonverbal behavior is more complex and merits closer inspection (see also Chapter 21, Hall and Gunnery, this volume).

An explanation for the fact that gender differences in nonverbal behavior do not simply reflect power differences is that women and men might use different nonverbal behaviors to express their power or dominance and that one and the same nonverbal behavior is used by women and men to express different things. For instance, certain nonverbal behaviors may be used to express dominance in men but not in women. Expressivity might be used to convey involvement in women whereas men might use it to convey dominance. Or, close interpersonal distance might be used to express affection in women and to express dominance in men.

Also on the level of perceived dominance, gender plays a role. Men are *perceived* as more dominant than women (Schmid Mast 2004), and people seem to pay more attention to signs of dominance in men than in women (Maner, DeWall, and Gailliot 2008). More importantly, gender of the target moderates whether and to what extent certain nonverbal behaviors are perceived as dominant. As an example, people attribute different levels of dominance to facial emotion displays (i.e., expressions of happiness, anger, disgust, sadness, and fear shown in photographs) depending on the gender of the actor (Hess, Blairy, and Kleck 2000), which may be due to gender-specific expectations regarding the expression of emotions and/or dominance. In the same vein, research in the field of physician-patient communication suggests that the same behaviors (e.g., speaking much, speaking in a loud voice, frowning, little gazing at the patient, or little smiling) are more strongly perceived as dominant when expressed by a female rather than by a male physician (Schmid Mast et al. 2011).

Furthermore, people sometimes use different and sometimes opposite behaviors to infer power or dominance of men and women. For instance, perceivers rely

more on downward head tilt and lowered eyebrows when assessing the status of women than when assessing the status of men (Schmid Mast and Hall 2004). Crossed arms, frowning, and fidgeting are perceived as indicators of low assertiveness when expressed by men, while they are perceived as indicators of high assertiveness when expressed by women (Schmid Mast et al. 2003). This suggests that the meaning attributed to nonverbal cues may depend on the gender of the expresser. For instance, fidgeting may be perceived as a sign of social anxiety when expressed by men – and thus related to low status – while it may be perceived as a sign of energy and involvement when expressed by women – and thus related to high status.

Depending on the gender of the speaker, dominant verbal and nonverbal communication styles have different outcomes (Carli 2001). People tolerate dominance in women less than in men (Carli 2001), and a dominant communication style leads to more negative evaluations along several social dimensions when expressed by women rather than men (Keating 2004). For instance, women who exert more visual dominance are liked less than men who exert the same level of visual dominance, and visual dominance reduces women's influence on the audience while it increases men's influence (Copeland, Driskell, and Salas 1995).

Gender is thus not only a moderator of how verticality is expressed and perceived, but gender also affects how nonverbal dominance translates into interaction outcomes such as how persuasive a message from a woman or a man is.

5.2 Personality

People who occupy the same hierarchical position do not all behave in the same way and this is also true for nonverbal behavior. Personality dominance can affect to what extent a person expresses his or her power position. With respect to speaking time, a study showed that high power individuals talked for the same amount of time in a social interaction regardless of whether they were high or low in personality dominance, while low power individuals differed in their talk time depending on their personality dominance (Schmid Mast and Hall 2003): Individuals scoring high in personality dominance talked more (equally much as the high power individuals) than the low personality dominant individuals. Personality dominance also seem to interact with status and gender (three-way interaction) in predicting nonverbal behavior: For women in subordinate positions, those who are high in personality dominance smile less than those who are low in personality dominance, while no such effect can be seen in men (Schmid Mast and Hall 2004).

Moreover, personality dominance can be expressed in different ways. One distinction can be made between sociable and aggressive dominance. Sociable dominance is characterized by positive attitudes toward others, a central position in groups, a strong need to influence others, a high self-esteem, and an independent

and active attitude; aggressive dominance is characterized by negative attitudes toward others and by a strong motivation to realize one's aims, even at the expense of personal relationships (Kalma, Visser, and Peeters 1993). Sociable and aggressive dominance are related differently to nonverbal behavior: A higher score of sociable dominance is associated with longer speaking times, more looking at others while talking, a more frequent use of a 'prolonged gaze pattern' (i.e., maintaining eye contact with the other for some seconds after stopping talking to signal to others that it is their turn to talk), and more gesticulation; a higher score of aggressive dominance, on the other side, is associated with more looking around during discussions (e.g., at papers, or at another person than the one who is talking) and in particular with less looking while listening, with more raised eyebrows, and with more interruption of the other (Kalma, Visser, and Peeters 1993).

Personality dominance in perceivers is also a moderator of how a target's dominance is perceived. Depending on their personality, people vary in their perception of the same individuals (Kenny et al. 1992) and about 10% of the variance in the perception of a target's dominance ("agency") is attributable to the perceivers' idiosyncratic characteristics (Moskowitz and Zuroff 2005). Furthermore, people seem to pay attention to characteristics in others that are salient in their own personalities (Battistich 1980; Battistich and Aronoff 1985; Hirschberg and Jennings 1980). For instance, men (but not women) who strive for power and are high on personality dominance perceive more power-related thoughts and feelings in others than men who are aversive to power and low in personality dominance (Schmid Mast, Hall, and Ickes 2006). Also, with respect to attention to nonverbal behavior, research suggests that high dominant individuals tend to focus more than low dominant individuals on nonverbal dominance cues in others (Battistich and Aronoff 1985; Hirschberg and Jennings 1980).

Also in persuasion, individual differences of the receiver affect which nonverbal behavior is more effective for persuasion. Following a regulatory-fit theory approach, Cesario and Higgins (2008) showed that when the message source used an eager communication style (i.e., gestures with animated and broad opening movements, hand movements openly projecting outward, forward-leaning body positions, fast body movement, fast speech rate) or a vigilant communication style (i.e., gestures showing precision, slightly backward-leaning body positions, slower body movement, slower speech rate) – while holding the content of the message constant – persuasion depended on the promotion-focus (i.e., tendency to engage in tasks with eagerness) or prevention-focus (i.e., tendency to engage in tasks with cautiousness) of the recipient. Persuasion was more effective when there was fit, that is, when the promotion-focused perceivers watched the eager expresser and when the prevention-focused perceivers watched the vigilant expresser.

To conclude, depending on the interaction between personality dominance and power position, people express different types of nonverbal behavior and a perceiver's own personality dominance influences the way he or she perceives the

nonverbal behavior expressed by others and the way he or she is affected by persuasive communication.

5.3 Cultural background

It is interesting to ask if, and to what extent, the expression and perception of verticality are cultural. In a study conducted with German, American, and Arab samples (Bente et al. 2010), participants were asked to recognize the status (employee vs. supervisor) of individuals who interacted and who were of the same nationality as the participant. Status could only be recognized above chance-level in the German sample. In the American and Arab samples, the status could not be detected by the participants. In some cultures (e.g., German culture), power position by nonverbal behavior may thus be more clearly expressed and perceived than in others (e.g., American, Arab).

People's judgments of *dominance* seem partly universal and partly cultural. Caucasian and Chinese men and women looking at photographed faces of individuals from both cultures that varied in nonverbal behaviors (i.e., direct or averted gaze; up, straight, or down head position) perceived men of both cultures as more dominant than women, which suggests a universal effect of gender on perceived dominance. However, participants perceived the faces of their own cultural group as more dominant than the ones of the other cultural group, which also suggests a culture bias in dominance perception (Bridge et al. 2007).

Even if there might be some constants across cultures (e.g., men being perceived as more dominant than women), studies on cultural moderators of the link between verticality and nonverbal behavior indicate that culture has an influence on the way people express and perceive power positions based on nonverbal cues.

6 Conclusions

Research shows that differences in verticality correspond to differences in nonverbal behavior. People in higher power positions or with a more dominant personality have more open body positions, maintain closer interpersonal distance, are more facially expressive, speak more loudly, and interrupt others more often than people in lower power positions or with a less dominant personality. However, many other nonverbal cues (e.g., looking at others more, smiling less, lowering the eyebrows more) are used by perceivers to infer power and dominance from the behavior of an expresser, which corresponds to people's beliefs (stereotypes) about the associations between power/dominance and nonverbal behavior. Interestingly, even if perceivers use more nonverbal cues than those actually related to verticality, their perceptions can still be accurate.

Nonverbal dominance behavior not only affects dominance perception but also other outcomes of social interactions. As an example, complementarity in nonverbal dominance among social interaction partners makes for more mutual liking, nonverbally dominant men are more attractive romantic partners, and leaders who are too dominant are perceived as less competent. Nonverbal behavior linked to persuasion can also be regarded as nonverbal dominance. Individuals who make longer eye contact, smile more, and are more facially expressive are more persuasive. Nonverbal behaviors conveying competence, sociability, caring, honesty, composure, and dynamism seem to enhance a source's persuasiveness.

Individual characteristics – like gender, personality, and cultural background among others – moderate the expression and perception of power and dominance, as well as outcomes of social interactions. As such, they must be taken into account when trying to understand expressed and perceived verticality, as well as their influences on the interpersonal level.

7 Future directions

Research has tested an array of different nonverbal behaviors in relation to power and dominance, but these typically remain on a correlational and descriptive level. We lack an understanding of why certain behaviors relate to verticality and why others do not. For instance, why do people higher on the vertical dimension have more expressive faces? And why are people who gesture more perceived as more dominant? Studying mediators of the expression or perception of power and dominance are needed in order to understand why certain behaviors are used to convey or to infer power. Some suggestions come from the fields of ethology and evolutionary psychology. Burgoon and Dunbar (2006), for instance, suggest that dominance behavior in animals (and maybe in humans) aims at conveying a sense of physical potency that enables the more potent ones to exert control over the other individuals. This potency would be expressed (and perceived) through behaviors and physical characteristics that communicate dynamism and strength (e.g., erect posture, gestures, expressivity, or fast speech rate), threat (e.g., absence of smiling, lowered eyebrows), and/or maturity (e.g., height, mature face). Indeed, animals that have or seek power over others are more likely to be (and to be perceived as) strong rather than weak, dynamic rather than limp, to threaten their opponents in case of conflict rather than to submit, and to be mature rather than individuals at the early stage of their development (Burgoon and Dunbar, 2006). This could explain, to some extent, certain expressions and perceptions of power and dominance in human societies as well. However, one must also keep in mind that human hierarchies are more complex than animal ones (e.g., human ones do not rely as much on physical strength). Several other factors such as, for instance, perceived competence or perceived self-confidence, will have to be further considered as potential

mediators of the link between nonverbal behavior and the vertical dimension of human interactions.

Future research will also face the challenge to operationalize the constructs of power and dominance more clearly and more systematically than in the past. The operationalization of dominance, in particular, differs in important ways from one study to another. For instance, Driskell and Salas (2005) operationalize nonverbal dominance as a loud and angry voice, knitted brows, glaring stare, muscle tension, and pointing gestures, while Ostrov and Collins (2007) operationalize it with negative and intrusive touch of the interaction partner. Furthermore, dominance is often defined in its aggressive form, while the sociable form of dominance is rarely considered (e.g., Sadalla et al. 1987). This is an important issue, because differences and inconsistencies in the definition and operationalization make the comparisons between studies, as well as their synthesis, difficult and imprecise.

Much research is needed to obtain more information on how contextual as well as individual factors moderate the link between nonverbal behavior and verticality. While the influence of some individual characteristics (e.g., gender) have been documented to a certain extent, others still need more in-depth investigation (e.g., personality, attitudes, cultural background). In the same vein, contextual influences need to be more systematically investigated. Expressions and perceptions of dominance and power may differ in important ways depending on the nature of the relationship (e.g., professional, hierarchical, romantic), on the social motives (e.g., goals, desires) of the interaction partners, as well as on their emotional state (e.g., joy, irritation). To illustrate, someone who tries to influence a friend in a decision may behave nonverbally very differently than a superior who argues with an employee about a task that needs to be accomplished. Also, a superior high in personality dominance may argue with this employee in a different way than a superior who low in personality dominance, and a superior who wants to keep all his employees may behave differently than a superior who wants to reduce their number. To date, the information we have about contextual influences on the expression and perception of power and dominance is still very scarce.

Most probably, methodological innovations will be part of future research in the field. As an example, computer-mediated automatic coding of nonverbal behaviors related to power and dominance is being developed and may facilitate the work of researchers in the field of nonverbal behavior: Settings are developed that enable automatic coding of dominance patterns, for instance in group conversations (Jayagopi et al. 2009), and will provide the basis for the analysis of temporal patterns of nonverbal behavior and of nonverbal composites. Along with clear-cut definitions of the concepts, strong designs, and consciousness of individual and contextual influences, they will enable future researchers in this field to better understand the nonverbal nature of the crucial dimension of power and dominance in interpersonal interactions – and their consequences on our social life.

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VI Focus on group membership

Judith A. Hall and Sarah D. Gunnery

21 Gender differences in nonverbal communication

Abstract: Male-female differences in nonverbal behaviors are presented and discussed, as well as male-female differences in several kinds of accuracy in perceiving other people through nonverbal cues. Published meta-analyses provide the gender-difference evidence that is reviewed, along with individual studies that are more recent or that address different issues in the relation of gender to nonverbal behavior and accuracy. In addition, the topic of flirtation and cross-gender relationship initiation, as these pertain to nonverbal communication, is reviewed. Nonverbal gender differences are well established for a number of behaviors and skills showing (for example) that women use more smiling, nodding, gazing, and facial and gestural expressiveness, and smaller interpersonal distances, and that women excel on several kinds of accuracy (judging emotions and personality through nonverbal cues; remembering other people's nonverbal cues and other people's appearance). However, there are gaps in the literature, and for some nonverbal behaviors and skills there seems to be little to no gender difference, or else there is not sufficient research for drawing a conclusion. Some insight is available into moderating factors, but much is lacking. The question of why these gender differences exist remains elusive, though several theoretical frameworks for understanding them are offered.

Keywords: male, female, gender, nonverbal behavior, accuracy in person perception, smiling, expression, gazing, distance, flirtation, courtship

1 Introduction

Gender – which in this chapter mainly refers to conventional categories of “men” and “women” – is a potent and ubiquitous social variable. Even if a person occupies quite homogeneous social worlds in terms of ethnicity, culture, social class, political values, or religion, it would be rare indeed for a person to live in a world that is homogeneous with respect to gender. Gender is constantly evident and relevant, and people think about it, respond to it, and enact it in myriad conscious and unconscious ways.

Nonverbal communication was one of the first domains in which psychologists looked at gender differences (e.g., Gates 1923). Since then a large literature has grown that describes both nonverbal behavior, that is, nonverbal cues that are available to the senses (e.g., can be seen or heard), as well as accuracy in sending

and receiving nonverbal cues. For both behavior and accuracy, we will discuss the gender differences, as well as perceptions and stereotypes, both in general and with respect to the special context of flirting and courtship.

Because of the constraints of length, research on infancy and early childhood is discussed in a very limited fashion; for additional gender findings for these age groups see Chapter 5, Halberstadt, Parker, and Castro, this volume. We should also add that the great majority of research available for review is based on White, middle-class college students in the U.S. Some research is based on nonselected people in public places (this is especially true for flirting and courtship research), but most studies are on convenience samples of college students in laboratory studies. Cross-cultural research is not great in quantity, and most studies do not analyze gender within cultural or ethnic subgroups.

We limit the present review in this chapter to the conventional categories of *men/males* versus *women/females*, in other words what a person would check on a questionnaire that asked for this binary choice. Researchers do not take account of people who would have preferred not to check either box, or who left the box blank, and only recently have researchers begun to make more nuanced comparisons, in particular between gay/lesbian and heterosexual people (Freeman et al. 2010; Knöfler and Imhof 2007; Miller and Malloy 2003; Pierrehumbert, Bent, and Munson 2004; Rendall, Vasey, and McKenzie 2008). Also, only a small amount of research looks at nonverbal communication in relation to the individual-difference dimensions of masculinity (agency) and femininity (communion) (Gallaher 1992; Hall and Halberstadt 1981; LaFrance and Carmen 1980; Zuckerman et al. 1982).

1.1 Ambiguities of explanation

Endemic to the study of nonverbal communication is the contrast between the ease of describing behavior and the difficulty of knowing what it means and, relatedly, what produced it (Hall 2006a, 2010). When it comes to nonverbal gender differences, description is the easy part. As an example, consider smiling, a behavior that occurs more in women than men. How do we understand this difference? Are women happier than men? Are they instead fulfilling a social role that requires them to look pleasant, regardless of how they feel? Are they displaying their low status? Are they responding unconsciously to how others treat them? Are they simply displaying an overlearned signal of gender group identification (“I am a woman, not a man”), without any particular message content beyond that?

The ambiguities of interpretation, which include understanding proximal causes of behavior as well as more distal causes relevant to the acquisition of skills and habits, are a considerable problem in this field. The present chapter can offer some guidance but we do not claim to have answers to the question “Where do nonverbal gender differences come from?” The problem is made even more difficult

by the fact that there need not be a common explanation for gender differences across a range of nonverbal behaviors and nonverbal communication skills, nor a common explanation for the same behavior or skill in different contexts or at different times. Furthermore, there might be a different explanation for a given behavior when it is enacted by men versus women. For example, a woman might smile because she thinks it makes her more physically attractive, while a man might smile because he thinks it makes him seem self-confident and therefore high in status. Research has gone much farther in documenting differences than in explaining them.

When we refer to women or men scoring higher than their counterparts, or doing more of a given nonverbal behavior, there is no implicit assumption that the given behavior is superior (by virtue of being “higher”), nor, in a different reading, that one gender’s behavior is the norm or standard, while the other gender’s behavior deviates from it and therefore requires explanation. It is possible to discuss the adaptiveness and functionality of different behavior patterns (as many chapters in the present volume do), but the documentation of difference per se does not justify value-based interpretations.

1.2 Meta-analysis and effect size reporting

A number of meta-analyses on gender and nonverbal communication have been published and we will draw on these extensively. However, one goal of this chapter is to update and expand on meta-analytic treatments, meaning that numerous individual studies will be mentioned. When we report effect sizes for meta-analyses, the metric will be the Pearson correlation between gender and the nonverbal behavior in question (point biserial correlation; Rosenthal 1991). This metric has a relation to another common metric of effect size, Cohen’s d (Cohen 1987), that is approximately $d = 2r$ for effects in the range found mostly in the present literature. For correlations greater than $r = 0.24$, d becomes progressively larger than $2r$, according to the formula $d = 2r / [\sqrt{1 - r^2}]$. Effect sizes that we report are scaled so that positive values indicate higher scores for females than males, and negative values indicate the reverse.¹ We do not report effect sizes for individual studies, and we do not report p -values. Readers should assume that the results we review reached acceptable levels of statistical significance.

¹ We report average effect sizes for collections of studies where the effect sizes were known; averages in which unknown effects were given an effect size of $r = 0.00$ are not included here, though such results are often available in the published meta-analyses.

2 Male-female differences in nonverbal behavior

2.1 Facial expressiveness

In her 1984 meta-analysis, Hall reviewed studies on overall facial expressiveness in adults, which used a variety of methodologies, mainly observers' global ratings of overall expressiveness. For the five known effect sizes, the mean effect was $r = 0.45$, quite a substantial gender difference. Kring and Gordon (1998) employed a systematic observation tool to measure facial expressiveness under controlled circumstances (watching emotional films) and found that women's faces were more expressive than men's, though women did not report more subjective emotional experience, suggesting that the gender difference in expressivity is related to habits and norms rather than experienced emotions. Women and men also differed in self-report of their typical emotional expressivity, consistent with Fischer and Manstead's (2000) finding that women rated themselves higher on the nonverbal expression of emotion than men rated themselves in 37 different countries.

In the Kring and Gordon (1998) research, women and men also differed on the "internalizer-externalizer" dimension (Buck 1977), which describes the tendency for males to have relatively unexpressive faces combined with relatively high physiological activity (skin conductance) when exposed to emotional stimuli, while females show the reverse pattern of high facial expressivity and low physiological activity.

2.2 Smiling

A large amount of research has been conducted on male-female differences in smiling. Summaries appear in Hall, Carney, and Murphy (2002) as well as in quantitative reviews. A meta-analysis (Hall 1984) found no difference in young children's social smiling ($r = -0.02$, 5 studies), a finding corroborated by Dodd, Russell, and Jenkins (1999) in a large study of yearbook photographs, by DeSantis, Mohan, and Steinhorst (2005) in a large study of children's newspaper photographs, by Else-Quest et al. (2006) in a meta-analysis on toddler and school-age children ($r = 0.06$, 12 studies), and by Wondergem and Friedlmeier (in press) in an examination of over 18,000 yearbook photographs spanning kindergarten through 12th grade.

The most comprehensive analysis of adolescent and older participants is the meta-analysis of LaFrance et al. (2003). The overall effect size in 418 studies was $r = 0.20$, with a clearly evident age trend. Adolescents (13–17 years) showed the biggest effect ($r = 0.28$) followed by steadily decreasing effects down to a low of $r = 0.06$ in the 65 and older group. This trend, when combined with the data on children mentioned above, indicates that the overall age trend is curvilinear, with the difference going from non-existent in elementary school to its strongest in mid-

to-late adolescence (consistent with Wondergem and Friedlmeier's [in press] data for high school yearbook photographs), and back to negligibility in late middle age.

LaFrance et al. (2003) concluded, consistent with Hall (1984, and Hall and Halberstadt 1986), that there was no gender difference in the absence of social interaction (implying an impact of socially triggered emotions or social norms), and that social tension was associated with a bigger difference favoring females over males. LaFrance et al. (2003) also found numerous other moderators, including the following: The gender difference was especially large when people were aware of being observed, were under explicit instructions to get acquainted, were engaged in self-disclosure, and were experiencing embarrassment (the latter consistent with the social tension result). A common thread in many of LaFrance et al.'s (2003) moderator effects was self-consciousness, as brought about by circumstances and/or emotion. Situations involving less constraint by roles or tasks also showed larger differences, suggesting that the tendency for women to smile more than men is more evident when there are no other tasks or norms that might partially override the genders' more typical tendencies.

It is important to remember that moderator analyses in a meta-analysis do not tell about the actual pattern of means between men and women, nor about causality. The finding that the gender difference is larger when the situation is rated as more nervous does not reveal (for example) whether being nervous makes women smile more, or makes men smile less, compared to another situation or their own baseline; it does not reveal the motives or other proximal influences that mediate the relation of situation to smiling (e.g., if women smile more in such a situation, is it because they become more nervous, or is it because they seek to relieve the other person's anxiety); and, it does not tell us whether it is really people's nervousness in the situation that causes the smiling, or some other variable. These ambiguities about moderator effects will not be repeated subsequently in this chapter, but readers should keep them in mind.

Another moderator of the smiling gender difference is posed versus spontaneous smiling. LaFrance et al.'s (2003) meta-analysis found that the gender effect was greater in "archival" data sources (e.g., advertisements and yearbook photographs) than in more naturalistic settings; this makes sense if the circumstances of the archival recording promotes stereotypical responding. Hall et al. (2001) took photographs of dyads that had hierarchical work relations while they were conversing in their workplace and while posing together for the camera. Women smiled more than men only in the posed photographs; the candid photographs' lack of effect may reflect both lower self-consciousness and the overriding impact of task requirements mentioned above as moderators in LaFrance et al. (2003).

The typical gender difference is evident cross-culturally. Szarota (2010) measured cross-national gender differences in smiling, using adults' pictures that were self-posted on internet sites as the source of data (100 of each gender in each of

10 countries). Across nine European countries plus the United Kingdom, the effect significantly favored women in all but Germany and Hungary, though even there the effects favored women in direction. The largest effects were in Italy and Poland.

In the yearbook study of Wondergem and Friedlmeier (in press), conducted in the state of Michigan (USA), the gender difference was stronger in African-American than European-American high school students, with the difference being driven by a steep drop-off in the smiling of African-American boys from 6th grade on, especially in schools that were predominantly African-American in enrollment. For both ethnic groups, girls' smiling did not change much from kindergarten to 12th grade, while boys' smiling showed fairly steady declines, especially among the African-American boys.

Women are smiled at more than men are (Hinsz and Tomhave 1991; Patterson and Tubbs 2005). The combination of this target effect with the actor main effect described above would lead to the gender difference being greatest in same-gender dyads (female-female compared to male-male), which is what LaFrance et al. (2003) found: the effect size for same-gender was significantly larger than the effect size for opposite-gender ($r = 0.24$ for same-gender, 45 studies; $r = 0.17$ for opposite-gender, 53 studies).

A provocative reversal of people's tendency to smile at women occurred in three studies of group members' unobtrusively observed reactions to female leaders during group interaction. Female leaders were the recipients of more negative affect displays during group interaction than male leaders, even when the leaders' contributions were held constant (Butler and Geis 1990; Koch 2005). This suggests that the nonverbal behaviors directed towards women in casual social encounters may be quite different from those directed towards them in task-oriented or hierarchical situations where different attitudes and expectations are activated.

2.2.1 Types of smiles

Studies measure smiling in various ways, including frequency, duration, intensity, facial pleasantness ratings, and overall ratings of smiling. LaFrance et al. (2003) concluded that these variations did not make much difference.

A possibly important distinction, however, is between Duchenne and non-Duchenne smiles (Ekman, Davidson, and Friesen 1990). The Duchenne smile includes a mouth movement suggestive of smiling (zygomatic major) along with a cheek-raising movement that produces crows' feet at the corner of the eyes (orbicularis oculi), while the non-Duchenne smile lacks the latter movement (see Chapter 6; Kappas, Krumhuber, and Küster, this volume). In the literature, the Duchenne smile has often been characterized as more authentic or as reflecting more true enjoyment than the non-Duchenne smile, which is sometimes called a social smile (Hecht and LaFrance 1998).

Hecht and LaFrance (1998) and Prkachin and Silverman (2002) found that women exceeded men on both Duchenne and non-Duchenne smiles, and Merten

(1997) found more Duchenne smiling in women than in men, but equal amounts of non-Duchenne smiling. Vrugt and Van Eeoud (2002) also found that women produced more Duchenne smiles than men (in a posing situation). It is premature to interpret the meaning and origins of such differences without knowing about the participants' concurrent emotional states and motives. But even if that is known, the correspondence between self-reported happiness and Duchenne smiling is modest (Fernández-Dols and Ruiz-Belda 1997), as is, for that matter, the relation between smiling in general and self-reported happiness (Hall and Horgan 2003). Also clouding interpretation of any gender difference in Duchenne smiling is the fact that a substantial number of people can execute a Duchenne smile on purpose (e.g., Ekman and Davidson 1993; Krumhuber and Manstead 2009). If women display a higher proportion of Duchenne smiles than men do, it could reflect different emotions, different motives, or different skills in expression.

It is certainly a common stereotype that women are less authentic than men in their nonverbal communication – with the caricature being that women are savvy expressors who are often fake, while men are blunderingly honest in their expressions. Bugental, Love, and Gianetto (1971) used the term “perfidious” to describe the faces of women because, in their study, wives' facial expressions matched the valence of their words more weakly than was the case for their husbands. In a larger and better controlled study, however, Halberstadt, Hayes, and Pike (1988) found exactly the reverse, with women being more consistent across cue channels than men.

2.3 Gazing

A well established finding is that females gaze at interaction partners more than males do. Studies on infants showed a tendency for girls to gaze more than boys (in Hall 1984, $r = 0.20$, 8 studies), and more recent studies confirm that infant girls gaze at social stimuli more than infant boys do (Connellan et al. 2000; Lutchmaya and Baron-Cohen 2002). In Hall (1984) the tendency for females to gaze at interaction partners more was also evident in studies on children ($r = 0.19$, 10 studies) and in adults ($r = 0.32$, 30 studies). Women's higher gazing may be limited, however, to interactions that take place at comfortable conversational distances. When the distance between interaction partners exceeded six feet, the gender difference actually reversed (Aiello 1977a, 1977b). (For more results on gender and eye behavior, see Chapter 9, Adams, Nelson, and Purring, this volume.)

Measurement methods vary in this literature (e.g., frequency of glances, mean duration of gazes, or overall duration of gaze). Hall (1984) reported that studies using duration measures showed stronger effects than studies using gaze frequency, with the effect sometimes reversing in the latter case (a finding also in Bente, Donaghy, and Suwelack 1998). Bente et al. also found that males had a

higher frequency of terminating gaze after mutual gaze. Both of these effects are consistent with males being less comfortable than females with gazing, since more frequent gazing and breaking gaze both suggest that extended gazing is aversive. In the latter study, females were also quicker to reciprocate a partner's gaze.

Hall (1984) found, in studies on adults, that women are gazed at more than men are ($r = 0.31$, 6 studies; also found in Patterson, Webb, and Schwartz 2002). The confluence of the actor and target main effects should produce a gender difference that is greatest when female-female dyads are compared to male-male dyads, (which is the case in Hall 1984, $r = 0.45$, 9 studies; also found in Yee et al. 2007).

The findings thus far lend themselves to the interpretation that gazing is more comfortable for women than men. Other studies support this view. Women in negotiation tasks produced better quality solutions when they could either see the other person or have eye contact with the person, whereas the opposite was true for men (Swaab and Swaab 2009). Porter et al. (2006) measured pupil dilation (an indication of interest) in response to faces shown with the eyes facing forward or off to the side. Females' pupils dilated more to forward-facing gaze than to averted gaze, while males' pupils showed no difference. Guéguen and Jacob (2002) found that when females were gazed at while being asked to do a survey, they responded better than when not gazed at, whereas the reverse was true for males.

Studies on gaze cueing also suggest that gaze has high salience and interest value for women. Gaze cueing refers to the impact of a target's gaze direction on a viewer's own visual behavior. The basic gaze cueing effect is that people are drawn to look in the direction of another's gaze. In an experiment, participants might see a face looking forward, then the eyes look to the left or right, and then a letter appears on the left or right of the screen and the participant has to identify the letter as quickly as possible. A bigger effect means participants are relatively slow to pull their gaze away from the direction of the target's gaze when they should, or, stated differently, that the gaze cue facilitates detection of a stimulus that lies in the direction of the gaze (Frischen, Bayliss, and Tipper 2007). The gaze cueing effect is stronger in women than men (Alwall, Johansson, and Hansen 2010; Bayliss, di Pellegrino, and Tipper 2005). Whether this means men are relatively immune to the gaze cue or, alternatively, they are better able to control their gaze response, is not clear (Frischen et al. 2007).

2.4 Interpersonal distance and orientation

Hall (1984) concluded, based on studies using nonreactive observational methods, that men established larger interpersonal distances than women did ($r = -0.27$, 17 studies). Not many studies were available for children, though the effect had the same direction. As with smiling and gazing, there was also a target gender effect: adults set larger distances towards males than females ($r = -0.43$, 9 studies) and

again the result was similar for children though based on few studies. This suggests that male-male dyads show the greatest distance and female-female dyads show the smallest distance. A more recent study of interpersonal distances in shopping malls in Turkey and the U.S. found distance greatest in male-male dyads (Ozdemir 2008).

Female children and adults tend to interact in a more facing orientation than their male peers, though in Hall (1984) the effects were smaller than some other differences (in adults, $r = 0.15$, 3 studies; in children, $r = 0.12$, 3 studies). Another orientation measure pertains to who is in front of the other while walking. In a study of people walking in groups on the street in Italy, men walked in front of women in dyads 74% of the time; in three-person same-gender groups, women were more likely to walk abreast than men, who were more likely to walk in a follow-the-leader style, a finding seen by the author as indicating more affiliation in female groups and more hierarchy in male groups (Costa 2010).

2.5 Head, arm, and body movements

Men's bodies are both more restless and more relaxed than those of women. Indices of restlessness, which included fidgeting and foot/leg movements, had an effect size in Hall (1984) of $r = -0.34$ (6 studies); indices of relaxation, which included leaning and feet on table, had an effect size of $r = -0.33$ (4 studies). Men were also more expansive in terms of widely spread positions of arms and legs ($r = -0.46$, 6 studies). Women were more involved, as defined by behaviors such as nodding and forward leaning ($r = 0.16$, 7 studies); more bodily expressive, as defined mainly by hand movements during speech ($r = 0.28$, 7 studies); and more self-conscious, as defined by self-touching ($r = 0.22$, 5 studies). Subsequent studies corroborate these conclusions (e.g., nodding, Helweg-Larsen et al. 2004; self-touching, McCormick and Jones 1989).

2.6 Interpersonal touch

Hall (2011) provided an update of the summary included in Hall (1984). Interpersonal touch is a complex topic, both methodologically and theoretically. Among other issues, there are many subtle varieties of touch that can have very different functions and meanings. The reviews indicate rather clearly that females are more likely to touch others, though this effect may be especially notable between females, meaning that male-male touch is maximally different from female-female touch (Montemayor and Flannery 1989; Stier and Hall 1984). In sports settings, male-male touch is less inhibited than in social settings though still less frequent than between women in the same settings (Kneidinger, Maple, and Tross 2001).

Henley (1977) proposed that there is an asymmetry in cross-gender touch, such that men are more likely to touch women than vice versa. Across all studies, this asymmetry does not appear to exist (Hall 2011). However, two moderators of this effect stand out. In young adult interactions, this asymmetry is evident, but in interactions between older individuals and in more established couples, it is reversed (Hall and Veccia 1990; Willis and Briggs 1992; Willis and Dodds 1998). Also, the asymmetry exists for touches with the hand but it is reversed for non-hand touches (DiBiase and Gunnore 2004; Hall and Veccia 1990).

Studies repeatedly find that women report more comfort with touch, especially same-gender touch, than men report (Andersen and Leibowitz 1978; Roesse et al. 1992). Willis and Rawdon (1994) found this to be equally true in the United States, Malaysia, Spain, and Chile. Both men and women (presumably heterosexual) agreed that male–male touch is less normal and appropriate than other kinds in a study by Derlega, Catanzaro, and Lewis (2001). The sources of these attitudes could lie in the need for men to control aggression amongst themselves, homophobic attitudes, or the existence of entrenched habits that take on a life of their own (Hall 2011).

2.7 Vocal nonverbal behavior

The voices of men are more low pitched than those of women (Hammerschmidt and Jürgens 2007), more so than mandated by anatomy alone, suggesting adherence to gender norms (Cartei and Reby in press). Hall's (1984) review concluded that men's voices are louder and more likely to contain speech disturbances (e.g., stutters, speech incompletions, omissions). Men emit fewer responses such as “uh-huh” and “mmm” while in the listener role, they are more likely to use filled pauses (“uh”) during their own speech, and their voices are less variable (less expressive) than women's (summary from Hall 1984; also Viscovich et al. 2003). (See Chapter 7, Patel and Scherer, this volume, for further data on male-female differences in vocal nonverbal behavior.)

3 Male-female differences in accuracy of perceiving nonverbal cues

3.1 Recall of appearance

Women are more likely than men to recall details about the appearance of other people when asked, without advance warning, to do so. This result holds in both live encounters and after viewing photographs or videotapes ($r = 0.19$, 5 studies, Horgan et al. 2004; $r = 0.25$, 4 different studies, Schmid Mast and Hall 2006; also

Horgan, McGrath, and Long 2009). This advantage extends equally to recall of the appearance of people who are not of focal interest for the perceiver (i.e., in the periphery of an observed interaction; Horgan et al. 2009). Furthermore this advantage consistently appears for recall of the appearance of other people but not consistently for recall of the nature or location of objects in the environment (as discussed in Horgan et al. 2009). Women's appearance is also more accurately recalled than is men's ($r = 0.24$, 4 studies, Horgan et al. 2004).

Conceptually related is the ability to recognize faces that one has seen before, as measured in laboratory experiments. Here, too, women score higher than men ($r = 0.17$, 28 studies, Hall 1984; also Guillem and Mograss 2005, and McBain, Norton, and Chen 2009). Hall's meta-analysis also found a statistical interaction between gender of perceiver and gender of target, such that same-gender recognition exceeded opposite-gender recognition, a result consistent with a more recent study by Lewin and Herlitz (2002). Women also have been found to be better at associating names to faces than men (Borges and Vaughn 1977).

3.2 Recall of nonverbal behavior

The accurate recall of other people's nonverbal behaviors such as smiling, gazing, and self-touching is higher in women than in men, based on live interaction and viewing videotapes ($r = 0.13$, 6 studies, Hall, Murphy, and Schmid Mast 2006). Recall of a more complex sort also revealed a female advantage: noticing and recalling covariations between behaviors, or between behavior and personal attributes, in videotaped social interactions (Carter and Hall 2008).

3.3 Accuracy of drawing inferences from nonverbal behavior

In the great majority of studies on accuracy in processing nonverbal cues, participants are asked to draw inferences about target persons' states (typically emotions) or traits (such as personality), based on viewing photographs or short excerpts of face, body, and/or vocal nonverbal behavior. A meta-analysis by Hall (1978) found that females were more accurate than males ($r = 0.20$, 46 studies), consistent with men's and women's self-assessments of their accuracy in decoding nonverbal cues (Zuckerman and Larrance 1979). There was no moderation by target gender, meaning this advantage held for both male and female targets. There was also no moderation by participants' age, which ranged from preschool to adult. More recent studies on preschool children have also found higher performance by girls (Boyatzis, Chazan, and Ting 1993; Székely et al. 2011). A recent study by Williams et al. (2009) found, as Hall did, no moderation by participants' age for participants between 6 and 91 years of age.

In Hall's (1978) meta-analysis, care was taken not to over represent any particular test, and as a consequence the most widely used test, the Profile of Nonverbal Sensitivity (PONS; Rosenthal et al. 1979), which measures accuracy of decoding social-affective meanings in face, body, and content-masked voice, was represented by only a few studies. When Rosenthal et al. (1979) examined 133 samples given just the PONS test, the gender effect was of identical magnitude to that for diverse instruments reported above ($r = 0.21$), with little evidence of moderation by participant age (elementary school to adult) and also little to no evidence that the gender difference took on different magnitudes in different cultural/national groups (comparison of 17 U.S.-culture college samples to 17 college samples from several other countries; a finding also in Izard 1971, Merten 2005, and Scherer, Banse, and Wallbott 2001).

Hall (1984) found a nearly identical overall female superiority in a meta-analysis of additional studies of nonverbal cue decoding that included only one study using the PONS ($r = 0.25$, 18 studies), with again no moderation by target gender or participant age. Hall (1978, 1984) additionally concluded that females' advantage was more pronounced when visual cues (face and/or body) were available compared to vocal cues alone.

More recently, McClure (2000) conducted a meta-analysis of nonverbal cue decoding in children and adolescents, which included mainly studies not included in Hall's meta-analyses. Overall, the effect size was $r = 0.18$ (60 studies), again with no moderation by participants' age. Notably, a number of the studies included in that review used the Diagnostic Analysis of Nonverbal Accuracy (DANVA; Nowicki and Duke 1994), a test whose items were intended by its developers to show a minimal gender difference.

Since those reviews, many additional studies have reported similar results, often with remarkably similar effect sizes. Examples of recent studies finding the same gender difference include judging emotions from the eyes (Baron-Cohen et al. 2001), identifying neutral facial expressions as neutral (Sasson et al. 2010), judging sexual orientation (Ambady, Hallahan, and Conner 1999), identifying facial emotions at stimulus exposures of 1/5 s or less (Hall and Matsumoto 2004), judging personality traits (Chan et al. 2011; Letzring 2010; Vogt and Colvin 2003),² and judging an interaction partner's thoughts and feelings (Thomas and Fletcher 2003; but see Ickes, Gesn, and Graham 2000). (For discussion of accuracy in perceiving flirtation cues, see section 6.2 of the present chapter.)

Studies also show that women make quicker responses when inferring emotional meanings from nonverbal cues (Hampson, van Anders, and Mullin 2006; Rahman, Wilson, and Abrahams 2004; Vassallo, Cooper, and Douglas 2009).

² For certain measurement methods, some of women's greater accuracy for judging personality may stem from the successful application of normative (base-rate) knowledge rather than distinctive ability to judge the cues of a particular target person (Chan et al. 2011); however, Letzring (2010) found an excess of female skill even after base-rate knowledge was taken into account.

3.3.1 Domain specificity

A systematic analysis of whether the gender difference in nonverbal decoding accuracy is constant over different content domains has not been undertaken. Nevertheless, this is an issue with important theoretical implications. Hall and Schmid Mast (2008) noted that the most studied domain in this literature is emotion, a domain in which women are socialized to have special interest and expertise (Brody and Hall 2008; Cross and Madson 1997; S. M. Rose and Rudolf 2006). It remains for future research to systematically investigate domains in which men's accuracy may be equivalent or better than women's.

Some insight into domain specificity is available, however. Accuracy of lie detection, a domain for which neither gender stands out in terms of an accuracy stereotype, does not show a gender difference ($r = 0.03$, 53 studies, Aamodt and Custer 2006). Also, several studies of judging dominance or hierarchical status, a male-stereotypic domain (Schmid Mast 2005), have failed to find a gender difference (reviewed in Hall and Schmid Mast 2008).

The Interpersonal Perception Task (IPT; Costanzo and Archer 1989) provides results consistent with a domain specificity account. Unlike other standard nonverbal cue judgment tasks, the IPT shows generally minimal gender differences as reviewed by Hall and Schmid Mast (2008). On the IPT, participants make judgments of lie-truth, kinship, intimacy, status, and competitive outcomes. If lie detection is gender neutral, kinship and intimacy are female stereotypic, and status and competition are male stereotypic, it is not surprising if the total score on the IPT shows a minimal gender difference. In a large enough study, the gender difference on these different domains could be separately examined, but this has not been done.

Hall and Schmid Mast (2008) found evidence for domain specificity in an experiment in which participants completed anagrams in a co-action or competitive condition vis-à-vis a partner, and were afterwards asked, with no forewarning, to remember how many anagrams the partner had completed based on their incidental observation while doing their own anagrams (a measure of nonverbal recall accuracy). For men, being in the competition condition raised their recall accuracy to the level of women in that condition, erasing a gender difference favoring women that would otherwise have occurred (i.e., that was significant in the co-action condition). Thus, the combination of a male-relevant motivational trigger (competition) and a non-affective cue domain (remembering the partner's task performance) had a positive impact on men's accuracy. This suggests that there are circumstances and/or accuracy tasks that promote men's accuracy. However, in neither Hall and Schmid Mast (2008) nor in the past literature is there yet evidence of a domain in which men's interpersonal accuracy exceeds women's.

3.4 Accurate knowledge about nonverbal behavior

Rosip and Hall (2004) developed a paper-and-pencil test of factual knowledge about the meanings and functions of nonverbal behavior, which was scored for accuracy against established findings in the literature (Test of Nonverbal Cue Knowledge, or TONCK). Across 4 studies, women scored higher on the TONCK ($r = 0.18$). Hall and Carter (1999) found that women were more accurate than men in stating the nature of gender differences in nonverbal communication, also a reflection of their knowledge in the nonverbal domain.

4 Expression accuracy

Expression accuracy can be divided into spontaneous versus deliberate, referring to the circumstances under which the cues are produced that are later judged for accuracy. Spontaneous cues are conveyed without much, or any, conscious awareness, as when a person's face reveals his or her emotional state while engrossed in watching a movie. Deliberate cues are sent on purpose; in research this usually means emotions are posed on request of the experimenter. Hall's (1984) meta-analysis concluded that women exceeded men in the accuracy with which their nonverbal cues could be judged ($r = 0.25$, 35 studies). This is consistent with the gender difference in facial expressiveness discussed in an earlier section, and it also matches a corresponding difference in men's and women's self-assessments of their accuracy in sending nonverbal cues (Zuckerman and Larrance 1979).

In the Hall (1984) meta-analysis, there was not an overall difference in the magnitude of the gender difference between spontaneous and posed methods, but there was a difference due to participants' age, with the gender difference being greater in adults than in children. Indeed, Buck (1977) found dramatic decreases in preschool boys' spontaneous facial expression accuracy between the ages of four and six years, but no comparable decrease for girls. This suggests that socialization pressure or modeling induces boys during this period to reduce their facial expressiveness, which then becomes a lifelong habit. Hall (1984) also found that the difference favoring females in accuracy of expression was due to accuracy in the facial modality; expression accuracy based on vocal cues did not show a gender difference.

5 How big are nonverbal gender differences?

The studies mentioned in this chapter and summarized in meta-analyses clearly indicate that there are many differences in the nonverbal behavior and accuracy

repertoires of males versus females. Though these are credible differences, we should still ask how big they are, for this would help us to understand the importance of the differences in everyday life. In absolute magnitude, the differences are small. For example, though the gender difference of $r = 0.20$ ($d = 0.40$) for accuracy of decoding nonverbal cues is extremely consistent and credible, nevertheless gender explains only 4% of variation in accuracy.

Informative though this absolute standard is, a more nuanced understanding of the magnitude of effects is obtained by a comparative approach. How big are the differences compared to other effects in psychology, compared to other gender differences in social psychology, and compared to other correlates of the same nonverbal communication variables?

Two major reviews have provided quantitative evidence on the first of these questions. Richard, Bond, and Stokes-Zoota (2003) summarized over 450 meta-analyses on social psychological phenomena, a research base encompassing more than 25,000 studies and 8 million people. The grand average effect size was $r = 0.21$ and the range of average effect sizes over 18 topic areas ranged from 0.13 to 0.32. Lipsey and Wilson (1993) performed a non-overlapping summary of the efficacy of psychological, educational, and behavioral treatments across 302 meta-analyses. The grand average effect was $r = 0.24$, seen by the authors as a resounding confirmation of the potency of interventions. The nonverbal gender differences are comparable to these.

The second question – comparison to other gender differences – was also addressed by Richard et al. (2003). Across 83 meta-analyses on gender differences in social psychology, the average difference was $r = 0.12$, a figure smaller than most of the nonverbal gender differences. The nonverbal differences are also somewhat larger than found by Leaper and Ayres (2007) in a meta-analysis of gender differences in linguistic affiliativeness ($r = 0.12$, 54 studies) and assertiveness ($r = -0.09$, 50 studies).

Hall (2006b) addressed the third question – comparison to other correlates of nonverbal communication variables – for smiling and accuracy of decoding cues. For social and personality correlates of smiling, the average absolute effect was $r = 0.32$ (52 studies), somewhat larger than the gender difference in smiling. For social and personality correlates of judgment accuracy, the average absolute effect was $r = 0.18$ (112 studies), a bit smaller than the gender difference in judgment accuracy.

Thus, nonverbal gender differences are small in absolute magnitude, but fall well within the range of what can be expected in social-personality psychology. They are, furthermore, relatively large compared to other gender differences, which may explain why stereotypes about nonverbal gender differences are quite accurate (Briton and Hall 1995). Finally, for two behaviors examined (smiling and judgment accuracy), they are either not smaller, or not much smaller, than other correlates of those same two behaviors.

6 Male-female differences in nonverbal behavior during flirtation and courtship

Men and women communicate nonverbally while interacting in a number of real world settings. One that lends itself nicely to the discussion of gender differences is flirtation and courtship. Whether for one night or a lifetime, forming sexual or romantic relationships is a common goal for both men and women. Both genders use nonverbal behavior and accuracy in decoding nonverbal cues in order to flirt and either communicate interest or disinterest with potential romantic or sexual partners. Thus far this chapter has discussed differences in the ways that men and women encode and decode nonverbal cues. This section on nonverbal flirting will show how men and women do this in a real world setting where both genders are motivated to accurately express and to some extent accurately perceive interest.

6.1 Nonverbal flirtation cues

Both men and women encode many of the nonverbal cues already described (smiling, gazing, interpersonal distance and orientation, movement, touch) to flirt. As previously outlined, men and women encode nonverbal cues with different frequencies as well as in different contexts, and the same is true in this specific domain. As with general nonverbal communication, studies have shown that women are generally more active in their use of nonverbal behavior to communicate sexual or romantic interest (see Moore 2010 for a review, as well as Chapter 19, Guerrero and Wiedmaier, this volume). A man is more likely to approach a woman in a courtship situation but not before the woman has likely initiated contact through a series of nonverbal behaviors (Grammer et al. 2000). The cues used by women to initiate the courtship process are often very subtle, but they have been shown to predict a man's approach and whether the woman will reciprocate the man's advances.

These nonverbal flirtation cues have been established in a tradition of research that is largely observational. Researchers have gone into bars, clubs, parks or other places where people may go to meet others or spend time with an existing partner and observe and code behavior that is seen to promote courtship or shut it down (McCormick and Jones 1987; Moore 1985, 1995; Renninger, Wade, and Grammer 2004). A few studies have experimentally manipulated cues that a female emits in a natural setting to measure how the cues influence the behavior of men in that setting (Guéguen 2008, 2010). Studies on nonverbal flirtation have looked mostly at the nonverbal cues emitted by women and picked up on by men, while few studies have observed the men's nonverbal behavior before they make contact with someone in a courtship context.

Flirtation is most commonly talked about in stages or steps (e.g., Morris 1971; Givens 1978). The first stages are almost entirely nonverbal and are often commanded by the woman emitting cues. Women will use positive facial expressions, directed gaze, positive self touch, and body orientation and movement to signal interest and begin an interaction with a potential partner (Grammer et al. 2000; McCormick and Jones 1987; Moore 1985, 1995).

The positive facial expression most commonly used is the smile. Guéguen (2008) found that if a female confederate smiled at a man when he entered a bar, that man was significantly more likely to approach the confederate later in the evening. The coy smile is a specific flirtatious expression that is characterized by slight activation of the zygomatic major muscle which pulls the lip corners up into a half smile and is accompanied by either downward facing eyes or darting eye contact (Moore 1995). While this smile is considered especially flirtatious, positive facial expressions such as smiling, grinning, and laughing, when encoded by either gender, are shown to escalate flirtation while negative facial expressions (e.g., frowning, scowling) deescalate these types of interactions (McCormick and Jones 1989).

Gazing in the direction of another person is also a nonverbal cue to flirtation. This cue when combined with a positive facial expression, like smiling, is particularly effective in escalating a courtship interaction (Walsh and Hewitt 1985). Moore (1995) identified three types of looking behavior used by females to signal interest. A Type I glance is a sweeping gaze around the entire room without focusing on anything in particular, Type II glances are darting glances at a particular individual without sustaining eye contact, and Type III glances are prolonged glances at one individual. In Type III glances, eye contact is made and sustained and the gaze may be perceived as indicating strong sexual interest. While Type I glances may show that a person is interested in his or her surroundings and maybe looking for someone to strike up a conversation with, it is the Type II and III glances that escalate the flirting interaction.

Women also use self-touching to signal interest before contact is initiated. These self-touches include preening or grooming in which the woman smooths or fixes her hair or clothing, licks her lips, or applies lipstick to the lips (Moore 1995, Schefflen 1965). These touches are usually very innocent, but can be more sexual in nature such as rearranging clothing to reveal more skin (Moore 1995).

One study was interested in what nonverbal behaviors men participate in before making contact with a potential female partner. Renninger et al. (2004) observed men in courtship situations in bars and noted a number of nonverbal behaviors that men perform that predict making contact with a woman. These researchers found that men who made contact with a woman during their time in the bar performed more Type II glances, changed locations within the bar more, touched other men without the touch being reciprocated, maximized the space they were in, and displayed fewer closed body postures. Some of these behaviors

(unreciprocated touching of same-gender individuals, taking up more space, and open body posture) are cues to dominance and researchers hypothesized that they are seen as attractive by women, motivating the women to nonverbally initiate a flirtatious interaction. This provides evidence that men do participate in nonverbal flirtation behaviors though the behaviors may differ from those emitted by women.

Once flirtation progresses and contact is initiated, two people are closer in proximity and possibly involved in a conversation, but nonverbal communication continues. Smiling (both coy and other types), directed gazing, and self-touching will continue with the addition of some different nonverbal behaviors. At this stage both men and women have been shown to touch another person to convey interest, but these touches differ in type and duration. McCormick and Jones (1987) found that in general women's touches at the beginning stages of flirting are perceived as communicating playfulness and affection and that women tend to participate in more self-touches as well as fleeting and casual touching of the other person. Guéguen (2011) found that when a female confederate briefly touched a male stranger's arm after asking him for help the man was more likely to glance at her and glanced at her with longer durations. The latency to make further contact with the confederate also decreased.

Men tend to touch more intimately and for longer durations, and their touches at the beginning of flirtation tend to be perceived as more sexual in nature (McCormick and Jones 1987). This gender difference switches once a relationship is formed. Once in an established relationship women tend to touch their partners more while men touch their partners less, as noted earlier in this chapter (e.g., Willis and Briggs 1992). This could be because males touch to initiate sexual contact, and women touch to sustain intimacy in a relationship. There is also an interaction between relationship status and gender in how men and women respond to being touched. Hanzel, Segrin, and Dorros (2008) report that unmarried men are more comfortable with touch than unmarried women, but that married women are more comfortable with touch than married men.

Both men and women also use body movement and body orientation to flirt. When trying to signal interest to another both genders will position their bodies so that they are oriented towards the person of interest and so that their body is open to that person (Fichten et al. 2001) as well as moving closer in proximity to the person of interest. Schefflen (1965) showed that when interacting with a partner at the initiation stages of any kind of a relationship (he studied initiation of therapeutic relationships between patients and clinicians) the individuals will close off the interaction to others by crossing their leg towards the other person or positioning the body in some other way so that they remain open to the other person but closed to all others. Schefflen used the term "quasi-courtship" to describe a heightened arousal and attentiveness between interaction partners even when sexual motives *per se* are not relevant.

Appearance and self-presentation are also nonverbal ways both genders convey interest and attract the interest of others. There is not much evidence for gender

differences in the quality of dress, meaning that both genders will try to look their best when wanting to attract a partner and both genders find this standard of grooming to be attractive. Grammer, Renninger, and Fischer (2004) found that females who reported going to a dance club to meet new people and flirt self-reported wearing more sexy or bold clothing.

Another appearance-related cue that can influence attraction and sexual interest is facial structure and body type. There are gender differences in facial features and body types of men and women that can affect how attractive an individual is perceived to be. For example, men's brows, noses, and chins tend to be more pronounced than women's. (For discussion of gender in relation to impressions based on facial appearance and body type, see Chapter 10, Zebrowitz, Montepare, and Strom, this volume.)

A large majority of work on nonverbal flirtation cues has been done in predominantly heterosexual environments. A. J. Rose and Zand (2002) interviewed 38 lesbians and found that they self-reported using many of the same nonverbal behaviors to communicate sexual interest as heterosexual women, but no observational research has been done on same-gender flirting. Interesting data about gender and nonverbal cues could be collected with homosexual dyads in which the whole interaction would take place with people of one gender. This could help disambiguate causes of these gender differences.

6.2 Accuracy in perceiving nonverbal cues to flirtation

The cues used to communicate interest are not only used to signal interest. If a woman smiles at a man she could be flirting with him or she could just be being friendly. This means that there is some skill involved in accurately perceiving whether nonverbal cues are signaling flirtation and sexual interest or if the person is trying to communicate something different. Researchers (e.g., Abbey 1982, 1987, Koukounas and Letch 2001, Shotland and Craig 1988) have consistently shown that men tend to perceive sexual interest more than women do, meaning men interpret nonverbal cues as signals to sexual interest more so than women.

There are competing theories on why men tend to overperceive sexual interest, but there is clear evidence that this overperception exists. La France et al. (2009) performed meta-analyses on men's and women's perceptions of flirtatiousness, promiscuousness, and seductiveness. They found that men perceive more flirtatiousness ($r = -0.09$, 28 studies), promiscuousness ($r = -0.16$, 28 studies), and seductiveness ($r = -0.20$, 28 studies) than women. When gender of the target was added to the analysis as a moderator, La France and colleagues found that men found women more seductive and promiscuous than women found women. This gender difference reversed for flirtatiousness where men found men to be more flirtatious than women found men to be. This could be because men perceive themselves as being more likely to initiate a flirtatious situation.

La France et al. (2009) interpreted the finding that target gender moderates the gender differences in perceptions of promiscuity and seductiveness as evidence for the error management theory of sexual misperception (Haselton and Buss 2000). This theory states that from an evolutionary standpoint it is more beneficial for men to incorrectly perceive friendliness as sexual interest than it is to misperceive sexual interest as friendliness because the latter would result in a missed opportunity to reproduce. The results of La France et al.'s meta-analysis support this hypothesis because men misperceived sexual interest only in women, not men, whom they are unable to reproduce with.

Research by Abbey (1982, 1987) and her colleagues makes up 50% of this meta-analysis and yet Abbey interpreted the finding from her several studies as supporting the argument that men are less sensitive to nonverbal cues in general and that consequently they were less sensitive to discrepancies between sexual interest cues and friendliness cues. Farris et al. (2008) have more recently found that men make an equal number of misses (saying cues are not flirtatious when they are) as false alarms (saying cues are flirtatious when they are not), providing evidence for a general inaccuracy in interpreting nonverbal cues. As indicated by the differences previously indicated in this chapter, it is probable that the misperception of interest cues could be the result of men's inferior interpersonal sensitivity, but studies showing that the sexual overperception is target gender specific may indicate that in this domain, overperception may have more complex causes than a general insensitivity to nonverbal cues.

Another study (Shotland and Craig 1988) pointed to men having a lower threshold for sexual interest in general, meaning when shown clips of men and women male judges rated both as showing more sexual interest than female judges. The overperception was not just in those whom they have the potential to mate with. Shotland and Craig found that both men and women can differentiate between sexual interest cues and friendliness cues but that the men's perceptual threshold is lower and so they are more likely to mistake friendliness for sexual interest. They hypothesized that men are more sexual and tend to project this onto others.

Looking at this issue from another perspective Place, Todd, and Asendorpf (2009) found that both males and females were more accurate in decoding the interest cues of men than women. This indicates that women might be less expressive in the way they communicate interest or that, as is hypothesized in the literature (Grammer et al. 2000), they express their intent in a less direct way (through subtle and ambiguous nonverbal cues) that may just be difficult to perceive in general.

7 Where do nonverbal gender differences come from?

As stated at the outset, many explanations can be offered and many may be true, depending on the specific behaviors, settings, and types of people in question.

Any search for “the” explanation is certainly misguided, considering that over history and over a lifetime, and even over time within a given social interaction, there is a stream of causation – this leads to that, which leads to that, and so forth – so that declaring one variable to be more the cause than another may be arbitrary. Furthermore, most research on nonverbal gender differences is merely descriptive and provides little to no insight into causative factors.

Three themes predominate in discussions of the sources of nonverbal gender differences.

7.1 Nature versus nurture

Andersen (2006) and Ellis (2006) presented biologically based arguments for the origin and development of these differences. Women may, for example, have evolved to be more sensitive to nonverbal cues than men because of advantages in terms of survival of offspring, and men’s lower levels of smiling may stem from the competitive advantage against rivals resulting from not appearing pleasant. It is true that some nonverbal differences do appear in early infancy; on the other hand, counter-arguments to the biological explanation would stem from the ease with which alternative explanations come to mind, and the fact that social learning occurs early in life. For whatever reasons, most writers have pursued an approach based on social factors.

The literature on nonverbal differences in flirtation and courtship is largely based on evolutionary theories. The end goal of courtship, at least from an evolutionary perspective, is reproduction. Women have more at risk in reproduction because of long gestation periods so they need to be more careful in choosing a mate. Trivers (1972) argued that this greater risk is why women are more nonverbally active at the initiation stages of a courtship encounter.

7.2 Motivation versus knowledge

A second discussion, relevant to the judgment accuracy domain, is about the relative contributions of motivation versus knowledge. Ickes, Gesn, and Graham (2000) proposed that women’s superiority in judging interpersonal cues is closely tied to motivational factors at the time of the skill assessment; according to this account, both women and men recognize that this skill is female stereotypic, and this recognition drives performance via motivation that is either increased or withdrawn when taking such tests. According to this argument, differences in judgment accuracy are due to transitory motivational factors and do not represent true skill domains in women versus men.

Though there is evidence that adding or subtracting motivation plays a role in accuracy of processing (remembering or interpreting) people’s spoken words, as

well as evidence that subtracting motivation can hurt accuracy of judging nonverbal cues (Horgan and Smith 2006), there is not much evidence that motivation can increase accuracy on judgments of nonverbal cues (Hall et al. 2009). In fact, some studies designed to experimentally raise people's motivation actually found that accuracy was impaired.

However, accurate factual knowledge of meanings and functions of nonverbal cues is positively correlated with accuracy in judging nonverbal cues (Davitz 1964; Rosip and Hall 2004). Thus, though motivational factors relating to gender-role socialization (Cross and Madson 1997) probably play a large role in the development of nonverbal judgment skills, there is at present not much evidence that motivation as an immediately proximal determinant plays much of a role in explaining the gender differences that have been found. Whether women's superior nonverbal judgment accuracy should be attributed to their acquired expertise (knowledge) or to motivational factors at play at the moment of making judgments is an important topic for future research.

7.3 Dominance/power versus gender socialization

A major theoretical debate was inspired by Henley (1977), who suggested that nonverbal gender differences had a common origin in women's subordinate place in society. According to this view, women's nonverbal repertoire is that of a submissive, subordinate person and men's is that of a dominant, powerful person. This sexual politics view of the field attracted a large following among psychologists, but its viability was weakened by research into how various dimensions of power and dominance are actually related to nonverbal communication (see meta-analyses by Hall, Halberstadt, and O'Brien 1997 and Hall, Coats, and Smith LeBeau 2005). For example, women exceed men in interpersonal judgment accuracy, accuracy of expression, gazing, and smiling, and they establish closer interaction distances, yet none of these differences is parallel to the correlations between dominance/power and the same nonverbal variables (in fact, some associations go the other way).³

Taking a national-level approach to this question, Merten (2005) administered an emotion recognition test to more than 40,000 people in 13 countries and corre-

³ In a parallel development with regard to verbal language style, Leaper and Robnett (2011) found in a meta-analysis that women use tentative speech forms (such as tag questions) more than men do, but, contrary to common assumptions, they concluded that this difference is due to women's superior interpersonal awareness of the other person's inclusion needs, not women's subordinate status (manifested in the need to ask the other person for confirmation of her statements). One might still argue that the interpersonal awareness itself is due to subordinate status, but it should be noted that the position that subordination is, by definition, the root cause of all gender differences, even if true, is unfalsifiable and therefore not empirically useful.

lated the gender difference with a country-specific gender empowerment measure. Across countries, the more gender equality there was, the bigger was women's advantage over men in accuracy of recognizing emotions, with a much bigger relation evident between gender empowerment and accuracy for women than for men. Less "subordinate" women (in terms of gender-role attitudes and domestic chores) were also better decoders of nonverbal cues in research by Hall et al. (1997).

Though some nonverbal gender differences do parallel dominance/power differences (e.g., loud voice, expansive body movements), and though surely in life there are instances when women's nonverbal communication is caused by subordination (e.g., an abused wife must accurately judge her husband's moods and must appear pleasant, at risk of life and limb if she does not), the overall pattern does not supply a convincing connection between dominance/power and the gender differences.

On the other hand, the nonverbal gender differences, like many other psychological gender differences, fit easily into the broad theoretical framework of gender socialization; women are socialized to be, and are expected to be, more interested and skilled regarding people, relationships, feelings, and so forth. The ways in which gender socialization influences nonverbal communication may be complex. Women's greater smiling, for example, has been theorized to involve multiple paths and feedback loops among positive affect, facial feedback, the expectations of others, positive reinforcements, behavioral reciprocity, modeling, adherence to norms, social sensitivity, and attitudes and values (Hall, Carter, and Horgan 2000).

Understanding the causes of nonverbal gender differences is additionally complex because of the ambiguity, alluded to in the Introduction, over what nonverbal behavior means. Researchers need to distinguish better among subtly different nonverbal cues (e.g., different types of smiles or gazes, different rates of nodding, different locations or manners of touch) that likely have different meanings. And, researchers need to understand better the meaning of the behavior in context – what the situation is, who the other people are and what relationship they have, what the tasks and interpersonal goals are, and so forth. Research that simply documents differences will not produce convincing evidence regarding their causes.

8 Conclusion

Gender differences in nonverbal communication and accuracy in decoding and encoding nonverbal cues are well established in the literature, but with a continuing shift in the way gender is defined and growing research with underrepresented populations (such as non-heterosexual people) new insight can be gained into the nature of these differences and whether they may be more flexible than the current research shows. The literature is rich in descriptive evidence, yet weak in uncover-

ing both the causal roots of the differences and possible functional outcomes of the differences for men versus women.

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John F. Dovidio and Marianne LaFrance

22 Race, ethnicity, and nonverbal behavior

Abstract: Nonverbal behaviors in the context of race and ethnicity are complex yet have significant consequences for race relations and inter-ethnic interactions. Differences in normative nonverbal behavior, which may be determined by cultural, socioeconomic, or contextual influences, can produce confusion, distrust, and dislike. Yet the topic of race, ethnicity, and nonverbal behavior is surprisingly understudied. The present chapter focuses primarily on the role of nonverbal behavior within the context of Black-White relations within the United States. First, the chapter explores racial and ethnic differences in nonverbal displays and skills. Although racial differences at the group level have been reported for some nonverbal behaviors, the overall pattern does not provide clear support for distinctive nonverbal patterns. Second, the chapter considers the role that nonverbal behavior plays in signaling the quality and valence of intergroup interaction. Third, the chapter discusses the reciprocal relationship between interpersonal and intergroup interaction on the one hand and the operation of nonverbal behavior on the other hand. Finally, the chapter describes how a comprehensive understanding of nonverbal behavior can provide critical insights into the dynamics of intergroup interactions and can ultimately foster more effective exchanges and harmonious relations.

Keywords: attribution, culture, implicit bias, intergroup interaction, nonverbal behavior, oppression hypothesis, power, prejudice, social identity, status

1 Introduction

Nonverbal behaviors assume many forms and enact many functions in human social interactions. Under the general rubric of nonverbal behavior, facial expressions are probably the most studied nonverbal cues followed in short order by gaze direction and eye contact, body movement and posture, and vocal variations, primarily in loudness and pitch. Researchers have also studied effects of touching, interpersonal distance and use of space, object-adaptors, and olfactory cues. Nonverbal behaviors are not only of many kinds but they have many uses in human social encounters. They reflect feelings and intentions that often go unspoken; they mirror and reinforce dominance and status hierarchies; they illustrate, buttress, and occasionally contradict the verbal stream; they assist in the coordination of speaking turns as well serve as an efficient means for conveying that one is listening and may or may not be comprehending what someone else is saying.

Finally, there are indications that nonverbal behaviors reflect a person's individual identity and group membership. For example, nonverbal cues have been found to reflect gender-role identification and cultural affiliation.

This chapter considers one particular swath through this multivariate array of behaviors and processes by addressing how nonverbal behaviors are implicated where race is involved. As will become evident, nonverbal behaviors in the context of race are complex yet have significant implications for the understanding of race relations and inter-ethnic interactions.

In the United States, "one drop of Black blood" historically has determined the rights, opportunities, challenges, and barriers faced by millions of Americans. Even today, race and ethnicity continue to exert powerful effects. In the United States and internationally, racial and ethnic minorities have poorer health (see Penner, Albrecht et al. 2010), higher rates of incarceration (Sidanius, Levin, and Pratto 1998), and less political power and economic resources (Sidanius and Pratto 1999) than do majority groups. It is therefore not a surprise that members of racial and ethnic minorities often harbor some level of distrust for politicians, police, and the medical community (Crocker, Luhtanen, Broadnax, and Blaine 1999; Dovidio, Gaertner, Kawakami, and Hodson 2002). Racial and ethnic minorities also have been found to encounter on a rather regular basis restrictive stereotypes and negative attitudes held by majority group members (Blair 2001). Here again, it is not unexpected that minority group members often exhibit high vigilance for signs of prejudice in intergroup interactions (Vorauer 2006).

In this chapter, we examine first whether racial or ethnic group membership is manifest in characteristic nonverbal behaviors. We then consider the role that nonverbal behavior plays in signaling the quality and valence of intergroup interaction. Finally, we discuss the reciprocal relationship between interpersonal and intergroup interaction on the one hand and the operation of nonverbal behavior on the other hand. Although we examine a range of intergroup contexts, our focus will primarily be on the role of nonverbal behavior within the context of Black-White relations within the United States.

2 Race, ethnicity, and nonverbal behavior

One idea of some longevity within the nonverbal communication literature is that members of different cultural groups "speak" different nonverbal languages just as they speak different verbal languages. Anthropologists, in particular, have argued that cultures often have their own characteristic modes of communication, one result of which is possible miscommunication when one group's preferred mode of interaction is at odds with that of another group. For example, E. T. Hall (1966) suggested that members of low-contact cultural groups often experience the

close interpersonal distances preferred by members of high-contact cultures as pushy or intrusive.

Within the United States, researchers have examined whether ethnic and racial groups show distinctive nonverbal communication styles (Dovidio et al. 2006 and Halberstadt 1985 for earlier reviews). For example, early on LaFrance and Mayo (1976) reported that Black listeners look less at their interaction partner than whites in same-race interactions. What remains up for debate is why such differences exist. It is possible that such group-level variations in nonverbal behavior are analogous to dialect differences in language. However, racial and ethnic groups often occupy different status levels within larger national units and so what might appear to be cultural variation may in fact be signs of differential status or power. We use the term “power” to describe the ability to control the outcomes of others while the term “status” represents possessing different levels of prestige with the potential of being able to exercise (or not) different levels or kinds of social control (Ellyson and Dovidio 1985). In the United States, White Americans enjoy significant advantages economically, educationally, and politically compared to Black Americans and Latinos.

2.1 Power and status

In the eyes of many social scientists, status and power represent fundamental dimensions of intergroup relations, each of which needs to be view in relational terms (see Burgoon and Dunbar 2006). In other words, one person’s status or power is relatively higher or lower than that possessed by others. Nonetheless, despite the fact that status is contextually variable, one person’s status may be relatively stable still because of ongoing differences in that the social position of that person’s group.

In general, high-status individuals are freer to move both literally and metaphorically. Observational studies attest to the fact that high-status individuals tend to adopt more open and relaxed postures, to take up more physical space, and to approach others more closely than do low-status individuals (Ellyson & Dovidio, 1985; Huang, Galinsky, Gruenfeld, and Guillory 2011). Low-status individuals appear to be more behaviorally restrained and to focus more on monitoring the behavior of others than do high-status individuals. Keltner and colleagues proposed that the various behaviors shown by high-power individuals could be construed as reflecting a broad approach orientation (Keltner, Gruenfeld, and Anderson 2003; see also Galinsky, Gruenfeld, and Magee 2003). In contrast, low power is association with a more inhibited orientation.

Another status-based model proposes that the relationship between nonverbal behaviors and power is based on the differential experience of those with chronic low status. Known as the Oppression Hypothesis, this model proposes that being

in a group with habitual low status causes its members to exhibit a set of unique nonverbal behaviors that are functional for coping with low status (Henley 1977; LaFrance and Henley 1994). In particular, members of chronically oppressed groups are hypothesized to be more sensitive and attentive to their social environment, more accurate at reading the nonverbal behaviors of others, especially high-power others, and to show more variability in nonverbal behavior as part of a general accommodating strategy.

The empirical literature indicates partial support for both models. With respect to the Approach-Inhibition view of power differences, J. A. Hall, Coats, and Smith LeBeau (2005) noted that people who have higher status or social power show greater facial expressiveness, adopt more open arm and leg postures, interact with others at closer distances, and interrupt others more often than do those with lower status or power, all of which could be interpreted as manifesting an approach orientation. However, no reliable status differences were obtained for touch, gesture, postural relaxation, and eye contact. Also, consistent with greater accommodation, Kraus and Keltner (2009) found that low socioeconomic status (SES) individuals displayed greater nonverbal cues of engagement (eye contact, eyebrow raises, head nods, laughs) and fewer signs of disengagement (doodling, grooming, object manipulation) than did high SES participants in dyadic interactions. This research also found that partner SES affected participants' nonverbal behaviors: People with partners who were higher in SES exhibited stronger indications of engagement and fewer cues of disengagement.

In terms of accuracy in interpreting others' behavior, the data are mixed. Low-power people frequently show greater motivation to be accurate in making judgments of high-power people than the reverse (Fiske and Dépret 1996; Goodwin et al. 2000). In addition, Kraus, Côté, and Keltner (2010) reported that low, compared to high, SES participants judged the emotions of an interaction partner more accurately and identified the emotion portrayed solely through muscle configurations surrounding the eyes with a higher degree of accuracy. Kenny and his colleagues (2010) argue that when stereotype accuracy is factored out, the data show higher accuracy by low-power people of high-power people than the opposite relationship. Nevertheless, the greater expressiveness of a partner, a factor not considered by Kenny et al., may also contribute to the greater accuracy of low-power people in interactions with high-power individuals (Hall et al. 2006).

In addition, a substantial number of studies reveal the opposite effect – that high-power or high-status people display greater nonverbal sensitivity and accuracy than low-power and low-status people. A meta-analysis by J. A. Hall, Halberstadt, and O'Brien (1997) revealed greater accuracy in judgments of nonverbal behavior among people higher in trait measures of dominance. Also, recently, in three studies Schmid Mast, Jonas, and Hall (2009) manipulated power and status in different ways (e.g., role in the context, recall of previous experiences, priming) and demonstrated converging evidence that higher power is related to greater accu-

racy in interpersonal judgments. (See Chapter 20, Schmid Mast and Cousin, this volume, for further discussion of interpersonal accuracy and the power/dominance dimension.)

Status distinctions in most societies are relatively stable at the group level. For example, in the United States, men have had higher status and greater social power than have women, and Whites have had higher status and greater social power than Blacks. The question has been whether these group differences in status are manifest in reliable differences in the nonverbal behaviors of lower-status and higher-status group members. Although the evidence is limited, the data for one nonverbal behavior, namely gaze behavior, is not consistent with a social status hypothesis. Whereas Whites generally look at others a greater percentage of time when they are listening to them than when speaking (Dovidio and Ellyson 1985), Blacks look more while speaking than listening (LaFrance and Mayo 1976), a behavior previously described as being more characteristic of dominant or powerful individuals.

Evidence of racial differences in accuracy of decoding another person's nonverbal behavior presents a mixed picture. Halberstadt's (1985) meta-analysis showed that although Black children (ages 4–11) showed equivalent or slightly lower levels of decoding accuracy relative to Whites, Black college students showed a higher level of accuracy than did White college students. Halberstadt saw these results as consistent with the oppression hypothesis. In general, though, Whites and Blacks are more accurate in decoding the nonverbal behavior of members of their own race than they are of other races (Bailey, Nowicki, and Cole, 1998; Weathers et al. 2004). Greater intragroup than intergroup accuracy is likely a function of greater familiarity with ingroup members than with outgroup members (Elfenbein and Ambady 2002). Consequently, the effect of chronic differences in power on nonverbal behavior in general and nonverbal accuracy in particular remains unsettled.

2.2 Group differences

In his analysis of cultural variability, Watson (1970) classified 30 countries as either "contact" or "noncontact" cultures. Members of the former were described as showing more eye contact, more direct orientation in interpersonal encounters, and more touching. The ongoing thesis about interactions between individuals from cultures varying in the "contact" levels should result in more miscommunication. The data on this are not yet definitive in part because multiple dimensions are at work in any intercultural encounter. (For further discussion of culture and nonverbal behavior, see Chapter 8, Bull and Doody; Chapter 11, Andersen, Gannon, and Kalchik; and Chapter 23, Matsumoto and Hwang; all this volume.)

In his seminal research on culture and facial expression, Friesen (1972) studied the facial displays made by Japanese and American males in response to viewing

distressing videos. Alone, members of both cultures showed comparable levels of negative emotions but when others were present, Japanese participants displayed less negative affect and more smiling while the Americans continue to show negative displays. Matsumoto and Kupperbusch (2001) subsequently reported that people from other collectivist cultures showed the pattern found for the Japanese participants while people from other individualistic cultures replicated the facial expressiveness shown by the American participants in the earlier study.

Within the same society, members of different racial and ethnic groups often have different subcultures. Jones (1986), for example, argued that Black culture consists of reactive and evolutionary components. The *reactive* component refers to the collective adjustments Blacks in the United States have made in response to oppression while the *evolutionary* describes those aspects that represent “the unfolding of a cultural core laid in an African past and characterized in function, if not form, across the cultures of the African Diaspora” (Jones 1986: 294). In particular, Jones identified five elements of this cultural core: time, rhythm, improvisation, oral expression, and spirituality. Something similar has been described for Latin Americans. According to Sanchez-Burks, Nisbett, and Ybarra (2000), *simpatico* is a core attribute that combines “expressive displays of personal charm, graciousness, and hospitality” (175). Whether these core cultural values rather than differential exposure to lower status are associated with distinctive nonverbal behaviors has yet to be determined.

There is empirical evidence for a scattering of racial differences in interpersonal distance, body orientation, touch, and gaze. Although Halberstadt (1985) concluded that there were no overall differences in interpersonal distances adopted by Blacks and Whites, age was found to be an important moderating factor. Black children maintained closer interpersonal distances than did White children, but Black adults maintained *greater* interpersonal distance than did White adults. However, this latter conclusion has not been replicated. Reid, Tate, and Berman (1989) found that Black children do not always maintain closer distances than White children. In fact, they found that Black children (ages 4–7) stood *farther* away from an infant of the same race than did White children.

In her meta-analysis of studies where body orientation and touch were the nonverbal behaviors of interest, Halberstadt (1985) concluded that Blacks tended adopt a less direct body orientation than Whites but that Blacks touched one another more often than Whites. Finally, with respect to gaze behavior, Halberstadt's (1985) analysis of eight studies showed that in same-race interactions, Blacks displayed significantly lower levels of visual contact than Whites. Similar results have been reported for adults (Smith 1983) and children (Reid et al. 1989).

Many fewer studies have compared Latino nonverbal behavior with that of Whites or Blacks. One study reported that Latinos in the United States interact at closer interpersonal distances than European Americans (Fortson and Larson 1968) and another study reported that Latinos showed more eye contact, more smiling,

and more laughing than White or Black participants (Holloway, Waldrip, and Ickes 2009).

2.3 Summary: Racial and ethnic differences in nonverbal behavior

Although racial differences at the group level have been reported for some nonverbal behaviors, the overall pattern does not provide clear support for distinctive cultural nonverbal pattern nor does it support a social status interpretation. For example, while the findings for spatial behavior (i.e., greater interpersonal distance among Black than White adults) are more consistent with the oppression rather than a cultural hypothesis, the results for touch (more touching by Blacks than Whites) are more consistent with the cultural hypothesis. Although racial differences in nonverbal behavior do not appear to neatly conform to ideas deriving from oppression or culture, this is not altogether surprising. Even when significant cultural differences have been found at the societal or cultural level, research shows that these show variability depending on social context. More importantly perhaps, the absence of broad racial or ethnic differences may actually set a reliable backdrop against which it is possible to determine whether social psychological variables like racist attitudes or intergroup hostility are manifest in interracial or interethnic interactions.

3 Nonverbal behavior in intergroup contexts

When interactions occur across group lines, individual dispositions toward out-group members leave their mark. In what follows, we examine four different, yet related, social psychological processes that affect interracial and majority-minority group relations. These involve social identity, structure, prejudice, intergroup anxiety, and group-based needs. These factors are often manifest in nonverbal behaviors and/or in their interpretations.

3.1 Social identity

Social Identity Theory (Tajfel and Turner 1979) and Self-Categorization Theory (Turner et al. 1987) distinguish between an individual's personal identity and his or her social identity. When personal identity is salient, then the individual's unique needs, values, beliefs, and motives are primarily responsible for affecting behavior. However, when social identity is salient, "people come to perceive themselves as more interchangeable exemplars of a social category than as unique per-

sonalities defined by their individual differences from others" (Turner et al. 1987: 50). Under these latter conditions, collective needs, goals, and standards take priority. For example, when one's social identity is relevant, individuals are more likely to spontaneously like, trust, cooperate with, and help in-group members than out-group members (for a review, see Dovidio and Gaertner 2010).

This differential positive orientation due to social identity salience has also been found to manifest itself nonverbally. A recent meta-analysis by Toosi et al. (2011) of 37 studies employing measures of nonverbal behavior in intergroup interaction found that, overall, people's nonverbal displays were more negative when they were interacting with a member of a different racial or ethnic group than when they communicated with a member of their own group. Weitz (1972), for example, demonstrated that Whites use colder voice tones for interactions with Blacks than with Whites. Word, Zanna, and Cooper (1974) found that Whites terminated interactions sooner with Blacks than with other Whites, and they exhibited greater physical distance from them during interactions with them. Similarly, Fugita, Wexley, and Hillery (1974) reported that Whites had both less eye contact and shorter glances with Black interviewers than with White interviewers. In a study by Dovidio et al. (1997), White participants displayed less eye contact and higher rates of blinking with Black partners than with White partners. In contrast to these findings, Bishop (1979) found no differences in Whites' physical distancing, forward lean, eye contact, or shoulder orientation as a function of the race (Black or White) of the partner.

While there is relatively consistent evidence of the race composition of dyads on specific nonverbal behaviors, the findings are generally stronger when coders, both trained and naïve, make global judgments of impressions based on silent video segments of interactions. Based on coders' ratings, Whites appear less friendly and pleasant nonverbally when they interact with a Black relative to a White partner (Apfelbaum, Sommers, and Norton 2008; Feldman 1985; Feldman and Donohoe 1978; Heider and Skowronski 2007; Norton et al. 2006; cf. Mallett, Wilson, and Gilbert 2008) and show less synchrony (Babbitt and Sommers 2011). They also are judged as more anxious, avoidant, and suspicious in interactions with Blacks than with Whites (Avery et al. 2009; Richeson and Shelton 2003; Schreer, Smith, and Thomas 2009; Trawalter and Richeson 2008). In Canada, White Canadians appear more open and intimate with White partners than with First Nation partners in initial exchanges (Vorauer and Turpie 2004). Although Blacks also exhibit less friendly nonverbal behavior in interracial than intraracial interactions (Mendes et al. 2008), they often show less bias nonverbally than do Whites (Feldman and Donohoe 1978; Trawalter and Richeson 2008; cf. Mendes et al. 2008). Overall, Toosi et al. (2001) found significant nonverbal bias in interracial interactions for majority-group members ($r = 0.11$, $n = 29$ studies) but not for minority-group members ($r = 0.02$, $n = 5$ studies). In addition, patterns of nonverbal bias were similar for male-male and female-female interracial dyads.

Social identity is associated not only with sensitivity to group differences but also with perceptions of pre-existing group differences in power and prestige. According to Expectation States Theory (Berger, Wagner, and Zelditch 1985; Correll and Ridgeway 2003; Ridgeway 2001), when members approach members of different groups, they harbor differential expectations about the status of whoever is present. Berger et al. (1985) described these appraisals as “diffuse status characteristics.” Such expectations tend to generalize across situations and may even be instrumental in bringing ongoing interactions in line through the action of behavioral confirmation. Expectation States Theory has received substantial empirical support with respect to interaction between women and men, and it has received some support in the realm of interracial behavior (see Berger et al. 1985; Correll and Ridgeway 2003).

Both Social Identity Theory and Expectation States Theory converge on the prediction that minority group members are more vigilant in their interactions with majority group members and hence will exhibit greater attention to nonverbal cues. Minority group members also expect to be more defensive in the company of majority members and hence will show less direct postural orientation than majority group members in intergroup contexts. By contrast, majority group members are predicted to display fewer nonverbal behaviors indicative of liking and more nonverbal indicators of dominance than minority group members in intergroup interaction.

There is some empirical support for these predictions. For example, in interracial interactions Turkstra, Ciccio, and Seaton (2003) found that Whites tended to take the floor more often, whereas Blacks tended to answer more questions. Whites also show less immediate, attentive, and involved nonverbal behaviors with Blacks than with Whites (Feldman 1985; Weitz 1972; Word et al. 1974). In addition, Blacks tend to show heightened attentiveness and sensitivity to nonverbal cues of prejudice (Richeson and Shelton 2005; Rollman 1978).

Social identity also shapes how people perceive the nonverbal cues displayed by others. For example, Blacks are especially accurate at detecting evidence of prejudice and discrimination from “thin slices” of majority group members’ behavior (Richeson and Shelton 2005) and Whites are more likely to perceive hostility in the faces of Blacks than Whites (Hugenberg and Bodenhausen 2004) including the tendency to misperceive neutral facial expressions of Blacks as conveying anger. These biases in perception have been found to occur even for “minimal groups” (Dunham 2011).

3.2 Structure of interaction context

In general, nonverbal displays conveying less friendliness and greater anxiety are stronger in situations that are social and unconstrained than task-oriented and

scripted. For instance, Babbitt and Sommers (2011) showed that nonverbal synchrony was lower in interracial than same-race interactions when the nature of the interactions was not explicitly defined or framed as social, but not when it was described as task-focused. Perhaps because of their task focus, studies of nonverbal displays in the context of professional activities, such as teacher-student interactions (Simpson and Erickson 1983) and healthcare provider-patient interactions (Colliver, Swartz, and Robbs 2001), tend to show lower levels of racial bias than average in Toosi et al.'s (2011) meta-analysis.

3.3 Prejudice

Intergroup interactions are notorious for activating pre-existing stereotypes and prejudices. Moreover these easily translate into nonverbal behavior toward the other as well as in the interpretations individuals make of each other's verbal and nonverbal behavior (Lakin 2006). Some of these attitudes are explicit, conscious, and potentially controllable while others remain implicit and mostly out of conscious awareness. Explicit attitudes are typically captured with self-report measures while implicit attitudes appear amenable to measurement using response-latency measures such as the Implicit Associations Test (IAT; see Greenwald et al. 2009).

Studies repeatedly find that explicit and implicit attitudes are often uncorrelated (Dovidio, Kawakami, and Beach 2001) with the result that people who appear low in racial prejudice measured explicitly may nonetheless show racial bias when it is measured implicitly (Dovidio and Gaertner 2004). Moreover, implicit and explicit attitudes likely affect behavior in different ways. Dovidio et al. (1997) proposed that explicit attitudes predict those behaviors that people have the ability to formulate, monitor, and control. In contrast, implicit measures are thought to predict spontaneous behaviors, which people are less able to control or even be aware of. In one study, explicit prejudice was found to predict the amount of overt bias shown in Whites' judgments and evaluations of Blacks, but White participants' implicit prejudice predicted behaviors believed instead to reflect anxiety (rate of blinking) and dislike (gaze aversion) (Dovidio et al. 1997). McConnell and Leibold (2001) also reported that Whites' implicit racial attitudes, but not their explicit racial attitudes, predicted how much Whites talked and the frequency with which they made speech errors and speech hesitations in interactions with Blacks. In addition their implicit attitudes tended to correlate with leaning away from their partner and adopting further seating distances during interracial interactions.

The disjunction between explicit and implicit attitudes among majority group members is linked with several outcomes. First, Whites' *explicit* attitudes and *verbal* behaviors are related and secondly, their *implicit* attitudes and *nonverbal* behaviors are related (Dovidio, Kawakami, and Gaertner 2002). Specifically,

Whites' explicit racial attitudes predicted the how positive their verbal exchanges were with Black interaction partners; however, their implicit racial attitudes were better at predicting the degree to which their nonverbal communication was positive. In addition, Whites' impressions of how friendly they were during their interracial interactions were based on their explicit attitudes and those verbal behaviors that they could easily monitor. They saw themselves as being non-prejudiced and believed that they behaved in a friendly and unbiased manner toward their Black partners.

Blacks, in contrast, when asked to assess how friendly their partners were during their interactions with them relied on their White partners' nonverbal behavior. Because Whites' nonverbal behavior was more negative on average than their verbal behavior, Blacks often came away from interactions with a negative impression. Thus, Whites' and Blacks' assessments of how the White person behaved were uncorrelated presumably because they relied on different manifestations.

It thus appears that individuals are able to monitor and control what they think and what they say relatively easily but are substantially less able to monitor and control what they feel, which may "leak out" through nonverbal behaviors. Unless people have the motivation and skill to control spontaneous reactions, whatever prejudices they harbor are likely to manifest themselves nonverbally (Dasgupta and Rivera 2006). In addition, when people are more cognitively taxed (e.g., by performing different tasks simultaneously), negative implicit attitudes (assessed using the IAT) are stronger predictors of more negative nonverbal behaviors, such as lower levels of eye contact and greater self-touching (Hofmann et al. 2008).

Similarly, other studies have shown that Whites' implicit intergroup attitudes and stereotypes predict the impressions that racial and ethnic minorities have of them (Fazio et al. 1995; McConnell & Leibold, 2001; Sekaquaptewa et al. 2003). In addition, Whites who are more implicitly prejudiced are faster to perceive hostility in the face of a Black than a White person and perceive the expression of hostility as lasting longer with a Black person (Hugenberg and Bodenhausen 2003).

Racial bias has also been found in task-oriented interactions. Johnson et al. (2004), for example, found that physicians displayed greater verbal dominance, less positive affect, and less patient-centered communication with Black patients than with White patients. This may account for findings showing that same-race interactions between physicians and patients (Cooper et al. 2003), and same-race interactions between teachers and students (Feldman and Donohoe 1978) are experienced more positively than cross-race interactions. When a White physician shows more implicit racial bias, Black patients feel less respected. They also like the physician less and have less confidence in the physician (Cooper et al. 2012). Doctors higher in implicit prejudice also appear less warm and friendly to Black patients. The effect of explicit prejudice is much weaker: Doctors who are more

explicitly prejudiced admit to lower likelihood that they will involve a Black patient directly into their medical care, but it is still the implicit bias that drives their nonverbal behavior (Penner, Dovidio et al. 2010).

It is important to recognize, however, that implicit attitudes are not intractable even though they are automatically activated. Implicit attitudes are “habits of mind” which are the result of repeated exposure and over-learning (Wilson, Lindsey, and Schooler 2000). Nevertheless, repeated exposure to and practice at making chronic egalitarian beliefs has the potential for creating alternative habits of mind (Moskowitz and Ignarri 2009), which inhibit previously automatically activated biases (Kawakami et al. 2000). Reducing implicit bias in this way also produces more positive nonverbal behaviors, such as more open and relaxed postures and closer approach toward Blacks (Kawakami et al. 2007).

It is also the case that when changes occur in nonverbal behavior there can be corresponding changes in intergroup interactions. Specifically, nonverbal behavior is an important mechanism in effecting self-fulfilling prophecies. Word, Zanna, and Cooper (1974) demonstrated that Whites exhibited less immediate and more negative nonverbal behaviors when interviewing Black than White confederates. Moreover, the researchers found that interviewers who showed such low-immediacy behaviors elicited less responsive and positive behaviors from interviewees. The interviewees who were treated this way were judged by independent raters to be less suitable for the position. In other words, experimentally produced interviewer nonverbal behavior which was modeled on how Whites interviewed Blacks elicited the behavior that White interviewers might have expected from Black interviewees.

Nonverbal behaviors are important not only because they convey a majority-group member’s biases toward a minority-group member, but also because such behavior is communicated to other members of their racial or ethnic group. In one study, White toddlers observed a brief videotape of a White adult interacting with a Black. When the White adult displayed negative nonverbal behavior such as leaning backward, the toddlers subsequently showed greater bias toward Blacks when than the White adult had been shown displaying positive nonverbal behavior such as leaning forward and sitting next to the Black person (Castelli, de Dea, and Nesdale 2008). Whether the White adult verbally expressed positive attitudes (e.g., appreciation of Blacks) or not had no effect on the toddlers’ racial bias.

Weisbuch, Pauker, and Ambady (2009) demonstrated that nonverbal bias can be transmitted via the mass media. They sampled 15-second video clips from popular television shows, in which a White character interacted with another White or Black character. Judges, who were unaware of the race of the character being addressed, rated the video clips representing interactions with Blacks as demonstrating less friendliness than those involving interactions with Whites. (For access to these video clips, see http://ase.tufts.edu/psychology/ambady/materials/weisbuch_et_al.htm). Moreover, after observing these brief, silent video clips of the

interactions with Blacks, White participants showed increased racial bias on both implicit (response-latency) and explicit (self-report) measures. This “contagion” of bias occurred even when participants were unable to consciously identify the pattern of nonverbal bias across the video clips.

3.4 Intergroup anxiety

For some people, anxiety is a normal reaction to being part of an interracial encounter; moreover such anxiety is often manifest nonverbally through high rates of blinking, closed postures, self-touching, and speech dysfluencies. For example, researchers have found that Blacks exhibit more speech disturbances, higher voice pitch, slower speaking rate, less eye contact (Fugita, Wexley, and Hillery 1974) and more fidgeting more than Whites (Garratt, Baxter, and Rozelle 1981; E. T. Hall 1966; Pennington 1979; Smith 1983). Moreover, anxiety may exacerbate tensions in intergroup encounters because anxious interactions are more cognitively and emotionally taxing (Trawalter, Richeson, and Shelton 2009). Indeed, feeling anxious in anticipation of interaction tends to cause members of both majority and minority groups to enter intergroup interactions with negative expectations (Mallett, Wilson, and Gilbert 2008; Shapiro et al. 2011). Anticipatory anxiety is also associated with a greater inclination to disengage early from such interactions or to avoid such interactions altogether (Plant 2004; Plant and Butz 2006).

The experience of anxiety is associated with the display of behaviors indicative of general discomfort (Trawalter and Richeson 2008). Because such signs of anxiety bear a considerable similarity to those associated with having an aversion to the immediate environment, anxiety-related behaviors may be interpreted as being interpersonally averse to this person who is not an in-group member. In the Netherlands, police officers have been found to be more suspicious of Black suspects and more motivated to interrogate them when they display the kinds of anxiety-associated behaviors that Blacks commonly exhibit in any interracial interaction (Vrij and Winkel 2006). This misinterpretation can happen on both sides of interracial encounters. For example, Whites and Blacks have been known to misinterpret anxiety-related behaviors, such less eye contact and more fidgeting, as reflecting unfriendliness more frequently in interracial than in intra-racial encounters (Devine and Vasquez 1998; Dovidio et al. 2007).

Speaking to this issue, a recent theoretical paper has postulated, however, that the anxiety experienced by majority and minority group members in interracial interactions is likely to have different sources. Starting with the insights provided by research on stress and coping. Trawalter, Richeson, and Shelton (2009) wrote, “Because whites and racial minorities tend to have different prejudice-related interpersonal concerns during interracial contact, they are likely to have a different focus during their interactions” (249). Whites, and majority groups more generally,

may be concerned about threats to their group's status as well as the desire to appear nonprejudiced (Dovidio and Gaertner 2004; Gaertner and Dovidio 1986).

Preoccupation with behaving in a non-prejudiced manner can further contribute to inconsistencies in Whites' verbal and nonverbal behaviors in interracial interactions. Hebl and Dovidio (2005) concluded that the display of negative nonverbal behaviors by members of majority or socially dominant groups is frequently at odds with their verbal behavior. Members of majority groups typically report feeling positively toward targets despite the fact that their nonverbal expressions and cues indicate more negative reactions. This gap between a self-reported favorable orientation and a set of negative nonverbal behaviors has often been observed for Whites when they participate interracial interactions (see Crosby, Bromley, and Saxe 1980).

Because Whites may be anxious about possibly acting in a prejudiced way in interracial interactions, they may focus most of their attention on managing what they say, which is easier than control their nonverbal behaviors. Since monitoring and controlling verbal responses is a highly demanding cognitive task, these very activities may actually facilitate the expression of less controllable nonverbal responses (Patterson 1995; Richeson and Shelton 2003; Richeson and Trawalter 2005). In short, Whites may be less adept at managing spontaneous emotion-generated negative behaviors that occur in interactions.

Vorauer and Turpie (2004) studied Canadian majority (White) and minority (First Nations) group members for signs that such processes may be at work. Interestingly, they found that higher evaluative concerns interfered with intimacy-building behaviors with minority group members among *low-prejudiced* Whites. Such concerns reduced bias among high-prejudiced Whites. Vorauer and Turpie interpreted these results as indicating that low-prejudiced Whites "choked" under the pressure of high evaluative concerns.

Minority group members have their own anxieties about majority group members. Even when majority group members do not directly control the resources of minorities, there is evidence that minorities put great stock in the perceptions that majority group members have of them (Kramer and Messic 1998). Consequently, in interracial contexts there is heightened concern about being able to detect and compensate for possible discrimination (Miller and Myers 1998; Shelton, Richeson, and Salvatore 2005). Minorities are especially sensitive to cues suggesting that their interaction partners devalue them in social identity terms (Murphy, Steele, and Gross 2007; Purdie-Vaughns et al. 2008).

Vigilance and wariness often lead minorities to be more emotionally inhibited in intergroup interactions than interacting with members of their own group (Frale, Blackstone, and Scherbaum 1990). It is also possible that minorities may compensate for potential bias before it has the opportunity to affect the interracial interactions in which they take part (Miller and Myers 1998). Specifically, concern about potential bias by White interaction partners may cause racial and ethnic

minority participants to engage in compensatory strategies, such as smiling and talking more, in order to ward off potentially negative outcomes (Shelton, Richeson, and Salvatore 2005).

The anxiety aroused by intergroup interactions also influences how people assess their experience in such encounters (Trawalter, Richeson, and Shelton 2009). The experience of anxiety is associated with regarding such interactions as effortful and has the effect of decreasing processing fluency (Alter and Oppenheimer 2009). *Processing fluency* is the subjective ease or difficulty with which people process information. In general, fluency tends to promote feelings of safety, increase perceptions of truth, and enhance feelings of familiarity and liking. In contrast, processing disfluency arouses anxiety, increases perceptions of psychological distance, deception, and risk, and reduces trust and self-disclosure (Alter and Oppenheimer 2009).

People not only experience more anxiety in intergroup interactions, but also display more nonverbal cues associated with discomfort (Trawalter and Richeson 2008). Because the nonverbal cues of anxiety overlap with those indicating dislike, anxiety-related behaviors are interpreted as discomfort with the situation when displayed by a member of one's own group but as unfriendliness when demonstrated by a member of a different group. Both Whites and Blacks often misinterpret anxiety-related behaviors, such as shorter gaze durations and more frequent self-touching, as signals of unfriendliness more frequently in interracial than in intraracial encounters (Devine and Vasquez 1998; Dovidio et al. 2007). In the Netherlands, police officers are more suspicious of Black suspects and are more motivated to interrogate them when they display the kinds of anxiety-associated behaviors that Blacks commonly exhibit in interracial interactions (Vrij and Winkel 2006).

Misinterpretations of cues, such as seeing anxiety as aversion, can have both immediate and longer-term effects on interpersonal and intergroup relations. Pearson et al. (2008), for example, showed that since intergroup interactions are substantially more fragile than intragroup exchanges, they are more damaged by dysfluencies. For example, a slight (1-second) delay in audio-visual feedback between interactants over closed-circuit television was imperceptible to participants and had no detrimental effect on same-race dyadic relations, it had a significantly adverse effect on cross-race dyadic interactions. Because of the delay, participants in cross-race interactions, compared to a control condition, perceived their rapport in more negative terms, perceived more anxiety in their partner, and became more anxious themselves. However, it was the perception of partner's anxiety, not their personally experienced anxiety, that primarily mediated the lower perceived level of rapport. These effects were symmetrical for both White and Black interactants. Thus, perceived anxiety in the other carries surplus meaning in cross-race interaction that disrupts social coordination and rapport. Moreover, these processes, which have been studied primarily in initial interactions between strangers, have

persistent effects across time, over a 15-day period of interactions between roommates (West, Shelton, and Trail 2009).

3.5 Needs for acceptance and empowerment

When social identity is salient, different group membership needs also become salient, namely needs for *acceptance* and for *empowerment* (Shnabel et al. 2009). The Needs-Based Model started with the study of interpersonal transgressions and the needs experienced by both perpetrators and victims in interpersonal relationships (Shnabel and Nadler 2008). Recent research extends the thinking to the psychology of perpetrator and victimized groups, including those in the Middle East and advantaged versus disadvantaged groups more generally. Minority group members often feel like victims who have lost status and control. In response, they seek reaffirmations to restore of lost power and competence. In contrast, members of majority (advantaged) groups seek acceptance and social approval from members of disadvantaged groups when they feel that the moral legitimacy of their status and privilege is questioned, (Shnabel et al. 2009).

With respect to race and ethnicity in the United States, Bergsieker, Shelton, and Richeson (2010) characterize these needs as needs for respect and being liked. Blacks and Latinos in relation to Whites seek and consequently make particular efforts to manage the impressions of Whites so that they are seen as competent. Whites, in contrast, seek being liked in intergroup contexts and hence often go out of their way to be ingratiating. In their empirical work, Bergsieker et al. (2010) videotaped Blacks and Whites in cross-race and same-race interactions and had raters code frequencies of *self-promoting behaviors* and *ingratiating behaviors*. The former intend to convey an image of power such as describing accomplishments, achievements, and talents, as well as exhibiting confidence. The latter are attempts at eliciting liking by the other person such as by being humorous, drawing attention to similarities or common acquaintances, and nodding and smiling in response to whatever the other person says. Blacks were found to show a much higher rate of self-promoting behavior than ingratiating behavior. Whites in interracial interactions, compared to same-race encounters, displayed more ingratiating behavior and less self-promoting behavior.

4 Summary, implications, and conclusion

Despite its obvious practical importance and theoretical value, nonverbal communication in intergroup contexts, generally, and interracial interaction, in particular, is surprisingly understudied. In 1985, Halberstadt observed specifically that, “[t]he first research on race and socioeconomic differences in nonverbal communication

was conducted in the 1930s..., but interest in these issues was not sustained until the early 1970s" (228). Our review of the literature reveals that the interest in race and nonverbal communication peaked in the 1970s, waned somewhat, and then has shown a resurgence with new interest in interracial dyadic interactions (Richeson and Shelton 2010).

Nevertheless, understanding racial and ethnic differences in nonverbal behavior nonverbal communication in intergroup interactions is important for improving race and ethnic relations. Yet, both general differences in social position and cultural factors account only partially for differences in patterns of nonverbal behavior across groups, and the data are not entirely consistent with either perspective. One reason for this may be that the racial and ethnic minority groups, like the White majority group, are highly diverse, reflecting different cultural heritages (e.g., African, African American, or Caribbean Blacks; Chicanos, Puerto Ricans, or Cubans), regional distributions, generations in the country, and spanning the range of socioeconomic background. Such "diversity within diversity" limits the extent to which overall racial and ethnic differences will be observed and may be expected.

Perhaps because in intergroup interactions the salience of between-group differences, social identity, and prototypicality of group membership (Tajfel and Turner 1979; Turner et al. 1987) are heightened, several systematic effects occur for nonverbal behavior in the context of interracial interaction, however. Nevertheless, differences in social power, a preferred explanation traditionally, appear to represent only a small part of the story. Instead, individual differences in prejudice, particularly implicit bias (measured, for example, with the IAT), are a better predictor of nonverbal displays and their interpretation. Whites higher in implicit prejudice show more negative nonverbal behaviors (less eye contact and less friendly nonverbal displays), and they are quicker to perceive hostility on the faces of Blacks, even those with neutral facial expressions. Reducing implicit bias produces more positive spontaneous nonverbal behavior in subsequent interracial encounters.

Because most Whites currently express positive racial views explicitly and endorse egalitarian values but still possess negative implicit attitudes, they frequently convey contradictory messages in interracial interaction. Verbal expressions, which are conscious and controllable, are typically positive and overtly friendly; nonverbal behaviors, which are more difficult to monitor and control, appear more negative. When these mixed messages are displayed, Blacks perceive Whites as untrustworthy (Dovidio, Gaertner et al. 2002). Thus, nonverbal behavior may be a critical component shaping Blacks' current distrust of Whites and the development of different racial perspectives.

That is, the different reliance on verbal and nonverbal behavior by Whites and Blacks in forming their impressions can lead to vastly divergent views not only about their interpersonal relations but also ultimately to race relations in general. Whites appear not to recognize the pervasiveness of intergroup bias, whereas Blacks report the pervasive influence of bias. In recent national surveys, only one-

third of Whites but nearly three-fourths of Blacks reported that racial discrimination is a major factor accounting for disparities in income and education levels (USA Today/Gallup 2008). Whereas a vast majority of Whites (71%) reported that they were satisfied with the way Blacks are treated in society, a nearly equivalent proportion of Blacks (68%) reported that they were *dissatisfied* with the way Blacks are treated in the U.S. (Gallup Minority Rights and Relations Survey 2007). Understanding the role of nonverbal behavior in interaction can thus provide fundamental insights for understanding and improving intergroup relations.

Recent research further implicates the critical importance of affective factors, particularly intergroup anxiety, in expressions and interpretations of nonverbal behavior in intergroup interactions. Both Whites and traditionally disadvantaged racial and ethnic minority groups (Blacks and Latinos) exhibit higher levels of anxiety in intergroup than intragroup interactions (Stephan and Stephan 2000). This heightened anxiety produces nonverbal displays of anxiety, including averted gaze, closed posture, increased interpersonal distance, and self-touching. While both Whites and Blacks readily recognize cues of anxiety exhibited by members of both groups, they ultimately interpret these cues differently. Because of negative group-based expectations and overlap between cues of anxiety and dislike, both Whites and Blacks associate cues of anxiety from the other group as signals of hostility and unfriendliness.

One consequence of this process of misattribution of anxiety to animosity may be a form of interracial pluralistic ignorance. For example, White and Black students say they are really interested in opportunities for interracial interaction, but they also explain that the reason they do not make overtures to members of the other group is because they anticipate being rejected by them (Shelton and Richeson 2005). Relatedly, Miller and Prentice (1999) observed that interpersonal interactions between members of different groups occur across a "category divide." Cues, including nonverbal behaviors that may have another origin, that may be interpreted negatively, are much more likely to be interpreted in this way in intergroup interaction than in encounters between members of the same racial or ethnic group. These misunderstandings can be quite costly because once people label these interpersonal difficulties as group-based problems, they believe it is especially difficult to resolve the conflict.

The power of nonverbal behavior is that it is expressed spontaneously, normally with limited reflection and control, and can powerfully shape impressions in ways that people may not realize or have difficulty articulating. In race and ethnic relations, differences in normative nonverbal behavior, which may be determined by cultural, socioeconomic, or local influences, can produce confusion, distrust, and dislike. Thus, a comprehensive understanding of nonverbal behavior can provide critical insights into the dynamics of intergroup relations and a shepherd them to be more constructive exchanges. Such efforts require an integration of work in communication, cultural processes, social cognition, and intergroup

dynamics. Although nonverbal behavior can be studied in terms of separate encoding and decoding processes and general differences in nonverbal displays across groups, we believe that the dynamic nature of nonverbal communication can best be studied during interactions. Further illuminating the critical role of nonverbal behavior in intergroup communication can provide new insights into race relations and how they are reflected in and shaped by intergroup interactions.

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23 Culture and nonverbal communication

Abstract: This chapter is concerned with the relationship between culture and nonverbal behaviors (NVB). We discuss the various channels of NVB including facial expressions, voice, gestures, body postures and gait, interpersonal space, gaze and touch. Although some NVB are universal and probably biologically innate, all are influenced by culture in profound ways, and we discuss how culture influences them. In this chapter we review evidence concerning the universality and possible biological innateness of NVBs, including several major debates and controversies that have occurred in the past. We also review much evidence concerning the cultural-specificity of NVBs, and describe how cultural influences contribute to the process of intercultural communication, providing challenges that go beyond intra-cultural communication.

Keywords: culture, universality, cultural specificity, cultural display rules, intercultural communication, nonverbal communication

This chapter is concerned with the relationship between culture and nonverbal behaviors (NVB). As we will see below, some NVB are universal and probably biologically innate; others are rooted in culture and are produced through development and enculturation. Regardless of source, culture influences how NVB is used in profound ways; just as members of every culture learn to communicate verbally through speech, they also learn to communicate nonverbally in culture-specific ways as well. Below we review the main research findings examining the influence of culture on the various aspects of NVB, and discuss how these influences contribute to the intercultural communication process. We begin our presentation with a discussion of culture and facial expressions.

1 Culture and facial expressions of emotion

1.1 Original debates concerning universality versus culture specificity

Darwin (1872) originally suggested that emotions and their expressions had evolved across species, were evolutionarily adaptive, biologically innate, and universal across humans and even nonhuman primates. According to Darwin, all humans, regardless of race or culture, possessed the ability to express emotions in exactly the same ways through their faces, and to a lesser extent in the voice. Darwin

(1872) claimed, in his principle of serviceable associated habits, that facial expressions are the residual actions of more complete behavioral responses. Relying on advances in photography and anatomy (Duchenne de Boulogne 1862/1990), Darwin engaged in a detailed study of the muscle actions involved in emotion and concluded that the muscle actions are universal and their precursors can be seen in the expressive behaviors of nonhuman primates and other mammals.

Darwin's work drew heavy criticism, especially from anthropologists such as Mead (1975) and Birdwhistell (1970). They noted vast differences in expressive behavior across cultures and concluded that facial expressions could not be universal. Instead they argued that emotional expressions had to be learned differently in every culture, and just as different cultures have different spoken languages they must have different expressive languages of the face as well.

Between Darwin's original writing and the 1960s, only seven studies attempted to test the universality of facial expression. Unfortunately these studies were inconclusive (Ekman, Friesen, and Ellsworth 1972). Thus, an influential review of the literature (Bruner and Tagiuri 1954) concluded that facial expressions were not universal but learned.

1.2 The original universality studies

In the mid-1960s, Tomkins resurrected interest in the study of emotions and faces with his landmark volumes (Tomkins 1962, 1963). He conducted the first study demonstrating that facial expressions were reliably associated with certain emotional states (Tomkins and McCarter 1964). Later he recruited Ekman and Izard to conduct what is known as the "universality studies."

In the first set of studies, the researchers obtained judgments of faces thought to express emotions panculturally and demonstrated high cross-cultural agreement on the emotions portrayed in the expressions (Ekman 1972, 1973; Ekman, Sorenson, and Friesen 1969; Izard 1971). These findings demonstrated the existence of six universal expressions – anger, disgust, fear, happiness, sadness, and surprise – as judges from around the world agreed on what emotion was portrayed in the faces.

One potential criticism of these studies was the fact that the cultures studied were relatively industrialized and people in those cultures may have learned to interpret the faces shown because of shared visual input through mass media such as movies or magazines. To address this criticism Ekman and colleagues (Ekman and Friesen 1971; Ekman, Sorenson, and Friesen 1969) conducted two studies with two visually isolated, preliterate tribes – the Fore and the Dani – in the highlands of New Guinea. In the first study the tribespeople could reliably recognize the faces of emotion posed by westerners; in the second study films of the tribespeople expressing emotions were shown to Americans who had never seen New Guineans

before, and the Americans were able to recognize the expressions of the New Guineans. Thus the ability to recognize facial expressions of emotion did not occur because of learning through mass media or other shared visual input because the New Guineans had no exposure to the outside world.

One of the most important findings related to universality came from Friesen's (1972) cross-cultural study of expressions that occurred spontaneously in reaction to emotion-eliciting films. In that study American and Japanese participants viewed neutral and stressful films while their faces were recorded. Coding of the facial behaviors identified the same expressions associated with the six emotions mentioned previously and corresponded to the facial expressions portrayed in the stimuli used in the previous judgment studies. Both cultures showed the same expressive patterns, providing the first evidence that facial expressions of emotion were universally produced.

1.3 Subsequent research documenting the universality of facial expressions of emotion

Since the original universality studies described above, more than 30 studies examining judgments of the same six facial expressions of emotion have replicated the finding of universal recognition of emotion in the face (Matsumoto 2001), including cross-cultural judgments of spontaneous expressions (Matsumoto et al. 2009). In addition, a meta-analysis of 168 datasets examining judgments of those emotions in the face and other NVB indicated universal emotion recognition well above chance levels (Elfenbein and Ambady 2002). Even when low intensity expressions are judged, there is strong agreement across cultures in judgment (Ekman et al. 1987; Matsumoto et al. 2002). Research from the past two decades has also demonstrated the universal recognition of a seventh emotion – contempt (Ekman and Friesen 1986; Ekman and Heider 1988; Matsumoto 1992b; Matsumoto 2005; Matsumoto and Ekman 2004).

Besides judgment studies, there have been over 75 studies that demonstrated that the facial expressions of anger, contempt, disgust, fear, happiness, sadness, and surprise are produced when emotions are elicited spontaneously (see review in Matsumoto et al. 2008a). These findings are impressive, given that they have been produced by different researchers in different laboratories using different methodologies with participants from many different cultures around the world, but all converging on the same pattern of results. Thus today there is strong evidence for the universality of seven facial expressions of emotions (see Figure 1).



Figure 1: The seven universal facial expressions of emotion. Reprinted with permission © David Matsumoto

1.4 Identifying the source of universal facial expressions

Several lines of research indicate that facial expressions of emotion are not only universally recognized and produced; they are biologically innate. We describe these briefly here.

1.4.1 Studies of blind individuals

A strong source of evidence for the biological basis of emotion – expression linkages comes from studies of congenitally blind individuals. Early case and anecdotal studies (Dumas 1932; Eibl-Eibesfeldt 1973; Freedman 1964; Fulcher 1942; Goodenough 1932; Thompson 1941) reported many similarities between blind and sighted individuals in their spontaneous facial expressions of emotion. These findings have been bolstered more recently by studies that actually measured the spontaneous facial behaviors of blind individuals when emotions were aroused, showing similarities with the facial behaviors of sighted individuals in both children (Cole, Jenkins, and Shott 1989) and adults of many different cultures (Galati, Miceli, and Sini 2001; Galati et al. 2003).

The latest study in this literature compared the spontaneous facial expressions of congenitally and non-congenitally blind judo athletes at the 2004 Athens Paralympic Games with the sighted athletes from the 2004 Olympic Games (Matsumoto and Willingham 2009). The blind athletes came from 23 cultures. There was near-

perfect concordance between the blind and sighted athletes in their expressions immediately at the end of matches, and when receiving their medals on the podium. Moreover the expressions of the blind athletes functioned in exactly the same ways as the sighted athletes. Winners displayed all types of smiles, especially Duchenne smiles, more frequently than the defeated athletes, who displayed more disgust, sadness, and combined negative emotions. Duchenne smiles are smiles that involve not only the smiling muscle (*zygomatic major*), which raises the lip corners, but also the muscles surrounding the eyes (*orbicularis oculi*), which raise the cheeks, thin the eyes, and thin the eye cover fold. Duchenne smiles have been reliably associated with true positive emotions (Ekman, Davidson, and Friesen 1990; Frank and Ekman 1993). When receiving the medal, all athletes smiled; but winners of the last match (gold and bronze medalists) displayed Duchenne smiles more frequently than did the defeated (silver medalists), who displayed more non-Duchenne smiles. Because congenitally blind individuals could not have possibly learned to produce these expressions, we believe that these findings provide strong evidence for a biologically based emotion – expression linkage that is universal.

1.4.2 Evidence from twin and family studies

Facial behaviors of blind individuals are more concordant with those of their kin than strangers (Peleg et al. 2006). And facial expressions of emotion are more concordant among monozygotic twin pairs than dizygotic twins (Kendler et al. 2008). These studies are strongly suggestive of a heritable, genetic component to facial expressions of emotion.

1.4.3 Evidence from the developmental literature

The same facial musculature that exists in adult humans exists in newborn infants and is fully functional at birth (Ekman and Oster 1979). Infants have a rich and varied repertoire of facial expressions including those that signal not only emotional states but also interest and attention (Oster 2005). Smiling, distaste (the infant precursor of adult disgust), and crying (the universal signal of sadness/distress) occur in neonates (Oster 2005). There is some controversy as to when other differentiated and discrete negative emotions occur. Some authors suggest that discrete negative emotions exist from birth or shortly thereafter and emerge according to a maturational timetable (Izard 1991; Izard and Malatesta 1987; Tronick 1989). Others suggest that infants, at least within the first year of life, display relatively undifferentiated or relatively unmodulated negative expressions, which ultimately transform into more differentiated, discrete expressions later (Camras et al. 2003; Oster 2005). Discrete expressions of anger and sadness have been reported in the early part of the second year of life (Hyson and Izard 1985; Shiller, Izard, and Hembree 1986). Regardless, by preschool children display discrete expressions

of the other emotions as well (Casey 1993). It is difficult to conceive of how this occurs if the children did not have the biological capability to do so in the first place.

1.4.4 Evidence from non-human primates

For years ethologists have noted the morphological similarities between human expressions of emotion and nonhuman primate expressions displayed in similar contexts (Chevalier-Skolnikoff 1973; de Waal 2002; Geen 1992; Hauser 1993; Liebal, Pika, and Tomasello 2004; Redican 1982; Snowden 2003; Ueno, Ueno, and Tomonaga 2004; Van Hooff 1972). Recent research has gone beyond demonstrating equivalence in morphological descriptions to identifying the exact facial musculature used in producing the expressions. The facial expressions considered to be universal among humans have been observed in nonhuman primates (de Waal 2003). Chimpanzees have a fully functional facial musculature that, while not as differentiated as that of humans, includes the same muscles that are used in emotional expressions (Bard 2003; Burrows et al. 2006). Moreover, the chimpanzee facial musculature produces many of the same appearance changes as does the human musculature, according to a comparison of the human and chimpanzee versions of the Facial Action Coding System (Vick et al. 2007). Chimpanzees can categorize facial expressions of emotion as humans do (Parr, Waller, and Heintz 2008). When these bodies of evidence are considered together, it is difficult to not conclude that facial expressions of emotion are not only universal but also biologically innate.

1.5 Debates and controversies

1.5.1 Universality in emotion recognition

Two decades ago controversy about the universality of facial expressions of emotion emerged, led by Russell and colleagues, who argued that findings documenting the universal recognition of facial expressions of emotion were hampered by methodological limitations. Russell argued that judgments of faces were influenced by the context of the judgment task, and more specifically what face immediately preceded the one being judged (Russell and Fehr 1987). He also argued that the use of posed faces, mostly by Caucasian expressors, biased the results in favor of universality, as did the use of forced choice selections of emotion labels when making judgments (Russell 1994). These criticisms were answered with strong rebuttals (Ekman 1994; Ekman and O'Sullivan 1988; Izard 1994) and rejoinders (Russell 1995; Russell and Fehr 1988).

Fortunately data have addressed the constructive points originally raised by Russell. For example a detailed analysis of order effects of the possible influence of prior faces on judgments demonstrated that no such effect existed when large

numbers of stimuli were presented (Ekman, O'Sullivan, and Matsumoto 1991a, 1991b), which is how most cross-cultural studies were conducted. Universal recognition of facial expressions of emotion has been obtained in multiple studies using expressors of many different ethnic backgrounds (Beaupré and Hess 2005; Biehl et al. 1997; Matsumoto and Hwang 2011; Wang et al. 2006; Wang and Markham 1999), thus ensuring that the accurate recognition of facial expressions of emotion is not limited to expressors of a certain ethnicity.

Spontaneously produced facial expressions produce more noise compared to posed expressions, and accuracy rates of spontaneous expressions tend to be lower than for posed expressions (Hess and Blairy 2001; Naab and Russell 2007; Wagner 1990; Wagner et al. 1992; Wagner, MacDonald, and Manstead 1986). A recent study demonstrated, however, that there was above chance agreement across cultures in emotion judgments of spontaneous expressions, and there were no cross-cultural differences in those rates (Matsumoto et al. 2009); across cultures lower agreement rates were related to the number of extraneous facial muscles involved in the expression that were not directly related to emotion signaling. Thus findings concerning universality were not limited to the use of posed expressions, and judgments of posed or spontaneous expressions appear similar across cultures.

Another criticism levied against the early studies concerned the use of the response scales provided to observers when making their judgments. Early studies provided different emotion labels, and observers were forced to select one of the labels available. Russell (1994) argued that high agreement rates might have been obtained because observers selected emotion labels by a process of elimination. Subsequent studies, however, have replicated the universality findings even when observers are given the chance to select “none” or “neutral” in what is known as a fixed choice judgment (Frank and Stennett 2001). High agreement rates have also been obtained when observers are allowed to match faces with emotion-eliciting stories (Matsumoto and Ekman 2004; Rosenberg and Ekman 1995), rate multiple emotions on intensity scales (Ekman et al. 1987; Matsumoto and Ekman 1989; Yrizarry, Matsumoto, and Wilson-Cohn 1998), or provide open-ended responses (Matsumoto and Ekman 2004; Rosenberg and Ekman 1995). Thus universality in emotion recognition is not affected by the judgment task provided to observers.

The debates about universality did sharpen the meaning of “universality.” Universality did not mean that *all* people of *all* cultures recognized the emotions in the face; rather universality meant that, in general, people of all cultures studied are better than chance in recognizing emotional expressions. The criterion for universality in emotion recognition, therefore, was whether or not the agreement rates for any group tested were better than chance, given the methodological parameters under which the studies were conducted.

1.5.2 Universality in production of facial expressions of emotion

Another controversy that existed concerned the fact that although universal facial expressions were reliably produced in the laboratory (involving participants from

different cultures tested by investigators of different cultures; see Matsumoto et al. 2008a: for a review), field studies suggested otherwise (Fernandez-Dols and Ruiz-Belda 1995; Kraut and Johnston 1979; Ruiz-Belda et al. 2003). Recently, however, Matsumoto and Willingham (2006) examined the spontaneously produced facial expressions of Olympic athletes immediately when they won or lost a match for a medal. Universal facial expressions of emotion did occur, and they clearly differentiated between athletes who had won or lost their last match. This study laid to rest concerns about whether universal facial expressions actually occur. The results were especially impressive given the real life nature of the situation, and the fact that the sample included 84 athletes from 35 countries.

1.5.3 Meaning and function of expression

A Darwinian approach to facial expressions suggests that emotional expressions co-vary with emotional experience, have unique physiological signatures (also referred to as *response system coherence*), and coordinate social interactions through their informative, evocative, and incentive functions (Keltner and Kring 1998). This approach claims that facial behaviors are expressions of an underlying state and are produced as part of a coherent response system when emotions are elicited. Even the term *expression* implies that there is an internal underlying state that is being expressed.

An alternative view known as the Behavioral Ecology view suggests that facial behaviors evolved from functions related to the control of sensory input, respiration, chewing and eating and were recruited to serve communication purposes. This view is also based in evolution, but considers facial movements as ritualized vehicles designed specifically for social communication, not emotional expression (Andrew 1963; Fridlund 1994). Fridlund (1994, 1997, 2002) suggested that the function of facial movements is to communicate information to others about one's behavioral intentions rather than internal states; thus facial displays should be called facial behaviors, not *expressions*, because the latter implies that there is something that is being expressed.

The Behavioral Ecology view makes no assumptions about a link between a facial display and an underlying emotion. Rather the content of communication of facial displays is about the behavioral intentions that are associated with the particular social situation. The signal value of such displays is that it allows decoders to adapt their behaviors to the encoder's displays, allowing for rapid social coordination. Raising one's brows and exposing the whites above the eyes, for instance, allows others viewing this behavior to reorient themselves, allowing them to adapt to the stimulus that produced the expression. Lowering one's brows and baring one's teeth allow decoders to halt or retreat, preventing aggression and violence. Fridlund's (1994, 1997, 2002) view suggests that the signal value of these movements provided animals with an adaptational advantage because they signal moti-

vational intent and allow for rapid behavioral adaptation by others. These adaptational facial displays became ritualized into the facial displays seen today.

There are both similarities and differences between the Darwinian and Behavioral Ecology approaches. They are similar in their view of the evolution of facial expression/behavior; the Behavioral Ecology view that facial behaviors evolved from functions necessary for survival, such as the control of sensory input or eating, is very similar to Darwin's (1872) principle of serviceable associated habits. Likewise, the Behavioral Ecology view that facial behaviors serve social coordination functions is very similar to the Darwinian view that facial expressions of emotion serve informative, evocative, and incentive functions (Keltner and Kring 1998).

The major point of contention between the two approaches concerns the link between emotion and expression/behavior. The Darwinian approach suggests this link exists; expressions serve social coordination functions *precisely because* of their inherent link to emotional states, which serve as motivations and dispositions for behavior. The Behavioral Ecology view, however, suggests that facial behaviors do not have intrapersonal functions, and their interpersonal functions evolved because of ritualized associations of certain facial movements that were associated with motivational states in the encoder that were socially adaptive.

In reality, inconsistencies exist in the literature regarding whether or not facial expressions of emotion occur when emotions are elicited, and both perspectives about emotion and facial behaviors/expressions are hard pressed to account for them (Parkinson 2005). Facial expressions likely play both roles – as signals of behavioral intentions as well as internal states, and some contexts likely facilitate the production of one of these meanings over the other. For example, emotional expressions are more likely produced when events that are closer to those that occurred in our evolutionary history elicit high intensity emotions (Matsumoto et al. 2008b). These events will recruit a host of physiological responses, fire the face, prime the body for behavior, evoke responses and incentivize behavior in the perceiver. When events that are far removed from our evolutionary history elicit emotion, they may not recruit the same physiological reactions and expressive behavior, and facial behaviors may be better understood as signs of behavioral intentions and not internal states.

1.5.4 Emotions as natural kinds

Another controversy that is indirectly related to facial expressions of emotion concerns whether emotions exist as discrete entities with physiological responses (i.e., natural kinds, including facial expressions), or whether they are social constructions that are given meaning only through a process of consciousness and labeling. The Darwinian view of facial expressions suggests the former. Recent work by Feldman Barrett (Feldman Barrett et al. 2007; Feldman Barrett 2006) has argued for the latter.

One of the main reasons why questions have arisen concerning the nature of emotion and expression is because of inconsistent findings on the relationship between emotional experience, expression, and physiology. Early studies found relatively weak relationships (Mandler et al. 1961; Weinstein et al. 1968), but recent studies have found stronger links (Hubert and de Jong-Meyer 1990). Meta-analyses in the area (Cacioppo et al. 2000) have concluded that the linkage among these response components is weak.

One of the reasons why previous literature has produced inconsistent results is probably because of the lack of reliable and timely markers that can be used to tell investigators exactly when to be looking for physiological specificity. Facial expressions can be those markers, and when used as such, they have been reliably associated with discrete and unique physiological signatures (Brown and Schwartz 1980; Ekman and Davidson 1993; Ekman, Davidson, and Friesen 1990; Ekman, Levenson, and Friesen 1983; Lang et al. 1993; Mauss et al. 2005).

Matsumoto and Hwang (2012) have argued that emotional experience is a domain of emotion that is fundamentally different than physiological reactions and expressive behavior. Because experience is constructed in the first place, and occurs precisely because of advanced cognitive abilities afforded to humans, it is no wonder that it is more heavily influenced by social and cultural factors (because human culture coevolved with those cognitive abilities). Thus it makes sense that researchers who focus on emotional experience argue for their construction while researchers who focus on expressive behaviors and physiological reactions argue for their existence as a natural kind.

1.6 Cultural differences in expressing emotion

Despite the existence of universal facial expressions of emotion, people around the world use the universal expressions differently. The first evidence for cultural differences in expression was in Friesen's (1972) study. In the first condition of this study, Americans and Japanese viewed the stressful films alone and produced the same expressions. In another condition, they viewed the films in the presence of an older, male experimenter. Here, cultural differences emerged; whereas the Americans continued to express their negative emotions, the Japanese were more likely to smile. Ekman and Friesen (1969) coined the term *cultural display rules* to account for cultural differences in facial expressions of emotion. These are rules learned early in childhood that help individuals manage and modify their emotional expressions depending on social circumstances. In the first condition of the experiment there was no reason for display rules to modify expressions because the participants were alone and their display rules were inoperative; in the second condition display rules dictated that the Japanese mask their negative emotions in the presence of the experimenter (Ekman 1972; Friesen 1972).

There are a number of ways by which universal expressions can be managed (Ekman and Friesen 1969, 1975). Individuals can express emotions as they feel them with no modification. But individuals can also amplify (exaggerate) or deamplify (minimize) their expressions; for instance feelings of sadness may be intensified (amplification) at funerals or minimized (deamplification) at weddings. People can mask or conceal their emotions by expressing something other than what they feel, as when nurses or physicians hide their emotions when speaking with patients with terminal illness, or when employees in service industries (e.g., flight attendants) interact with customers. Individuals may also learn to neutralize their expressions, expressing nothing, such as when playing poker (poker face), or to qualify their feelings by expressing emotions in combination, such as when feelings of sadness are mixed with a smile, with the smile commenting on the sadness, saying “I’ll be OK.” People can also simulate emotions, expressing them even when they are not felt. These behavioral responses have been found to occur when spontaneous expressive behaviors have been studied, even in preschoolers (Cole 1986).

As studies documenting cultural differences in expression peppered the literature (Argyle et al. 1986; Edelmann et al. 1987; Gudykunst and Nishida 1984; Gudykunst and Ting-Toomey 1988; Matsumoto and Kupperbusch 2001; Noesjirwan 1978; Szarota 2010; Waxer 1985), a consensus emerged that when emotions are aroused, the displays are *either* universal *or* culture-specific, depending on context. A recent study (Matsumoto, Willingham, and Olide 2009), however, showed that emotional displays can be both for the same person in the same context, if displays are examined *in sequence across time*. In this study changes in Olympic athletes’ expressions after their initial reactions were classified into one of several regulation strategies, and the relationship between these expressive styles and cultural variables such as Hofstede’s (2001) cultural dimensions (i.e., country level scores on the dimensions Individualism, Power Distance, Uncertainty Avoidance, Masculinity, and Long Term Orientation), and country demographics such as population density and affluence, were examined. Although the athletes’ initial reactions were universal, their *subsequent* expressions were culturally regulated, and associated with population density, affluence, and individualism. Athletes from urban, individualistic cultures expressed their emotions more; athletes from less urban, more collectivistic cultures masked their emotions more. The average length of time from an initial, universal emotional expression to a culturally moderated modification was less than 1 s.

1.7 A worldwide mapping of cultural display rules using the Display Rule Assessment Inventory (DRAI)

After the original inception of the concept of display rules, cross-cultural research on them was dormant until Matsumoto’s (1990) study examining display rules in

Americans and Japanese, and a similar study documenting differences in display rules among four ethnic groups within the U.S. (Matsumoto 1993). Later Matsumoto and colleagues created the Display Rule Assessment Inventory (DRAI), where participants choose one of six behavioral responses (corresponding to the ways expressions are managed in real life, as described above) when they experience different emotions with family, friends, colleagues, and strangers (Matsumoto et al. 1998, 2005). They demonstrated cultural differences in display rules, and provided evidence for its internal and temporal reliability and for its content, convergent, discriminant, external, and concurrent predictive validity with personality.

Matsumoto and colleagues (2008c) then administered a more comprehensive version of the DRAI in over 30 countries, examining universal and culture-specific aspects to display rules, and linking the cultural differences to culture-level individualism (vs. collectivism). Most countries' means on overall expression endorsement suggested a universal norm for expression management. Individuals of all cultures had a display rule norm for greater expressivity toward in-groups than toward out-groups, indicating another universal effect. Collectivistic cultures were associated with a display rule norm of less expressivity overall than individualistic cultures, suggesting that overall expression management for all emotions is central to the preservation of social order in these cultures (Figure 2). This finding is commensurate with the behavioral findings from previous findings (Friesen 1972; Matsumoto and Kupperbusch 2001; Matsumoto, Willingham, and Olide 2009). Individualism was also positively associated with higher expressivity norms in general, and for positive emotions in particular. Individualism was positively associated with endorsement of expressions of all emotions toward in-groups, but negatively

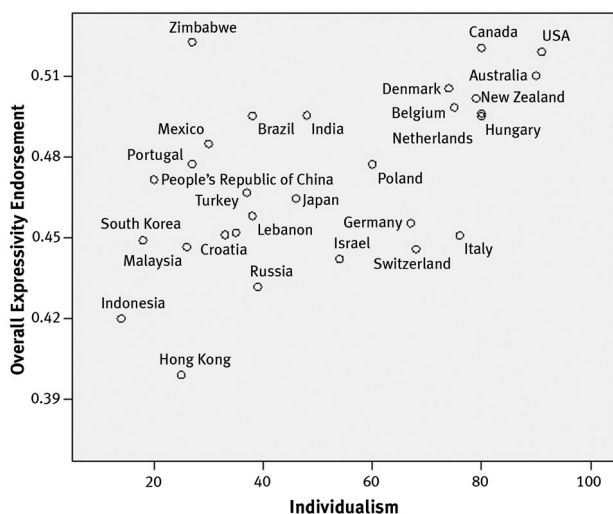


Figure 2: Graphical representation of the relationship between individualism and overall expressivity endorsement

correlated with all negative emotions and positively correlated with happiness and surprise toward outgroups. Cumulatively, these findings suggest a fairly nuanced view of the relationship between culture and display rules that varies as a function of emotion, interactant, and overall expressivity endorsement levels.

1.8 Cultural similarities and differences in judging emotion

Not only are the seven universal facial expressions panculturally recognized (Elfenbein and Ambady 2002; Matsumoto 2001), but cultures are similar in other aspects of emotion judgment as well. For example, there is pancultural similarity in judgments of relative intensity among faces; that is, when comparing expressions, people of different countries agree on which is more strongly expressed (Ekman et al. 1987; Matsumoto and Ekman 1989). There is also cross-cultural agreement in the association between perceived expression intensity and inferences about subjective experiences (Matsumoto et al. 1999), and in the secondary emotions portrayed in an expression (Biehl et al. 1997; Ekman et al. 1987; Matsumoto and Ekman 1989). This agreement may exist because of overlap in the semantics of the emotion categories, antecedents and elicitors of emotion, or in the facial configurations themselves.

There are cultural differences in emotion judgments as well, such as in the absolute levels of recognition across cultures; for example, Americans typically have higher agreement rates when judgment emotions than other countries (Biehl et al. 1997; Elfenbein and Ambady 2002; Matsumoto 1989; Matsumoto 1992a; Matsumoto et al. 2002). There are also cultural differences in ratings of the intensity of expressions; for example, Japanese tend to rate expressions lower in intensity than Americans (Biehl et al. 1997; Ekman et al. 1987; Matsumoto 1990, 1992a; Matsumoto et al. 2002; Matsumoto, Kasri, and Kookan 1999). Other cultural differences have led to interesting debates and controversies.

1.8.1 Debates and controversies

1.8.1.1 Judging faces in context

Despite the fact that facial expressions always occur in context in real life, most mono- or cross-cultural judgment studies presented them fairly acontextually. Writers have long debated the relative contribution of face and context in contributing to emotion messages by studying congruent and incongruent face – context combinations (Bruner and Tagiuri 1954; Ekman and O’Sullivan 1988; Fernberger 1928; Russell and Fehr 1987). One type of study examines the linkage between an emotion-eliciting context and a facial expression, which we have called *response linkage* (Matsumoto and Hwang 2010). Studies involving congruent response linkages have found an additive effect (Bruner and Tagiuri 1954; Knudsen and Muzekari

1983), which probably occurred because of the increased signal clarity in the overall emotion message when two different signal sources provide the same message. Interestingly, studies involving incongruent response linkages have generally demonstrated a face primacy effect, indicating that the signals in the face tend to override the signals provided by the context (Ekman and O'Sullivan 1988; Ekman, O'Sullivan, and Matsumoto 1991a; Frijda 1969; Goldberg 1951; Nakamura, Buck, and Kenny 1990).

But context effects also exist. Masuda and colleagues (2008) presented faces depicting emotions imbedded within a group of other faces also depicting emotions, and asked American and Japanese observers to label the emotion of the central figure. Americans were more likely to produce labels consistent with the central figure despite the emotions portrayed by the others, whereas Japanese were more influenced by the other's expressions when labeling the central figure.

To clarify this literature Matsumoto, Hwang, and Yamada (in press) conducted two studies involving observers from the U.S., Japan, and South Korea, who judged facial expressions of anger, sadness, and happiness presented together with a congruent or incongruent emotion-eliciting context. When faces were congruent with contexts, the agreement rates in judgments were near perfect, with no cultural differences. This suggests that previously documented cultural differences in emotion recognition rates may have been the result of methodological artifacts because observers were asked to make judgments of emotion solely from faces. In reality such judgments are made from cues from both faces and contexts, and when multiple cues are given cultural differences are eliminated. When faces and contexts were incongruent, there were both face and context effects, and the relative contributions of each were moderated by culture. American judgments were more influenced by faces, while Japanese and South Korean judgments were more influenced by context. The results provided a more nuanced view of how culture and emotion moderate judgments of faces in context – by showing how face and context effects occur simultaneously – and how cultural similarities and differences existed in the judgments.

1.8.1.2 Cultural ingroup advantage to facial emotion recognition

A cultural difference that has received attention concerns the possibility of an *ingroup advantage* in emotion recognition (Elfenbein and Ambady 2002). This refers to the tendency for individuals to more accurately recognize emotional expressions produced by members of their own culture rather than those produced by another. This effect was originally demonstrated in a meta-analysis of cross-cultural studies examining judgments of facial expressions of emotion (Elfenbein and Ambady 2002), and a number of subsequent studies provided support for it (Elfenbein and Ambady 2003a, 2003b; Elfenbein et al. 2004, 2007). Researchers arguing for the existence of this effect have suggested that it occurs because of

“emotion dialects” – culturally derived, minor variants of emotional expressions (Elfenbein et al. 2007; Wang, Toosi, and Ambady 2009; Wickline et al. 2009). According to this view people are more accurate when judging such expressions because those expressions are differentially used in their culture.

Unfortunately, none of the research supporting the ingroup hypothesis has utilized spontaneous expressions that would support a dialect theory. Recently one study tested the dialect theory of the ingroup effect using spontaneous expressions produced by Olympic athletes in a naturalistic setting (Matsumoto, Willingham, and Olide 2009). Across all emotions studied, the ingroup advantage hypothesis was not supported, raising questions about whether cultural dialects actually occur when emotional expressions are spontaneous, and whether they create a cultural ingroup advantage in judgment. Future studies will need to examine the possible sources of the ingroup effect further.

2 Culture and gestures

As described elsewhere in this volume (Chapter 8, Bull and Doody, this volume), gestures are body movements (primarily hands, although they occur in head and face as well) that are used to illustrate speech or convey verbal meaning. Gestures are generally classified into two major categories: those that co-occur with speech, called *speech illustrators*, and those that can occur independent of speech, called *emblems*.

2.1 Speech illustrators

Speech illustrators are movements that are directly tied to speech and illustrate or highlight what is being said. There are different types of speech illustrators (Efron 1941; Freedman and Hoffmann 1967); all are associated with verbal behavior on a moment-to-moment basis (Kita et al. 2007) and are directly tied to speech content, verbal meaning, and voice volume. They likely occur outside of or with minimal conscious awareness and intention.

The study of culture and gestures has its roots in the work of Efron (Boas, Efron, and Foley 1936; Efron 1941), who examined the gestures of Sicilian and Lithuanian Jewish immigrants in New York City. Efron found that there were distinct gestures among immigrant Jews and Italians who adhered to the traditional culture, but that those gestures disappeared as people were more assimilated into the larger American culture, and their children adopted the gestures typical of Americans.

The meaning and function of illustrators are likely similar across cultures, and likely a biologically innate product of our evolved capability for speech. Even chil-

dren who are congenitally blind gesture when they speak, even when they know they are speaking to other blind individuals (Iverson and Goldin-Meadow 1998). But cultures differ in rules about the appropriateness of both the amount and form of illustrative gestures, and in the frequency of illustrator usage, expansiveness, and duration. Some cultures, such as Latin and Middle Eastern cultures, strongly encourage the use of large, illustrative gestures when speaking; they are highly animated in their gesticulation (Kendon 1992, 1995). In Italy, for instance, one is expected to “speak with your hands.” Other cultures are much more reserved in their use of gestures. The British, for example, gesticulate less than Italians when speaking (Graham and Argyle 1975) and large gestures are considered impolite in British culture. East Asian cultures discourage the use of such gestures, especially when in public; thus Asians are even more reserved in their gesticulation.

Cultural differences also exist in forms. When counting, for example, Germans use the thumb for one, while Canadians and Americans use the index finger (Pika, Nicoladis, and Marentette 2009). People of different cultures also use different gestures while describing motion events (Kita 2000; Kita and Ozyurek 2003; McNeill 2000). When pointing, people in the U.S. and many western European cultures use the index finger. People of some other cultures, however, learn to point with their middle finger, which of course resembles an obscene gesture in many cultures.

“Hybrid” gestures refer to gestures that are originally associated with one language but come to be used with another, and occur among immigrants and bi- or multilingual individuals. They were first observed by Efron (1941), who reported about a U.S.-born Eastern Jewish individual who used a classical Eastern Jewish culture gesture (fist clenched, thumb outstretched, describing a scooping motion in the air as if digging out an idea) even when speaking English. Another type of hybrid gestures was described by Morris and colleagues (Morris et al. 1980), who described the combining of two different gestures (the flat hand chop threat gesture of Tunisia combined with the A-OK ring gesture to produce a ring-chop hybrid gesture). Other studies have documented that immigrants often use gestures from their original culture when using their second language (Schefflen 1972). This cross-linguistic transfer of gestures seems to occur from a high frequency gesture culture to a low frequency culture (Pika, Nicoladis, and Marentette 2006).

2.2 Emblems

The other category of gestures is that which conveys verbal meaning independent of words. These are known as *symbolic gestures*, *emblematic gestures*, or *emblems*. Just as every culture has its own verbal language, every culture develops its own emblem vocabulary in gestures. Emblematic gestures are culture specific (and some are gender specific; see Ekman 1976; Friesen, Ekman, and Wallbott 1979; Morris et al. 1980).

Unlike illustrators, emblems can occur without speech, as in the peace sign (forefinger and middle finger up, palm facing outward) or OK (thumb up, hand in fist) in North American culture. Because emblems are culture-specific, their meanings across cultures are often different and sometimes offensive. The North American A-OK sign, for example, means “OK” in some cultures, an orifice having sexual implications in some cultures, “money” in some cultures, and “zero” in some cultures (Morris et al. 1980). Placing both hands at the side of one’s head and pointing upwards with the forefingers signals that one is angry in some cultures; in others it refers to the devil; and in others it means that one wants sex (is horny). The reversed peace sign – forefinger and middle finger up in a ‘V’ shape, with the palm facing inward – is an insult in England and Australia meaning “screw you.”

We also gesture with our heads, the most common of which are the emblems “yes” and “no.” In the U.S., as in many cultures of the world, these head gestures are nods and shakes of the head. But while most people of most cultures nod their head yes and shake their head no, some cultures of the world do not do so. We also gesture with our bodies. In the U.S. and many other cultures, the emblem for “I don’t know” is a shrug. Shrugs are often displayed in our shoulders, but also by our hands or even our faces.

Although the movements associated with emblems are culture specific, there appears to be universality in the content themes, functions, and reasons why cultures have a rich vocabulary of emblems (Morris et al. 1980). Rituals concerning greetings and salutations, references to locomotion or mental states, and insults are aspects of life that occur in all cultures, and for which it would be convenient to be able to signal without words. Thus it makes sense that all cultures develop some emblems for these universal aspects of life. But the specifics of the movements associated with each emblem are different, as these are influenced by national and linguistic boundaries, cultural influx across history due to wars or immigration, and the richness of the word or phrase signaled in the verbal dictionaries of the cultures (Morris et al. 1980).

Morris and colleagues (1980) argued that some emblems arose from gesturing particular symbols. For example the crossed fingers for good luck was originally a surreptitious “sign of the cross” to signal to another one was a Christian, and then became just the sign of the cross to ward off Satan, and now just “good luck.” Interestingly the crossed fingers emblem did not occur in non-Christian cultures in Morris and colleagues’ (1980) study. Morris called other emblems “relic” emblems in that they were trace representations of specific behaviors; for example, the Greek “moutza” is an insult emblem that involves a forward hand gesture, palm outward, with fingers spread upward. It was the original “talk to the hand” that we now see with younger people. The moutza is a representation of tossing garbage or urine, or possibly wiping cinders or other effluent on the face of another. Its origins were thought to be in ancient Greece where the public would toss their garbage or urine on prisoners as they were transported through the

streets. This no longer occurs, but that gesture remains as a relic of that action, and today is used as an insult or a curse.

Some emblems are becoming recognized across cultural boundaries despite differences in origin, such as come, go, hello, goodbye, yes and no (Hwang et al. 2010). These results are likely being driven by the strong influence of mass media around the world, particularly television, movies, and the internet, where people can view the behaviors of others of different cultures and learn how to decode behaviors. These technologies may be helping to homogenize gestures into a world-wide emblem dictionary, and if so, it may be only a matter of time that a homogenized, universal set of emblematic gestures replaces culture-specific ones.

3 Culture and gaze

Gaze is a powerful NVB, most likely because of its evolutionary roots in animals. Research on humans and non-human primates has shown that gaze is associated with dominance, power, or aggression (Fehr and Exline 1987), as well as affiliation and nurturance (Argyle and Cook 1976). The affiliative aspects of gazing begin in infancy (Fehr and Exline 1987), as infants attend to adults as their source of care and protection.

These meanings and functions of gaze and visual attention are similar across cultures, and all cultures create rules concerning them because both aggression and affiliation are behavioral tendencies that are important for group stability and maintenance. But cultures differ in the amounts of gaze considered appropriate. Arabs, for example, gaze much longer and more directly at their partners than do Americans (Hall 1963; Watson and Graves 1966). Watson (1970), who classified 30 countries as either a “contact” culture (those that facilitated physical touch during interaction) or a “noncontact” culture, found that contact cultures engaged in more gazing and had more direct orientations when interacting with others, less interpersonal distance, and more touching. Within the U.S., ethnic groups differ in gaze and visual behavior (Exline, Jones, and Maciorowski 1977; LaFrance and Mayo 1976). (For further discussion of contact cultures and cultural differences in proxemics and touch, see Chapter 11, Andersen, Gannon, and Kalchik, this volume.)

Stereotypes about gaze also influence judgments of deception and credibility. Around the world a commonly held belief is that when people are not looking one straight in the eye, they are likely to be lying (The Global Deception Research Team 2006). These beliefs influence actual judgments; in one study (Bond et al. 1990), American and Jordanians were videotaped while telling lies and truths, and the videotapes were shown to other Americans and Jordanians who made truth/lie judgments. In both cultures, individuals who avoided eye contact were judged to be deceptive. However, there is little or no empirical support for the belief that gaze is reliably associated with lying (DePaulo et al. 2003).

4 Culture and vocal behavior

Nonverbal vocal cues are called *paralinguistic cues* and include the tone of voice, intonation, pitch, speech rate, use of silence, and volume (see Chapter 7, Patel and Scherer, this volume). Early work on paralinguistic cues provided evidence that some specific emotional states were conveyed through the voice across cultures (Beier and Zautra 1972; Matsumoto and Kishimoto 1983; McCluskey and Albas 1981; Scherer 1986), a view that has garnered more support in recent work (Sauter and Eimer 2010; Sauter et al. 2010; Simon-Thomas et al. 2009). Anger, for instance, produces a harsh edge to the voice; the voice gets louder, and speech rates increase. Disgust produces “yuck” or gagging sounds, while fear produces higher pitch and sudden inhalations. Sadness produces softer voices and decreased speech rates.

The voice and verbal style is also used to illustrate and amplify speech, and culture likely moderates the use of these vocal characteristics in social interaction. Little cross-cultural research on this topic, however, exists.

5 Culture, interpersonal space, and touch

The use of space in interpersonal interactions is called *proxemics* (see Chapter 11, Andersen, Gannon, and Kalchik, this volume). Hall’s (1966; 1973) classic work in this area specified four levels of interpersonal space use depending on social relationship type: intimate, personal, social, and public. He suggested that interpersonal distance helps to regulate intimacy by controlling sensory exposures, because the possibility of sensory stimulation (smells, sights, touch) is enhanced at closer distances. This meaning and function of space is a universal aspect of life that exists across cultures; thus cultures must regulate the use of space, as such regulation is necessary for social coordination; violations of space bring about aversive reactions (Sussman and Rosenfeld 1978).

Hall (1966, 1973) suggested that in the U.S. intimate distances are less than 18 inches (46 cm), personal distances are 18 inches to 4 feet (1.2 m), social distance is 4–12 feet (3.66 m), and public distances are greater than 12 feet. People of all cultures appear to use space according to these four distinctions, but they differ in the size of the spaces they attribute to them. A study of people from five different cultures (American, Swedish, Greek, Southern Italian, and Scottish), for example, showed that the cultures were similar in the order of the distances for different types of transactions, but that there were significant mean differences in the actual distances used (Little 1968). Cultures around the Mediterranean, Middle East, or of Latin origin interact at closer distances. Arab males tend to sit closer to each other than American males, with more direct, confrontational types of body orientations (Watson and Graves 1966). They also use greater eye contact and speak in

louder voices. Arabs, at least in the past, learned to interact with others at distances close enough to feel the other person's breath (Hall 1963, 1966). Latin Americans tend to interact more closely than do individuals of European backgrounds (Forston and Larson 1968) and Indonesians tend to sit closer than Australians (Noesjirwan 1977, 1978). Italians interact more closely than either Germans or Americans and Colombians interact at closer distances than do Costa Ricans (Shuter 1976). When interacting with someone from their same culture Japanese sat the farthest away, Venezuelans the closest, with Americans somewhere in the middle (Sussman and Rosenfeld 1982); interestingly, in the same study, when the non-native English speakers spoke in English they adopted the American conversational distance compared to when speaking with others from their home country in their native language. Cultural differences in the use of space even occurs when individuals set dolls to interact with each other (Little 1968).

But the culture of the interactants is not necessarily the main determining factor of the appropriate interpersonal spacing to take in an interaction. Rather the major single factor determining distances appears to be the relationship of the interactants; the specific content or affective tone of the interaction is the next most important (Little 1968). And, much of the information we have about the use of interpersonal space involves dyadic interaction. We have much less research information about the use of space among groups of people, especially strangers, across cultures.

A logical extension of interpersonal space is touch, as touch requires close physical contact. The study of touch is known as *haptics*. Recent research has demonstrated that touch communicates distinct emotions such as anger, fear, disgust, love, gratitude, and sympathy in at least two different cultures (Hertenstein et al. 2006). Just as cultures regulate space, they also regulate touch, and the meaning and function of touch is likely similar across cultures; cultures differ in the amounts of touching behavior deemed acceptable. As mentioned above, Watson (1970) classified 30 countries as either a "contact" culture or a "noncontact" culture. Violations of the cultural rules regarding touch are likely to be interpreted in the same way as those of space, producing aversive consequences.

6 Culture, postures, and gait

Postures communicate attitudinal states and general affect, as opposed to the specific emotions communicated by face and voice. These include liking, orientation (closed or open), attention (direct or indirect), and openness. These various dimensions can be summarized as communicating general positivity as well as status relationships (Mehrabian 1968a, 1968b, 1969).

There is surprising little cross-cultural research on the production or interpretation of the meaning of postures across cultures. The studies that do exist suggest

that people of different cultures interpret postures according to the same dimensions (i.e., positivity, status), but place different weights of importance on specific aspects of these dimensions (Kudoh and Matsumoto 1985; Matsumoto and Kudoh 1987).

Gait refers to the pattern of movement of the body when walking. Only a handful of studies have examined cross-cultural differences in gait and perceptions of it. Montepare and Zebrowitz (1993) obtained judgments from Korean observers of 5 to 70 year old Americans as they walked from one end of a room to the other and back, and compared those judgments to those previously obtained from American observers (Montepare and Zebrowitz-McArthur 1988). There was cross-cultural agreement in perceptions of age, sex, strength, and happiness, but cross-cultural differences on perceptions of dominance. The authors suggested that some reactions to gait information may be universal while others more influenced by culture.

There has also been some interesting research in the speed with which individuals across cultures typically move through their cities (Kirkcaldy, Furnham, and Levine 2001; Levine and Bartlett 1984; Levine et al. 1989; Levine and Norenzayan 1999). These studies have demonstrated that pace is associated with punctuality, coronary heart disease, and a variety of attitudinal and personality traits.

7 Culture and communication

7.1 Cultural influences on the communication process

The existing literature strongly suggests that the meaning and function of many nonverbal behaviors are likely similar across cultures, probably due to many aspects of life and communication needs that are universal. For instance in all cultures insults occur, touch is intimate, and direct gaze can be aggressive. But the literature also strongly suggests that culture influences NVB in important and profound ways. Cultures differ in the forms of some NVB (e.g., emblems), and amounts associated with appropriateness (e.g., gaze, touching). Cultural differences in NVB, therefore, can be summarized according to cultural norms associated with overall expressivity that is encouraged or discouraged in specific cultures (Table 1). In broadest terms, on one hand Expressive cultures are likely to facilitate the use of facial expressions and gestures more frequently, with greater intensity and duration; the use of louder voices, direct gaze, with relaxed and open postures, at closer distances. On the other hand, Reserved cultures are more likely to facilitate the use of less facial expressions and gestures, softer voices, avoid direct gaze, with more rigid, closed postures at relatively greater distances.

The distinction between Expressive and Reserved cultures is related to Hall's (1966, 1973) distinction of high- and low-context cultures, as well as Watson's (1970) classification of contact and noncontact cultures. Our distinction is differ-

ent, however, as we believe there is sufficient evidence to suggest that cultural differences extend beyond any single channel of NVB, and encompass the entire constellation of NVBs involved in interaction. At the same time, we do not believe that there is a unidimensional, positive relationship among all of the various channels of NVB; some cultures may facilitate more or less behaviors differentially across channels. Differences in the relationships among channels across cultures may be an interesting avenue of research in the future.

7.2 Intercultural communication and nonverbal behavior

Cultural differences in NVB make intercultural interactions and communications more difficult than intracultural communication. Intercultural communication is more likely to be marred by uncertainty and ambiguity (Gudykunst and Nishida 1984; Gudykunst, Yang, and Nishida 1985; Hogg et al. 2007), not only because of questions concerning the verbal messages, but also because of cultural differences in the NVBs associated with the verbal messages. These may lead to aversive reactions that increase the potential for misunderstanding, miscommunication, and misattributions about intent or character, which disrupts social coordination and increases the potential for conflict. It is easier for people from Expressive cultures to judge those from Reserved cultures as being untrustworthy, inscrutable, sly, deceptive, or shifty. At the same time it is easier for people from Reserved cultures to judge those from Expressive cultures as arrogant, loud, rude, immature, or vulgar. Many of these negative reactions occur unconsciously and automatically because they are rooted in cultural filters for interpreting the appropriateness of behavior that are developed early on through the process of enculturation.

Many of these interpretations and attributions, however, may be misguided or incorrect, because the cultural filters with which one uses to interpret the NVB of others may or may not be the cultural framework within which the person's behavior is rooted. One of the goals of intercultural interactions is to reduce the uncertainty inherent in the situation (Gudykunst, Nishida, and Chua 1986; Gudykunst, Yang, and Nishida 1985), and one way to do this is to realize that cultural differences in NVB exist, that engaging with such differences may produce negative emotional reactions, and that these differences and reactions are a normal and inevitable part of the communication process. By creating these kinds of expectations, we can begin to ensure that intercultural interactions are not an obstacle but instead a platform for staging the development and exchange of ideas and the sharing of goals in new and exciting ways not actualized by intracultural communication.

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VII Settings

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24 Media and computer mediation

Abstract: This essay reviews approaches to nonverbal communication related to media and computer-mediated systems. Following presentation of traditional research on verbal and nonverbal channel reliance, the essay reviews several theories and principles concerning the presence or absence of nonverbal features in online and offline platforms and users' adaptations to same. The next section discusses the manipulation and influence of nonverbal features in traditional mass media and new social media, including multimodal communication such as audio and video conferencing. A section on human-computer interaction covers the ways in which computers cue social responses and can be used to persuade, as well as their functions in online collaboration tools. A section on virtual and immersive environments considers virtual and augmented reality as well as embodiments such as intelligent computer agents and avatars that incorporate nonverbal features. The essay closes with a cursory introduction to some of the new means by which digital media systems facilitate recording and analyzing nonverbal communication in native face-to-face and mediated settings and concluding observations about variations in the level of specificity and rigor in the conceptualization and study of nonverbal communication in mediated interaction.

Keywords: computer-mediated communication, social media, virtual communication, virtual reality, channel reliance, computers as social actors, CAPTOLOGY, multimodal communication, embodied computer agents, interactivity, nonverbal communication

The role of nonverbal behavior in communication has been an issue of great centrality in the burgeoning research about the effects of media and computer-mediated exchange on communication processes. In traditional, face-to-face (FtF) communication, nonverbal cues are a given. We tend to consider their organic properties as part of a multimodal communication process. We tend to assume that nonverbal communication just happens without too much deliberation about it, outside of the contexts of speech training, acting, or other domains where there is conscious rehearsing and delivery. But when it comes to mediated communication, various technologies uproot this commonplace. Nonverbal communication is not a given; it is, at best, sometimes an option.

Most forms of communication media alter, impede, or eliminate some number of nonverbal code systems. How this affects communicators, or whether they actively adapt to such differences has been at the core of research on relatively

new, digital media for interpersonal and group interaction across the Internet. At the same time, old media—traditional broadcast media like TV and film, for example—not only feature many of the native FtF nonverbal communication systems but also involve particularized factors related to their own technological forms that differ from FtF settings. These include how they represent people and interactions, adjust the sensory information available to receivers, and affect perceptual processes in ways that color interpretations of the messages. Media technologies reflect choices that their designers or users have made about whether to embody messages in somewhat natural ways, through photos or video images, or to employ some iconic representation of communicators, such as their gender, mood, or social category membership. The new media landscape is, in a sense, about choices regarding cues and channels that a foundation of principles from nonverbal communication research should inform.

For all this opportunity, however, the sophistication of much scholarly commentary on the role of nonverbal communication in mediated interactions resembles what Mark Twain is often attributed to having said about the weather: Everybody talks about it, but nobody does anything about it. That is, fine-grained findings and distinguishing principles from nonverbal communication research are less often applied to new media design and analysis than they might be. It is not uncommon for researchers to allude to the various nonverbal cue systems that are used in FtF interaction, channel by channel, and in association with function after function, only to read that the cues are all swept away *en masse* by various computer-mediated systems.

Fortunately, unlike the weather, when it comes to exploring nonverbal communication and mediated interaction, a good number of people have not only talked about it but done something about it as well, and their positions and findings are sufficient to fill out a chapter on the subject. This essay reviews a variety of approaches to nonverbal communication and their implications in media and computer-mediated systems. It focuses first on traditional research on verbal and nonverbal channel reliance, which provides the dominant approach to explaining how the absence of nonverbal cues might affect online behavior. It then reviews major computer-mediated communication (CMC) theories and principles that explicate how the presence or absence of various features and processes distinguish between online and offline platforms. The essay then segues into the role of nonverbal cues in traditional (“mass”) communication, considering how visual aspects – e.g., camera angles and visual frames – cue alternative responses and arouse varying points of view in traditional media and how visual, vocalic, and verbal cues affect communication and conversational grounding in audio and video conferencing, with an eye to what accommodations can be made with media to enhance their effects. New “social media” reintroduce certain nonverbal cues into electronic exchanges, and the chapter examines recent research on their effects along with verbal messages in these platforms. Discussion of human-computer interaction

research follows, with an emphasis on how nonverbal cues may arouse responses to computers as though they were social actors and how vocalics, kinesics, and appearance cues, or electronic equivalents, affect the credibility and persuasive potential of websites and interfaces. Also considered briefly are collaboration tools that alter turn-taking patterns. We conclude our review of the substantive contributions of nonverbal features in mediated platforms by examining virtual and immersive environments, with their use of computer agents and avatars, that allow researchers to tamper with, or isolate, the appearance of certain nonverbal behaviors and create imperfections in otherwise sophisticated nonverbal representations that lead to the “uncanny valley” effect. Lastly, we provide a cursory fly-by of some of the new means by which digital media systems facilitate recording and analyzing nonverbal communication in native FtF and mediated settings. Our concluding remarks present some observations about variations in the level of specificity and rigor in the conceptualization and study of nonverbal communication in mediated interaction, and the importance of increasing the quality of such research toward better understanding and effective designs as technologically-based communication systems evolve.

1 When nonverbal cues are “absent”: Effects of and adaptations to communication in CMC

What is as yet a brief history of mediated communication research highlights the centrality of nonverbal communication in our thinking about human interaction by any means. Two strands of research have addressed this issue, one grounded in the issue of what channels or modalities people rely on when processing social information and one grounded in the emerging field of CMC.

1.1 Channel reliance in face-to-face interaction

Predating the diffusion of CMC technology, the stream of research on channel reliance was intended to answer the basic question of whether people depend more on verbal or nonverbal modalities during FtF communication in forming judgments about a speaker’s meaning, and under what conditions different channels take precedence. As interpersonal communication technology emerged, the findings from this line of inquiry quite naturally became the basis for comparisons of various mediated and nonmediated communication settings since different media afforded message recipients and judges different degrees of access to visual, auditory, haptic, and proxemic nonverbal cues and/or verbal cues.

The oft-cited (and erroneous) estimate that 93% of meaning comes from nonverbal channels – a claim that was discredited decades ago yet continues to surface

in popular articles about nonverbal communication—was drawn from extrapolating estimates from two classic studies (Mehrabian and Ferris 1967; Mehrabian and Wiener 1967). The one in which verbal, facial and vocal signals were all included involved repeating the same neutral verbal expression along with changing vocalic and facial expressions. The research concluded that 55% of meaning comes from the face, 38% from the voice (totaling 93% from nonverbal channels), and 7% from the words. By holding the words constant, verbal content had no chance to influence meaning. This and other methodological flaws undermined the validity of these studies.

Although the conclusion that far more meaning is carried by nonverbal than verbal channels was unjustified from those early experiments, a host of subsequent investigations, some conducted experimentally and some based on examination of naturally occurring discourse, yielded a number of consistent findings, enough to warrant some generalizations about the relative impact of nonverbal and verbal channels in deriving social meaning. Listed in Table 1, these generalizations have been summarized and elaborated in Burgoon (1985), Burgoon, Guerrero, and Floyd (2010) and Burgoon, Guerrero, and Manusov (2011) and updated here.

An important conclusion to be drawn from the combined propositions is that channel reliance is a complicated matter and requires nuanced interpretations. Nowhere is this more evident than in the work on empathic accuracy – correctly identifying another's thoughts and feelings. That program of research has turned up evidence of greater reliance on verbal than nonverbal channels and on audio rather than video information (Gesn and Ickes 1998; Zaki, Bolger, and Ochsner 2009). Although it seems straightforward that words themselves would be essential for giving precise descriptions of another's thoughts, even feeling states are more accurately identified when perceivers have access to full verbal and nonverbal rather than exclusively nonverbal information. Hall and Schmid Mast (2007) speculate that, apart from aspects of the methodology that favor channels with verbal information, this divergence from the predominant model of nonverbal channel reliance is because judgments of another's cognitive states may favor verbal information, whereas judgments regarding emotional states may benefit from nonverbal input. Another reason is that feeling states in everyday interaction are ambiguous, so access to verbal information helps to disambiguate them. Other minority perspectives come from researchers suggesting that verbal and nonverbal cues might be similarly potent in expressing immediacy (Wiener and Mehrabian 1968) and research establishing the interoperability of verbal and nonverbal displays in conflict negotiation (Donohue et al. 1983; Jordan, Street, and Putnam 1983). Thus, a more nuanced take on the issue of channel reliance underscores that it depends on the communication function under consideration, while still reaffirming that greatest understanding typically derives from a combination of channels such that redundant and complementary information becomes clear.

Conjectures as to when and why people's proclivities draw them toward reliance on nonverbal modalities in extracting social meaning offers some purchase

Table 1: Empirical Generalizations about Channel Reliance

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1. *Adults generally rely more on nonverbal than verbal cues in determining social meaning.* This claim summarizes the prevailing pattern, but must be qualified by the conclusions that follow.

 2. *Children rely more on verbal than nonverbal cues.* At some unknown age children shift from their initial total reliance on nonverbal channels for communication to verbal ones and then back again toward the adult model. Presumably, language acquisition is a driving force.

 3. *The more the nonverbal and verbal meanings conflict, the more adults rely on nonverbal cues for interpretations.* The greater the congruence between verbal and nonverbal messages, the greater the weight that verbal content carries in contributing to meaning.

 4. *Communication function moderates channel reliance.* Language content carries more weight for factual, abstract, and persuasive communications, whereas nonverbal modalities often carry more weight for emotions, impressions, and messages that define interpersonal relationships. When the goal is a hybrid one, such as accomplishing accuracy in inferring another's thoughts, feelings and attitudes (known as empathic accuracy), perceivers (e.g., therapists) attain higher accuracy when they have access to the verbal than the nonverbal information. Predicting a target's thoughts and attitudes naturally requires some access to what they say. Yet audio cues still contribute significant diagnostic information (relative to chance).

 5. *When meanings are congruent across channels, information tends to be combined additively; when meanings are incongruent, channels of information may be combined in nonadditive fashion.* When various channels are at odds, extreme cues and negative cues often have more influence. However, nonverbal cues still tend to be believed over verbal ones.

 6. *Individuals have idiosyncratic but consistent biases in channel reliance.* Some people are more literal and focus on verbal information, some consistently rely on a specific nonverbal channel (e.g., facial expressions or voice), and some are more adaptable according to the situation. Notwithstanding these personal predilections, reliance on nonverbal channels remains the prevailing pattern in social interaction.

on the issue of how people respond to the presence or absence of nonverbal modalities in mediated communication. Of course, one answer is that humans are innately programmed to attend to nonverbal cues because of the alerting capacity and consequent benefits for survival that such cues afford. It has been suggested, for example, that not only humans but other species in the animal kingdom orient automatically and immediately to sounds that warn of potential danger. Our finely tuned auditory system is capable of detecting a wide array of acoustic signals and distinguishing human from nonhuman sounds. Because awareness of alarm cries and other distress signals confers survival benefits, humans may be naturally oriented to what is transmitted through the vocal channel.

Visual biases and special attentiveness to conspicuous, novel, deviant, or unexpected stimuli, too, may owe their potency to innate tendencies to orient to visual information in one's social environment. Burgoon, Guerrero, and Floyd (2010) discuss the primacy of nonverbal visual information in sizing up another's

status as friend or foe and in forming essential first impressions. The nonverbal literature is rife with support for visual biases influencing information processing (e.g., Burgoon, Blair, and Strom 2008; DePaulo and Rosenthal 1979; Noller 1985). Stiff and colleagues (Stiff et al. 1989) hypothesized that the attention-gaining quality of nonverbal visual cues distracts attention from other (often more reliable) verbal information. Also, when situational familiarity is absent, receivers must utilize both verbal and nonverbal information to interpret the situation. Burgoon, Blair, and Strom (2008) add a social interaction explanation. They speculated that receivers attend to controllable cues such as smiles, facial expressions, eye contact, gestures, spacing, and dress that are senders' stock in trade when "putting their best face forward" because such cues make receivers privy to senders' intended messages. Thus, the primacy of visual information in the phylogenetic, ontogenetic, and interactional history of the species affords it a unique prepotency over the relative newcomer, historically speaking, that is language.

Other explanations for the power of nonverbal channels to shape meaning include people's abiding faith in the veridicality and spontaneity of nonverbal cues. Aside from controllable cues like smiles and others mentioned above, many other nonverbal behaviors are considered to be relatively beyond control. Foot and leg movements, micro-momentary facial expressions, and vocal tension, for example, are thought to speak "the truth," especially as regards deep psychological and emotional states (Ekman and Friesen 1969). By virtue of their supposed status as read-outs of internal conditions, they weigh more heavily in the attribution of meaning than more malleable and packaged verbal expressions. As well, the communicative division of labor between the verbal channel, which conveys propositional content, and the nonverbal codes that simultaneously handle interpersonal business, enables nonverbal cues to exert significant influence in clarifying verbal content.

The mainstream conclusions arising from the channel reliance work not only point to the significant role that nonverbal modalities play in the construction and deconstruction of meaning but also help to frame commonly held assumptions that nonverbal communication is indispensable for many communicative functions. These assumptions presage the concerns with the loss of nonverbal channels that inspired much of the earliest speculations, in the 1980s, about what would happen when nonverbal cues are "filtered out" of CMC.

CMC research in the 1980s was dominated by a "loss of social meaning" camp. We turn to this stream of research next, beginning with notions about the deleterious effects on communication due to the absence of nonverbal cues in CMC, followed by notions of how CMC users adapt to the absence of missing cues by substituting other forms of identification and symbols to overcome these losses.

1.2 The absence of nonverbal cues in CMC

Early research on CMC focused on the differences between offline communication, which is multi-modal and rich with nonverbal cue systems, and text-based, Internet communication. Research explaining how the absence of nonverbal communication impoverished CMC of social meaning was followed by research exploring how users adapt to the absence of nonverbal communication. As we will discuss, the conceptualizations and treatments of nonverbal communication in CMC research have been somewhat inconsistent, no doubt impeding progress in this young field.

By most accounts, the systems that were the precursors to the Internet were developed as data security and transmission systems, and human communication via digital computer networks was an afterthought. Yet the potential for CMC to help coordinate remote collaborators was recognized as early as the 1970s, when basic computer conferencing systems first appeared (see Hiltz and Turoff 1978). These systems transmitted typewritten characters cheaply and quickly. Unlike telephones, and like the email systems we still employ, they sent messages to numerous receivers simultaneously, and stored them until receivers viewed them. Telecommunication research soon focused on the dual impacts of such systems: the potential gains in communication efficiency and the potential losses in the quality of communication.

Early research on CMC reflected assumptions about nonverbal communication that were similar to positions often provided in nonverbal communication research, and reflected the same dichotomy about channel reliance: that nonverbal communication conveys affective and relational messages, while verbal statements convey substantive content. The dominant view of channel reliance, from the perspective of CMC research, fits comfortably with the mainstream view of nonverbal research. It assumed that nonverbal communication held a monopoly on the transmission of personal qualities, emotions, relational messages, humor, sarcasm, and the like. Consequently, text-based CMC, which transmits none of the physical or aural cues of FtF communication, was expected to lack the social qualities that these cues convey. This view has dominated CMC research in one way or another (see, e.g., Nardi and Whittaker 2002), and it is still seen in some corners of contemporary CMC research.

Indeed, across several academic fields that address the issue, the absence of nonverbal communication from CMC was the primary influence expected to affect the quality of computer-mediated telecommunication relative to FtF interaction or the telephone. That said, researchers were none too specific about which nonverbal codes or what functions those cues performed might be most strongly missed. This is not to say that researchers did not mention specific cue systems; they did, some quite comprehensively and others by reference to a good summary article. However, there was no reason to hypothesize about nonverbal codes one at the time, since, compared to FtF communication, they were all gone.

Culnan and Markus (1987) summarized much of the early CMC research, identifying common assumptions in the theories and paradigms that they characterized as taking a “cues-filtered-out” approach. They concluded that “substituting technology-mediated for FtF communication will result in predictable changes in intrapersonal and interpersonal variables” (423). The extant theories and paradigms described these changes as detriments. Although they focused on the same universe of missing cue systems, the dysfunctions they seemed to render differed among these theories.

1.2.1 Social presence theory

Social presence theory existed prior to CMC, and had been developed in the 1970s to study various teleconferencing systems such as audio and video conferencing (Short, Williams, and Christie 1976). The theory’s articulation included a thorough literature review of various nonverbal cues and their social psychological and interpersonal effects. Nevertheless, the theory counted one cue the same as another, and focused on the number of communication cue systems (kinesics, proxemics, vocalic, haptics, etc.) a medium can support. That number was said to relate to the degree of social presence a medium’s users experience. Social presence is the salience of one’s partner(s) in a conversation, or the sense that others are participating. FtF communication features the greatest level of social presence. Video conferencing loses haptics, some proxemics, and some kinesic codes, and it is therefore expected that there is less social presence in video conferencing than FtF communication. Audio conferencing loses all visually-conveyed cue systems, producing even less social presence. The theorists further asserted that the level of social presence a medium conveys affects the socioemotional tone of the interaction it supports. Short et al. (1976: 66) equated social presence with sociability, sensitivity, warmth, and personal orientation.

Social presence theory was imported to CMC research (e.g., Rice and Case 1983). Researchers suggested that CMC offers no nonverbal cues, and therefore, conveyed little social presence. This explanation seemed consistent with the empirical results that were accumulating during the early studies of CMC. Most CMC experiments involved small group decision-making, with some subjects communicating using computer terminals while control groups met FtF (see Rice and Associates 1984 for review). Variables of interest in these studies often focused on the frequency and quality of decision-making and the socioemotional nature of communication. Generally, CMC groups achieved consensual decisions less frequently, with fewer verbal comments, and verbal statements were more task-oriented than socioemotional.

Although social presence theory places a premium on the alleged effects of nonverbal cues in communication by small groups, few researchers attempted to analyze the nonverbal communication of FtF control groups. One study attempted

to do so but aborted the real-time coding effort due to its difficulty (Hiltz, Johnson, and Agle 1978). Nevertheless, the absence of nonverbal cues remained its explanatory force. Without them, CMC users were said to be unable to express and detect charisma – critical for persuasion and agreement in a group.

1.2.2 Lack of social context cues

Research exploring the lack of social context cues hypothesis defined two classes of nonverbal cues that establish context, and therefore norms, in FtF interaction: static cues, which do not change during a specific interaction, and dynamic cues, that may vary during communication episodes (Siegel et al. 1986). Despite this differentiation, both types were posited to be absent from CMC, which was suggested to cause deindividuation and normlessness, absence of status differences, a loss of “affective bonds,” and reduced social influence. Experimental findings that were said to reflect these states included more uninhibited comments, greater decision shifts, and greater equality of message contributions in CMC than in FtF communication (Kiesler, Siegel, and McGuire 1984; see for review Sproull and Kiesler 1991).

1.2.3 Media richness theory

Media richness theory (Daft and Lengel 1984, 1986) dealt with the presence and absence of nonverbal cues in a somewhat different way. The theory focused on four dimensions that describe communication systems as richer or leaner. The first dimension is the capacity for a system to convey nonverbal cue systems in addition to verbal messages. Like social presence theory, movement from FtF to video- or audio-conferencing systems, or to written documents represents reductions in the number of nonverbal dimensions. Other factors include immediacy of feedback (from bidirectionality to asynchronicity or one-way memoranda), capacity for message personalization, and natural language potential. The theory specified that richer media were required for efficient discussion of equivocal decisions, whereas leaner media were more efficient for less equivocal tasks.

Among the differences between media richness theory and the other cues-filtered-out theories is the hypothesized effect on communication due to mismatched richness/equivocality. The previous models focused on problems in the detection of personal qualities and the transaction of emotional and relational messages due to the absence of nonverbal cues in CMC. In contrast, media richness theory originally focused on the role of nonverbal cue capacity and other media characteristics in terms of their impact on intersubjective meaning and the disambiguation of substantive content via alternative communication channels. The theory was empirically examined somewhat indirectly for some time. Despite its intuitive appeal, it has received little support in experimental small group settings (e.g., Dennis and Kinney 1998).

It is interesting to consider the cues-filtered-out research as a whole in terms of its treatment of nonverbal communication. Different approaches specified drastically different effects of the presence or absence of nonverbal communication: social lubrication or content clarification. The generally poor results of CMC meetings in these studies reflected whatever set of effects researchers were examining. It is quite possible that both social and instrumental communication problems occurred in these experiments. The broad specification of nonverbal cues, as an undifferentiated set, did little to help refine understanding. Comparisons of FtF and CMC conditions tended to exemplify the all-or-nothing assumptions about nonverbal cues and communication that the theories conceptualized. As we will see, it was later researchers in human-computer interaction who began to ask which subsets of cues or specific signals are critical to collaboration, and whether there are alternative ways to represent these signals via digital media.

1.2.4 Adaptation theories

As CMC diffused into organizations, the types of online interactions grew, including the world-wide Usenet newsgroup discussions, now-defunct proprietary systems that existed at the time such as Prodigy, Compuserve, and America Online (the precursor to AOL.com), and the Internet itself. Both anecdotal and systematic accounts accrued documenting more socially oriented online interactions than could be accounted for by the extant theories of the time (e.g., Sproull and Faraj 1997; Steinfield 1986). The 1990s saw the introduction of theoretical alternatives to the cues-filtered-out approaches to CMC. These positions also acknowledged the absence of most nonverbal cue systems in CMC. Unlike their theoretical predecessors, however, they focused on how CMC users adapted to the absence of nonverbal communication in order to experience interpersonal and/or group relations online. In doing so, they implied a new view of channel reliance. The newer perspective focused on the availability of different cue systems as contingencies that influenced the employment of different codes for the management of relational and instrumental communication, rather than the prescription that only certain codes could perform one or another function.

1.2.5 Social information processing

The social information processing (SIP) theory of CMC rejected the notion that nonverbal cues have a monopoly on the communication of identity, affect, and relational messages (Walther 1992). In contrast to previous positions, SIP assumes that CMC users are interpersonally oriented in general and adapt the communication cues that are available to them in order to exchange social information. That is, bereft of nonverbal channels, CMC users substitute verbal and textual content and style variations to transact information about themselves, their emotions, attitudes, and interpersonal orientations.

The substitution or translation from nonverbal to verbal signals in CMC has implications for the rate of communication and its social consequences, according to SIP. It recognizes that the simultaneous transmission of verbal and nonverbal messages in FtF interaction supports a relatively great amount of social information accompanying any given utterance. If CMC users must express all social and task information via a single channel, language, much less information is transmitted per utterance. Consequently, according to SIP, more exchanges are required over time in order for CMC to support a similar level of identification and relational development as multi-modal FtF communication.

These propositions have received a fair amount of empirical support (e.g., Walther and Burgoon 1992; see for review Walther 2011). One study compared individuals' expression of liking or disliking among dyads communicating in FtF or using a real-time CMC chat system like Instant Messenger in order to assess the forms that these expressions took across communication settings (Walther, Loh, and Granka 2005). Using techniques similar to those of earlier channel reliance studies (but allowing spontaneous, natural variation in verbal content), FtF conversations were coded for a number of specific vocalic, kinesic, and language behaviors, whereas CMC was analyzed at the language level alone. Results showed, unsurprisingly, that FtF liking/disliking is expressed primarily through vocalic cues, and secondarily through kinesic cues; verbal behavior as a set did not account for a significant amount of the variance in FtF affect. In CMC, various verbal behaviors were associated with liking variations, and these verbal cues accounted for as great a range of variance in CMC as was performed vocally and physically in FtF interaction.

1.2.6 Hyperpersonal CMC

The hyperpersonal model describes how CMC leads to idealized impressions and heightened levels of affiliation in CMC (Walther 1996). It incorporates the SIP model's assumption that CMC users express social information via verbal behavior. It also specifies how CMC users fill in the gaps from missing nonverbal information by projecting qualities about their CMC partners.

When these projections are positive, the model states, CMC users exploit the malleable quality of written language to present themselves selectively online. Whereas spontaneous FtF communication provides some opportunity to shape intentionally one's verbal and nonverbal performance, CMC offers a greater opportunity. By occluding partners' potential observations of nonverbal behavior, CMC allows users to concentrate strictly on construction of their verbal messages to partners. Even real-time online chat affords a modicum of planning and editing of messages, and asynchronous CMC allows even more so, resulting in more affectionate messages (Walther 2007). Reciprocal messaging processes in CMC allows users to exert considerable influence on partners' affective states (Tong 2011), and CMC

partners attribute greater intimacy to partners' self-disclosures than FtF partners do (Jiang, Bazarova, and Hancock 2010). Online self-presentations even alter senders' subsequent self-perceptions in the direction of the online performance they make (Walther et al. 2011).

1.2.7 Interactivity and interaction dynamics

The focus on the presence or absence of nonverbal cues in various media suggests that the degree and nature of content, and content alone, distinguishes FtF from media and one medium from another. Another major direction in mediated communication research has to do with other properties of interaction that relate to the dynamics of communication, which may involve various nonverbal (and verbal) streams. Indeed, perspectives surrounding nonverbal behavior as a communicative activity focus on its dynamic properties and the dynamic interplay among modalities through which messages are conveyed. In this light, the study of interactivity has been a focus and a beneficiary of new communication technology. Questions about how various technologies support or fail to support interactivity have arisen from this focus. Moreover, framing these questions in light of emerging, real-world communication technology has allowed us to enhance our understanding of interactivity in communication with or without technological factors.

Interactivity as a term surfaces in a variety of contexts with an equally varied range of meanings. At its simplest, interactivity refers to interdependent message exchange between two or more people. But that definition belies a wide range of attributes that have been associated with the construct. In the realm of mediated communication, interactivity has been conceptualized according to the structural properties, or *affordances*, that characterize different communication media (Burgoon et al. 2000; Burgoon et al. 2002; Dennis and Valacich 1999; Lombard and Ditton 1997). Chief among the intrinsic properties that “afford” interactive as opposed to noninteractive exchanges and thus define the degree of interactivity present in FtF, computer-mediated and human-computer interaction are the following, each of which has a nonverbal aspect related to it.

Contingency refers to the extent to which one person's queries, responses, and comments are dependent upon the prior ones of another interlocutor. Such contingency can be evident verbally, as in the use of anaphoric references, but it may also be evident through nonverbal signals, as in one speaker's gestural pattern or speaking tempo being mirrored by the next speaker, or both interactants' head movements being temporally synchronized. The body of nonverbal theory and research related to interpersonal adaptation, interpersonal coordination, and accommodation begins with the premise that human interaction is a contingent activity – one person's actions influence and are influenced by those of other actors. (For further reading on coordination and adaptation, see Chapter 17, Patterson, this volume, and Chapter 18, Lakin, this volume.) Forms of CMC that fail to

create contingent interaction seem unnatural and unpleasant. For example, just as automated scripted statements that fail to respond to the queries or responses of an interlocutor are experienced as negative violations of conversational norms, so are CMC forms in which a frozen, nonresponsive photo is displayed during a video conference, or an embodied conversational agent fails to give appropriate back-channel cues (Burgoon et al. 2012). Conversely, embodied conversational agents that are social chameleons in their ability to mimic human behavior – for example, nodding their heads as a backchannel cue—are more difficult to distinguish from real humans, doubtless because they create the contingency essential to human interaction (Bailenson et al. 2008). Contingency is thus a hallmark of interactivity and in interpersonal communication is routinely gauged from the nonverbal patterns exhibited between two or more people.

Participation refers to the extent to which senders and receivers are fully active contributors to a dialogue. Nonparticipative communication formats are ones in which senders give monologues (e.g., a public speech), receivers listen passively, or third-party observers merely watch, listen or lurk. As with contingency, participation is often verified by nonverbal signals such as turn-taking cues and interactional synchrony. If turn-switches are neither present or possible among actors, then the medium is a nonparticipative (and noninteractive) one. A radio broadcast versus a call-in talk show illustrates the difference between a noninteractive and interactive medium.

Mediation and modality richness concern whether an electronic or mechanical medium is interposed between actors and how many modalities are present for transmitting and receiving messages. The common comparison is between oral FtF communication, for which all the nonverbal sensory channels are available for exchange, and text communication, which is verbal-only. In reality, other means of communication such as telephones, video conferencing, or even pen and paper communication qualify as mediated. Thus, mediated communication can vary from lean in its symbol variety to rich. Mediated communication inherently has had more limitations on how many communication channels are available for actors to “interact.” For example, visceral, kinesthetic, and tactile responses that are present in FtF interaction are missing from most forms of multi-modal CMC. The absence of these nonverbal modalities is the foundation for the theorizing about the aforementioned effect of “cues filtered out.” The presumed importance of the full sensory experience in FtF communication is, in fact, one of the motivators for developing new forms of virtual communication that create virtual touch, simulate the aroma of fresh coffee, or create other forms of sensory immersion so as to replicate the sensory experience of FtF communication. Such efforts are a potent testament to the presumed importance of nonverbal message exchange. As these virtual forms achieve greater realism, the mediation feature may produce less of a divide between interactive and noninteractive communication. Already some evidence indicates that mediation per se is far less of an issue than medium richness or

the degree of proximity available in FtF versus mediated forms of communication (Burgoon et al. 2000).

Geographic propinquity refers to whether users are co-located or distributed. Just as proxemics is a fundamentally important communication dimension that gives rise to a range of culturally defined formal and informal messages, different forms of mediated communication presumably derive significant impact from the psychological closeness or distance that users perceive. The more distal the communication, the less interactive it is perceived to be. Proximal media increase perceived interactivity in the sense of users feeling more engaged, immediate, and individuated (Burgoon et al. 2000), and may affect the degree to which actors process information more abstractly or more concretely (Henderson and Waksalak 2010; Trope and Liberman 2010). Skyping with another who is half way around the world can partially ameliorate the actual physical distance between interactants but there remains some reduction in how involved, close and personalized the communication “feels” to participants. In that respect, even though the medium affords actual interactivity, the perceptions of interactivity are attenuated. This perceptual lack of interactivity may translate into reduced participation, a basis for concern among designers of distance education, for example, that has prompted a variety of mechanisms to overcome this perceptual problem. However, proximity may be less influential on communication patterns than synchronicity. Several investigations have found that hypothesized proximity effects did not materialize, conceivably because other factors such as synchronicity and group size were more potent predictors of group behavior (Fjermestad and Hiltz 1998; Valacich et al. 1993).

Synchronicity concerns whether interaction is same-time, which permits immediate bidirectional feedback, or asynchronous, which permits premeditation, rehearsability, and editability before transmitting (Dennis and Valacich 1999). The feature of synchronicity resonates with the nonverbal code of chronemics. Media such as chat and g-chat that permit same-time communication create a sense of social presence, immediacy, and mutual co-orientation that is lacking from asynchronous media such as email or fax. By contrast, research has shown that asynchronous media not only weaken the sense of engagement among users but also dampen trust, confidence in information and people, and are associated with poorer task performance. It should be noted that synchronicity is often conflated with media richness. Richer media are also likely synchronous. Evidence supports that temporal immediacy increases a sense of engagement, mutual understanding, interaction coordination, and individuation and may even trump proximal immediacy (Burgoon, Chen, and Twitchell 2010). According to media synchronicity theory, the impact of synchronicity on communication may also depend on whether the messages being exchanged are merely intended to convey information or to create convergence of attitudes and understanding. Five media properties related to synchronicity – parallelism (described next), symbol variety, rehearsability, reprocess-

ibility, and transmission velocity – are theorized to determine how well conveyance and convergence communication processes are achieved (Dennis, Fuller, and Valla-cich 2008). Given that most communication tasks require both conveyance and convergence, multiple media may be required to maximize communication out-comes, a conclusion that speaks to the complexity of identifying which features of interactivity are responsible for what outcomes. That said, even within *asynchro-nous* media, the degree of urgency and interactivity can still be introduced through the response latency and timing of when a message is transmitted.

Parallelism refers to whether the medium permits concurrent communication and multiple addressees, as in the case of electronic brainstorming, or only permits serial messages. This again is a chronemics-related affordance. For instance, Bai-lenson and colleagues (2005) have shown that immersive virtual environments can be designed such that, in contrast to the usual human interaction pattern of speak-ers directing eye contact to other group members in a serial fashion, all recipients of a message may simultaneously experience “mutual gaze” with the speaker. Unclear is whether this feature alters the degree of interactivity, but it seems rea-sonable to expect that serial communication yields less interactivity than parallel communication.

Identification is the extent to which participants are fully identified, partially identified, or anonymous. Speculatively, the more individuals are fully identified rather than anonymous, the more bases there are upon which interdependent actions can arise. Vague identities lead to more stereotypical responses and less “social penetration,” leading interaction to operate at a more superficial level. Nonverbal features are especially relevant to establishing and fleshing out identi-ties. Everything from physical appearance features, physical attractiveness, voice, facial expressions, and gestural patterns can serve to convey one’s gender, age, culture, nationality, racial heritage, group membership, and personality (Burgoon, Guerrero, and Floyd 2010). Nonverbal communication, then, is central to the pro-cess of identification. The various nonverbal codes can be seen as creating layered identities that can shift mediated interactions from a flat, one-dimensional form, to two-dimensional, three-dimensional and even four-dimensional exchanges (if temporal dynamics are taken in account). Lacking such rich identifying informa-tion, anonymous communication may be perceived as less interactive in that there are fewer touchstones upon which common ground can be assessed or promul-gated. At the same time, mediated forms of communication also permit creation of false and pseudo-identities. Users can send touched up photographs or filter their voice quality. They can locate themselves in counterfeit environments, as depicted in a TV ad showing a student claiming to his parents on a video call that he is studying in the library, while the false backdrop falls away to show a bar scene. These are but a few of the nonverbal machinations that users can undertake for purposes of establishing a false identity. The nonverbal accoutrements silently reinforce a false verbal report or send implicit information that is absent from the

verbal channel, thereby effectively using mediated communication as a means of deception. As new technologies allow further warping and misrepresentations of “reality,” the role of nonverbal codes in this aspect of interactivity will doubtless draw more research attention.

1.2.8 Multi-modal vs. unimodal CMC and effort

Another framework has recently been articulated that acknowledges the role of nonverbal behavior in communication and its absence in certain communication technologies. This framework focuses on the different levels of effort that multimodal and unimodal communication require, and the consequences of that differential. The efficiency framework (Nowak, Watt, and Walther 2009) reflects an assumption previously noted in the presentation of SIP theory: that FtF communication involves the simultaneous transmission of numerous messages via multiple nonverbal and verbal channels. This capacity is coupled with the notion that FtF communication is a deeply ingrained process that is often performed with relatively little conscious effort.

Any reductions in cue systems due to technology, and the great reduction of cue systems in CMC, require greater effort for communicators to achieve outcomes comparable to those they might have achieved FtF. Whereas SIP theory argued that CMC was as capable of relational development as FtF interaction, the efficiency framework suggests that the SIP-like adaptations CMC users must make to translate instrumental and affective impulses into verbal cues incur behavioral cost.

The framework presents two consequences of effort. First, individuals dislike expending greater rather than lesser levels of effort to accomplish comparable outcomes. Because CMC requires more effort than FtF communication, users are likely to express less satisfaction with CMC than FtF communication for most tasks, and may even denigrate the quality of their work, even if the instrumental outcomes of their efforts are no worse in objective quality. Such findings are common in the CMC literature, although rarely before have they been explained (e.g., Gallagher and Kraut 1994).

The second implication of greater effort requirements for technology-mediated communication is that, in some cases, greater effort produces better outcomes. This contention is likely to be quite context-dependent, although examples are easy to find. A group of collaborating authors may find it easier to talk about their project FtF, but a group of authors exchanging written comments via CMC may be producing material that becomes part of their output. The grounding principle, discussed later in this chapter, also suggests that commenting on a draft online may be more effective than talking about a draft-to-be in person.

1.2.9 Nonverbal messages and nonverbal surrogates in CMC

As reflected above (see especially 1.2), much of the conceptual work about CMC presumes that text-based CMC features no nonverbal cue systems. This premise is

challenged by the identification of chronemic influences on message interpretations online. Other research has focused on how CMC users attempt to make up for facial expressions through the typographic constructions resembling facial expressions of emotion, or “emoticons” in CMC.

The timing of online communications influences users’ perceptions of the urgency of messages and some relational characteristics among CMC interlocutors. Many CMC systems display the day and time a message was sent, making chronemic cues potentially salient to users. The first study to examine chronemics in CMC focused on when, during the day or night, an individual appeared to have sent an email message, as well as the latency of the target’s reply (Walther and Tidwell 1995). When the content of the messages connoted a business issue, observers rated initial messages sent at night as more dominant and less affectionate than ones sent during the day. When the exchanges involved social rather than task-oriented messages, a different pattern emerged. Social messages initiated by day signaled more dominance and less equality than when social messages were initiated at night. More affection was ascribed to a slower reply to a daytime message than a fast reply, but a fast reply at night showed more affection than a slow one. Döring and Pöschl (2009) replicated this study fourteen years later using mock-ups of cell-phone based text messages (or “SMS,” simple messaging systems). Using European subjects to provide ratings of dominance and affection, their results mirrored those of Walther and Tidwell (1995).

Kalman and Rafaeli (2011) extended research on CMC chronemics by incorporating a factor from nonverbal expectancy violations theory (EVT) (Burgoon and Hale 1988), the rewardingness of the actor, to reactions to email response latency. For poorly regarded job applicants, the response delay to an email from a prospective employer (1 day, 2 weeks, or not at all) did not matter. But for highly regarded job applicants, the more delinquent the response, the less socially attractive the applicant was perceived to be. Though not a commonly tested relationship in EVT, the results revealed that highly regarded individuals can commit negative violations and that the ways users manage media nonverbally is responsible for committing this violation. Similar research on email latencies and EVT by Sheldon, Thomas-Hunt, and Proell (2006) held the reply latency constant, and experimentally manipulated raters’ perceptions of actor reward level. Although the findings of this research comported more with EVT – high-reward violators were accorded more positive evaluations for latency than were low-reward violators—one can see that a robust, fully-crossed application of EVT to CMC chronemics still awaits. Despite this, the presence of chronemics in CMC is becoming recognized as the last code to survive the reduction of nonverbal cues in the shift from FtF to CMC formats.

A longstanding technique that CMC users have employed to infuse emotional expression in online discourse is through the use of emoticons. Rezabek and Cochenour (1998: 201) defined emoticons as “visual cues formed from ordinary

typographical symbols that when read sideways represent feelings or emotions.” Different cultures with different languages, facial expressions, and emotional display rules use different emoticons (and do not all require readers to imagine them sideways). Yuki, Maddux, and Masuda (2007) argue that in the Japanese culture, emotional expression is less likely to be overtly displayed public as it is in America. Because of this, Japanese people are more likely to look to the eyes rather than the mouth for emotional expression. Common Japanese emoticons therefore use the eyes—such as ^_^ — as compared to American emoticons which focus on the mouth to show expression—such as :-).

So widespread is the assumption that emoticons communicate affect that very little research has actually examined the proposition. Almost all research about emoticons has offered descriptive findings about who uses them or when (e.g., Derks, Fischer, and Bos 2007). Two studies have examined emoticons’ effects. Byron and Baldridge (2007) found that the presence of a smiley face emoticon in an e-mail increases the perceived likeability of the sender by the receiver of the e-mail. Walther and D’Addario (2001) found meager effects of emoticons on message interpretations. Smiley emoticons had no effect on interpretations of verbal statements. Frowny emoticons led to interpretations of negative affect, but to a limited extent. Although a frowny emoticon functioned like sarcasm, making a positively-worded statement seem affectively negative, a frowny emoticon did not make a negatively-worded statement any more negative than a negative statement with no other emoticon at all. The authors concluded that negative emoticons exert influence similar to negative language, but positive emoticons are probably phatic, i.e., conventional but essentially meaningless acknowledgments.

2 Nonverbal cues in traditional and new media

2.1 Mass media and new media

In 1974, Randall Harrison, one of the pioneers in the field of nonverbal communication, wrote in *Beyond Words* about the role of media in nonverbal communication, thereby linking the two from the earliest days of contemporary investigation of nonverbal communication. That work presaged the emergence of the study of visual communication and how media shape our processing of visual forms of communication (Messaris 1994). Harrison’s book identified *mediatory codes* as one of the four classes of nonverbal communication and considered how special effects of media, such as camera angle and proximity, when interposed between sender and receiver, affect observers’ perceptions and interpretations. Mediator codes are analogic – comprised of continuous, infinite, and natural (nonarbitrary) units such as proximal or distal positioning in a proxemic message. One of the most ubiquitous uses of media to express “nonverbal messages” is the manipulation of proxim-

ity through camera angle (Meyrowitz 1986, 1998). For example, a close-up camera shot creates the same sense of immediacy, involvement and intimacy with the subject as does interacting with the person FtF in close proximity. An upward camera angle makes the target appear more imposing and powerful whereas a downward camera angle places the beholder in a superior position and creates the same message of dominance as does adopting an elevated position vis-à-vis others (Lombard and Ditton 1997). Close-ups and upward shots may also underscore the importance of the individual(s) being featured. Thus *camera distance* and *vertical camera angle* have long been recognized as staples among the mediatory codes used to signal to onlookers how to perceive, interpret and respond to visual images.

Fast-forward 20 years and Messaris (1994, 1997 Messaris, 1998) and others have explicated a host of other syntactic and semantic conventions of our visual “language” that are the bread and butter of advertising, marketing, and film-making among other mass media arenas. Syntax refers to the temporal or spatial juxtaposition of images to convey temporal or spatial or even implicit causal relationships among depicted objects. For example, just as use of the principle of precedence can convey ordering (and superiority) between people – for example, the dignitary who walks down a red carpet first is presumed to be more powerful than those who follow – so can the ordering of images imply relationships. Absent other conventions such as camera fades, pages dropping off a calendar or clock countdowns to convey the passage of time, the scene shown first is assumed to precede temporally the scene shown second. Visual montages also imply connections among images without having to state the various depicted elements are related. Just as nonverbal messages can be used to express what can’t or shouldn’t be said aloud, spatial juxtaposition can also convey otherwise illegitimate or proscribed messages. The beautiful nature scenes so often depicted in cigarette advertisements that are meant to implicitly obviate the explicit messages about the health dangers of smoking illustrate the point. Similarly, the physically fit and active individuals shown in diet plan and breakfast cereal commercials are meant to imply that diet alone will make one physically fit without the inconvenience of having to exercise. The mind, in a logical participatory fashion, fills in the missing arguments between the visual data and the conclusions to be drawn.

Semantically, one of the most obvious features of visual communication is the use of the principle of *size*. Lombard et al. (2000) experimentally manipulated the size of a television screen on which participants viewed the same series of commercially available videos and found that the larger screen created a much greater sense of presence. Participants watching the video clips on the larger screen felt more involved and excited and enjoyed the activity more than those who watched on a small screen. Size of a person, object, or scene being displayed can also be manipulated. Size is a commonly understood signal, not only in the homo sapiens world but also throughout the animal kingdom, of power and dominance (Burgoon and Dunbar 2006). Visitors to Universal Studios can see the old

stage sets for westerns with their small door frames and raised thresholds meant to make the actors, many who were not especially tall, look larger than life. Close-up camera shots, like conversing in very close proximity, cause the other's face to fill up one's visual field and to arouse one's kinesthetic senses. Conversely, distal shots make the other appear small and insignificant.

A complaint by feminists has been that media too often portray women as diminutive and weak and men as large and potent. Ethologically based principles of elevation, centrality, physical potency (often instantiated through size, expansiveness of postures and gestures, and facial neoteny), threat, and access to valued resources are understood automatically and instinctively as messages of dominance or submission (see Burgoon and Dunbar 2006) and thus often pass without scrutiny when used as visual rhetoric. Goffman's (1979) provocative *Gender Advertisements* showed through an extensive compilation of advertisements how women were being portrayed differently than men. The ads routinely showed men in expansive postures, filling up much of the space in a photograph, and being centrally located, whereas women were depicted in contracted postures, taking up far less of the pictorial real estate, and being placed on the periphery. Men were also regularly the taller of the two, portrayed in serious commanding and instructing roles whereas women were displayed in more frivolous and childlike ways. Goffman argued that these presentations did not depict how men and women actually behaved but rather operated in service of maintaining the social order by portraying how men and women should function in society. Although the work's conclusions provoked controversy, it remains an excellent testament to how media can shape perceptions through use of tacit messages. Subsequently, Archer and colleagues (1983) demonstrated similarly that men and women were depicted differently in the media in terms of what they labeled "face-ism" – men's faces were more prominent, whereas women's bodies more prominent, in contemporary American periodicals, in photographs from 11 cultures, and in 6 centuries of art, and in amateur drawings. And, more recently, Bell and Milic (2002) conducted a systematic analysis of 827 advertisements from Australian magazines in which they demonstrated a wealth of semiotic resources in advertisements that are still used to sustain gender stereotypes. Applying a system of visual semiosis for analyzing the degree of representational realism or veridicality of images (e.g., color, degree of contextualization, comprehensiveness of representation, nature of the perspective, sources of illumination, and degree of brightness), they modified it to reflect social dimensions as well. Their hypothesis was that women continue to be represented in passive "infantilized" roles, despite social advances that have been made. Among the most significant semiotic resources they found to create differential portrayals of men and women were *perspectival angle*, *plane of composition*, and *direction of gaze*. For example, women gazed more frequently at the onlooker than did men, a semiotic act that purportedly creates a relationship with the viewer. More generally, this analysis revealed a variety of semiotically interpretable resour-

ces that could be used by the media to create different portrayals of a given subject or group.

Another semiotic feature is the *visual metaphor*, which preserves many of the same iconic characteristics while simultaneously violating other aspects of the usual relationship between sign and signified. The violation of reality present in so many of these images attracts attention while the metaphorical aspect is emotionally evocative. Messaris (1997) offers the example of a political ad with a photograph of a woman with a troubled look to her eyes and with her mouth completely blotted out. The photo is eye-catching. Juxtaposed with the caption – “Most politicians think women should be seen and not heard. In the last election, 54 million women agreed.... Make Them Listen. Vote.” – it makes the point in a striking fashion.

Other devices include *visual distortions* – slight deviations from normalcy that are sufficient to arrest our attention, *visual parodies* – modifications of familiar images like a “fractured” facial expression on the Mona Lisa or happy faces on the usually sober figures in Grant Wood’s *American Gothic*, and use of the “rear view” – filming or photographing a subject (who may also be largely naked) from the back rather than the front, thereby not only directing attention toward what the subject is holding (an expensive alcohol) or ostensibly viewing (scenic grandeur) but also being sexually provocative. These attention-gaining maneuvers might be regarded as nonverbal visual invitations to “look at me.” Yet other devices such as *first-person versus third-person point of view* change the apparent subjectivity of the experience. Action thrillers that take you down a darkened passageway as viewed from the cameraperson’s perspective create more psychological distance and apparent objectivity than if filmed as if you are sitting on the protagonist’s shoulder as he or she ventures into the unknown. In this case, the tacit message in the former case may be that you, the onlooker, are to experience the situation as representational, as realistic, whereas in the latter case you are to experience it emotionally, much as the protagonist is experiencing the adrenaline rush, fear, and excitement that the situation evokes.

These various devices are of course no longer confined to traditional broadcast and print media; they are now the stock in trade for all forms of mediated communications, ranging from email advertisements tailored to specific addressees to websites and YouTube videos. What marks them as relevant to nonverbal communication is not only that what is so often being manipulated is nonverbal in nature but also that these nonverbal meta-messages have become assimilated into our “media lexicon” to the point that they are taken for granted and exert influence at a subconscious level, unscrutinized for their fidelity to reality. One may not question, for example, whether a decontextualized video snippet from a presidential campaign speech is accurate and complete because the third-person viewpoint implies that what is being seen is a true and full account of reality. These implicit nonverbal messages, which are the grist of the field of visual communication, have yet to be embraced as mainstream nonverbal communication topics.

2.2 Audio and video conferencing

Consistent with the long-held desire to overcome the perceived disadvantages of remote collaboration via technology, videoconferencing has been a frequent focus of research. Video conferencing arrangements for the most part, until recently, have been deployed in order to overcome the missing facial expressions and gestures that are lost when collaborators use voice-based teleconferencing or text-based CMC for their work. Following from this perceived need, video conferencing systems traditionally have been deployed so that speakers can see each other. Ironically, most industrial applications of video conferencing, as well as most research on the technology, have yielded dismal results. Even when users like video, almost all empirical assessments show no significant improvement in task performance from video conferencing compared to other media (Tang and Isaacs 1993). Video may even distract or overload users with information (Hinds 1999; Storck and Sproull 1995), leading to decrements in the relative quality of collaborative tasks.

A breakthrough in video conferencing focused on the question of what cues are most important to convey through teleconferencing media. Kraut and colleagues (Kraut, Fussell, and Siegel 2003) argued that when working on a collaborative task that has a tangible object which can be presented visually, the visual focus of video conferencing is better directed toward the object than it is toward the collaborators. By focusing on the object visually, and complementing it the language and vocalics of audible speech, conversation becomes grounded.

Grounding, according to Clark and Brennan's (1991) theory of language and conversation, refers to a state in which interlocutors have a similar focus and are mutually aware of one another's similar focus. When conversations are grounded by a mutual visual referent, communication becomes more efficient. Less deictic language is required in particular. Deictic language, like deictic gestures, points to or co-orient people to some place or thing, but deictic language often requires numerous phrases and confirmatory feedback indicating that everyone is indeed looking at the same place on the same thing. Therefore, when spoken conversations are grounded by video that reflects an object of common focus, communication is more efficient, tasks take less time, and the quality of joint outcomes improves compared to voice support or to voice-plus-video when the video focuses on collaborators. Empirical studies have supported these contentions using virtual representations of mutual tasks (Gergle, Kraut, and Fussell 2004) as well as using physical tasks such as advising a worker on repairing bicycles (Kraut et al. 2003). The popularity of the free video conferencing software, Skype, may benefit from such recent discoveries, although the use of Skype seems as often as not for socially oriented discussions rather than task-oriented discussions. When the object of interest is a partner's attitude or feeling, rather than an external object, interlocutors' faces may yet be the most useful focus for the visual field video conferencing provides.

2.3 Social media

Many new forms of social media offer blends of text-based CMC along with photographs, videos, and other means of nonverbal communication. Social network sites such as Facebook, for instance, are replete with both text and photos. The impacts of these systems on communication processes are currently the focus of considerable research attention.

Social network sites offer users a profile to build. Profiles usually contain a base photo (profile picture) of the profile's owner, along with categories in which the owner may share information about his or her occupation, education, and favorite musical groups, books, movies, quotations, etc., through text and graphics. In addition, individuals' friends may post messages on one another's profiles. When they do so, their own profile picture appears alongside their comments. Among students, these types of photos comprise a new corpus of consumer photography – photos from one's college years – which were scarce before the era of inexpensive digital cameras and social network sites (Mendelson and Papacharissi 2011).

Research has begun examining the interplay of these verbal and nonverbal elements in the Facebook environment. Impression formation and (mis)management have been one topic of interest. Since one's friends' faces' photos appear juxtaposed to one's own face on Facebook, one study examined whether the attractiveness of friends' faces influenced perceptions about the profile owner's attractiveness. Prior research using pictures, offline, has alternatively found assimilation or contrast effects when a target photo is presented alongside other (attractive or unattractive) photos compared to when such a photo is presented by itself (Melamed and Moss 1975). When assimilation occurs, observers perceive the target photo to be more similar in attractiveness to those photos with which it appears. When contrast occurs, a target photo appears more attractive when it is presented alongside unattractive photos, and more unattractive when it appears alongside more attractive photos. Because assimilation effects are more likely when observers are told that there is some kind of relationship among the individuals in the photos, Walther et al. (2008) hypothesized that having less attractive Facebook friends leads to perceptions of a profile owner as being less physically attractive, and vice versa for the effect of attractive friends. These predictions were confirmed in an experiment using Facebook mock-ups.

Noting that most of one's Facebook friends are already known to one another through offline interaction, another study investigated whether individuals present photos and other information on Facebook that was discrepant with what friends know about them offline (DeAndrea and Walther 2011). Respondents readily identified misrepresentations in their friends (and their own) Facebook profiles. The less relationally close the respondent was to the friend, the more the respondent attributed hypocrisy and distrust as a result of the misrepresentation. The role of

nonverbal messages in the social media environment will doubtless attract more research attention in the future as scholars attempt to answer the question of whether such effects duplicate those found in FtF interaction or have properties unique to the mediated environment.

2.4 Human-computer interaction

Human-computer interaction (HCI) concerns the myriad ways in which humans interact with computerized devices ranging in ascribed intelligence from simple, noninteractive systems that may record human responses or provide simple prompts to highly advanced devices equipped with artificial intelligence that are meant to simulate human interaction and/or augment human intelligence. The latter are of primary interest here.

2.4.1 Computers as social actors

The issue of whether media-based interactions mirror FtF interaction was a driving force behind a very profound and provocative line of research known as computers-as-social-actors, or CASA (Reeves and Nass 1996). The simple premise that sparked this research was that human psychological and social patterns may be so deeply ingrained that they can be invoked and applied to inanimate objects like computers or robots, disregarding the evidence of the fundamentally asocial nature of the objects. To test this premise, a series of experiments investigated whether findings that had been produced in human-human interaction would be replicated when one of the actors was replaced with a computer. Results demonstrated not only that humans applied gender and ethnic stereotypes to the computers, imputed personalities to them, and regarded them as team members but also, under the right conditions, the computers elicited interaction patterns like those in human-human interaction (e.g., Moon and Nass 1998; Nass, Moon, and Carney 1999; Nass et al. 1995). Nass (2000) confirmed that the human actors did not actually think of the computers as “human” but simply that the right “social signals” from the computers elicited the highly scripted social responses.

This very robust finding has been applied in a variety of arenas. As one illustration, Nunamaker et al. (2011) equipped a kiosk designed for security screening with a human-looking avatar with alternative guises and demeanors (e.g., smiling or unsmiling, attractive or unattractive appearance) and tested human reactions to it. Not only did research participants address the avatar as “sir” or “ma’am,” but they also ascribed more power to the unsmiling male avatar and more trust and liking to the smiling female avatar. Ongoing research into what nonverbal signals matter in the embodiments of avatars and robots and with what effects builds upon the foundation set by the CASA research program.

2.4.2 CAPTOLOGY

One outgrowth of the CASA program of research is a novel direction called CAPTOLOGY, a term coined by B. J. Fogg that refers to Computers as Persuasive Technology. The Persuasive Technology Lab is designing, researching, and analyzing interactive computing products such as cell phones, websites, video games, chat bots, wireless technologies, and other mobile technologies. Although not concerned primarily or exclusively with nonverbal communication, numerous aspects of nonverbal communication are utilized in persuasion, whether in nonmediated or mediated form.

In his first book on the subject, Fogg (2003) outlined the ways in which computers can function as persuasive tools and can function like social actors, taking on many of the characteristics of humans and eliciting the same psychological responses that are triggered in human-human persuasion. Among the key principles that have been instantiated are attractiveness, similarity, praise, reciprocity, and authority.

Another aspect of CAPTOLOGY concerns the characteristics of computers that engender trustworthiness and expertise. Among the principles that have been explored regarding credibility concern presumed, surface, reputed, and earned credibility, as well as the principle of (near) perfection. Presumed credibility derives from generalized assumptions about others based on stereotypes, and so in that regard can be heavily influenced by all the ways in which nonverbal cues elicit and reinforce stereotypes. Surface credibility is similar in that it is based on outwardly available indicators such as dress, attractiveness, and the like. Physical appearance, kinesics, and vocalics are likely to play the largest role in this aspect of credibility, and these are the nonverbal codes that are attracting the most research attention in the design of embodied conversational agents, robots, and avatars as well as images and video transmissions of interacting users. Reputed credibility comes from others' observations and imputations, which could include the endorsements or introductions from third parties. Earned credibility is meant to reflect objective bases for assessing credibility based on repeated performances rather than reliance on subjective judgments (although this tends to be at odds with the standard definition of credibility as a subjective judgment).

2.4.3 Nonverbal cues in collaboration tools

As computer-based decision aids and expert systems have become more commonplace in organizational contexts, computer-based tools for collaborative work have gained increasing acceptance. One such type of groupware enables co-located and distributed groups of varying sizes to interact via computer in parallel mode, that is, people can all "speak at once" via text. For co-located groups, people remain in the same room, and even though they are proscribed from speaking to one another, they experience proximity and some of the interactive properties of FtF

communication while simultaneously transmitting brainstorming ideas, categorization of ideas, votes and so forth via networked computers. In distributed groups, same-time text-based interaction is also utilized but the properties associated with geographic proximity are absent. The relevance to nonverbal communication is that the availability of proxemic, chronemic, kinesic, and vocalic information, as well as the presence or absence of shared environmental context, may exert significant influence on task performance and social relationships among group members. Although seldom discussed in terms of nonverbal communication, substantial research streams in the CSCW (computer-supported cooperative work) community, and management information systems research (selective works which have been mentioned in passing here), have explored the impact of these nonverbal codes; their theories, hypotheses, and findings can be mined for additional insights into nonverbal communication.

2.5 Virtual and immersive environments

2.5.1 Virtual and augmented reality

Virtual reality (VR) systems use technology in which individuals see some graphical representation of themselves and other actors move through artificial environments that computational systems present to them primarily through visual projections. By using kinesic sensors on the participants' head and body to track individuals' actual movement, their behavior can be shown via graphic displays of their bodies via projections to participants' head-mounted viewing lenses. Behavior can be recreated veridically for viewing by the individual and/or by others, or their kinesic behavior can be modified by system operators so that it appears to others in ways that are not tied to the actor's actual performance. For instance, Bente (2007) had participants at different computer workstations converse with each other online, while researchers captured participants' gaze using eye-tracking systems, and kinesic movement using head and finger sensors, and redisplayed these movements on avatars appearing on the opposite conversational partners' video displays. The researchers artificially and surreptitiously elongated or reduced gaze from one conversational partner toward another using computational systems, while the second conversational partner's gaze was transmitted to the first partner without distortion, as a control condition. When participants perceived that they received greater gaze, they evaluated their partners more positively compared to reduced or natural gaze conditions.

We mentioned above Bailenson et al.'s (2005) work on gaze, which warrants elaboration as another form of transformed social interaction. In a FtF small group discussion, one speaker can establish mutual gaze with one partner but not others. Communicators therefore experience "zero-sum gaze": one either receives a partner's gaze or does not. In VR, experimenters can make it appear to each partner

as though a speaker is looking directly at him or her, all the time, allowing for the experience of “augmented gaze.” Experiments comparing actual gaze to augmented gaze found that participants enjoyed interaction more, and engaged in interaction longer, in augmented rather than zero-sum gaze, in a VR environment.

In another form of transformed social interaction, we see intrapersonal as well as interpersonal effects. Bailenson and colleagues (2005) compared subjects’ responses to the VR representation of a conversational partner under several conditions. In one condition, the partner’s apparent VR kinesic behaviors were comprised by the actual body and head movements of a real other person. In other conditions, the partner’s apparent VR kinesics were actually comprised of the subject’s own body and head movements, projected onto the partner’s bodily representation, in real time or at delays of 1 to 4 seconds. Results showed that subjects preferred interacting with the 4-second mimic than they did with a virtual partner who reflected a real person’s movement. Researchers attributed this response to a similarity/liking effect for kinesics; no one’s behavior is more similar to one’s own than his or her own behavior is.

Yet other research along these lines shows intrapersonal effects on one’s identity and social behavior as a result of physical appearance cues. Yee and Bailenson (2007) examined the effects of VR participants’ exposure to their own virtually transformed physical appearance, to see if it affected their self-concept and, as a result, their social interactions with others. They manipulated participants’ virtual views of themselves to appear to be taller or shorter than a partner. Taller-appearing subjects negotiated more aggressively in a game in the VR environment than did those who appeared to themselves to be shorter. In a related experiment, when VR participants saw their own faces in the virtual mirror of a VR environment, but their faces had been morphed to be marginally more attractive than their baseline appearance, they moved closer to a confederate’s avatar and disclosed more. Fox, Bailenson, and Binney (2009) had individuals view avatars that looked like themselves eating healthy food or fattening food, and subjects saw the avatars become slimmer or fatter as they watched. Female participants mimicked the healthy eating behavior of their avatars during a post-test period, in line with notions of self-efficacy and observational learning theory, since one’s own empowered (virtual) self is a strong role model for offline behavior. Surprisingly, males did not conform to these predictions.

2.5.2 Embodiments

Nowhere is the relevance of nonverbal signals to mediated communication more evident than in the guises and demeanors used by mediated interactants, whether they be avatars selected by a human entity or embodied conversational agents representing a nonhuman entity. Avatars are the visual characters participants select to represent their identity in virtual worlds. They can range from inanimate

objects to cartoon-like animated characters to animals to “heroes and heroines” to other more anthropomorphic representations. In various games, these avatars can change characteristics as the individual advances through different levels of the game. The relevance to nonverbal communication lies in such things as what features of the avatar are viewed as symbolic analogues to the user’s own personality or qualities. For example, avatar size, expressivity, and ferocity may function as nonverbal signals of one’s dominance and power. The neoteny or maturity of facial features may create approachability or social distance, and so forth. Research into avatar selection may thus speak to how people convey their identities through nonverbal signals, and whether they choose to display online identities that are isomorphic or discordant with their own identities.

One area in which this is particularly germane is what gender and group membership attributions are made about individuals based on their selection or observation of avatars that represent themselves and others in virtual worlds. Visual characteristics of even relatively inanimate icons (a face or cartoon character representing a chat user) can anchor identification of self and others, and bias information processing and social influence in online spaces. Lee’s (2004, 2005) experiments have shown that the stereotypical gender appearance of an icon can have a profound effect on users, even when they should rationally discount the icon’s apparent gender as representing other users’ biological sex.

Turning from static icons and from avatars which are meant to convey a human’s identity and whose actions and communication are driven by the human actor, embodied conversational agents and robots are computer-based entities whose actions and communication are driven by artificial intelligence. Such entities range in degree of anthropomorphism and degree of “embodiment.” Least anthropomorphic are the mechanical voices that deliver messages and thus achieve pseudo interactivity but may follow a very limited script, as in voice recognition systems that can walk users through a decision tree in reaching their banker or gather their flight information or take service requests. Embodied conversational agents, by contrast, may present an onlooker with an animated, human-like head and upper torso that speaks, delivers backchannel cues in response to onlooker comments, and appears to be understanding the onlooker. Robots like MIT’s Rosie may abstract only certain human features, such as being shaped a bit like a human head with elements that look like human eyes and may respond with a limited set of utterances. Those are equipped with speech recognition software and text-to-speech capabilities may give the appearance of much greater interactivity that simulates human dialogue.

The development of embodied conversational agents, robotics, and what is now termed *affective computing* is beyond the scope of this chapter. What is of interest here is what empirical research has so far demonstrated about which nonverbal features are most essential to create pseudo-dialogue and to convey emotional responses. As noted previously, intelligent agents that fail to give and

“understand” the turn-taking and emotional signals of the human actor fail the nonverbal equivalent of the Turing test, i.e., they fail to exhibit sufficient “intelligent behavior” to be regarded as human rather than a machineal. Yet equipping artificial agents with all the nuances of human speech and emotion remains a hard challenge. Thus, at present, what is more attainable is incorporation of nonverbal features that create the minimally acceptable signals for interpersonal interaction (Bente et al. 2008; Blascovich et al. 2002).

A highly ambitious program of research by several laboratories in Europe called the SEMAINE (Sustained Emotionally Coloured Machine-Human Interaction Using Nonverbal Expression) project (Gunes and Pantic 2010; Schröder et al. 2009) undertook just such a mission and developed a “sensitive artificial listener” or SAL. Their research showed that it is possible to create different embodied agents with different affective states – cheerful Poppy, gloomy Obediah, hostile Spike, and straightforward Prudence – that can elicit different emotional reactions from interlocutors, who interact with the agent as if he or she were human. However, to do so required, among other components in the computer architecture, (1) templates for gathering human actor nonverbal behavioral patterns, including separate templates for detecting head movements, facial expressions, pitch contours, fundamental frequency, and the like; (2) speech detection algorithms to determine whether the actor is speaking or not; (3) an emotion detection system for recognizing the emotional states of the human, based on presentation of various action units in the face and emotional components in the voice; (4) behavioral rules for what actor behaviors should be followed by what agent behaviors (e.g., actor commentary should trigger backchanneling cues of interest); (5) behavior selection templates and decision tree algorithms that determine which among alternative behavioral responses will be selected; (6) a dialogue management system that also takes into account the verbal input from the human interactant; and (7) an utterance selection system for choosing among alternative verbal responses. It should be evident that the complexities of building an embodied agent that truly accomplishes the contingent and relevant responses of interpersonal interactivity requires significant knowledge of nonverbal communication functions, message production, and message interpretation.

Finally, questions continue to arise about the degree of realistic physical appearance for the virtual representations of actors or intelligent agents online. Some research has found that iconic but non-realistic visual representations are the most engaging and most comfortable for HCI users (Nowak and Biocca 2003). Others suggest that maximal realism provides the most natural and comfortable interface for users (see for review Groom et al. 2009), and studies that include highly realistic graphics find that these are the most favored by users. These different findings may seem to be at odds, but methodological limitations and a synthetic conceptual approach help to resolve this conflict. Methodologically, many studies of this nature suffer from a ceiling effect, in that the stimuli with the most

realism in these studies still appear somewhat cartoonish and artificial even though they are more anthropomorphic than alternative stimuli, which are favored.

Why would almost-great realism be less appealing to users than either great or moderately good realism? An answer is found in a perspective known as the Uncanny Valley effect. Originally articulated by Masahiro Mori (see MacDorman 2005), the uncanny valley proposes that up to a certain point, the more lifelike and realistic a humanoid robot is – and by extension, an agent or avatar – the more users perceive it as familiar and comfortable. Once a high point of realism is reached, however, remaining anomalies and subtle imperfections incur a feeling of strangeness, eeriness, and discomfort. This negative response to an uncanny but imperfect representation looks, on a graph, like a sudden drop, or descent. Beyond that point, once more, when a representation reaches perfect realism, users' comfort and pleasure revert to extremely high levels. The "valley" is a metaphor for the cubic polynomial relationship between an interface's realism and users' comfort with it. Nonverbal communication analysts will note that slight misalignments in the synchrony of multiple nonverbal channels is a common source of discomfort with otherwise highly realistic interfaces. That is, if the face seems to move naturally but the eyes do not blink, users dislike the interface (Bailenson et al. 2005). In video, if vocalizations of phonemes are slightly misaligned with the movement of lips, representations are strange and discomforting (Chaume 2008). Users may prefer less realistic interfaces, or auditory ones, rather than subject themselves to dissynchrony.

3 New methods for analyzing recorded nonverbal communication

Our discussion of mediated communication would not be complete without some mention of emerging technologies for analyzing nonverbal behavior, technologies that are probing the depths of nonverbal behavior in previously unimaginable ways. These technologies have become available and useful as more communication has become mediated, and its artifacts – video and audio recordings – have afforded offline analysis. Some of the tools are now also functioning in real-time, making on-the-fly analysis of nonverbal behavior a reality (see also Chapter 3, Harrigan, this volume).

3.1 Automated kinesic analysis from video

In the past, observation of nonverbal behavior required laborious, time-intensive counting and rating of nonverbal behavior by trained human observers. New computer vision techniques and machine learning have produced quantum leaps in

our ability to capture and track nonverbal behavior automatically. Among the nonverbal behaviors that have been subjected to automated analysis are gait, posture, postural shifts, gestures, head movements, facial expressions such as smiling and frowning, blinks, and micro-expressions of emotion.

Gait and posture can be assessed using walk mats, unobtrusive force platforms, computer imaging with high-definition cameras or even the X-Box Kinect, which uses infrared cameras, to identify limbs, joints, change points in movements, and center of pressure while standing. Readings can identify x, y, and z axes of body position. A sample image is shown in Figure 1.

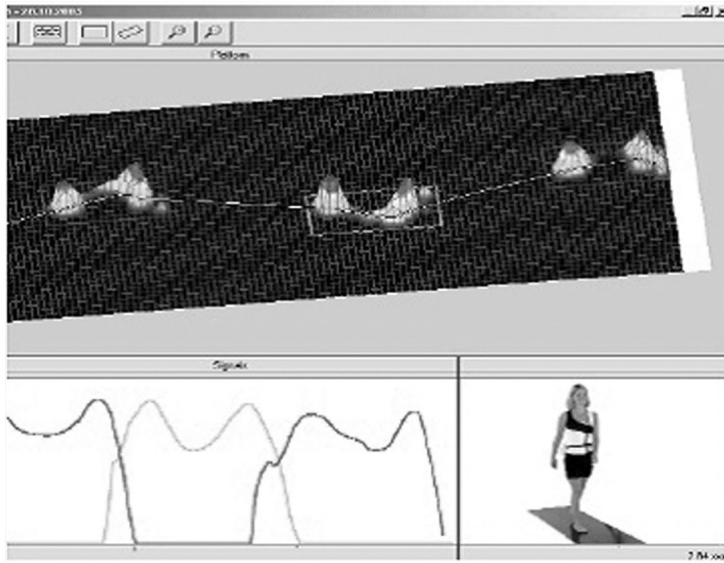


Figure 1: Zebris FDM System for gait analysis

Other bodily movements such as hand gestures, shoulder shrugs, postural shifts, nods, and head shakes can be captured using computer vision techniques. Skin blob tracking, active appearance models or active shape models can locate hands, head or face automatically from high speed (30 fps or 60 fps) video images then track changes in the image as the pixels change (Ahn et al. 2011; Burgoon et al. 2009; Corcoran, Ionita, and Bacivarov 2007; Meservy et al. 2005; Michael et al. 2007). Using such techniques as skin texture detection, template matching, background subtraction, Kalman filters, Monte Carlo approaches for non-Gaussian nonlinear target tracking, and Bayesian inferencing, body regions such as the head, hands, and torso are located. Bounding boxes (a superimposed image of a box surrounding an image) isolate these regions, then ellipses are fit within them and the x and y coordinates are recorded in pixels. From these raw features, higher-

order features are calculated so that pose angle (e.g., head tilted), position (e.g., hand touching face), change (e.g., gesturing downward) and velocity of change can be calculated across frames. Head pose and face tracking techniques can also locate facial landmarks from which visible facial expressions such as smiles or lip pursing can be calculated, and emotional microexpressions that last only milliseconds can be detected (see Figures 2a and 2b).



Figure 2a: Sample skin blob tracking to identify hands and face. The 3 bounding boxes for the head, left hand and right hand have ellipses fit inside each, with x and y coordinates captured to describe horizontal and vertical positions of each ellipse.

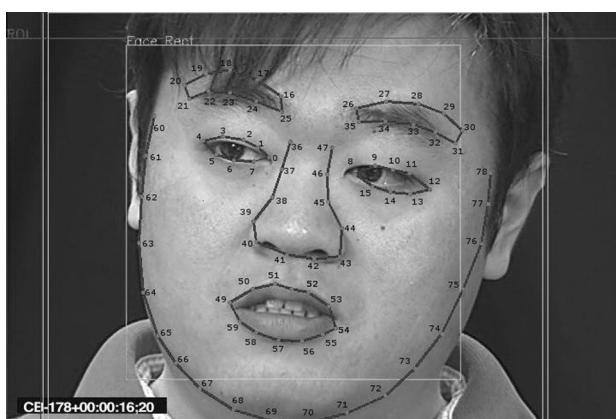


Figure 2b: Sample use of active shape modeling to identify facial landmarks for tracking facial expressions.

Both high-speed (60 fps) visible spectrum digital cameras and very fast (250 fps) near-infrared cameras can be used to detect blink patterns and changes in pupil diameter. With this level of granularity, flurries in blinks and nonlinear patterns such as initial suppression of blinks followed by clusters of rapid blinking can be detected.

3.2 Automated vocalic analysis

Speech and hearing scientists and pathologists have long relied on instrumentation to conduct acoustic analysis of the voice, but until recently, such tools as Praat have been restricted to very brief utterances and have been designed more to identify phonetic patterns than to analyze prosodic and paralinguistic qualities such as tempo, pitch variety, dialect, nonfluencies, or other vocal patterns. However, new technologies can now provide automated analyses of vocal parameters. Instead of relying on subjective human assessment of such parameters, tools such as Computerized Voice Stress Analysis or Layered Voice Analysis can now report features related to fundamental frequency (what is heard as pitch), harmonics, variation, temporal patterns, and other stress-related features. Although such tools are often hawked commercially as lie detectors under such fanciful names as the Lantern and Truster, and although experimental tests have failed to validate these technologies as lie detectors (Bhatt and Brandon 2008; Damphousse 2008; Harnsberger et al. 2009), the parameters that they seek to analyze have been shown to relate systematically to cognitive and affective processes (Elkins 2011).

Other approaches relying on automated linguistic analysis can measure nonfluencies by utilizing dictionaries of filled pause type disturbances (“ah,” “um” etc.) and detecting other dysfluencies such as repetitions of words at the beginning of a turn at talk. Two such tools are Linguistic Inquiry and Word Count (LIWC; Pennebaker 2011) and Structured Programming for Linguistic Inquiry and Content extraction (SPLICE; Moffitt 2011). These can be applied to audio and video-based media exchanges through use of speech to text translations.

4 Conclusions

This review reflects a field that is quite variable with respect to the sophisticated application of nonverbal communication research to conceptual and empirical studies of mediated communication. In some contexts, researchers have looked carefully at the operations of specific nonverbal codes offline to see what their potential loss or replacement may entail online. In other areas of research, it is unfortunately more common to see gross-level indictments of new media versus traditional communication, blithely alluding to codes but without careful consid-

eration of specific cues and processes that are truly implicated by particular aspects of media.

These issues become crucial as systems emerge that have the capacity to involve multimedia, or that have the potential to represent messages that are otherwise transacted nonverbally in the forms of icons, graphics, or other indicators of intrapersonal states and interpersonal intentions. We are seeing that the lack of specificity about nonverbal cues and functions in previous research can hamper our readiness to reintegrate or replace nonverbal signals in new electronic formats that can enhance communication. As Cappella and Pelachud (2002: 4–5) observed,

Much of what is known about human social interaction is ignored by computer modelers. Instead, they often import their own assumptions into their models. Attend even one computer conference on “real characters” and you will find fascinating models, elegantly presented, but with little empirical foundation... The science of relationships – especially human interaction in relationships – needs to be imported into the science of modeling interactions.

The most promising prospects for the future of both conventional and mediated communication may reside in the increasing sophistication of methods for the recording and analysis of nonverbal behaviors, so that our understanding of their functions in both traditional and technological contexts becomes more easily observed, more readily analyzed, and ultimately more amenable to systematic insertion, deletion and modification as the technologies of representation continue to advance.

There is a tension in the advancement of communication technologies. Users prefer easier-to-use communication systems, and they advocate the development of systems that resemble FtF communication, with all the nonverbal cues thereunto pertaining. Ironically, people seem to remain as unaware or incorrect as they have ever been about what specific nonverbal cues they want, need, or use in FtF encounters (Knapp, Wiemann, and Daly 1978). How would a brilliant programmer even begin to create programs that reflect the vernacular descriptions with which people describe their nonverbal behavior? Instead, according to Olson et al. (2002), system designers need to outsmart technology users: Designers may develop displays that use alternative symbol systems – a glowing light on one’s screen, for example – to represent a remote colleague’s mood during a remote collaboration. The notorious “like” signifier that now appears on Facebook, where one user vaguely signals approval or positive evaluation of some picture, verbiage, or link a friend has posted, provides proof-of-concept that there will continue to emerge ways to replace smiles and nods in electronic communications, and the replacements may be more efficient and effective than the nonverbal original.

On the other hand, technology development also pushes for greater realism in its rendering of humans and environments. Video games, military simulations, and entertainment media offer digital representations so realistic that users seem to leap over the uncanny valley. One may wonder whether representational realism may ultimately lead people to abandon their assumptions that what they see is

real. As the capabilities for software and hardware to disrupt visual linearity of video (change from first-person to third-person perspective in depicting a sequence of events, for example) and the availability of consumer-level software that readily alters pictorial information, the value of photographic proof may decline. There is now so much deception in media – from airbrushing photographs, to placing different heads on different bodies, to creating animated characters that are so realistic one might swear they are human – are people more or less likely to identify what is objective reality? Do they care? Will the “new reality” being generated by technology that increasingly deters deception detection make people ever more suspicious or ever more sanguine about the blurring lines between mediated and FtF experience, where the details lie in the representation and synchronization of nonverbal communication?

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Sarai Blincoe and Monica J. Harris

25 Nonverbal behavior and education

Abstract: This chapter surveys the literature on nonverbal behavior in education with an emphasis on recent studies. At the elementary school level, the effects of teacher nonverbal behavior on student learning outcomes are inconsistent or weak, but the effects on student attitudes toward the teacher, course content and learning are generally consistent and larger. Reasons for these differences are discussed. In the higher education setting, we review the literature on the effects of teacher immediacy in relation to perceived student learning and attitudes toward instructors. Other areas of research reviewed include: teacher expectancy effects, impression formation from thin slices of teacher behavior, nonverbal behavior as a means of classroom management, and, given the increasing popularity of online education, the implications for students when teacher nonverbal behavior is absent altogether. Several gaps in the literature are explored, including the lack of data on actual student learning and the paucity of information on student nonverbal behavior and its effects on teachers. Methodological concerns are discussed, including the literature's emphasis on self-report measures. With recent studies being regrettably scant, the chapter concludes with a call for increased research in this area, particularly studies that use behavioral observation in actual classroom settings.

Keywords: teacher nonverbal behavior, education, immediacy, expectancy effects, distance learning, classroom management

We can all call to mind good teachers we have been blessed to have throughout our lives: the elementary teacher whose warm smile made us feel special; the stern high school teacher whose reputation for toughness was matched only by how much we learned in his class; the college professors whose passion for their subject led us to pursue a career in the same field. If we were unfortunate, we can also call to mind the bad teachers we have encountered: the teachers whose sneers made it clear they did not like either teaching or children; the professors who hadn't revised their notes in the past 20 years; the droners whose monotone lulled us to sleep every lecture. Research in educational psychology and communication has long sought to identify what separates the good teachers from the bad. While the answers to this question are still far from being settled, teachers' nonverbal behaviors undoubtedly play an important role in teaching effectiveness (McCroskey, Richmond, and McCroskey 2006).

The purpose of the current review is to survey the available literature on the role of nonverbal behavior in education. Because teachers' nonverbal behavior has been the topic of several reviews in the past (Babad 2005b; Doyle 1977; Harris and Rosenthal 2005; McCroskey et al. 2006; Richey and Richey 1978; Woolfolk and Brooks 1985), we emphasize the literature published more recently. Moreover, we emphasize the nonverbal behaviors of teachers because data on the effects of students' nonverbal behavior are scant (see Brooks and Woolfolk 1987, for a review of the smaller literature on students' nonverbal behavior). We organize our review by summarizing the available research separately by age group (elementary and secondary students vs. post-secondary education) and finish with an agenda for future research in this area.

1 Nonverbal communication and student outcomes at the elementary and secondary level

In a review article published in 1985, Woolfolk and Brooks noted that little research on the direct effects of teacher nonverbal behavior on student learning had been conducted; unfortunately, that situation has not been significantly ameliorated during the subsequent 25 years. The studies reviewed in this section examine two broad categories of student outcomes: learning, typically measured as scores on actual performance measures, assessed via a recall test administered after a brief lesson, and attitudes, or affect toward the teacher and class. To assess nonverbal behavior, researchers generally adopt either a molar or a molecular approach – what McCroskey, Richmond, and McCroskey (2006) called a “forest” or “trees” approach. With the molar approach, nonverbal behavior is operationalized in global terms as “positive” or “warm” and reflects a composite of discrete nonverbal cues. In the molecular approach specific nonverbal cues are studied in isolation.

The advantage of the molar approach is that it recognizes that nonverbal behaviors rarely manifest in isolation and that instructional settings are typified by the simultaneous transmission of multiple nonverbal and verbal messages, which may have unique patterns of interaction (Flevaris and Perry 2001; Fox and Poppleton 1983; Goldin-Meadow, Kim, and Singer 1999; Reid 1980). A disadvantage of the molar approach is that the causal role of a discrete nonverbal cue cannot be determined. The identification of a causal path is particularly important for teacher training. As Harris and Rosenthal (2005) argued, if teacher smiles were – hypothetically – shown to be the most important causal factor predicting student cognitive learning (or other positive student outcomes), then “training could be more efficient, simpler, and ultimately more successful if it focused on increasing the frequency of teacher smiles” (p. 170).

1.1 The molar perspective and learning outcomes

Although popular belief would have that nonverbally warm teachers would elicit better academic outcomes, especially for elementary aged children, the research evidence on this hypothesis is actually fairly mixed. Several researchers have found that negative teacher nonverbal behavior can have inconsistent effects on student performance (Goldberg and Mayerberg 1975) or even improve performance (Woolfolk 1978). Using a controlled microlesson, Woolfolk (1978) manipulated both verbal and nonverbal teacher behavior. Two male and two female teachers presented a vocabulary lesson to a randomly selected sample of 6th grade students. The teacher presented a vocabulary word printed on a card, spelled the word, used the word in two example sentences, and then instructed students to write as many original sentences as they could with the new word in a two minute period. The teacher silently observed the writing period and then delivered verbal feedback that was either negative or positive (e.g., “You’re writing very interesting sentences. This must be a smart class”) and accompanied by either positive or negative nonverbal behavior (head nod or shake; smile or frown; positive or negative tone of voice). Students were exposed to only one of the four combinations of verbal and nonverbal feedback over the course of the lesson. Student performance was assessed as the total number of sentences written by each subject during the 16 total minutes of writing time (two minutes each for eight vocabulary words). Surprisingly, teacher negative nonverbal behavior led to significantly greater performance during the lesson. A second performance measure, calculated as the difference between pre- and post-test spelling scores, showed no effect of teacher nonverbal behavior for boys, but girls counterintuitively made greater gains when the teacher nonverbal behavior was negative.

On the other hand, and consistent with our intuitions, several studies have identified positive associations between learning and warm or expressive teacher nonverbal behavior (Hamann, Lineburgh, and Paul 1986; Harris, Rosenthal, and Snodgrass 1986; Keith, Tornatzky, and Pettigrew 1974; Kleinfeld 1974; Schiaratura and Askevis-Leherpeux 2007). For example, Harris, Rosenthal, and Snodgrass (1986) conducted an observational study, videotaping ten teachers as they taught a lesson on sentence completion and arithmetic word problems to students in kindergarten, first, and second grades. Judges’ global ratings of teacher warmth positively predicted student performance variables.

In a more recent study, first and second grade children at a French school, identified as the highest and lowest achieving children in their respective classrooms, completed two performance subscales (Schiaratura and Askevis-Leherpeux 2007). The tests were administered by an experimenter who was blind to achievement level. The children were randomly assigned to a warm or neutral nonverbal condition; the verbal behavior of the experimenter was the same in each condition. Each condition manipulated posture (forward lean vs. sit straight), facial expres-

sion (frequent smiles vs. blank face), eye contact (frequent vs. rare) and voice (warm vs. expressionless). This manipulation was used during the introduction period, but no reinforcement was given during the actual test; the experimenter remained silent and neutral. Children in the warm style condition scored higher on both tests than children in the neutral condition. Further, the scores of the low achievers in the warm style condition did not differ from the scores of high achieving children in the neutral condition (Schiaratura and Askevis-Leherpeux 2007).

The studies reported above vary in their findings; more studies have identified positive effects of warm teacher behavior on performance, but in some cases, negative nonverbal behavior positively affected performance. The differences in results across studies may be attributable to several factors. In some cases, researchers did not methodologically or statistically provide a way to assess the unique contribution of nonverbal behavior, above and beyond verbal behaviors. Variability in methodology is also prevalent. Some researchers used behavioral coding of actual classrooms, whereas students in other studies observed a stranger teaching a brief lesson in which teacher behavior was systematically manipulated. The existence of interactions with student gender (Woolfolk 1978), race (Kleinfeld 1974) and ability (Schiaratura and Askevis-Leherpeux 2007) suggest that student-level variables could account for some of the inconsistency. It is clear from our review that the literature on the effects of teacher nonverbal behavior on student learning outcomes, at least at the molar level of analysis, is dated, muddy, and in desperate need of a series of carefully conducted studies that can separate the effects of verbal and nonverbal behavior and control for student-level variables.

1.2 The molecular perspective and learning outcomes

Shifting now to a discussion of the molecular approach to nonverbal behavior, the literature remains sparse. Although considerable research entailed the development of reliable and systematic observation systems for nonverbal behaviors (see for example, Aspelin 2006; Evans 1969; Silverman and Buschner 1990) or undertook exhaustive coding of teacher nonverbal cues (see for example Keith et al. 1974), most of these studies reported factor or cluster analyses of all the variables (verbal and nonverbal) combined together. Keith et al. (1974), for example, coded 38 separate behaviors in categories such as facial expression, body movements and orientation and gestures from videotapes of 43 teachers participating in teacher training programs. Additionally, they coded student verbal and nonverbal responses of 19 types. Three major clusters of behaviors were identified, which the authors labeled (a) positive task-relevant interaction, (b) observation and group interaction, and (c) teacher disapproval and pupil misbehavior. Analyses showed that enthusiastic student responses were associated with a combination of teacher verbal questioning and increased frequency and duration of teacher smiling.

Teachers were observed to give approving verbal comments four times as often as smiles, but nonverbal signals of approval were more closely associated with task-relevant student responses, such as looking at the teacher and answering questions, than the verbal comments. Such systems and studies are valuable; they provide a unique and detailed look at naturally occurring teacher-student interactions. But the lack of equivalence of clusters or factors across studies makes it difficult to ascertain which nonverbal cues, or groups of cues, predict student outcomes.

1.2.1 Teacher use of gesture

Of the many nonverbal cues available for study, only gesture has received rigorous research attention in an educational context, and that attention is relatively recent (Pozzer-Ardenghi and Roth 2007). A prototypical study of gesture and learning outcomes was conducted by Goldin-Meadow et al. (1999). They videotaped eight teachers presenting a math lesson to 3rd and 4th grade students. Videotapes were coded for the problem-solving strategies displayed verbally and gesturally (e.g., pointing to numbers to be summed) by the teachers. The students' comprehension of these strategies was operationalized and assessed as the students' ability to repeat back to the teacher. They found that 60% of the teachers' speaking turns contained both speech and gesture, of which there was a 2:1 ratio of turns where the verbal and nonverbal strategies were matched (the gestured problem-solving strategy reinforced the strategy conveyed through speech) as opposed to mismatched (the gestured strategy differed from the strategy conveyed in speech). Importantly, gesture was capable of both beneficial and detrimental effects. As the authors summarize, "gesture aided comprehension when it matched that speech and hurt child comprehension of teacher speech when it mismatched that speech" (Goldin-Meadow et al. 1999: 726).

The importance of gesture as a form of external support for spoken language comprehension has been further demonstrated, with both experimental and observational methods and in multiple classroom contexts (Goldin-Meadow, Kim, and Singer 1999; Lazaraton 2004; McNeil, Alibali, and Evans 2000). Valenzano, Alibali, and Klatzky (2003) showed preschool children one of two videotaped lessons about symmetry. The videos were identical with the exception that in one the teacher did not produce any gestures and in the other the teacher explained the concept while using pointing and tracing movements. Children who saw the verbal-plus-gesture video scored higher on a posttest, in which they had to judge six items as symmetrical or not, and explain those judgments, than did children who watched the verbal-only video lesson.

Based on their study of preschool and kindergarten children, McNeil, Alibali, and Evans (2000) suggested that the relationship between gesture and the comprehension of speech may depend on the complexity of the spoken message. In each

of two experiments, children played a communication game in which they were asked by a speaker on a video to select certain blocks from a set. Children selected and stacked six blocks according to the speaker's instructions. Each instruction was accompanied by one of three types of gestures: reinforcing gesture (gestures depicting "up" or "above" were used simultaneously with saying "up" or "above"), conflicting gesture (gestures depicting "up" or "above" were used simultaneously with saying "down" and "below") or no gesture. In experiment 1, the speaker's instructional messages were complex for preschoolers; specifically, the sentences included a compound relative clause. The pattern of results was such that reinforcing gestures facilitated comprehension of the speech for the preschool children but conflicting gestures did not hinder comprehension. In experiment 2, the messages used for the preschoolers were less linguistically complex and contained less information. Once again, conflicting gestures did not hinder comprehension, but the reinforcing gestures also did not aid in speech comprehension.

1.2.2 Other discrete nonverbal cues

The impact of additional discrete nonverbal behaviors on learning outcomes has received passing attention but with inconsistent results. In two studies, Otteson and Otteson (1980) used a repeated measures design to compare the performance on a story recall task of first graders who were read stories under the presence or absence of the teacher's gaze. There was a significant positive relationship between gaze and recall. However, Sims (1986) failed to find an effect of teacher facial expression (enthusiastic versus bored) on selection recognition for preschoolers listening to musical selections.

1.3 Attitudinal outcomes

Studies on student attitudes (often referred to as affective learning) have principally applied a molar approach, examining the effects of a composite of nonverbal behaviors on student attitudes toward the teacher and class (Chaikin et al. 1978; Darrow and Johnson 2009; Goldberg and Mayerberg 1973; Martin and Mottet 2011; van Tartwijk, Brekelmans, and Wubbels 1998; Woolfolk and Woolfolk 1975; Woolfolk, Woolfolk, and Garlinsky 1977).

In a study by Chaikin et al. (1978), 5th grade students participated individually in a lesson with a female teacher. The teacher's use of "close" behaviors, such as smiling, leaning forward, head nods, and eye contact, produced more positive evaluations from students than distant behaviors (e.g., side to side head movement, frowns, leaning away, little eye contact). Students also felt more liked by the teacher when she exhibited close behaviors. Goldberg and Mayerberg (1973) also manipulated the affect (positive vs. neutral vs. negative) of teacher nonverbal

behavior in their study of White and Black 2nd and 6th graders. For most of the students, the teacher with positive nonverbal behaviors was evaluated most positively. Only the Black 2nd graders evaluated the neutral teacher more highly than the positive teacher.

Woolfolk and colleagues have used their microlesson methodology, in which a trained teacher delivers either positive or negative verbal feedback accompanied by either positive or negative nonverbal behaviors, to investigate student attitudes. In one study, students were more willing to self-disclose when the teacher used positive nonverbal behaviors (Woolfolk and Woolfolk 1975). In a second study (Woolfolk, Woolfolk, and Garlinsky 1977), teachers, particularly female ones, were reacted to more positively in the positive nonverbal feedback conditions, but the verbal channel accounted for a substantially greater proportion of the variance than the nonverbal channel in children's perceptions of the teacher.

1.3.1 Attitudes toward classes and content

Early research on student attitudes focused on feelings about and perceptions of the teacher. The quantity of research remains limited, but the focus is expanding to include studies of attitudes toward the class or content. Although this topic has been addressed most often with college students (see sections 5.0 to 5.4 below) the relation between teacher nonverbal behavior and students' attitudes toward school has also been studied at the elementary level (Allen and Shaw 1990; Koka and Hein 2005; Martin and Mottet 2011; Mottet et al. 2008). Allen and Shaw (1990) report that supervisors' higher ratings of elementary and secondary teachers' nonverbal immediacy were predictive of supervisors' ratings of more student affective learning (i.e., appreciation of subject matter, feelings toward the teacher). In a large survey study, Mottet and colleagues (2008) collected ninth-grade students' perceptions of their second-period teachers' nonverbal immediacy behaviors. Students also self-reported their study strategies and attitudes (i.e., interest in taking additional high school and college classes or pursuing a career in the same content-area as the second-period class). Students perceived the math/science teachers as using significantly less nonverbal immediacy than the nonmath/science teachers. The students' perceptions of math/science teachers' nonverbal immediacy was positively related to student study strategies, but nonverbal immediacy did not predict student attitudinal outcomes. Martin et al. (2011) manipulated teacher nonverbal behavior (i.e., immediate or not) and measured student attitudes. In addition to positively impacting student affect for the teacher, nonverbal immediacy positively impacted student affect for a writing conference activity and the writing process itself.

In the studies reviewed above, the molar approach was used to examine student attitudes toward teacher, class, and content as they relate to warm/positive/close behaviors versus cold/negative/distant behaviors. The consistent effects

emerging from this literature lead naturally to the study of key moderators. Teacher quality is a likely candidate. For example, would teachers who routinely received high evaluations be considered “good” even if nonverbally cold? Another likely moderator is subject matter. Perhaps instructor warm/cold behavior is more important for certain subject domains (humanities, perhaps) and less important for other domains (math, perhaps) where verbal clarity, say, affects student comprehension more than nonverbal attitude.

1.4 Differential effects of teacher nonverbal behavior on student outcomes

Our review shows that the effects of nonverbal behavior on student learning outcomes are inconsistent or weak, but the effects on student attitudes are generally consistent and larger. Why should academic performance and academic attitudes be differentially affected by teacher nonverbal communication? Harris and Rosenthal (2005) offer several explanations. Firstly, the studies assessing learning are typically laboratory-based and short-term. For example, students may view a short video of an unfamiliar teacher in which nonverbal behavior is manipulated and learning is measured with an immediate post-test. As previously discussed, this approach allows researchers to examine the effects of specific nonverbal behaviors, in isolation, but it is possible that the impact of teacher nonverbal behavior on student academic performance is a long-term one, developing out of the more familiar, extended relationship which results from prolonged exposure in a shared classroom environment. Another possibility is that cognitive outcomes may differ from attitudes in the degree to which other factors determine them. Student ability, course content, and the nature of the performance assessment are all factors that may strongly predict learning, leaving little room for the influence of teacher nonverbal behaviors. Student attitudes toward class and course, on the other hand, are likely to be more responsive to the teacher him or herself, including his or her use of nonverbal communication.

1.5 Reflections on the literature

The use of both a molecular and molar approach in this area of nonverbal research has contributed to the advancement of the literature. Unfortunately, the quantity of studies remains limited and they are increasingly difficult to conduct in light of more stringent IRB requirements and logistical issues, such as the demands on in-class time. Researchers may wish to consider alternative teaching settings, such as one-to-one tutoring, where the impact of nonverbal behavior may be more profound. Another significant problem is the lack of methodological consistency and

a unifying theoretical rationale, particularly for the study of discrete nonverbal cues. Here we may recommend the literature on gesture as one to model; in this area progress is being made and the results from it are, notably, consistent.

2 Nonverbal mediation of teacher expectancy effects

Few events have been as pivotal in the history of educational research as Rosenthal and Jacobson's (1968) publication of *Pygmalion in the Classroom*. Their study showed that children whose teachers had been led to believe that they would bloom academically in the upcoming school year did in fact demonstrate significant increases in IQ during that time, presumably as a result of the teachers' expectations acting as self-fulfilling prophecies. Although the original *Pygmalion* study attracted considerable criticism (e.g., Elashoff and Snow 1971) and was subsequently shown to be more limited in its findings (significant expectancy effects were obtained only for children in the first and second grades), it sparked a very large body of research that has since confirmed the basic phenomenon and explored the factors that moderate and mediate when teacher expectancy effects occur (Babad 1993; Jussim and Harber 2005; Jussim, Rubstelli, and Cain 2009; Rosenthal and Rubin 1978).

Relevant to the purposes of the current chapter is the research looking at teachers' nonverbal behaviors that mediate expectancy effects. In other words, how do teachers treat the children for whom they hold positive expectations differently compared to children for whom their expectations are less positive, or even negative? This question was addressed extensively in Harris and Rosenthal's (1985) meta-analysis of the mediation of expectancy effects. Their meta-analysis summarized the results of 135 studies examining 31 separate mediating behaviors, ultimately collapsing them into one of four broad categories of behavior: affect (the socio-emotional warmth directed by the teachers toward high-expectancy students); feedback (the tendency to give more differentiated feedback including praise and criticism); input (teaching more material, and more difficult material, to high expectancy students); and output (offering high expectancy students more response opportunities).

The affect factor is the one that bears relevance for this review. Looking at the behaviors comprising the affect variable individually, Harris and Rosenthal (1985) found that teachers holding high expectancies about certain students will display a warmer climate as rated subjectively, engage in greater eye contact, smile and nod more often, and stand closer to those students. Posture lean, touch, gesture, and speech rate were also examined in the meta-analysis but did not yield a statistically significant effect size, undoubtedly due in part to the small numbers of studies investigating those behaviors.

In a summary analysis combining the mediating variables for which there existed the greatest number of studies, Harris and Rosenthal (1985) found that positive teacher expectancies were associated with more positive nonverbal climate behaviors, mean $r = 0.20$, and more positive climate behaviors in turn predicted better student outcomes, mean $r = 0.36$. In short, teachers are nicer and friendlier toward the students about whom they hold more positive expectations, and students who are treated more nicely by their teachers in turn do better in school. This basic result has been largely supported in research on teacher expectancy mediation published since the meta-analysis (for a review, see Rosenthal 2002).

Although the basic phenomenon of teacher expectancy effects is no longer questioned, enough questions remain that the current lack of research activity in this area is disconcerting. Most of the recent research has concentrated on identifying the magnitude and nature of teacher expectancy effects in large-scale naturalistic contexts (e.g., de Boer, Bosker, and van der Werf 2010; Jussim and Harber 2005). While these studies provide important evidence of the ecological validity of teacher expectancy effects and their real-world importance, they don't allow a fine-grained analysis of how exactly teachers' expectations are communicated to their students. Moreover, the few studies that have been conducted in the past ten years that have looked at the mediation of teacher expectancy effects have tended to focus more on verbal mediators; for example, Wilson and Stephens (2007) found that coaches directed less negative feedback toward their high expectancy athletes, and Natanovich and Eden (2008) found that supervisors of undergraduates who tutored grade-school students displayed more positive leadership behaviors toward those tutors for whom they had been led to expect better performance. The data simply do not exist that allow us to have a good handle on the relative importance of nonverbal behaviors compared to other mediating processes. More data on individual mediating behaviors would also be desirable, as having solid evidence of what specific variables were most strongly implicated with communicating positive or negative expectancies would facilitate designing interventions for use in teacher training programs.

3 Teacher favoritism and nonverbal bias

Ask teachers if it is appropriate to show favoritism toward certain pupils, and they will undoubtedly say no. But ask students in a classroom who the "teacher's pets" are, and they will readily identify them—and there will be good agreement among students about who these favored students are (Babad 1995; Davis and Lease 2007; Tal and Babad 1989, 1990). Moreover, teacher favoritism does not appear to be a uniquely Western phenomenon, as cross-cultural data exist documenting favoritism in countries including Ghana (Opoku-Amankwa 2009), China (Fan, Li, and Jin 2009), and Turkey (Aydogan 2008).

Studies exist documenting differences in teacher behavior directed toward students whom they like compared to less-liked students (Babad 1993b; Good and Brophy 1972; Newberry and Davis 2008). For example, teachers pay more attention to favored students and praise their responses more than they do non-favored students (Opoku-Amankwa 2009), seat them at the front of the classroom (Babad and Ezer 1993), and direct more positive nonverbal affect (e.g., warmth and friendliness) toward them (Babad 1993b, 1995, 1998). More generally, the research on the mediation of teacher expectancy effects reviewed above is applicable to a discussion of teacher favoritism, as the nonverbal behaviors demonstrated by teachers toward favored students will be isomorphic to those displayed by teachers toward high-expectancy students.

Moreover, the differential behavior displayed by teachers toward their pets or high-achieving students is readily detected by other students in the classroom. For example, Babad, Bernieri, and Rosenthal (1991) found that fourth grade students viewing short (10 second) videotaped clips of an unfamiliar teacher's face and body were more accurate than chance in determining whether the teacher had been interacting with a (not visible) high- or low-achieving student. This finding was replicated by Babad and Taylor (1991). Interestingly, in a study comparing high school students' and adults' ability to detect teachers' tendency to engage in differential behavior from 10-second clips of behavior, Babad (2005a) found that the high school students could make such judgments accurately, but adults could not, suggesting that students may possess a situational awareness of biased and unbiased teacher behavior that is not shared by adults. What has not yet been investigated in research is whether there are individual difference moderators in how detectable favoritism is across teachers; for example, is it easier to detect teacher favoritism in teachers who are generally on the cold side, compared to teachers who are more warm and enthusiastic generally?

Although the research reviewed above suggests that differential teacher behavior displayed toward favored or disliked students occurs and has negative ramifications for classroom climate and student morale (Babad 1995), less attention has been devoted to training teachers to avoid displaying bias. Babad (1990) conducted one experiment in which he provided explicit feedback to a group of teachers regarding the extent to which their students perceived differential behavior on their part. Analyses showed that teachers who were receptive to this feedback and motivated to become less biased displayed a nonsignificant tendency toward less differential behavior; however, teachers who were resistant to the feedback did not change their behavior. The most likely explanation for the failure of this and other interventions to change teachers' biased behavior (Good and Brophy 1974) is that teachers are not intentionally trying to engage in biased behavior but that it 'leaks' through nonverbal channels not under their conscious control (Babad, Bernieri, and Rosenthal 1989). To the extent that this is true, and in light of the increased cognitive load that teachers operate under while in front of the classroom in terms

of planning what they are saying and monitoring student behavior, the prognosis for eliminating teacher bias toward favored students seems bleak.

4 Teacher nonverbal communication and classroom management

Managing classroom dynamics and student personalities is a significant portion of the cognitive load facing teachers. Studies of classroom management are relatively new, but the research from the past thirty years indicates that classroom management is a critical ingredient, perhaps even the most critical ingredient, for effective teaching (Wang, Haertel, and Walberg 1993). It seems almost axiomatic: students are more likely to learn if they cooperate and participate in class activities, which in themselves have been designed to produce learning. Thus it is beneficial to explore the potential of nonverbal behavior to aid in the establishment and maintenance of student cooperation and participation. Shrigley (1985) reported that 40% of common class disruptions can be curbed by a teacher's effective use of body language. Similarly, van Houten et al. (1982) found that verbal reprimands were more effective for reducing disruptive behavior when delivered simultaneously with a firm grasp on the student's shoulders, the maintenance of eye contact, and a close posture.

One factor of interest in classroom management is the size of the group with which the teacher is interacting. Van Tartwijk and colleagues (1998) found that student perceptions of teacher interpersonal style were principally a function of the teacher's front of the classroom behavior, rather than a function of behavior in small group or one-on-one interactions. Summarizing their earlier, unpublished research, Van Tartwijk et al. (1998) reported that nonverbal behaviors related to dominance, such as looking continuously at students and speaking with a loud and emphatic tone of voice, are shown by experienced teachers almost twice as much as student teachers, but experienced and new teachers did not differ in behaviors more typically associated with one-on-one interactions, such as low speech volume and body forward lean.

Studies of proxemics, the distances between interacting persons, are abundant in the literature on classroom management. Generally, where students sit in relation to the teacher affects student participation, with those students who are moderately verbal being more encouraged to participate by close proximity than those in the extremes (i.e., reticent or highly talkative) (Brophy and Good 1974; Koneya 1976; Smith 1979). Additional positive nonverbal behaviors, including smiling and physical contact, have also been found to increase attentive, on-task behaviors (Bettencourt et al. 1983; Kazdin and Klock 1973; Keith, Tornatzky, and Pettigrew 1974).

4.1 Classroom management training programs

Readily acknowledging the importance of classroom management, and the integral role of nonverbal behaviors in managing a class, many educators and researchers developed training programs designed to enhance teachers' use and awareness of nonverbal cues in the classroom (Bettencourt et al. 1983; Fetter 1983; French 1971; Kern 1978; Love and Roderick 1971; Richmond et al. 1986). Bettencourt et al. (1983) randomly assigned teachers of 1st through 6th graders to receive either no training or training to become more enthusiastic; however, this training did not focus exclusively on nonverbal behavior. Thus the finding that the students of trained teachers were more on-task may not be due entirely to changes in the use of nonverbal behaviors. A program reported on by Kern (1978), designed to familiarize teachers with self-training techniques, found that video feedback improved teacher nonverbal behavior and that good teachers made better use of cues, such as gestures and physical nearness than did average teachers. Although a promising beginning, these early training program studies typically did not randomly assign teachers to conditions, use sufficient sample sizes, and in many cases, failed to report empirical evaluations of the programs.

Education Nonverbal Yardsticks (ENVoY) was developed by Michael Grinder following his observational research in thousands of classrooms. The program trains K-12 teachers and administrators on the purposeful use of voice (whispers and "just above class" volume), eyes, body (freezing and hand gestures) and breathing (the "pause"), to manage the classroom and to aid students in the comprehension of content. The program has been the focus of several research studies that address the shortcomings in the evaluation of the older nonverbal training programs discussed above. A three-year study of the ENVoY program found positive outcomes for teachers as well as students, including the ability for teachers to get the attention of the class more quickly, fewer off-task students, and fewer discipline referrals to the principal's office (Garfield 1998).

ENVoY was also a component of a three-year grant funded study by the U.S. Department of Education to provide teachers with support in implementing standards-based education (Edwards et al. 1998). In this study a treatment group of teachers received cognitive coaching and the ENVoY training in nonverbal classroom management. Compared to a control group of teachers, the treatment group of teachers increased significantly in teaching efficacy and attitudes toward school culture from year 1 to year 3 of the study. The investigators cautioned, however, that the cognitive coaching may have been more responsible for these effects than the nonverbal classroom management program, which was not introduced until year 2 of the study.

Although classroom management has long been a concern for teachers, administrators, and parents, empirical research on the topic remains sparse. That research specific to the role of teacher nonverbal behaviors in managing a class

should lag even further behind, is not, therefore, surprising. A recent survey study of Canadian pre-service teachers found that the most frequently employed classroom management strategies were initial correction strategies, specifically, the use of nonverbal body language and physical proximity to students (Reupert and Woodcock 2010). These nonverbal initial correction strategies were also reported to be more successful than the use of rewards and later correction strategies, such as referral to other professionals or contact with parents. The authors note, however, that pre-service teachers reported significantly lower success scores than frequency use scores with these initial correction strategies, suggesting that additional training in these heavily utilized nonverbal classroom management tools would be beneficial (Reupert et al. 2010). There already exists a tacit acknowledgment of the importance of nonverbal behavior for teachers who wish to control and facilitate the activities of their students, but training programs may be limited and those that exist (excepting the ENVoY program) generally lack sufficient testing of their efficacy.

5 Teacher immediacy and student outcomes at the postsecondary level

The nonverbal construct that has attracted perhaps the greatest attention in educational research is teacher *nonverbal immediacy*, first defined by Mehrabian (1969) as the set of behaviors that “enhance closeness to and nonverbal interaction with another” (p. 203). Because immediacy and liking are integrally and reciprocally related, a reasonable hypothesis is that greater nonverbal immediacy on the parts of teachers will be associated with more positive student outcomes. This hypothesis was first tested in Janis Andersen’s (1978) doctoral dissertation, which sparked a large body of subsequent research on the issue. Because this literature has been summarized in two meta-analytic reviews (Harris and Rosenthal 2005; Witt, Wheelless, and Allen 2004), we will not go into details of these earlier individual studies here. Rather, we will first present a general overview of the immediacy research, summarize the meta-analytic results, and then survey the more recent contributions to the literature on this topic since the publication of the meta-analyses, closing with a consideration of the most pressing questions remaining to be answered regarding teacher nonverbal immediacy.

5.1 The prototypical nonverbal immediacy study

The teacher nonverbal immediacy literature is striking compared to other research literatures with respect to its relative homogeneity, permitting the description of a prototypical study that represents the area with high accuracy. In the prototypical

study, large classes of undergraduates are recruited. The students are then asked to complete two paper and pencil measures, one tapping into nonverbal immediacy and the other assessing students' evaluations of the course, instructor, and their self-rated learning. The measures of nonverbal immediacy that are used in this literature are all highly similar, varying only slightly with respect to the items included and changes in the anchors associated with the response scale. More specifically, most studies of teacher nonverbal immediacy use either a 14-item scale introduced by Richmond, Gorham, and McCroskey (1987) or a 10-item subset that deleted those items with low base-rates (e.g., the item asking about touching behavior) or low item-total correlations (McCroskey et al. 1996).

The prototypical study in this area also adopts a highly admirable methodological feature introduced by Plax et al. (1986). Rather than have the undergraduates rate the instructor of the class they were currently attending, where data collection took place, researchers generally ask the students to rate the instructor of the class they had immediately before or after the current class. This procedure conveys several important methodological advantages. First and foremost, it avoids selection bias that could result if only those instructors who allowed data collection in their classrooms were rated in the study. Presumably, instructors with poor lecturing styles would be less likely to allow researchers in their classrooms for a study of teaching effectiveness. Second, this procedure also increases the variability and external validity of the classes being rated. Rather than including only instructors of education or communications courses (the departments most likely to sponsor research in this area), this method ensures that a wide variety of instructors from a range of disciplines will be rated. Unfortunately, most researchers in this area either do not collect specific data on the course that is being rated or do not report analyses comparing disciplines (the Mottet et al. (2008) study of high school teacher immediacy being an exception). Thus a comparison of the expectations for, or occurrence of, immediacy across different courses or disciplines is not possible.

A less admirable methodological feature of the immediacy literature is its reliance on self-report outcome measures, with the vast majority of researchers distinguishing among what they term affective, behavioral, and cognitive learning. *Affective learning* is a bit of a misnomer, as it refers to students' evaluative reactions toward the course or teacher. *Behavioral learning* is also somewhat of a misnomer, as careful inspection of the items designated as behavioral learning indicates that, in the vast majority of cases, behavioral learning referred instead to behavioral intention variables, such as asking students if they intended to take another class with the target teacher again.

Cognitive learning refers to more specific measures of student academic performance. In this literature, cognitive learning is operationalized in one of two ways. First, a small number of studies assessed cognitive learning by obtaining scores on actual performance measures, such as a test covering recall of material presented in a given lecture or course grades. The second and most common

approach was to obtain students' self-reports of how much they had learned in the class. Most of the studies adopting this measurement approach rely on Richmond, Gorham, and McCroskey's (1987) *learning loss* measure, which asks students to estimate, first, how much they learned in the class with the current instructor and, second, how much they think they *could* have learned in the class if they had an ideal instructor. A difference score is created between the two responses, and that constitutes the learning loss measure.

While actual cognitive performance would appear to be the outcome measure of choice in an educational context, most researchers in the area rely on the affective learning or learning loss measures. Proponents of this state of affairs argue that it is a necessary evil, because the "development of measures, or even approaches to the measurement, of cognitive learning has frustrated instructional communication researchers consistently" (McCroskey, Richmond, and McCroskey 2006: 424). A skeptic might be tempted to rebut that the assessment of learning is in fact the bread and butter of education, so it seems disingenuous to argue that such assessment cannot be validly done.

Moreover, the learning loss measure raises serious validity concerns, as it is not clear how meaningful participants' estimates of how much they think they could have learned with an ideal instructor are. Chesebro and McCroskey (2000) defended the use of the learning loss measure, reporting a correlation of -0.50 between it and recall. More recent investigations, however, report much lower relations between perceived learning and actual cognitive performance (Hess and Smythe 2001; Goodboy, Weber, and Bolkan 2009; King and Witt 2009).

5.2 Meta-analytic findings on the relation between teacher immediacy and student outcomes

Two meta-analyses of the immediacy literature have been published (Harris and Rosenthal 2005; Witt, Wheelless, and Allen 2004). The meta-analyses differed in important ways with respect to their decision rules and analytic strategies; e.g., the Harris and Rosenthal meta-analyses excluded effect sizes incorporating verbal immediacy, as well as studies that used written scenarios describing hypothetical teachers. The Witt, Wheelless, and Allen meta-analysis included studies that assessed verbal immediacy and hypothetical scenarios, and they also corrected effect size estimates for unreliability in the measures and the use of median splits.

Despite these differences, the two meta-analyses yielded remarkably similar findings. The overall relation between nonverbal immediacy and affective learning was a mean r of 0.49 in Witt, Wheelless, and Allen (2004) and a mean r of 0.43 in Harris and Rosenthal (2005). Students who perceived their instructors as displaying greater nonverbal immediacy had more positive attitudes about their educational experience, and this effect was of medium-to-large magnitude. Teacher nonverbal

immediacy was also related to students' perceptions of how much they had learned (termed *cognitive learning* in Harris and Rosenthal 2005, mean $r = 0.36$, and *perceived learning* in Witt, Wheelless, and Allen 2004, mean $r = 0.51$).

Both meta-analyses make it clear, however, that the positive benefits of teacher immediacy do not necessarily translate into actual gains in students' academic performance, with Witt, Wheelless, and Allen (2004) reporting a mean r of 0.17 and Harris and Rosenthal (2005) reporting a mean r of 0.14. Because one could argue that actual academic performance is, or should be, the dependent variable of primary interest, it is somewhat frustrating to note that in both cases the mean effect sizes were based on a very small subset of studies (11 and 6 effect sizes, respectively).

5.3 Recent advances in the immediacy literature

Most of the work on immediacy that has been published since the meta-analyses possesses a similar methodology and obtained similar results, namely that students who rate their teachers as having greater nonverbal immediacy report more positive attitudes toward the class and feel they have learned more (e.g., Allen et al. 2008; Burroughs 2007; Creasey, Jarvis, and Gadke 2009; Goodboy, Weber, and Bolkan 2009; Houser and Frymier 2009; Martin and Mottet 2011; Mottet et al. 2008; Mottet et al. 2006; Pogue and Ah Yun 2006; Wang and Schrodtt 2010; Wilson 2006; Wilson, Ryan, and Pugh 2010; Witt and Schrodtt 2006).

More recent studies have also branched out to other outcome variables, examining the relation between teacher immediacy and such variables as negative student behaviors (e.g., challenging the norms of classroom behavior and testing/grading policies; Goodboy and Myers 2009); students' tendency to text during class (Wei and Wang 2010); students' resistance to comply with teachers' requests (Burroughs 2007); class attendance (Rocca 2004); class participation (Rocca 2008); students' perceptions of the appropriateness of the instructor's use of humor (Frymier, Wanzer, and Wojtaszczyk 2008); and students' feelings of empowerment (Houser and Frymier 2009).

Two recent studies raise the intriguing question of whether teacher immediacy might in some cases have negative educational effects. In a randomized experiment using hypothetical scenarios, Rester and Edwards (2007) found that, while excessive amounts of immediacy were perceived favorably coming from female professors, the same amount of immediacy was more likely to be considered as offensive or even possibly constituting sexual harassment when coming from a male professor. Titsworth (2004) found that high levels of teacher immediacy led to students taking less detailed notes, with less detail in notes resulting in lower scores on a recall test. Because immediacy is almost always construed as a positive construct, these findings deserve additional attention.

A gratifying amount of research has also recently focused on establishing the cross-cultural relevance of the teacher immediacy construct. Several authors have rightly noted that immediacy may be differentially implemented and differently perceived in other cultures. Most notably, the classroom structure is substantially different in collectivistic cultures such as Japan and Korea than in individualistic cultures such as the United States. Teachers are expected to be substantially more formal and authoritarian, and students are expected to display more conformity and obedience, in Asian countries than in the U.S. (Myers, Zhong, and Guan 1998; Park et al. 2009; Zhang 2005a, 2005b, 2006). Despite these differences, for the most part, cross-cultural studies of teacher immediacy find comparable relations between translated versions of common immediacy measures and student outcomes (Johnson and Miller 2002; Park et al. 2009; Pribyl, Sakamoto, and Keaten 2004; Zhang 2005a, 2005b, 2006; Zhang et al. 2007). Zhang and Oetzel (2006) have also developed and tested a Chinese Teacher Immediacy Scale that does not assess specific verbal or nonverbal behaviors but rather focuses on three molar facets of instructional immediacy, relational immediacy, and personal immediacy.

5.4 Reflections on the immediacy literature

A critical evaluation of the immediacy literature reveals both valuable lessons learned and challenges to overcome. First and foremost, the meta-analytic results establish clearly that teacher immediacy is both salient to students and relates to their satisfaction with the classroom experience and their perceived learning. This is an important finding and highlights immediacy as a crucial construct in discussing teacher effectiveness.

However, the meta-analyses also highlight some limitations in the literature. While the homogeneity of methods and measures employed in this literature permits easy comparison across studies, the conclusion offered by Harris and Rosenthal (2005) holds even more true today: “there is little left to be learned from studies asking undergraduates to rate their teachers’ nonverbal immediacy and provide self-reports of outcome variables” (p. 165). Instead, we need to know answers to such questions as whether/how immediacy is communicated differently in teaching different age groups, different disciplines, or in different cultures. Moreover, the vast majority of the literature has relied on students’ reports of instructor immediacy, yet at least one study has found that student reports are not significantly related to objectively coded behaviors from videotapes (Smythe and Hess 2005), raising serious doubts about the validity of the commonly used immediacy measures.

Along these lines, research is also needed on examining the specific components comprising immediacy; e.g., is tone of voice more important than eye contact in establishing immediacy? Answering such questions would likely necessitate

experimentally manipulating the presence or absence of discrete nonverbal behaviors and gauging their effects on perceived immediacy. Laboratory or field experimentation would also help in addressing another limitation in this research, which is its overwhelming reliance on correlational studies and consequent inability to draw firm conclusions regarding the causal role of immediacy.

Another important direction for future research on teacher nonverbal immediacy is to determine what effects, if any, immediacy has on students' actual academic performance. We know that students like classes better when they are taught by teachers expressing higher levels of nonverbal immediacy, and they report being more inclined to take similar classes in the future. And that is admittedly an important benefit in its own right, on the reasoning that positive attitudes toward one's teachers and classes will presumably pay off down the road with an increased commitment toward education. However, as noted by King and Witt (2009), course grades have been "utilized extensively as the primary measure of student academic achievement and have shown predictive validity in future academic and professional success" (p. 119), whereas the learning loss measure does not possess a similar level of construct validation.

King and Witt (2009) advocate the adoption of confidence measures as a means of evaluating cognitive outcomes in the immediacy literature. These measures ask participants not to recall what they have learned (or to predict what they could have learned) but rather how confident they are that they have learned important course objectives. The advantage of such measures is that they do not require identifying actual course content to be learned and can be assessed using self-report measures. King and Witt report a significant correlation between confidence scores and final course grades, $r(70) = 0.34$, $p < 0.01$. Unfortunately, confidence was not related to teacher immediacy, $r(70) = -0.02$, leading us to agree with King and Witt's reluctant conclusion, "At most, the results provide additional evidence that the association between immediacy and some forms of learning assessment, course grades, and confidence in learning should be regarded with a degree of skepticism" (p. 118).

6 Thin slice judgments and student attitudes

Another active area of research presently looking at teachers' nonverbal behavior is the body of studies focusing on the extent to which students' evaluations of teachers can be predicted from very brief "thin slices" of teachers' nonverbal behavior. This program of research had its start with an influential study published in 1993 by Nalini Ambady and Robert Rosenthal, showing that global ratings of the positivity of college instructors, based on three ten-second clips of nonverbal behavior, correlated strongly with the end of semester evaluations received by those instructors in their classes, $r = 0.76$. Ambady and Rosenthal (1993) also coded

the videotapes for a number of specific nonverbal cues to determine which, if any, specific behaviors might predict teacher evaluations. This analysis found that only instructor fidgeting with hands or objects was significantly and negatively related to teacher evaluations, although several other cues (most notably frowning, downward gaze, head nods, forward lean, laughing, and sitting) demonstrated moderate relations that did not reach statistical significance due to the small sample of teachers involved. Study 2 of Ambady and Rosenthal (1993) replicated this methodology with a sample of high school teachers and obtained similar results with respect to the global rating of teacher nonverbal positivity. Interestingly, in both studies the relation between “thin slice” judgments of the teachers and subsequent teacher evaluations held even after controlling for the physical attractiveness of the teachers.

The initial Ambady and Rosenthal (1993) study thus provided the first demonstration that student evaluations of teachers could be predicted successfully by brief judgments of teachers’ nonverbal behaviors, confirming the importance of instructors’ nonverbal expressive style in convincing students of the value of a course. Later studies were conducted with the goal of replicating this finding and identifying the situational and individual difference variables that moderated the relation between instructors’ nonverbal behavior and teaching evaluations. For example, Ambady and Gray (2002) found that being in a sad mood impaired students’ accuracy in making thin slice judgments of teachers.

A study examining the instructional context of the videotaped clips revealed important limitations in the ability of thin slice judgments to predict teacher evaluations (Babad, Avni-Babad, and Rosenthal 2004). In this study, 67 college professors were videotaped in four contexts: (a) the first minute of the first class of the semester; (b) lecturing; (c) interacting with individual students in class; and (d) talking about the course in the professor’s office. Analyses revealed that teacher evaluations could be significantly predicted by thin slice judgments taken from the clips showing the instructor lecturing to the entire class, but not from the first day of class or talking about the course clips. Most surprising, thin slice judgments made of the clips showing the instructor talking with individual students were *negatively* related to teacher evaluations. The authors explained this counterintuitive result by positing that differences in course difficulty could account for the discrepancy; that is, more difficult courses receive lower teaching evaluations generally, but instructors of difficult courses try harder when talking to individual students.

Detailed coding of the videotape clips revealed that 25 of 42 discrete nonverbal behaviors were significantly correlated with the global thin slice judgments (Babad, Avni-Babad, and Rosenthal 2004). In summarizing the pattern of these correlations, Babad, Avni-Babad, and Rosenthal (2004) concluded that good lecturers “are very expressive in their faces, hands, bodies and voice, and they stand rather than sit and move in the classroom space. They show strong orientation toward their

audience. They make continuous shifts in the various channels of their nonverbal behavior (which probably prevents boredom and increases student interest). And yet, despite their high level of activity, they are relaxed and avoid demonstrating negative behaviors” (p. 27).

More recently, Tom, Tong, and Hesse (2010) examined thin slice judgments obtained with and without audio and related them to end of the semester evaluations for a sample of distance-learning instructors. Analyses showed that thin slice judgments predicted teacher evaluations more strongly ($r = 0.35$) when no sound was present than in the audio + video condition ($r = 0.10$). A possible explanation for this disparity is that not enough verbal content is present in the 10 second clips that are typical in the thin slice research, and the resulting lack of comprehension interferes with students’ judgments.

What can we conclude from the thin slice literature? First, the data overwhelmingly point to the important role played by teachers’ nonverbal behavior in predicting students’ evaluations of the quality of instruction and the value of the course. While this finding may seem like common sense (nobody likes the professor who drones endlessly in a monotone), the ability of thin slice judgments based on 10- or 30-second samples of behavior to predict end of the semester evaluations is impressive. However, a crucial gap in the literature remains, and that is the relationship between teachers’ nonverbal behavior and students’ actual learning. As was the case for the literature on nonverbal immediacy, the thin slice literature has not yet documented a link between teacher nonverbal behavior and more cognitive outcomes. And as was shown in the infamous “Dr. Fox” study (Naftulin, Ware, and Donnelly 1973), students may be misled by an enthusiastic instructor into believing they have learned material of value. The obvious next step in this literature is thus to determine the nature and magnitude of the relation between thin slice judgments and actual student learning.

7 Distance learning and the lack of teacher nonverbal communication

Our discussion of the literature on nonverbal behavior in education, particularly in higher education, makes clear the benefits of nonverbal immediacy for student outcomes and student evaluations of the teacher. But this discussion has been based on the significant assumption that students can observe their instructor during interactive face to face learning. Such an assumption is rapidly becoming erroneous. Distance learning (DL), characterized by a geographical distance between the instructor and the learner, limited opportunities for face to face interactions, and the use of some type of medium to span the distance (Guerrero and Miller, 1998) has become increasingly popular due to its reduced costs of instructional delivery and potential to reach untapped markets of nontraditional students

(LaRose and Whitten 2000). According to the U.S. Department of Education, in the 2006–2007 academic year, 66% of 2- and 4-year Title IV degree granting postsecondary institutions offered a distance education course with an estimated 12.2 million enrollments in college-level credit granting distance education courses.

Mirroring the growth of DL instruction, an entire literature on computer mediated communication (CMC) has similarly evolved and been applied to educational settings, bringing initial exploration of and answers to questions of how online learning environments work in comparison to face-to-face ones (Luppigini 2007). A major concern for distance learning advocates and critics alike has been learner motivation, and research in conventional class settings suggests that affective responses to instruction can influence cognitive outcomes (LaRose and Whitten 2000). There is a concern that as nonverbal components of teacher immediacy, including proxemic distance and touch, are lost in the distance learning format, student outcomes will suffer correspondingly.

The initial research on distance learning and nonverbal behavior sought to measure teacher immediacy in distance learning settings (Guerrero et al. 1998; Hackman and Walker 1990) and compare DL immediacy to immediacy in the conventional classroom (Freitas, Myers, and Avtgis 1998; Offir et al. 2004). Hackman and Walker (1990) assessed students enrolled in an Instructional TV distance learning program. These students watched videos from a remote site, and opportunities to communicate back to the instructor were offered via traditional phone lines. Instructor immediacy was assessed, along with perceived student learning and satisfaction. The instructor's vocal variety and avoidance of tense body positions was positively correlated with course satisfaction and satisfaction with the instructor.

A study by Guerrero and Miller (1998) used segments from actual videotaped courses to assess nonverbal interaction and initial impressions of instructors. The four clips used for the study varied in the degree of nonverbal interaction and were shown to students not actually enrolled in the courses. Warm and expressive instructors were rated as more natural and trustworthy, but these ratings interacted with perceptions of composure. Somewhat counterintuitively, student interest and enjoyment of the material was higher for instructors whose displays were less composed; the authors suggest that a wholly composed and fluid presentation can be interpreted as phony or insincere.

Distance learning can take many forms, including a blended format, in which students learn in a conventional classroom at one campus, while students at another campus or DL site are simultaneously instructed through interactive computer classrooms. Freitas, Myers, and Avtgis (1998) compared the experiences of conventional and DL students enrolled in a blended format course and found no differences in student perceptions of verbal immediacy, but students in the conventional classroom perceived a higher rate of some nonverbal immediacy behaviors (eye contact, gestures) than the DL students. No differences were observed for

student perceptions of facial expression, vocal variety, touch or body position across the two types of sections. Offir et al. (2004) looked at teachers' interaction patterns as they changed instructional contexts, from a conventional classroom to a DL environment. Content analyzing 30 lectures from each environment, they identified significant differences in four major nonverbal categories: posture changes, gestures, facial expressions and eye contact. Specifically, these behaviors were occurring more frequently in the conventional environments.

What emerges from these studies is that immediacy behaviors are, of necessity, different in DL learning environments, but these differences may not be as detrimental as feared because teachers may compensate with other behaviors (Offir et al. 2004), and verbal immediacy may not be affected at all. The majority of the studies discussed above took a generalized look at nonverbal behavior in the form of instructor immediacy and compared immediacy behavior in DL and conventional environments or measured DL immediacy in relation to student motivation and affective learning. A positive association between teacher immediacy and outcomes is consistently identified, but research on nonverbal behavior in these state of the art educational environments needs to develop in the same ways that NV research in traditional settings has, and continues to, develop. More attention should be given to discrete nonverbal behaviors, student behavioral and cognitive outcomes and the reciprocal effects of students on instructors.

The rapid pace of technological change, moreover, means that studies conducted more than a few years ago are no longer an accurate picture of the state of nonverbal behavior and immediacy in distance education. A few years ago the state of the art in Internet video still had many problems; it was jerky, blurry and small, typically recorded from a single camera at the back of a conventional classroom, making the teacher's facial expressions, eye contact and other nonverbal behaviors difficult, if not impossible, to see (LaRose and Whitten 2000). But the Web is becoming increasingly interactive, and now we have fluid real-time video in high definition. A further technological advance that will likely draw increasing research attention in the next few years is that of collaborative virtual environments. In these CVEs, users can communicate through multiple channels, and the characteristic use of avatars offers exciting possibilities for nonverbal communication (Allmendinger 2010). But for now, research in this area remains focused on nonverbal behavior operationalized as immediacy.

8 Teachers' perception of student nonverbal communication

Although the bulk of research on nonverbal communication in education has focused on teachers' nonverbal behaviors, as early as the 1970s, researchers were studying the influence of students' nonverbal behaviors on teachers' subsequent

attitudes or behavior (Brooks and Woolfolk 1987; Jenkins and Deno 1969; Klein 1971). Andersen, Andersen, and Mayton (1985) assessed the accuracy of teacher perceptions of student nonverbal behavior and compared them to actual developmental patterns. Over 900 teachers of kindergarten through 12th grade estimated the percentage of their students who engaged in certain nonverbal classroom behaviors, including emotional regulation and expression and turn-taking behavior. Of particular interest were teachers' perceptions of student ability to communicate confusion. Across all grade levels, teachers reported that about 50% of students indicated their confusion nonverbally, and slightly more than 50% indicated it verbally. There was no developmental trend; older students were not more or less likely to communicate confusion verbally, or nonverbally, than younger students.

When it comes to classroom management, it is important for teachers to be able to perceive cues of confusion. This will require that teachers decipher student cues as much as it requires the students to decipher the cues of the teacher. It is unlikely that children from kindergarten through 12th grade will always express their confusion in a verbal or nonverbally readable fashion. Moreover, the problem is not restricted to primary and secondary students, as college students may also be reluctant to communicate verbally lest their peers consider them ignorant (Mottet and Richmond 2002). Alternatively, students may communicate confusion, but the teachers may fail to perceive it.

The possibility that teachers may be unable to perceive their student's confusion was examined in a series of studies of beginner, novice, and expert elementary teachers (Webb et al. 1997). With the expectation that experienced teachers should be able to observe and interpret student's nonverbal signals, both facial expressions and body language, to check comprehension, Webb et al. (1997) used video clips of 4th grade students taking a oral multiple choice test. Students were selected for filming based on their performance on the test and their ability to exhibit unambiguous nonverbal cues of understanding. Before viewing the video clips, the teachers participated in a discussion, with a moderator, about the importance of teacher assessment of student comprehension via nonverbal cues. This discussion prepared teachers to attend to the nonverbal aspects of the video clips. The teachers were next shown the videos and asked to judge student comprehension of the material based on the visual, nonverbal behavior. During the video viewing, expert teachers asked more questions of the moderator, seeking additional contextual information about the classroom environment, student ability and class material. Novice and beginner teachers were more likely to use their own personal behavior patterns as templates for judging student comprehension. Initially, experts did not outperform the other teachers at deciphering comprehension, but after getting feedback on their initial performance and having the opportunity to discuss it with other teachers they were more effective at deciphering the nonverbal signals.

8.1 Teachers' reaction to student immediacy behaviors

Instructors respond positively, in the form of motivation, self-confidence and evaluations of students, to positive student nonverbal feedback, including immediacy behaviors (Baringer and McCroskey 2000; Brooks and Woolfolk 1987; Jenkins and Deno 1969; Klein 1971). The student who chooses a seat near the front of the classroom is perceived as more attentive, likeable, and responsive than those who choose to sit further away (Woolfolk and Brooks 1983). In a study of 129 professors teaching classes of 35 students or less, instructor perceptions of student immediacy were correlated positively with perceptions of student credibility, interpersonal attraction, affect toward the student, teacher motivation, and projections of student achievement (Baringer and McCroskey 2000). Student nonverbal responsiveness may also have implications for the instructor's assessment of a student's work. Mottet and Beebe (2006) asked professors to rate the nonverbal responsiveness of a randomly selected student. Professor ratings of student responsiveness were positively correlated with the professors' evaluations of the students' speech presentations (a more subjective type of assessment) but not with grades on an objective knowledge test.

8.2 Student nonverbal behavior in distance learning environments

In reviewing this literature, we are reminded again that the classroom is a mutually influential environment. Student behavior will differ in the DL environment just as instructor behavior does. But reflecting the conventional classroom research, the student use of nonverbal behavior and its effects on the instructor have rarely been investigated in a DL context. The only study of which we are aware is a survey study by Witt and Wheelless (1999) that examined student expectations of instructor nonverbal immediacy. Students preparing to take a distance learning class had lower expectancies than students preparing to take a traditional class, and the class format accounted for 10.6% of the variance in expectancies. Further, those who had never enrolled in a distance learning course had lower expectancies for instructor immediacy than those who had previously completed a DL course.

8.3 Reflections on the literature on teachers' perceptions of student behavior

Although the idea that teachers could be affected by the nonverbal behaviors of their students was introduced early on in research on nonverbal behavior in educational contexts, the literature remains sparse. The discussion in this chapter of

teacher expectancy effects and bias and the unintended differences with which teachers nonverbally respond to individual students further emphasizes the need to better understand the reciprocal and mutual influences in the classroom. As noted by Mottet and Richmond (2002), one variable that changes from year to year in a classroom is the student; teachers often have very different experiences with each new group of students they teach. And yet we continue to focus on teacher's nonverbal behavior as the source of student success or failure rather than looking at the contributions of individual differences in student nonverbal usage.

9 Nonverbal behavior and education: Where do we go from here?

Kenneth Ring (1967) once famously criticized social psychology as a “field of many frontiersmen but few settlers” (p. 120). The situation for research on the impact of nonverbal behavior in education is in some ways even more bleak, in that there is a paucity of both settlers *and* frontiersmen/women: Despite a healthy burst of research activity in the 1970s and 1980s, surprisingly little empirical research in this area is being conducted at present. To give one concrete example, a PsycINFO database search crossing the terms “teacher*” and “nonverbal” yielded only 49 relevant peer-reviewed articles published since 2005. Moreover, most of the research that is taking place now falls under the topic of instructor immediacy, which as we discussed above, seems disappointingly mired in a self-report methodology that is unlikely to result in any new significant advances in the field.

Conducting research in the schools poses considerable logistical and ethical challenges, as gaining access to the classroom and parent consent involves seemingly endless paperwork and IRB hoops to pass through. Conducting nonverbal research presents its own unique set of logistical challenges, as recording interactions and coding the tapes for relevant nonverbal cues requires daunting time and resources. Thus it is perhaps understandable that relatively few researchers are inclined to tackle both sets of challenges simultaneously.

Although understandable, the lack of research on nonverbal behavior in educational contexts is regrettable. Teachers matter in students' lives, and a large portion of how they affect students is likely nonverbal in nature. Yet we simply cannot generalize from research on nonverbal communication in other settings to understand what goes on in the classroom, because the classroom is a unique interaction setting: As anybody who has ever taught can vouch, teaching is not at all the same as talking to or with another person. A teacher's voice, gesture, posture, use of space, and eye contact will all differ dramatically than what is displayed in normal conversational practice. There is thus no substitute for data collection in actual educational settings, despite the practical difficulties involved in conducting such

studies. A research agenda calling for behavioral observation and experimentation in the classroom should therefore become a priority for educational and nonverbal communication researchers.

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26 Nonverbal communication in the workplace

Abstract: Nonverbal communication is an important but under-studied element of organizational life. This chapter summarizes key insights into the functions, applications, and ubiquity of nonverbal communication in the workplace setting. The chapter is intended to provide an accessible and research-based resource by which academics and practitioners alike can better understand the unique challenges and opportunities of nonverbal communication. The authors present an overview of nonverbal behavior, speak about the workplace as a communication context, and explore the details of relevant issues including: status and power, physical appearance, interviews and performance assessments, sexual harassment, attire and uniforms, leadership communications, advertising and sales, emotions and deception, and computer mediated communication. Future directions in organizational nonverbal behavior research are also discussed.

Keywords: nonverbal communication, workplace, organizations, status characteristics, appearance, interviews, facial behavior, vocal behavior, gestures, impression management

Communication skills are among the most important skills for businesspeople. In workshops aimed at honing these important skills, it is not at all uncommon to hear, further, about the importance of nonverbal communication. Often speakers confidently declare that research shows a full 93% of all communication is nonverbal – 55% comes from body language and 38% from tone of voice. Although such an assertion seems suspect upon reflection, its widespread prevalence in industry networking guides and repetition by presentation gurus lends it an air of credibility. However, the original research behind this much-abused statistic does not support these broad conclusions (Mehrabian and Ferris 1967). To counteract the misapplications of his famous equation, Dr. Albert Mehrabian, a pioneer in nonverbal communications, even adds a bolded disclaimer on his website explaining that these figures apply only to the very specific situation of communicating one's own feelings and attitudes (Mehrabian 2011).

Yet, like all good urban legends, the misapplication of this statistic persists. And it provides a well-suited context to introduce the study of nonverbal communication in the workplace. We begin this section with the “Mehrabian Myth” anecdote because it illustrates the extensive gap between research and practice. The subject of nonverbal communication is widely acknowledged as being extremely important, but is vastly under-researched and thus often greatly misunderstood in busi-

ness practice (Riggio 2005). And this should not come entirely as a surprise. Although verbal behaviors such as writing are governed by well-defined rules that are practiced for years, nonverbal behaviors are often dependent upon the relationship history of the people involved and can be performed with a degree of automaticity (Ekman 1965, 1985). For these and other reasons, it holds a special promise and merits unique attention.

The aim of this chapter is to survey key insights into the functions, applications, and issues of nonverbal communication in the workplace setting. In doing so, we hope to provide an accessible and factual resource by which researchers and practitioners alike can better understand the unique challenges and opportunities in workplace life.

1 Survey of workplace nonverbal communication

1.1 Definition, components, and purpose

To begin with, it makes sense to qualify the scope of this domain. After all, there exists a wide array of potential behaviors that qualify as nonverbal. A straightforward definition might read: Any form of communication that does not specifically use words is considered nonverbal. This definition includes a speaker's vocal tones and inflections, but excludes the actual words used in the exchange (DePaulo and Friedman 1998). To make this expansive subject more tangible and accessible, we list on the next page seven primary components of nonverbal communication from the relevant literature (Richmond, McCroskey, and Hickson 2011), paired with a relevant and intuitive example from workplace life in Table 1.

Thus we can see the ubiquitous ramifications of nonverbal communication in the workplace. From preparing for the job interview to executing the position's responsibilities and eventually exiting the firm, businesspeople are constantly exchanging and interpreting nonverbal behavior. This much is certain. However, simply knowing the key components of nonverbal communication does not necessarily provide insight into the underlying purposes behind these behaviors. Why do some colleagues stand far apart from each other? What does it mean when a supervisor gives a blank stare? Does body posture play a role in perceiving who has higher status? In short, we must ask ourselves two questions: Why do we engage in nonverbal behaviors? And secondly, what do they tell us about the workplace life?

Table 1: The 7 Key Components of Nonverbal Communication

Appearance	The choice of heels worn by a pharmaceutical sales representative to a meeting with a physician.
Movement	The sweeping gesticulations of a visionary CEO presenting a keynote address.
Facial Behavior	The slight furrowing of an advertising copywriter's brow upon receiving critical feedback.
Vocal Behavior	The tone of an interviewer's voice while telling a candidate, "We'll get back to you."
Space	The distance between two standing coworkers when they collaborate on a project.
Touch	The firmness with which a supplier shakes a buyer's hand after the two sign a contract.
Time	The speed with which an account executive responds to a client's email.

There are four primary functions of nonverbal communication: identification, relationship, emotion, and delivery (Patterson 1983). The key components and workplace issues inherent in each of these functions are listed in Table 2.

- *Identification*: Signaling affiliation with or distance from a particular group.
- *Relationship*: Forming, modifying or broadcasting dominance or affection.
- *Emotion*: Expressing and interpreting feelings, attitudes and intentions.
- *Delivery*: Integrating verbal and nonverbal messages in listening and speaking.

1.2 Workplace as a context

As we previously mentioned, nonverbal behavior is context dependent (Ekman 1965; see also Ambady and Weisbuch 2010). The same "okay" gesture in the United States means "money" in Japan and "zero" in France; it is a vulgar sign in Germany and a meditation sign in India (Verderber, Verderber, and Sellnow 2007). Our nonverbal actions shift not only with cultural context, but also social context. People are more likely to smile while watching a video if they watch it with a friend – or are merely told a friend is watching the video (Fridlund 1991). The specifics of social context are equally important. For example, people often show less emotion around strangers than they do around familiars (Buck et al. 1992). We additionally tend to utilize specific emotional displays, such as smiling, when we are seeking to curry favors from others (Godfrey, Jones, and Lord 1986). So the people in a context and our ambitions within the context are of great significance. Is it any

Table 2: Nonverbal Functions, Components and Examples of Workplace Issues that are Relevant to these Functions

Function	Components	Examples of Workplace Issues
Identification	■ Appearance ■ Space	■ Employee-Culture Fit ■ Work-Life Balance ■ Attire and Uniform ■ Workplace Discrimination
Relationship	■ Facial Behavior ■ Touch ■ Space	■ Status and Power Displays ■ Leadership Perceptions ■ Sexual Harassment ■ Organizational Culture
Emotion	■ Facial Behavior ■ Movement ■ Vocal Behavior	■ Employee Motivation ■ Workplace Productivity ■ Team Rapport
Delivery	■ Facial Behavior ■ Movement ■ Vocal Behavior ■ Time	■ Interviewing Techniques ■ Performance Assessments ■ Communication Effectiveness ■ Salesperson Persuasiveness

(Adapted from Remland 2006)

surprise then that the workplace should be a context that provides a wide variety of implications for nonverbal communication?

But the workplace is not a single entity that functions uniformly across firms and industries. Not only do different workplaces exhibit a wide array of diversity in terms of structure, power distribution, culture, etc., but there exists a great deal of diversity within any organization as well. For example, even within a university, academic departments differ tremendously. Daily life involves a wide variety of interactions among people of different organizational positions: supervisors addressing subordinates, employees communicating with clients, or peers speaking with peers. Within the complex matrix of organizational positions and interaction contexts, we find many interesting situations that draw significantly from questions of nonverbal communication.

Indeed, workplaces manifest their own unique standards about what nonverbal displays are appropriate (Ekman, Sorensen, and Friesen 1969). Workplaces often tend to suppress negative displays that create social distance and encourage integrative displays that support organizational goals such as customer service (Wharton and Erickson 1993). Such display rules can be described explicitly and are even enumerated in many corporate manuals (Van Maanen and Kunda 1989). For these reasons, the workplace provides a rich environment to document the vast challenges and opportunities of nonverbal behavior. Now let us look in depth at some of the field's most salient points of analysis.

2 In-depth discussion of workplace nonverbal behavior

Instead of arranging our discussion around the particular nonverbal functions or components, we chose to instead formulate functional topics that align with broad areas of research interest. We then explore the full breadth of nonverbal concerns related to each topic. This makes for easier readability and more insightful commentary – as real-life issues seldom fit neatly into a single function or component. For example, sexual harassment is a relationship issue, but has components of delivery and identification. Under which should it be categorized? The extant research has focused on several such issues, which we address here: status and power displays, physical appearance effects, job applicant behaviors, interview structures, performance evaluations, gender differences, sexual harassment, attire and uniforms, effective communication, advertising and sales, and computer mediated communication.

2.1 How to know who's in charge: Nonverbal displays of status and power

Among some of the most important nonverbal relationship cues are perceptions of leadership, status, and power (see Hall, Coats, and Smith LeBeau 2005; Chapter 19, Schmid Mast and Cousin, this volume). In fact, some nonverbal displays such as those of pride may function *primarily* to transmit messages of deserved high status – a message that others interpret automatically and unambiguously (Shariff and Tracy 2009). Some leaders are not aware of the overt nature of these status signals. They thus often unknowingly degrade the time, territory, or physical presence of subordinates through nonverbal displays of their high status, which erodes the quality of unequal relationships (Remland 1981). However, leaders can consciously manage their status displays through the use of posture, body orientation, and vocal dynamics – notably, leaders whose nonverbal cues suggest less status difference between them and their subordinates are considered more considerate (Remland 1984). This observation holds whether leaders decrease their own status displays or allow subordinates to increase their status displays. As such, there is a significant need for increased awareness of how status is communicated in organizational settings.

Consider the status cues evident as one walks into an office building. In many cases, the layout of offices makes superiors harder to access and more insulated than subordinates (Remland 1981) – particularly within Western cultural settings. Even within a conference room, for example, leaders tend to exercise dominant status by voluntarily sitting at the head of tables (Heckel 1973). Interestingly, those who assume such leadership seating positions also tend to maintain a greater

internal locus of control (Hiers and Heckel 1977). Yet, perhaps the richest source of nonverbal status information comes less from the environment and more from the individual. For example, when interacting with students, teachers – who have a functional role of higher status–tend to occupy more direct space with their bodies and use gestures such as touching other’s possessions and pointing to intrude disproportionately upon the space of others (Leffler, Gillespie, and Conaty 1982). Although this is confounded with the sharing of information inherent to the teacher role, they also speak more frequently, even if that means interrupting others (Leffler, Gillespie, and Conaty 1982). In other studies, those in higher power positions also tend to speak with louder volume (Ridgeway, Berger, and Smith 1985). High-status individuals maintain lowered brows (Keating, Mazur, and Segall 1977) and have a higher visual dominance ratio: looking proportionately more while speaking compared to looking while listening (Dovidio et al. 1988).

Anecdotal evidence suggests it is not at all unusual for superiors to lean back in their chairs, look around the room while being spoken to, and arrive late to meetings (Remland 1981). Needless to say, such behavior would be deemed completely inappropriate for subordinates. High status, thus, is actually less associated with formality and more associated with an easygoing, relaxed, and inattentive demeanor (Remland 1981).

However, nonverbal signals may not merely reflect power. They might also help *create* power. Simply holding expansive body postures for two minutes shifts an individual’s neuroendocrine profiles to one conducive to leadership: increased testosterone and decreased level of cortisol, the stress hormone (Carney, Cuddy, and Yap 2010). Conversely, the same research shows that low-power postures decrease testosterone and increase cortisol. As a result, those who hold high-power poses experience an increased tolerance for risk and feel significantly more “powerful” and “in charge.” Research shows that body posture has a greater effect in determining an individual’s thought and behavior patterns than hierarchical role: those with an expansive posture think of more power-related words and are more prone to act in situations (Huang et. al 2011; see also Hall, Coats, and Smith LeBeau 2005 for a general review, and Chapter 19, Schmid Mast and Cousin, this volume).

2.2 How looks can literally pay off: Workplace effects of physical appearance

Although the promise of posture shifts in increasing the personal power of individuals is compelling, many significant nonverbal cues are less malleable. For example, elements of physical appearance such as facial structure, attractiveness, and height are largely determined by genetic components and early exposure to hormones such as testosterone, and cannot be easily changed. Yet they have notable impact on workplace perceptions. Attractive individuals typically receive greater

compensation than the unattractive (French 2002) and are viewed as more intellectually competent (Jackson, Hunter, and Hodge 1995), dominant, mentally healthy, intelligent, and socially skilled than unattractive people (Feingold 1992). Additionally, they are less lonely, less socially anxious, more popular, and more socially skilled (Feingold 1992). Those with attractive faces and likeable voices are also considered better nonverbal communicators (Larrance and Zuckerman 1981). However, it seems that as the quality of work increases, the bias towards physical attractiveness diminishes: the unattractive are not discriminated against if their work is impressive, whereas unattractive people performing average or sub-par work are judged lower than their more attractive counterparts (Sigall and Aronson 1969).

Managers find highly attractive candidates better suited for hire and promotion than marginally attractive candidates (Marlowe, Schneider, and Nelson 1996). One study even found that physical appearance had a larger effect on interviewer ratings than impression management, verbal behavior, and other nonverbal behaviors (Barrick, Shaffer, and Degraasi 2009). This could be because of the primacy effect – appearance may be given disproportionate weight in applicant assessments because it is among the first cues that an interviewer receives. Attractiveness, a significant component of appearance, has a complicated relationship with hiring intentions, especially for women. Use of eye contact, smiling, and head movements were more significant than attractiveness in assessing whether female applicants deserved a job (Young, Beier, and Beier 1979) – suggesting that interviewers cared not only about an individual's appearance, but also about interpersonal cues indicating the quality of their relationship. In organizations with masculine cultures and job responsibilities, attractive women are actually seen as less qualified and less likely to be hired than unattractive women (Cash et al. 1977). Although there are certainly biases towards hiring and promoting attractive and male candidates, these biases decrease as the experience level of hiring managers increases (Marlowe, Schneider, and Nelson 1996).

An interesting and relatively understudied bias is that towards charisma, especially in CEOs (Khurana 2004). For example, in discussing the reasons why a well-qualified internal candidate was bypassed in favor of an external candidate, a firm's director explained: "A top executive must have stature and poise. Someone needs to move with focus, crisply and gracefully. They need to make the first move to shake hands..." (Khurana 2004). Needless to say, vague perceptions of charisma – which are largely nonverbal – do not necessarily translate into competence. It is also worth pointing out that the realm of nonverbal behavior is complex enough to have conflicting findings in the literature on questions as basic as whether high versus low status individuals are the first to shake hands (c.f. Hall 1996).

Other nonverbal elements of appearance also have significant impact on workplace-related outcomes. For example, the obese typically receive less compensation

than their thinner counterparts (Cawley 2004) and daughters who are overweight tend to receive less money from their parents during college than do sons (Crandall 1995). Height is positively related to social esteem, leader emergence, performance, and success – it too was correlated to income after controlling for sex, age, and weight (Judge and Cable 2004). Height is also a key factor affecting promotions of managers (Melamed and Bozionelos 1992) as well as election of politicians. In fact, not since 1896 have US citizens elected a president whose height was below average (Judge and Cable 2004).

Facial appearance is another extremely influential nonverbal cue. For example, the facial dominance of West Point cadets in their graduation portraits relates not only to their ranks at the military academy, but also to promotions in their late career – over 20 years after their portraits were taken (Mueller and Mazur 1996). This could relate to biases about appearance, and also the likely greater exposure to testosterone for those higher in facial dominance. Even more interestingly, inferences of competence based solely on one-second exposure to the faces of candidates predicted the outcomes of 68.8% of the U.S. Senate races in 2004 and were also linearly related to the margin of victory (Todorov et al. 2005). However, one cannot define a specific set of superior facial characteristics for politicians because the desirability of such facial traits partially depends on the current political environment (Little et al. 2007; Rule et al. 2010).

2.3 How to impress without saying a word: Interviewee nonverbal behaviors

Many of the aforementioned perceptions of credibility, status, and leadership potential are informal and occur through everyday interactions. However, organizations also maintain formal processes for determining the qualifications of job applicants and evaluating the performance of employees. What effect do nonverbal behaviors have on such formal processes? This is one of the most well researched questions of nonverbal issues of workplace environment and deserves in-depth discussion.

As with the more informal assessments, nonverbal elements play a role in the interview process for both interviewer and applicant. Certain behaviors have been demonstrated to affect likeability and hireability. For example, increased use of gestures, eye contact, and smiling lead to better ratings (Washburn and Hakel 1973) whereas movements reflecting tension or stress harm evaluations (i.e., shifting gaze, awkward speech, body swaying, etc.; Patterson et al. 1992). Applicants are seen as significantly warmer and more enthusiastic when they increase immediacy by sitting closer to their interviewer or expressing greater perceptual availability (Imada and Hakel 1977).

Unlike with verbal behaviors, applicants instructed to convey particular impressions cannot seem to significantly modify their nonverbal behavior (Peters

and Lievens 2006). In the case of changing emotional displays to suit one's own interpersonal goals, however, men better make significant adjustments, yet women seem either unable or unwilling to do so (Levine and Feldman 1997). This aligns with the fact that nonverbal reactions occur rather quickly and more spontaneously than verbal reactions. This difficulty in consciously manipulating nonverbal channels could be the reason that Sigmund Freud once famously said, "No mortal can keep a secret. If his lips are silent, he chatters with his fingertips; betrayal oozes out of him at every pore" (Freud 1905/1997).

Ultimately, it is difficult to make a generalized assessment of the full impact exerted by nonverbal elements in interviews. For example, research suggests that in situations where resume and verbal information vary widely among the interviewees, nonverbal behavior alone has a relatively small effect relative to resume credentials (Rasmussen 1984). This could be because the significant differentiation in relevant verbal content such as resume credentials and spoken answers overshadows the influence of nonverbal behaviors, which typically have less variation than do verbal behaviors (Riggio and Throckmorton 1988). However, nonverbal behavior could play a more significant role when the candidate pool is more similar in verbal behavior and qualifications. For instance, displaying high levels of nonverbal expressiveness is known to increase outcomes when verbal behavior is strong, but not when verbal content is poor (Rasmussen 1984). In the case of a close and competitive job selection processes, nonverbal cues may just make or break an applicant's case.

2.4 How to ask the right questions: Interviewer behaviors and interview structures

Firms utilize interviews to ascertain particular information about the candidates. However not all types of information are equally accessible and not all interview formats are equally effective. For example, social skills are more accurately inferred from interviews than motivation to work is because social skills are transmitted interpersonally through nonverbal cues such as dress, speaking time, and gesture rate (Gifford, Ng, and Wilkinson 1984). Therefore a consideration of the interview process from the firm and interviewer side also merits attention.

Interviewer behavior affects the applicant behavior. If an interviewer first sits at a distance from the job applicant, the applicants are more likely to choose a seat farther away from the interviewer (Word, Zanna, and Cooper 1974). If the interviewer makes frequent speech errors, applicants follow suit (Word, Zanna, and Cooper 1974). And if an interviewer asks sex-related questions, female applicants' performance diminishes – they speak less fluently, give lower quality answers, and ask fewer job relevant questions (Woodzicka and LaFrance 2005).

The interview method is another significant variable in the applicant evaluation process. For example, interviewers tend to evaluate applicants more posi-

tively when using videoconference technology as opposed to in-person interviews (Chapman and Rowe 2001). This could be because face-to-face interviews provide additional nonverbal cues that likely reveal the interviewees' anxiety, which leads to more negative evaluations (Chapman and Rowe 2001). As such, the interviewing method, whether done by phone, videoconference, or in-person determines the amount of nonverbal cues available to the interviewer, and thus impacts overall judgment.

Certain interview structures enable applicants to influence interviewers more significantly with their nonverbal behavior. In behavior description interviews, which seek to assess knowledge, skills, and abilities based on past performances, applicants' nonverbal impression management tactics have little effect (Peters and Lievens 2006). Yet, in situational interviews, which ask applicants to respond to hypothetical situations, the same tactics influence evaluations – perhaps because the shorter answers elicited in situational interviews increase interviewer reliance on nonverbal content to form judgments (Peters and Lievens 2006).

Some firms choose not to standardize interview questions, criteria, or formats. This increases the discretion available to interviewers (Huffcutt and Roth 1998). Applicant self-presentation tactics are most effective in such unstructured interviews, which suggests that employers are at a disadvantage in gathering reliable information if they routinely employ unstructured interviews (Barrick et al. 2009). Interviewer stereotyping biases also have greater influence on ratings in less structured interview formats (Huffcutt and Roth 1998). Of structured interviews, behavior description interviews also have less bias than do situational interviews (Huffcutt and Roth 1998).

Based on the body of available research, there are notable nonverbal effects in evaluations based on racial factors (for a review of race effects in interviews more generally, see Arvey 1979; Huffcutt and Roth 1998; also see Chapter 22, Dovidio and LaFrance, this volume). Whites interviewing Blacks tended to keep more physical distance and stuttered more often (Word, Zanna, and Cooper 1974). Interview lengths were also typically shorter (Word, Zanna, and Cooper 1974). An interesting study had Black, Hispanic, and Irish retail job applicants wear caps that were either neutral or accentuated their race, but did not tell them which they were wearing (Barron, Hebl, and King 2011). Applicants predicted that other-race managers would treat those who displayed ethnic identification less favorably, and applicants who received negative treatment presumed they were wearing the ethnic identification caps. Interestingly, manifesting ethnic identification actually *improved* the job application interactions across all races. Their interracial interactions with store managers were longer and more positive – but their ethnic identification did not improve same-race interactions. Therefore, racial discrimination in the interview process may have implications in the implicit assumptions at play when judging members of minority groups based on their nonverbal behavior.

2.5 How to pick winning performers: Interview outcomes and job performance

An important and related question to evaluating job seekers is how to evaluate job incumbents, as well as the association between the two – i.e., whether interview judgments predict actual job performance. Research demonstrates that self-presentation tactics have a greater impact on interview ratings than they do on job performance ratings – especially those tactics related to appearance and impression management and less so with verbal and nonverbal behavior (Barrick et al. 2009). Because interviewers have less information and limited interaction with applicants, self-presentation tactics could have a stronger initial impact at interviews that fades in performance reviews as interactions increase (Barrick et al. 2009).

Even so, certain nonverbal cues that affect interview performance also affect job performance. Such vocal cues include pitch, pitch variability, speech rate, pauses, and amplitude variability; visual cues include attractiveness, smiling, gaze, hand movement, and body orientation. All of these taken together can elicit personal reactions such as liking, trust, and perceived credibility in interviewers (DeGroot and Motowidlo 1999). In turn, interviewer reactions suggest the extent to which the applicants, as future employees, would be cooperative and supportive of them, which colors their hiring decision (DeGroot and Motowidlo 1999). Interestingly, the same vocal cues that lead interviewers to form favorable personal reactions are also associated with effective performance in management jobs. This is understandable as individuals who can elicit such positive personal reactions have a greater chance of being interpersonally successful, which is crucial to the effective performance of managerial duties.

2.6 How gender works at work: Differences in status, power, and influence

A large body of research has examined gender differences in nonverbal behavior (see Chapter 21, Hall and Gunnery, this volume). In the present chapter, we focus on the role of gender in judgments made in organizational settings. Power and status concerns play out through nonverbal behavior in even the most basic of workplace environments. For example, in an office building's elevator, both men and women tend to avoid violating personal space whenever possible. However, both genders are less apt to encroach upon a male's space, and men particularly would rather violate a female's space than that of another male (Buchanan, Juhnke, and Goldman 1976).

There are certain differences in how the power displays of males and females are interpreted. For men, maintaining direct eye contact increases perceptions of credibility and a relaxed facial expression increases perceptions of most forms of

power: reward, legitimate, referent, expert, and credibility (Aguinis et al. 1998). In contrast, women who maintain direct eye contact increase perceptions of coercive power (Aguinis and Henle 2001), a suboptimal power base that increases resistance and decreases organizational commitment (Aguinis et al., 1996). Additionally, a relaxed facial expression decreased perceptions of all six power bases for women (Aguinis and Henle 2001).

Men are expected to use direct means such as assertion, jokes, or threats to influence others to complete work, whereas women are expected to use indirect means such as appearance, charm, and compliments (DuBrin 1991). If men score high in expansiveness, a dominant trait, they are seen more favorably, versus women who display less of the trait are regarded more positively (Gallaher 1992). In a sample of physicians, the satisfaction of role-playing patient observers was higher when doctors displayed more sex-stereotypical nonverbal behavior (Schmid Mast et al. 2008). Indeed, women are more persuasive with male judges when they use warmth and friendliness as opposed to more stoic task-oriented styles (Carli, LaFleur, and Loeber 1995). This same work shows that likableness and competence both predict influence, but men are more apt to like and be influenced by a competent woman who is also sociable.

Men and women also differ in the degree of competence they communicate when speaking with their superiors, peers, and subordinates. Women are seen as more competent when talking to superiors and subordinates, and less competent when talking to their peers (Steckler and Rosenthal 1985). Men are perceived as less competent when talking to superiors and more competent when talking to their peers and subordinates. These findings could reflect the efforts of women to increase displays of competence to superiors, who are more likely to doubt their ability (Steckler and Rosenthal 1985).

In conversations between peers, emergent female leaders seem to be disadvantaged, especially if they demonstrate dominance. In a study examining mixed gender groups of equal status, emergent female leaders received more negative nonverbal responses and fewer positive responses than men (Butler and Geis 1990; Koch 2005). This held even if women offered the same suggestions and arguments as their male counterparts. Such findings correspond to work on stereotypes demonstrating that women are perceived as being either likeable or competent, typically high in warmth and low in competence (Ekes 2002; Fiske et al. 2002). When women speak with other women, their vocal behaviors converge and accommodate to the more attractive conversant (Haas and Gregory 2005). By contrast, if two women are similarly attractive or similarly unattractive, they dynamically compete for status in conversation instead of accommodating.

However, conversation patterns change when women have official leadership roles. Legitimate power, as bestowed by position and status within an organizational hierarchy, is more important than gender in understanding conversation patterns (Johnson 1994). That is, although gender has significant impact on percep-

tions of power, competent and sociable females with legitimate power hold considerable ability to achieve success in workplace situations. For example, regardless of gender, subordinates engaging with their superiors are more supportive, with higher rates of back channeling, positive interruptions, and less talking time, and are less directive as well, qualifying their statements more frequently (Johnson 1994).

2.7 How ambiguity becomes threatening: Sexual harassment in organizations

Sexual harassment is a salient point of focus because it thrives on the ambiguity of nonverbal behaviors. It concerns subjective interpretations of events, which makes black and white distinctions difficult. According to one study, men and women agree in their perceptions of a woman whose behaviors connoted a high interest in sex, but men typically perceive behaviors more sexually than do women (Kowalski 1992). This effect is intensified because women also tend to see an ambiguous act as sexually harassing more often than do men (Jones and Remland 1997). This ambiguity is worth discussing because many actions that can be interpreted as harassing are also normal expressions of high status – and status and gender issues often get intermingled, to the extent that women are often seen as lower in status (Lockheed and Hall 1976).

For example, men high in likelihood to sexually harass describe themselves as more socially and sexually dominant and carry themselves as such (Murphy, Driscoll, and Kelly 1999). In fact, observers in the study could identify such men by silent video clips based on their dominant nonverbal behaviors. Indeed, in related work, women interacting with task administrators viewed the dominant ones as being more sexual and more likely to show gender-based attention and enact sexually harassing behaviors (Kelly et al. 2005). Thus, disentangling dominance and harassing behaviors can be difficult. But the effect of male dominance is significant. Although women did not consciously notice, interacting with such a dominant administrator negatively affected their performance. These studies also found that nonsexual aggression, such as hostile displays and impeding the job performance of others, have larger negative effects on victims' overall job satisfaction than does sexual aggression (Lapierre, Spector, and Leck 2005).

2.8 How to dress for success: The uses and outcomes of attire and uniforms

Clothing can be a powerful signal of a firm's brand, whether worn by its employees in an office or in customer-facing environments. Think about the powerful message

communicated by the IBM consultant uniform of a “white shirt, dark suit and sincere tie” (Smith 1999). However, aside from such marketing communication uses, clothing in the form of uniforms can be used to promote egalitarianism (Florida and Kenney 1991). For example, in many Japanese firms, middle managers wear the same uniforms as shopfloor workers and most top executives even wear company uniforms (Florida and Kenney 1991). Uniforms also serve to increase worker identification with the company (Florida and Kenney 1991).

The dress of employees is an important symbol that can influence the way others judge the employee’s behavior and intent (Galin 1990). Those who consciously use clothing not only have higher public self-awareness (Solomon and Schopler 1982) but those who value attire believe it can be manipulated to influence the views of others, achieve greater power and influence, and obtain work-related outcomes such as promotions (Peluchette and Karl 2006).

There are various degrees of formality in clothing. Based on a sample of 190 M.B.A. students, researchers found that employees tend to prefer business casual attire (48%) followed by formal business (28%) and casual clothing options (24%) (Peluchette and Karl 2007). If employees feel their attire is role-appropriate, they also tend to feel their clothing improves their performance in that role (Solomon and Schopler 1982). The effect of clothing on self-perception is worth noting. These business students reported feeling most authoritative, trustworthy, and competent when wearing formal business attire but friendliest when wearing casual or business casual attire. They also reported feeling significantly less productive when wearing casual attire than when wearing business casual attire. There are even potential bottom-line impacts to the strategic use of clothing. For example, one-day absences and Friday absences decreased significantly in female employees after their firm implemented casual days (Yates and Jones 1998). Additionally, individuals in an experimental study were less sensitive to the nonverbal emotional cues in language when wearing formal business attire compared to Hawaiian print shirts (Sanchez-Burks 2002). Clothing, therefore, can serve a variety of organizational and personal goals, whether utilized consciously or unconsciously.

2.9 How to convince and succeed: Effective leadership communication

Managers may spend four out of five hours at work engaged in communication (Mintzberg 1973). And their nonverbal communication is extremely impactful on those around them. Viewers tend to smile automatically upon seeing an image of a leader expressing reassurance and frown when a leader is threatening (McHugo et al. 1985). Such expressive displays of leaders have a direct impact on the emotions of viewers on an automatic level regardless of their prior attitudes of the leader (McHugo et al. 1985). Nonverbal cues not only play into leader effectiveness,

but can even identify the emergent leadership status of people gathered in a small group – they are also more important than verbal cues in generating liking (Stein 1975). So we can determine that nonverbal cues are important for communication competency of managers.

However, as Dr. Martin Remland, an expert in the field of nonverbal communication said, “Much of what a manager says may be contradicted by what he or she does” (Remland 1981). Indeed, a survey of many types of workplaces found that 45% of employees felt frequently or occasionally confused by inconsistent cues from their supervisors (Graham, Unruh, and Jennings 1991). Additionally, more than 94% felt frustrated or distrustful when confronted with discrepant communications (Graham et al. 1991). Such inconsistency between nonverbal and verbal cues leads others to form a negative impression of the individual, characterized by decreased honesty and coherency (Weisbuch et al. 2010). Organizations cannot reach maximum productivity with such frequent occurrences of verbal-nonverbal discrepancies, which cause frustration. Workplace productivity and morale could be significantly increased if awareness of nonverbal behaviors improved (Weisbuch et al. 2010). As such, the most successful leaders are receptive and attentive to the needs of their subordinates (Bass 1990). This, in turn, leads employees to feel increased satisfaction with their managers (Byron 2007). As such, the abilities of leaders to decode their followers’ feelings and react to them with support and motivation nonverbally are key to success (Riggio 2005).

Nonverbal behaviors also affect people’s perceptions of the leaders. Even subtle nonverbal cues of approval from group members can make a leadership performance seem more competent than an identical performance marked by disapproving nonverbal cues (Brown and Geis 1984). Similar results have been found elsewhere. In fact, studies show that ABC newscaster Peter Jennings’ nonverbal bias in favor of Ronald Reagan is a likely culprit to explain voting behavior: viewers of his station were far more likely to vote for Reagan (Mullen et al., 1986).

In workplace situations, the positive affect of leaders can increase the positive affect of followers who are influenced by emotional contagion (Johnson 2008). Emotional contagion plays a significant role in groups – for example, in observing work groups across a variety of industries, researchers found that members who sat in meetings together ended up experiencing mood convergence which extends to facial expression and vocal indicators of affect – all in a relatively short period of time (Bartel and Saavedra 2000). Thus, those teams whose members choose to withhold displays of negative emotions better reduce the negative performance effects caused by dysfunctional behavior – which mitigates the power of behavior that can adversely affect organizations and their employees (Cole, Walter, and Bruch 2008). As such, leaders must be cognizant not only of their nonverbal behaviors, but also of the nonverbal behaviors of others and how the collective influence can affect culture, performance, and other outcomes.

2.10 How marketers win hearts and minds: Nonverbal cues in advertising and sales

Television advertisements provide a host of nonverbal cues such as music, casting, setting, gestures, facial behavior, dress, mood, commercial format, and camera format (Haley, Richardson, and Baldwin 1984). Such nonverbal elements correlate more strongly with attitude shift than they do with recall. In general, however, nonverbal cues are far more likely to work against a commercial than to enhance its effectiveness – they frequently provide deception cues (such as fast glib talk, cliché settings, coy or cute antics, and exaggerated demonstrations) that cause suspicious viewers to ignore the ad's content (Haley et al. 1984). These researchers find that nonverbal cues that communicate simplicity and single-mindedness actually work best in changing attitudes about products.

One of the trademarks of good advertising is its ability to “feel right.” Research shows that this sensation of alignment between an individual's priorities and the style of advertisement influences the message's effectiveness (Cesario and Higgins 2008). For instance, if promotion-focused individuals – i.e., who tend to look for how they may be able to benefit from a situation and view goals as aspirations – watch an advertisement where messages are delivered in an eager nonverbal style or if prevention-focused individuals, who tend to look for how they could be harmed from a situation and view goals as obligations – receive messages delivered in a vigilant nonverbal style, they are more likely to have positive attitudes towards the message's topic and higher intention to follow its recommendation (Cesario and Higgins 2008). Thus advertisements that suit viewers' preferred delivery style foster the feeling of regulatory fit and thereby increase message effectiveness.

The nonverbal behaviors of salespeople have important effects on their presentations. For example, steady eye gaze positively affects believability and engagement, but does not significantly affect persuasiveness or perceived trustworthiness (Leigh and Summers 2002). Frequent speech hesitations influence buyers to view presentations as less interesting and less persuasive (Leigh and Summers 2002). Many of the same interpersonal skills that increase one's efficacy in other communication contexts, like interviews, also hold true for sales.

Another element of effective salespeople is their ability to induce facial expression in others. If customers smile while looking at a product, they feel better and may consequently like the product better. Thus, salespeople who can encourage customers to smile have better odds at selling (Puccinelli, Motyka, and Grewal 2010). Research suggests that the best strategy for salespeople to induce this reaction is a pleasant smile and display of moderately friendly behavior as it is likely to invoke a social norm to smile back. However, as many of us have experienced, overly excited and exuberant salespeople are less effective (Puccinelli, Motyka, and Grewal 2010).

2.11 How to see the signs: Recognizing emotions and deception nonverbally

The skill to recognize emotions through nonverbal behavior is an important one. Those high in this ability more accurately obtain information about the internal states of others, which leads to better decision-making and increased workplace effectiveness (for reviews, see Elfenbein 2007 and Hall, Andrzejewski, and Yopchick 2009; see also Chapter 15, Nowicki and Duke, this volume). The body of existing work shows that this connection between effectiveness and emotion recognition accuracy is relatively robust, having been replicated across a wide range of workplace settings and job functions that includes business executives, foreign service officials, school principals and teachers, physicians, therapists, and public service workers. Among the variety of relevant business functions are negotiation abilities, sales competencies, and deception recognition.

Negotiation has a fundamentally crucial emotional component (Kumar 1997). In order to negotiate effectively, one must understand his or her counterparts' interests and preferences, even though such information is often explicitly hidden and revealed only through nonverbal channels (Elfenbein et al. 2007). The research with negotiation is also notable because it demonstrates a workplace benefit from emotion recognition accuracy that cannot be attributed to potential bias on the part of judges completing performance evaluations. Like many skills, even if emotion recognition is generally beneficial there can also be a problem having "too much of a good thing." In particular, those individuals who are highly skilled in the more challenging arenas of recognizing others' expressions – notably, the leakier channel of vocal tone versus the more controllable channel of facial expression – can be capable of "eavesdropping" on messages they were not meant to receive, which can make them less valued as colleagues (Elfenbein and Ambady 2002).

We discuss above the importance of producing appropriate nonverbal messages in effective selling. However, the ability of salespeople to decode their customers' nonverbal behaviors could be even more important. In fact, nonverbal expressions can offer more accurate information about customer feelings than what customers actually say (Puccinelli, Motyka, and Grewal 2010). Salespeople who more accurately read nonverbal expressions of emotion are more successful across multiple measures of job success such as average annual salary increases and units sold per month (Byron, Terranova, and Nowicki 2007). Leakier cues such as tone of voice may be more diagnostic of true feelings, whereas more controllable cues such as facial expression may indicate what the customer wants others to think (Puccinelli, Motyka, and Grewal 2010). Accordingly, as with negotiations, a customer who deeply desires a product and expresses this desire nonverbally is actually hampered in the negotiation process.

There is a significant literature on the recognition of deception (see Chapter 16, Frank and Svetiva, this volume). Several nonverbal cues tend to accom-

pany acts of deception including body movements (gestures, shrugs, postural shifts, head, foot and leg movements, and increased touching of the head, face, neck, or hair) and vocal behaviors (response latency, response length, speech rate, speech errors, speech hesitations, and pitch increase) along with diminished eye contact and increased smiling (Feldman and Chesley 1984; Zuckerman, DePaulo, and Rosenthal 1981; DePaulo et al. 2003). However, more recent large-scale work casts doubt on whether there are diagnostic cues that indicate deception (Hartwig and Bond 2011).

Deception and its detection have both inherent and contextual elements. For example, the ability to appear honest across situations is general, not situation specific; and is related primarily to dynamic facial nonverbal behaviors (Frank and Ekman 2004). This means that some people are perceived as deceptive independent of their actual behaviors. However, other situational elements impact detection recognition. For example, nonverbal deception cues have greater impact in assessing less serious offenses than greater ones (Feldman and Chesley 1984). This is presumably because when faced with more serious accusations, individuals have a right to appear nervous, even if innocent. Other contextual influencers are more demographic. For example, older customers are good at masking negative feelings, whereas younger consumers are better at masking positive feelings; politeness norms across various cultures also can affect perceptions of agreement and honesty (Puccinelli, Motyka, and Grewal 2010). Thus, an increased sensitivity to nonverbal behaviors is beneficial to a variety of business activities.

2.12 How the digital workplace connects: Computer mediated communication

The workplace must no longer be a single “place.” Although employees were traditionally co-located, or situated in the same physical location, new trends have emerged along with the advent of practical remote technology solutions. For example, an increasing number of employees either engage in telecommuting, the process of working remotely from home and communicating using either telephones or Internet access. Offshore outsourcing is another growing trend, whereby employees may work in a different country than their direct supervisors. Virtual Teams, cross-functional groups that operate across physical and time differences and communicate mainly through information technologies, pose unique leadership and communication challenges (Kayworth and Leidner 2001).

As communication in the business world increasingly turns digital, elements of nonverbal behavior are being translated to online media such as email (see Chapter 24, Burgoon and Walther, this volume). Just as the face and the voice are the primary in-person means to signal emotion, emoticons and text are the approximate online correlates (Carter 2003). The use of acronyms, icons, emoti-

cons, and formatting such as capitalizations and italics can be considered quasi-nonverbal cues that display emotion (Carter 2011). Most research on the use of nonverbal cues via text-based communication has been done specifically on emoticons. For example, without the use of emoticons, most people misperceive the correct emotion, attitude, and attention intents. (Lo 2008). With emoticons, however, receivers can correctly understand the level and direction of emotion, attitude, and attention expression. These results prove that emoticons perform nonverbal communication functions. Further, the invention of emoticons suggests the strong power of the human urge to express nonverbal cues – in that being thwarted was so frustrating that early users invented a new communication channel.

Yet, since the sender's actual expressions cannot be seen in text-based communication, there still exists a great deal of ambiguity to which individuals must adjust (Carter 2011). Effects of ambiguity include the neutrality and negativity effects, by which emails intended to be positive seem emotionally neutral and messages with negative information find those elements emphasized (Byron 2008). The reduced availability of cues and feedback make emails less physiologically arousing than in-person communication (Byron 2008). In a field study inside a Fortune 500 company, researchers found that this reduction in social context cues has substantial effects on communication (Sproull and Kiesler 1986). For example: emails reduced status differentials because messages from superiors and subordinates looked the same, people preferred to email superiors more than subordinates, people engaged in irresponsible behavior more frequently online than in face to face communications, emails were preferred for sending negative news, people overestimated their contributions to email communications, 60% of emails provided new information, and, finally, much of the information in emails would not have been conveyed through another medium (Sproull and Kiesler 1986). For these reasons, emails tend to be more task-oriented and perhaps should be (Sarbaugh-Thompson and Feldman 1998).

Computer mediated communication is also unique in that it diminishes most clues of an individual's uniqueness because text-based messages all look more or less the same, especially in emails (Collins 1992). Because of the lack of physical and social subtext in online communication, it is easy to forget not only the identity of the target person but also your own, which can lead to uninhibited behavior called flaming (Collins 1992). As a result, emails sent in organizations scored high for flaming as they contained profanity, capital letters, and excessive exclamation points or question marks, which can lead to organizational conflict (Turnage 2007). Thus, along with the increased amount of new information and improved speed of communication, organizations must adapt to face the new nonverbal challenges that accompany computer-mediated communications. (See Chapter 24, Burgoon and Walther, this volume, for extended discussion of nonverbal behavior and computer mediation.)

3 Future directions in workplace nonverbal behavior

Although there is a unique and noteworthy role of nonverbal behavior in workplace situations, much of the existing research in applied settings focuses on medical, counseling, and classroom environments – or, alternatively, is simulated by college students (Graham, Unruh, and Jennings 1991). Even so, the area of nonverbal behavior touches many elements of Industrial/Organizational Psychology and Organizational Behavior, such as emotions, trust, negotiation, leadership, power, diversity, among others. The relative lack of more research relevant to workplace settings could be because “few workplace interactions lend themselves easily to study by nonverbal communication researchers” and research topics that “do not seem to have direct ties to organizational productivity and profits” are regarded as a “nuisance” (Riggio 2005). Because of the deep need for research to help bridge the gap between science and practice, future work needs to go where the phenomenon actually lives. In doing so, we point out that applied research needs to follow the best practices developed over decades by those working within traditional academic departments. This means, notably, using bona fide stimuli and measures of sensitivity to nonverbal cues – even when self-report and vignette measures are simpler for researchers.

There is a growing need for research that deals with the nonverbal elements involved in online communication, especially as the use of electronic mail and online marketing shifts the way the firms communicate both internally with employees and externally with customers. Interestingly, virtual communications are, through their technologically-mediated nature, relatively more accessible for researchers to record and study. There are certainly unique opportunities and challenges in these low-context communication channels – especially with more recent developments such as the proliferation of social networking websites. Another relevant trend is the continued emergence of workplace relationships that span cultural and political lines. As different cultures express key emotions in varying ways (Elfenbein et al. 2007), it is worth examining what business practices are impacted and how stronger lines of communication can be forged across such boundaries.

Finally, although the impact of certain nonverbal behaviors can be isolated and studied in experimental settings, the workplace is a complex and adaptive system. Because in the office there exists an abundance of verbal and nonverbal cues, some of the existing work done in controlled laboratory settings may not necessarily translate. Notably, the study of nonverbal behavior typically examines such behaviors in isolation from each other, one communication channel at a time, for the purpose of experimenter control. However, in the real world nonverbal behavior typically accompanies a rich set of cues including not only the multiple nonverbal channels expressed simultaneously, but also verbal language and larger context around the situation and relationships. Research that has modeled the use

of multiple sources of information has been informative about the way we use these multiple sources of information in tandem. For example, nonverbal behaviors have significantly less impact on interview outcomes when considered in context with verbal content and resume information (Rasmussen 1984). To balance out the inherent inadequacies of laboratory experiments to represent the complex delivery of these multiple nonverbal channels and relationship context, we recommend the increased use of naturalistic observation. At this time, there is a dearth of such work in the field, due largely to limited access and logistical challenges. However, by giving up some researcher control, we also limit researcher interference in the ebb and flow of real life. As such, this methodology could yield new insights that could tap into the gestalt of real-world communication. Naturalistic observation would be especially helpful in studying the integration between verbal and nonverbal elements, where they are produced and comprehended simultaneously and in real time. Elements of nonverbal delivery in complex situations like the workplace deserve further study. It can help inform communicators, managers, and salespeople alike in how to best further their organizational goals.

Workplaces, as well as society at large, have taken great pains to train individuals in verbal skills. Reading, writing, and speaking all enjoy significant training in educational and organizational settings. However, equally important nonverbal elements typically receive negligible attention. This is especially important given that workplace environments often lack a vocabulary for discussing emotional experiences (Sandelands 1988) – and, yet, emotional experiences are woven into everyday life and we live so much of our modern lives in organizational settings. As such, there is a real value for work that serves to not only observe and describe, but can also prescribe normative uses of these aforementioned phenomena.

Most employers hardly recognize the potential that nonverbal behaviors carry in their workplace – and many of those who do have little research-driven advice to utilize. In the gap between the need for actionable advice and available research, a host of pop literature and training has emerged. Needless to say, there is a great deal of overstatement and oversimplification in such cases – but they arise from an enthusiasm and even thirst outside of academia for what scholars know about nonverbal behavior. It is our belief that a deeper understanding of and command over nonverbal behaviors carries extremely valuable benefits for business practitioners across industries and organizational positions – as well as valuable benefits for researchers trying to understand the role of nonverbal communication in some of the rich settings where it unfolds on a daily basis.

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27 Clinical interactions

Abstract: The delivery of healthcare requires face-to-face interaction; health professional and patient engage in an interpersonal exchange. Effective communication facilitates the accuracy of information transmitted in the clinical interaction, contributes to reducing stress and offering support to patients, and fosters patients' active involvement in their care. Recognition of the importance of communication between patients and clinicians has grown in recent years, and considerable evidence points to communication as an important component in a variety of patient outcomes including satisfaction, health, adherence to treatment, and psychological well-being. Research on patient engagement in the medical visit provides strong evidence that better clinical outcomes occur when patients actively communicate and share in the decision-making process. This chapter examines the role of clinicians' verbal and nonverbal communication in achieving better health outcomes and in helping to decrease patient anxiety and emphasize the human bond and empathic connection between clinician and patient. The role of communication in building and maintaining trust and rapport, and the role of interactional "synchrony" between clinician and patient are examined. Several reliable and valid assessment tools for evaluating verbal communication as well as nonverbal encoding and decoding in clinical interactions are presented.

Keywords: clinician-patient interaction, verbal communication, nonverbal communication

1 Introduction

More than three decades ago, models of health, disease, and illness began a steady shift from the biomedical to the biopsychosocial (Engel 1977). Increasing attention began to be paid to the patient as a person whose health behavior, treatment adherence, and resultant treatment outcomes were a function not only of the technical clinical interventions offered but also of the quality of interpersonal communication available in the clinical context. Empirical evidence began to accumulate, demonstrating that the outcomes of care depended upon how that care was delivered to the individual.

Healthcare requires a dyadic – usually face to face – interaction; two individuals, health professional and patient, must engage in an interpersonal exchange. As Eric Cassell noted many years ago (Cassell 1985: 1), "...all medical care flows through the relationship between physician and patient." To broaden this perspective somewhat, we would argue that effective interpersonal communication is

required of all healthcare relationships including those that patients/clients have with nurses, nurse practitioners, physician assistants, dentists, pharmacists, counselors, and therapists. Indeed, the role of “relationship” in psychiatric and psychological treatment outcomes was recognized decades ago by Dr. Lester Luborsky and colleagues (Luborsky et al. 1971), whose research demonstrated that psychotherapy treatment outcomes depended considerably less upon the theoretical orientation of the therapist than upon the quality of the interpersonal relationship the therapist was able to develop with the patient. Outcomes were best with more therapist experience, empathy, similarity of patient and therapist, and therapist attitude and interest patterns. But despite the recognized importance of subtle, interpersonal elements of the therapeutic exchange, surprisingly little empirical attention has focused on the nonverbal aspects of psychotherapeutic settings, and there have been historically few studies designed to explicitly test hypotheses (Wiener et al. 1989). Many urge the importance of attending to nonverbal elements of psychotherapeutic exchanges and advocate for incorporating them in a purposeful way into one’s practice (Foley and Gentile 2010), yet many studies use analogues rather than actual encounters, and relatively few studies have included manipulations that allow for cause-and-effect conclusions (Hall, Harrigan, and Rosenthal 1995). The themes that have emerged from the psychotherapeutic literature, however, indicate that “immediacy” (a positive interaction style involving forward lean, eye contact, smiling, a relaxed and open-limbed posture, and close [but not “too” close] physical proximity) is an important facilitator of client engagement and more effective therapeutic work, and that the additional element of postural congruence between the client and therapist is also beneficial (Hall, Harrigan, and Rosenthal 1995). Therapists seem to be perceived as more empathic when they convey positive affect, such as by nodding and smiling (Fretz, Corn, and Tuemmler 1979), coordinating their gestures with their spoken words (Siegel and Sell 1978), and making eye contact (Seay and Altekruse 1979; Tepper and Haase 1978). Eye contact also seems to be associated with a perception that the therapist is genuine (Kelly and True 1980).

Extralinguistic (or paralinguistic) cues – elements of speech other than the verbal content, including things such as tone, pitch, volume, inflection, and rate – have also been linked to perceptions of therapists. For example, Duncan and colleagues found that when therapists were engaged in productive work with clients they exhibited warm and relaxed, yet serious vocal cues but when interactions were less productive this was reflected in their less involved, dull, and flat speech (Duncan, Rice, and Butler 1968). Greater extralinguistic anxiety was communicated to patients in an inpatient setting (Blanck et al. 1986). This is meaningful because of the priority that is often given to the vocal characteristics of a message, assuming that they are a good indicator of underlying feelings, beliefs, or emotions and because patients may be especially sensitive to these cues owing to their already heightened sense of anxiety (Hall, Harrigan, and Rosenthal 1995).

Despite having a more concrete task orientation, the medical therapeutic relationship is similar in many ways to the psychotherapeutic relationship. Although there are typically more technical aspects of medical care delivery than one finds in psychotherapy, this in no way negates the importance of the medical relationship itself, or the communication that takes place within the context of that relationship. Indeed, as we shall see in the next section, clinical interactions in medicine may be particularly sensitive to these non-technical, relationship-focused elements of care – not only because of patients' heightened anxiety, but because of other characteristics of the encounter, such as power and status differentials (Fiske 1993) – and thus, the primary focus of this chapter is on medical interactions.

Although the emphasis of this chapter is on what happens between clinicians and their patients, communication among healthcare team members is also vital. Patients report the desire for better team communication (Oskay-Ozcelik et al. 2007) but it is also important for the prevention of errors in care delivery and the accuracy of the “handoff,” as well as the health outcomes that depend upon providers' coordination with each other (Dovey et al. 2002; Gong et al. 2007; Landucci 1999; Lingard et al. 2005). Until health care is delivered exclusively by robots and computers, human interface will be essential, and that interface will depend upon human communication, the goals of which include: (1) enhancing the accuracy of information transmitted between parties in the clinical interaction, (2) reducing stress and offering solace and comfort to patients (and perhaps to family, as well), and (3) fostering patients' active involvement in their own care so that they take responsibility for their adherence to recommended treatments (Hall, Harrigan, and Rosenthal 1995; Ong et al. 1995; Roter 2000). This communication is in large part nonverbal in nature.

2 Why nonverbal communication is especially important in clinical interactions

It is estimated that more than half of communication takes place using nonverbal channels (Burgoon, Guerrero, and Floyd 2009) but despite this, clinical care and training have tended to rely disproportionately on the verbal elements of communication and to place less emphasis on elements such as the nuanced nonverbal communications that convey emotional content (Levinson and Pizzo 2011; Philip-pot, Feldman, and Coats 2003; Roter et al. 2006). Verbal and nonverbal communications exist as two separate, although often parallel, channels that flow simultaneously through any encounter. When verbal communications are unclear, greater reliance is placed on nonverbal cues to supplement the content of what has been verbalized. When nonverbal cues are congruent with what is explicitly stated, they

lend credence to the stated content. When the two are inconsistent, however, nonverbal cues become particularly salient (Martin and Friedman 2005). In cases where interactants have very different status or power it may be difficult for the lower status individual to request information or clarification, again resulting in a greater reliance on nonverbal cues. Diminished nonverbal sensitivity thus poses a particularly potent problem in clinical settings, such as medicine, where there often occur the very types of interactions in which nonverbal cues are most useful – those in which power and status differentials are pronounced and the verbal communications that occur are often ambiguous or otherwise challenging to interpret (DePaulo and Friedman 1998).

Communication has long been recognized as the cornerstone of psychotherapeutic care (Kiesler 1979; Luborsky et al. 1971) and, in the past two decades, a clearer recognition of the role of nonverbal communication in psychotherapeutic contexts has been achieved. Increasingly, efforts have been made to both understand nonverbal, non-conscious processes and also to incorporate nonverbal elements into diagnosis and intervention (Philippot, Feldman, and Coats 2003). Researchers who study nonverbal communication have also become more interested in applications to clinical settings and in emotion regulation (Gross 1998; Nowicki and Duke 1994; Philippot, Feldman, and Coats 2003). Formal recognition of the importance of communication in general, and nonverbal communication specifically, has been relatively slower in coming to the medical realm (Hall, Harrigan, and Rosenthal 1995) despite how crucial effective verbal and nonverbal communication are for delivering effective medical care. But recently, recognition of the importance of the quality of communication between patients and clinicians has grown and communication is accepted as an important component in a variety of patient outcomes including biomedical, behavioral (such as adherence to medical regimens), psychological (such as well-being) outcomes and satisfaction (e.g., Devine and Cook 1985; DiMatteo, Hays, and Prince 1986; Greenfield, Kaplan, and Ware 1985; Kaplan, Greenfield, and Ware 1989; Stewart 1995). Along with this recognition has come a better understanding of the key roles that nonverbal expression and interpretation play in effective healthcare communication and partnership.

Research on patient engagement in the medical visit also provides strong evidence that better clinical outcomes occur when patients actively communicate and share in the decision-making process (Brody et al. 1990; DiMatteo, Reiter, and Gambone 1994; Kaplan et al. 1996; Ong et al. 1995; Rao, Weinberger, and Kroenke 2000). This engagement, in turn, is more likely when it is actively encouraged, either by clinicians directly or through patient-training programs (Adams, Smith, and Ruffin 2001; Cegala et al. 2000; Greenfield, Kaplan, and Ware 1985; Haywood, Marshall, and Fitzpatrick 2006; Heisler et al. 2002; Post, Cegala, and Miser 2002; Street et al. 2005). Both verbal invitations (e.g., “What are your thoughts on this?” or “Which of these options seems most reasonable to you?”) and nonverbal signals

from providers (e.g., maintaining silence long enough to give patients ample opportunity to respond thoughtfully; forward lean to indicate that attention is being paid) convey the sense that the patient's viewpoint and opinion are valued and encourage the patient's involvement and personal responsibility.

Health professionals speak to each other in a codified language, with shorthand expressions that have tremendous meaning to other health professionals. This specialized terminology has developed to facilitate precise and accurate verbal communication in clinical settings while at the same time maintaining brevity; from the patient's point of view, however, medical jargon often serves as a barrier and a source of confusion (Hadlow and Pitts 1991; Thompson and Pledger 1993; Nielsen-Bohlman, Panzer, and Kindig 2004). Although technical language can facilitate efficient communication among clinicians, its advantages are frequently offset when their patients fail to understand what they are saying. When medical professionals use medical terms that patients do not understand, patients leave the medical visit without comprehending their health status, disease diagnosis, or treatment recommendations (Castro et al. 2007; Lerner et al. 2000). Indeed, when excluded from the verbal dialogue because of words that have no meaning to them, patients tend to focus on their providers' nonverbal cues (Martin and Friedman 2005).

Nonverbal communication can be divided into two basic components: encoding and decoding. *Encoding* refers to the expression of information, such as about emotional states, by nonverbal means including facial expressions, eye contact, body postures, fluidity of movement, tone of voice, and so on. In the clinical interaction with a bed-ridden patient, for example, a clinician might sit down next to the bed, instead of hovering over the patient, and might make eye contact and perhaps hold the patient's hand. *Decoding* refers to the perception and interpretation of these informational expressions by someone who receives them. For example, a physical therapist might attend to cues of pain in a patient as she attempts a particular stretching exercise or a pharmacist might take note of the confused expression on a patient's face as he scrutinizes the paperwork that comes with his prescription.

An element of special challenge for health professionals involves the very important point that most nonverbal expressions or cues do not have a single, unambiguous meaning and therefore they are susceptible to misinterpretation. Purposeful nonverbal behaviors can have different meanings to different individuals. For example, extended eye contact may signal a variety of meanings including that more focused attention is desired, or that attention is being paid, or that one is irritated, or that one is sympathetic, or that one is romantically interested. Similarly, non-conscious behaviors may also represent different states of mind in different people; fidgeting might indicate nervousness or boredom, or might be a mostly meaningless habit. It has also been demonstrated that the same behavior can have different interpretations depending upon who is doing the interpreting or decod-

ing. Gender, severity of disease, and age have all been shown to change the “meaning” attributed to a nonverbal cue (Hall et al. 1994). Studies of adults’ perceptions of “baby talk” directed toward them show, for example, that such talk can be perceived as disrespectful and demeaning or as warm and nurturing depending on the how well the recipient is able to function on his or her own (Caporael, Lukaszewski, and Culbertson 1983; O’Connor and Rigby 1996). Therefore, it is critical not only that nonverbal cues be noticed and attended to, but also that they be accurately interpreted within their context (Knapp and Hall 2010).

Individuals vary in their decoding skills (i.e., some people are naturally more sensitive than others) as well as in their encoding skills (i.e., some are more expressive than others). Later we will return to the issue of teaching and learning nonverbal communication skills, but here we note that it is possible to become a more effective nonverbal communicator. Because of the often ambiguous nature of nonverbal cues, developing greater sensitivity and accurate communication often requires prompt verbal clarifications of nonverbal messages regarding patient distress, pain, and other feelings.

Although asking questions regarding medical terms would help patients to understand their conditions, reduce their stress, and motivate their adherence, research strongly suggests that patients rarely ask for clarification but instead remain passive. Many patients even offer clues suggesting that they do understand (e.g., head nods, smiles) although they have no idea what they have been told (Roter and Hall 2006; Tuckett et al. 1985). Indeed, a majority of patients leave their physicians’ offices without being able to report accurately what they are now supposed to do to care for themselves (Kravitz et al. 1993; Sherbourne et al. 1992). Reluctance to ask for additional explanation may reflect a variety of factors including patient sensitivity to the clinical time constraints and embarrassment about not possessing knowledge that seems to have been assumed by the clinician. Patients might also wish to be perceived as “good patients” as opposed to patients who cause difficulty for the clinician (Tija et al. 2008; Tuckett et al. 1985). A clinician’s nonverbal behaviors – including facial expressions, body positioning and movement, and extralinguistic elements such as tone of voice, inflection, and rate of speech – are all fundamental to the patient’s ability, willingness, and comfort in asking questions and participating actively in care. Specific nonverbal behaviors that tend to facilitate (or discourage) patient involvement will be addressed in more detail later in this chapter.

The process of clinical care is often intimidating, and even frightening, for patients, particularly when they do not fully understand their conditions, their prognoses, or the words that are used in talking to them about their illnesses. Further, the social setting is anxiety-provoking and strange (and may be particularly distressing to some patients depending upon their social and cultural norms). In medical encounters, patients may be required to partially disrobe (and perhaps to don a flimsy paper garment), and they are likely to be viewed and touched,

sometimes quite intimately, by someone they only recently met. In psychotherapeutic settings, patients may be expected to divulge painful or embarrassing information about themselves, all without the reciprocity that typically accompanies such revelations in normal social interactions.

All of these elements serve to emphasize the relative powerlessness and vulnerability of the patient. Nonverbal cues used effectively by a clinician could help to counteract these negative feelings by decreasing patient anxiety and re-emphasizing the human bond and the empathic connection between the two parties (Ben Sira 1980; Fogarty et al. 1999; Hatfield, Cacioppo, and Rapson 1993). Nonverbal expressions can serve to reinforce for the patient that the clinician cares and has his or her best interests in mind. These cues are also vital to the development of trust and rapport (DiMatteo et al. 1980; Friedman, DiMatteo, and Taranta 1980; Hall, Harrigan, and Rosenthal 1995; Harrigan, Oxman, and Rosenthal 1985; Horwitz et al. 2007; Thom et al. 2001).

Trust is central to patients' ability to believe in and adhere to medical recommendations (Altice, Mostashari, and Friedland 2001; Safran et al. 1998; Street et al. 2009; Thom et al. 2001). Individuals are often motivated to please those whom they like, trust, and care about – they wish to return in kind the concern and effort that has been extended to them by these important people in their lives including trusted health professionals (Becker and Maiman 1975; Martin, Haskard-Zolnierrek, and DiMatteo 2010). Nonverbal indicators of care, concern, and empathy can do much to facilitate the development of this trust-bond and to improve patients' belief in their treatments and commitment to adhere to them. Patients are most likely to follow treatments they fully understand and believe in, given by health professionals they trust who also help patients to manage the demands of treatment (DiMatteo, Haskard-Zolnierrek, and Martin 2012). Effective nonverbal communication helps to build the trust that is essential not only to patients' satisfaction with the care they receive, but also to patients' willingness and ability to engage in self-care, and to adhere to treatments, ultimately fostering better health outcomes (Street et al. 2009).

Treatment-related beliefs are also relevant to placebo effects – that is, the real outcomes that are associated with receiving a treatment or intervention but are not due to the direct effects of that treatment or intervention. In clinical settings, placebo effects describe the additional benefits that may accrue when a patient engages in a therapy, over and above what the therapy (e.g., drug, dietary change) can accomplish due to purely physiological effects. In all medical settings, the outcomes of care are dependent not only on treatments themselves, but also on the context in which they are received (Shapiro and Shapiro 1997). When negative affect is lessened and positive expectations are enhanced, such placebo effects are likely to occur (Verheul, Sanders, and Bensing 2010). Of course, negative expectations, such as for undesirable side-effects associated with a medication, can also facilitate “nocebo” effects (in which patients' pessimistic beliefs and negative

expectations produce negative health consequences). The power of placebo or expectancy effects to be elicited through nonverbal communication of expectations has been solidly demonstrated in a variety of contexts from the initial, and now classic, classroom studies to clinical settings (Ambady, Koo et al., 2002; Ambady, Bernieri, and Richeson 2000; Babad, Bernieri, and Rosenthal 1991; Learman et al., 1990; Rosenthal and Jacobson 1968; Rosenthal and Rubin 1978).

3 Clinicians' nonverbal communications and their relation to outcomes

Studies suggest that many patients want more opportunities than they tend to be offered to know more about their health status and to be actively involved in their own care (Blanchard et al. 1988; Faden et al. 1981; Tuckett et al. 1985). When prevented from being engaged in partnership with their providers, and when participation is subtly discouraged, patients tend to rely on the nonverbal behaviors of their clinicians to supplement the verbal information they receive from them (DiMatteo and DiNicola 1982; Friedman 1982; Roter and Hall 2006). Patients might, for example, scrutinize the facial expressions of their providers for clues to the likely efficacy of the treatments prescribed for them. The power and status differential that typically exists between patients and clinicians can make patients hesitant to press for information or to express any reservations they might have about their recommended regimens and may place undue emphasis on nonverbal cues (for example, interpreting a physician's furrowed brow as a comment on the prescribed medication when it instead reflected the physician's concern about a different patient altogether) (Fiske 1993; Friedman 1982). In addition to providing information and supplementing verbal content, nonverbal communications are important to relationship building and the establishment of trust between clinician and patient (DiMatteo et al. 1980; Friedman, DiMatteo, and Taranta 1980; Hall, Harrigan, and Rosenthal 1995; Harrigan et al. 1985; Thom et al. 2001). Attention, concern, and empathy can all be conveyed without spoken words, and the profession of these sentiments in the absence of nonverbal verification (for example, positive statements to the patient with a negative voice tone or completely neutral facial expression) may in some cases be viewed as suspect and even prove detrimental to the developing relationship. Of course, this is not always the case, as demonstrated by one study in which positive verbalizations paired with negative voice tone were positively related to patient satisfaction (Hall, Roter, and Rand 1981). On the other hand, nonverbal cues such as positive gestures, a warm touch, or other such reassuring cues can act as powerful motivators that help encourage and motivate patients, and may be associated with measurable placebo effects.

Clinicians often communicate their preferences for the orchestration of the encounter through nonverbal channels. Those who act in a hurried manner, such

as by glancing frequently at the clock or their watch, demonstrate for patients that there is not much time for discussion, and that the patient is not fully welcome to ask questions or bring up concerns that may take a while to talk through. Other nonverbal indicators that patients are not welcome as partners in their own care include: interrupting the patient, leaning backward away from the patient, taking longer speaking turns, engaging excessively with the medical chart (especially while the patient is talking), and greater use of social touch which emphasizes the status difference between the two (Fisher 1983; Patterson 1983; Street and Buller 1987, 1988; West 1984).

On the other hand, providers who exhibit more welcoming nonverbal cues and reciprocate the affiliative behaviors initiated by their patients demonstrate their belief in the importance of their patients' active involvement in the process of their own medical care (Buller and Street 1992; DiMatteo, Hays, and Prince 1986; Lepper, Martin, and DiMatteo 1995). Some of these welcoming and inviting nonverbal cues include leaning forward toward the patient, head nodding, placing oneself physically closer to the patient, making eye contact with the patient, and spending less time looking at the medical chart (Beck, Daughtridge, and Sloan 2002; Bensing 1991; Hall, Harrigan, and Rosenthal 1995; Larsen and Smith 1981). Studies suggest that, on average, female clinicians tend to be somewhat more warm, responsive, and nonverbally engaged with their patients than are male clinicians (Hall et al. 1994; Roter and Hall 2006). They nod and smile more at their patients, and use more back-channel communications (verbal statements and nonverbal signals that encourage patient engagement such as “uh-huh,” “mmhmm,” and “I see...”). Female clinicians also tend to engage in more partnership-building.

Female clinicians are also less dominant, on average, than are their male counterparts (Roter and Hall 2006). Although some clinicians consciously aim to minimize the power and status differentials between themselves and their patients, their extensive education, specialized knowledge, and high social status can make equality quite difficult to achieve. In addition, elements of professional procedure and demeanor may unintentionally serve to reiterate the power differential. For example, patients make appointments with healthcare professionals and come to their locations rather than the reverse; providers practice on their own “turf,” in an environment that is foreign and can be intimidating to patients and emphasize the superior status of the provider. Dominance can also be conveyed through extralinguistic cues such as moderately fast, clearly articulated, deep, loud speech (Knapp and Hall 2010) – yet these are elements that are routinely taught as effective modes of professional communication (e.g., Koneru, 2008). Clearly there are nonverbal aspects of clinical interactions that lend themselves to the maintenance of distance between patients and providers. Although not malicious in intent, and more likely the result of clinicians' desire to encourage and motivate patients and to tailor communications to patients in certain groups (e.g., those who are less educated, lower income, minorities, or the elderly), nevertheless certain nonverbal

communications are likely to contribute to the healthcare disparities often observed in vulnerable populations (Benbassat, Pilpel, and Tidhar 1998; Cooper-Patrick et al. 1999; Roter and Hall 2006).

Clinician and patient usually display “synchrony” when their clinical interaction is working well; they demonstrate good rapport and effective sharing of information (Koss and Rosenthal 1997). In the 1970s, social behaviorists and linguists measured communication fluidity and quality using the “synchrony” construct (sometimes also referred to as “symmetry”) (e.g., Natale 1975; Smith 1979). Synchronous relationships (i.e., symmetrical interactions) involve a give-and-take between clinicians and patients; synchrony is also a well-recognized concept in therapist-client relationships (Kiesler 1979).

Synchrony is defined by mirroring or similarity of movements and postures, matched tempo on the part of the interactants, and something called “behavioral meshing” in which interactants’ behaviors seem to blend together smoothly and in a coordinated fashion (Hall, Harrigan, and Rosenthal 1995). Interactional synchrony has been shown to relate to patient perceptions of the quality and effectiveness of the interaction both in psychotherapeutic and medical settings. Synchrony is also associated with positive patient outcomes in both arenas (Koss and Rosenthal 1997; Ramseyer and Tschacher 2011).

Effective nonverbal communication exhibited by health care providers predicts a number of patient outcomes including greater likelihood that a physician will be chosen and that appointments will be kept, reduced likelihood of malpractice litigation, and greater patient satisfaction with treatment (Ambady, LaPlante et al. 2002; DiMatteo, Friedman, and Taranta 1979; DiMatteo, Hayes, and Prince 1986; Haskard, Williams, DiMatteo, Heritage et al. 2008; Schmid Mast 2007; Roter et al. 2006). A review by Beck and colleagues (2002) found that 16 different nonverbal behaviors were shown in at least one study to be related to patient outcomes. Specifically this particular review found positive effects associated with slight forward lean, head nodding, more direct body orientation, arm symmetry, uncrossed legs and arms, and less mutual gaze. On the other hand, more mutual gaze (which is typically associated with positive outcomes; cf. Bensing, Kerssens, and van der Pasch 1995), body orientation away from the patient, backward lean, crossed arms, and frequent touching were associated with negative patient outcomes, some of which were long term. For example, facial expressivity (nodding, smiling, frowning) has been linked to improvements in cognitive and physical functioning over a several-month follow-up period whereas distancing (looking away, not smiling) has been strongly associated with poorer functioning over that same period (Ambady, Koo et al. 2002).

4 Patients’ nonverbal communications

Hippocrates (1923 translation) was perhaps the first to formally urge that attention be focused on the patient’s facial expression as a component of clinical diagnosis.

Since the early days of medicine, observation and attention to the unspoken elements presented by patients have provided key insights that have proven invaluable for diagnosing problems and prescribing treatments. Indeed, the diagnostic interview remains a foundational element of modern medicine despite the fact that many technical diagnostic tools are available and the importance of communication as a tool often fails to be formally recognized. Not only is effective communication relatively inexpensive, but it also allows the ephemeral skill *qua* art called “clinical experience” to manifest itself. Clinical experience depends upon sensitivity to patients’ communication, that is, putting together small elements of expression and information that, by themselves, might be uninformative (e.g., breathing pattern, vocal tone and inflection, tenderness to the touch, awkward or restricted movement, and so on). Together these cues might suggest a conclusion that effectively supplements information garnered from technical sources such as diagnostic tests, or suggests that additional exploration is required. Clinicians often gain crucial insight into patients’ experiences of pain, anxiety, or depression by attending to nonverbal expressions (Bensing, Kerssens, and van der Pasch 1995; Craig, Prkachin, and Grunau 2001; Robbins et al. 1994).

Although facial expressions can provide useful information about the emotional or physical state of an individual, they are also the nonverbal cues of which we are most aware, and that are most likely to be consciously manipulated; indeed, we learn to monitor carefully the expressions of our faces (Ekman and Friesen 1969, 1974). Purposeful facial movements are governed by cortical pathways. These manipulations are not perfect, however, as subcortical areas initiate spontaneous expressions (Rinn 1991). Therefore, one is likely to find, on the face, a mix of conscious, volitional expressions and those that spring unbidden to the features, to be captured for analysis and study or to be queried further by an observant physician or other member of the healthcare team (Quill 1989).

Because of the potential for conscious manipulation of some aspects of facial expression, other nonverbal channels, such as posture, extralinguistic cues, and movements or gestures might be even more valuable sources for detecting nonverbal “leakage” because individuals are less adept at controlling them (DePaulo and Friedman 1998; Friedman 1982). A case manager working with a long-term chronic disease patient, for example, may notice a slumped posture that is uncharacteristic of the patient, or an unusually quiet voice with flattened affect. The case manager might suspect that the patient is experiencing some depression. During a routine outpatient visit a nurse practitioner might observe a patient swinging her leg vigorously and moving restlessly instead of sitting quietly. This may prompt additional questions about whether the patient is experiencing a time of high anxiety in her life, or if there is something making her especially nervous about this particular visit. A pharmacist might note a patient’s raised voice and fast speech tempo when he says “That sounds like an awfully complicated set of instructions. Is all of this even necessary?” She may hypothesize that something other than contrariness is

going on and offer additional explanation or another form of available support. A psychotherapist might proceed more slowly and gently with a patient after he observes her crossed arms and closed body posture.

Of course, in each of the scenarios just described, the nonverbal behaviors have multiple potential meanings. Perhaps the seemingly depressed chronic disease patient was actually up all night with a friend-in-crisis and is simply tired; the restless outpatient might have read a magazine article claiming that 200 calories per day can be burned through fidgeting; the cranky-sounding individual might have a grumpy temperament; and the psychotherapy patient might just be reacting to the cold in an air-conditioned room. Knowing the patient's typical (or baseline) behavior is very useful in that it better enables the identification of meaningful deviations (Knapp and Hall 2010). But even in these cases, nonverbal behaviors cannot be read like recipe books, and sensitivity to nonverbal cues should always be coupled with the skill of tactful inquiry and an openness to fully hear the patient's experience.

Just as clinicians provide nonverbal cues to the way in which they would like the interaction to proceed, patients also divulge information about what they need from the clinician and their preferences for the way the encounter should progress. Patients who wish to be involved in their care might make eye contact, nod, lean forward, and use facial expressions and vocal tones and inflections (Coker and Burgoon 1987). They might also make indirect statements about their lives or emotions that serve as clues to their needs (Levinson, Gorawara-Bhat, and Lamb 2000). If they perceive resistance from the clinician, they might lean further toward the clinician, pause to wait for the clinician's attention to return to them, or even interrupt the clinician (Patterson 1983). Conversely, patients who make little eye contact, maintain a closed body posture, and use a passive tone of voice decrease the likelihood that they will be drawn into an active role in their own care (Kaplan, Greenfield, and Ware 1989; Patterson 1983).

Because specific behaviors cannot be reliably linked to specific meanings across individuals, nonverbal and verbal cues are both subject to misinterpretation. In one recent study, researchers selected, from 886 audiotaped medical interactions, 25 in which patients reported that they wanted to be heavily involved in medical decision making and 24 in which patients desired very little input to medical decisions. Independent raters evaluated seven different behaviors (asking questions, stating preferences, initiating, processing, resistance, deference, and information behavior) in an effort to assess patients' desire for involvement in their care but were accurate at a rate no better than chance. The study's authors suggest that clinicians may be best able to tailor patient-centered approaches if they initiate a targeted, verbal discussion about patient preferences for involvement, as these are difficult to infer from patients' own behaviors (Hudak et al. 2008). The findings of this study reiterate the potential error in assuming that nonverbal cues can be "read" as one might read words on a page (as well as highlighting the fact that patients may not effectively communicate their preferences verbally).

In some cases patients' nonverbal cues may not directly indicate their preferences about the interaction, but instead patients may be experiencing anxiety or emotional discomfort that they do not feel they can share with the clinician. Patients might believe that there is not enough time, or they are embarrassed to broach the subject, yet still express their true feelings, unknowingly, through nonverbal channels (Beisecker and Beisecker 1990; Street and Buller 1988). For example, a patient might say one thing ("I think everything's clear, I don't have any questions") but have a confused facial expression or seem unable to make eye contact (Cormier, Cormier, and Weisser 1984; Patterson 1983; Quill 1989). Anxious patients who have multiple agendas but are only expressing a single agenda have also been shown to engage in more self-touch (such as touching their hair or face) (Shreve et al. 1988). A clinician who is alert to these discrepancies – the mismatch between what is said and what is displayed through nonverbal channels – will be better prepared to offer reassurance, as well as to make additional queries in order to elicit necessary information and then follow up on it (Quill 1989).

Interpersonal sensitivity on the part of clinicians is related in meaningful ways to the patient experience. More interpersonally sensitive physicians have been shown to be slightly better at detecting signs of distress in their patients than physicians who are less sensitive (Robbins et al. 1994). They also tend to have more satisfied patients and to have fewer appointment cancellations (DiMatteo et al. 1980; DiMatteo, Hays, and Prince 1986). When role-playing patients watched a genetic counseling session conducted by a counselor with greater interpersonal sensitivity, they learned more (Roter et al. 2008) and observers better liked and were more satisfied with interpersonally sensitive medical students when viewing their interactions with standardized patients (Hall et al. 2009). But, as Hall (2011) notes, the causal importance of interpersonal sensitivity to these outcomes is uncertain and the explanatory pathways associated with any such causal relationships remain unknown.

5 Measuring nonverbal communication

Considerably more attention has been paid, historically, to the assessment of verbal compared with nonverbal communication in the clinical situation (Buller and Street 1992). As such, there are several reliable and valid assessment tools for evaluating the verbal portion of interactions. These are typically quantitative systems that require counting the number of times particular behaviors occur during the encounter (for instance, how many open-ended questions are asked, or how many back-channel responses are made). Arguably the most popular and widely used is the Roter Interaction Analysis System (RIAS; Roter 1991; Roter and Larson 2002), but the Process Analysis System (Bales 1950) on which the RIAS was based,

the Verbal Response Mode (VRM; Stiles 1992), and Verona Medical Interaction Classification System (VR-MICS; Del Piccolo et al. 2005) are also in common use.

The RIAS has been used extensively over a wide range of medical specialties, continents, and empirical applications, and with different types of interactions including nurse-patient and tele-consultations (Miller and Nelson 2005; Roter and Larson 2002; Tachakra and Rajani 2002). It codes behaviors according to categories of interaction and is able to distinguish elements of global affect. It identifies communicative elements that are related to positive patient outcomes, and is generally cost-effective.

The VR-MICS was developed to evaluate clinical skill in communicating with distressed patients. This method overlaps somewhat with its predecessor, the RIAS, and researchers can elect to use only one portion (patient or physician) of the system (Del Piccolo et al. 1999; Saltini et al. 1998). It, too, is cost-efficient and has also been advocated as an effective training tool.

The VRM is somewhat different from both the RIAS and the VR-MICS, in that it is an all-purpose classification system. Each speech act is coded twice – once for intention and once for grammar. Although utterances may receive seemingly subjective ratings (such as “attentiveness” or “presumptuousness”) the VRM makes it clear that these are *not* subjective ratings, but instead are defined by their objective categorizations (Stiles 1992). The “uncodable” designation is only used when an utterance is incomprehensible.

These quantitative or count-based systems can be contrasted with impression rating systems, in which more subjective evaluations of the interaction are made. Although rating systems are typically not as well validated and often are designed specifically for a particular study or two, they do have the potential to address some of the weaknesses inherent in coding methods (Campbell et al. 2007; Roter, Hall, and Katz 1988). Campbell and colleagues, for example, developed a rating system that has proven reliable, valid, cost-effective and efficient, with just 19 items, measuring process and content dimensions (Campbell et al. 2007). Some systems, such as the RIAS, combine both count-based and ratings-based assessments.

Despite their detailed coding of the verbal elements of communication, the systems just described are often also able to provide good insight into the nonverbal components of interactions. For example, an important part of the RIAS is the raters’ global ratings (e.g., responsive, dominant, friendly and so on) which rely heavily on nonverbal cues. It is thus sensitive to emotional aspects of clinician-patient interchange (Roter and Larson 2002). This is crucial because, as we have noted thus far, nonverbal elements are vital to the establishment and development of an effective partnership between patient and clinician. In addition to what can be learned from aspects of verbally focused measurement tools, there are also some assessments that specifically target nonverbal behaviors.

A more extensive body of empirical work, including well validated assessments, exists for assessing decoding skill than for encoding skill (Hall and Bernieri

2001). These tools provide the foundation for research exploring the landscape of nonverbal communication and establishing links between effective nonverbal communication and clinical outcomes. There is good evidence that even with very small bits of information (often referred to in the literature as “thin slices” of behavior) to work with, people demonstrate better than chance-level accuracy and excellent predictive validity (Ambady and Rosenthal 1992; DePaulo 1992; Rime and Schiaratura 1991). In fact, these “thin slices” can be just as reliable and valid as longer, more extensive observations (Ambady and Rosenthal 1992; Ekman and Friesen 1969; Friedman, Oltmanns, and Turkheimer 2007).

With regard to encoding skill, we again see that some tools utilize count-based techniques, with tallies being taken of particular nonverbal cues (e.g., number of back-channels, number of head-nods, number of smiles). In contrast, there are some methods which are referred to as “global” assessments in which no tallies are taken. Instead, the encounter is viewed as a whole and subjective evaluations are made by raters (e.g., “The doctor was warm,” “The clinician was friendly”) typically on a Likert-type scale. These global assessments have been shown to have high validity – sometimes better than assessments based on tallies (Rosenthal 2005). The Physician-Patient Global Rating Scale (Haskard, Williams, DiMatteo, Rosenthal et al. 2008) is one such measure, modeled after the techniques described by Rosenthal (2005) and incorporating the nine dimensions of global affect found in the RIAS. Another valid technique for measuring encoding skills is to have untrained raters interpret the posed (and recorded) emotions of individuals portraying particular emotional states (Zuckerman et al. 1976). DiMatteo and colleagues effectively used this technique to assess doctors’ encoding ability and they found that physicians who were better at expressing or encoding emotion not only had more patients, but their patients were also more satisfied (DiMatteo, Hayes, and Prince 1986).

Decoding skills, on the other hand, are typically assessed in terms of “accuracy” with the test-taker identifying or classifying nonverbal expressions that are known and his or her percent of correct responses being calculated. When measuring nonverbal decoding skill, the Profile of Nonverbal Sensitivity (PONS; Rosenthal et al. 1979) is a frequently used instrument, providing information about how well an individual decodes signals sent in 11 different “channels” (three pure visual channels; two pure auditory channels; and six audio-visual combinations). It consists of more than 200 short video clips accompanied by forced-choice dichotomous interpretations, and in each case there is a correct answer (for example, one might have to decide whether the actor is “nagging a child” or “expressing motherly love”). Because of its length (necessary in order to adequately pair the various channels with one another), it can be cumbersome to use. In response to this, short forms have been developed, most recently the “MiniPONS” (Bänziger et al. 2011) which has only 64 items and demonstrates high correlations with the full PONS.

The Interpersonal Perception Task (IPT; Costanzo and Archer 1989) is another popular measure, similar in some ways to the PONS with 30 short video clips of naturalistic interactions that require decoding of five domains (status, kinship, deception, intimacy, and competition) and draw on multiple nonverbal channels. As with the PONS, each IPT item has a correct answer. In contrast to the PONS, the IPT includes a variety of individuals with both male and female actors (the PONS has a single, female actor), and it depicts spontaneous nonverbal behaviors in natural contexts. In addition, it is easy to obtain, simple to use, and relatively inexpensive. And, although not especially long in its full version, there is also a 15-item version (IPT-15) with reliability and validity perhaps better than the original version (Costanzo and Archer 2011).

The Facial Action Coding System (FACS; Ekman and Friesen 1978; Ekman, Friesen, and Hager 2002) is also well known and represents a comprehensive system for coding facial expressions. It does not, however, address other aspects of nonverbal communication, such as extralinguistic cues or bodily movements. In addition because of its high degree of specificity and comprehensiveness, it is a complicated system and requires trained experts to label the expressions. Although it is designed to be self-teaching (that is, the techniques can be learned not only at workshops but also with manuals), it is time-intensive and therefore may be less desirable for some clinical settings.

There are also several well known self-report measures of nonverbal encoding, or expressivity – one of them is the Affective Communication Test, one of the first self-report measures of ability to effectively transmit and use nonverbal cues (ACT; Friedman, Prince, et al. 1980). This questionnaire consists of 13 self-report items that describe attitudes and behaviors that are relevant to emotional expressivity. The ACT is a reliable and valid measure of individual differences in expressivity and, because it is short and simple to use, it is an ideal tool for assessing baseline levels of expressivity and evaluating changes that occur, such as after a training program.

The Emotional Expressiveness Questionnaire (EEQ; King and Emmons 1990), the Emotional Expressivity Scale (EES; Kring, Smith, and Neale 1994), and the Berkeley Expressivity Questionnaire (BEQ; Gross and John 1995) were all designed to focus specifically on the outward expression of emotion (unlike the ACT which includes using nonverbal behaviors to “move, lead, inspire, or captivate...” Friedman, Prince et al. 1980, p. 333). Each of these is a self-report measure; the EEQ and BEQ specifically distinguish between the expression of positive and negative emotion, whereas the EES does not.

6 Training clinicians to be effective nonverbal communicators

Are effective nonverbal communicators simply born that way? Or can individuals improve their nonverbal communication skills? This question represents a twist on

the age-old controversy over nature and nurture that has thrived in psychology more generally for many decades. Therefore, it is not surprising that the answer to this question is also similar: both innate ability and learned behavior contribute to nonverbal communication skill. Research evidence suggests that although people vary in their expressivity, naturally occurring attentiveness, and accurate decoding of others' nonverbal communication, these skills can be enhanced with training and practice, although it is not clear how long-lasting some of the changes are, especially those related to encoding (Ambady, Bernieri, and Richeson 2000; Knapp and Hall 2010). Although nonverbal communication skills can be learned, it is also the case that certain elements, such as nonverbal expressivity, have some degree of stability. For example, one clever study (Peleg et al. 2006) recruited congenitally blind participants along with sighted family members and, by asking them to do things such as describe past experiences, elicited facial expressions reflecting six different states: surprise, joy, disgust, concentration, anger, and sadness. The researchers then used computer programs to match the expressions of the blind participants with two groups – one including their family members, and one without. Participants were placed in the correct family group 80% of the time (vs. the 50% that would be expected by chance, if expressions did not have a heritability component). Another, more recent, study evaluated event-related brain potentials (ERPs) elicited by changes in facial expression and used a model fitting approach to demonstrate that a substantial proportion of the individual variability in these ERPs is attributable to genetic factors (from 36% to 64% depending on wave type and brain area) (Anokhin et al. 2010). Findings such as these aptly illustrate that there are indeed meaningful, innate individual differences when it comes to nonverbal communication.

Given that there are varying levels of innate nonverbal communication skills, it is reasonable to suggest that this characteristic should be considered as part of the selection and training process for medical school. In fact, more than three decades ago it was suggested that improving the encoding and decoding skills of clinicians through both training and selection might improve both the quality and the cost-effectiveness of care (DiMatteo et al. 1980). Further, because of the increasing emphasis being placed on the clinical team, it may even be reasonable to include this as one element in the selection and educational process for all clinicians in training – dentists, therapists, nurses, dieticians, and so on. In terms of selection, it is vital that the most reliable and valid assessment tools be used so that the individual's current encoding and decoding skills are represented as accurately as possible. In addition to the tools themselves, attention must also be given to the way in which the tools are used – to their administration and interpretation – so as to minimize biases and errors. Ideally, a prospective study design would be employed with high-quality follow-up data being collected and outcomes evaluations being made in order to better understand the utility of these pre-screening measures in terms of positive patient impact.

Of course clinical training programs cannot and should not rely entirely on nonverbal communication skills when making admissions decisions. Many other factors are also important, and there will certainly be a range of nonverbal communication abilities amongst groups of trainees. With that in mind, it is reasonable to suggest that focused efforts be made to improve the skills of every clinician in training – those who are weak to begin with can become competent while those who are strong at the outset can become stellar. Multi-faceted communication training programs do work, as was nicely illustrated in a study that spanned six months and involved training physicians on a range of topics from empathizing to recognizing and assessing tension in relationships, and employed a variety of techniques including workshops, coaching sessions, CDs, videos, and booklets (Haskard, Williams, DiMatteo, Rosenthal et al. 2008). This study not only demonstrated the importance of communication skills training (verbal and nonverbal) to a variety of outcomes (including patients' satisfaction with care and information received; patients' willingness to recommend the doctor to others; independent ratings of the sensitivity and connected nature of physicians' communication with patients; and more counseling on lifestyle topics by physicians); it also showed that outcomes are best when patients also undergo training. A group of 21 experimental studies comprising a recent meta-analysis confirms the measurable difference that can be made by communication training programs (Haskard-Zolnieriek and DiMatteo 2009).

There are many books available which aim to promote better clinical communication skills, including nonverbal elements (e.g., Dickson, Hargie, and Morrow 2003; Kurtz, Silverman, and Draper 2005; Tate 2003) but it is not clear that simply becoming informed is enough, in the absence of the opportunity to practice with feedback. Instead, the teaching of nonverbal communication skills – along with verbal – ought to be a foundational component of medical school curricula, and of the training programs for other health professionals such as nurses, physicians' assistants, and others.

7 Conclusion

It is clear that the nonverbal behaviors of clinicians set the tone for the encounter and thereby have a meaningful influence on the outcomes of the interaction. Each interactant comes to each encounter with a personal history, a current state, and a set of skills with which to communicate information, including needs and desires, to the other person. Although words are certainly useful in this regard, much of this communication is relegated to nonverbal channels – and for a variety of reasons including that most clinical interactions have restrictive time constraints, and that some topics are difficult to explain or embarrassing to discuss. Successful outcomes, not only for the patient, but also in terms of the clinician's

personal satisfaction, rely on an effective and efficient communication process and this can be facilitated through nonverbal channels. Reliable and valid measurement tools exist for evaluating both encoding and decoding skills and training programs exist that can help clinicians and patients alike to improve their communication skills. There is still much to be learned about which nonverbal elements are most important in clinical settings – this information must come from additional well designed studies that examine nonverbal cues both as independent and dependent variables. These data must be used to improve training programs and these training programs must be evaluated with a rigorous experimental design. In the meantime, the data we do have provide some excellent hints about which approaches are likely to be most efficacious, yielding the most positive outcomes for patients and their healthcare providers.

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Mark L. Knapp and Judith A. Hall

28 Glimpsing the future: emerging issues and trends

“It is said that the present is pregnant with the future.” Voltaire

Unlike many other prognosticators, the person many refer to as the father of modern management practices, Peter Drucker, accurately predicted a number of key business and economic trends during the latter 20th Century. Nevertheless, he was keenly aware of the difficulties involved in foreseeing the future. “Trying to predict the future is like trying to drive down a country road at night with no lights while looking out the back window,” he said. His solution for divining the future? “The best way to predict the future is to create it,” said Drucker. And that seems to be exactly what the chapters in this volume have done. The research reviewed and critiqued in each of the preceding chapters provides both a state-of-the-art summary of knowledge gleaned from the past and a glimpse at our future endeavors. Barring immense pressure from unforeseen academic and societal events, these glimpses, taken together, are the best indicators of the future being created for the study of nonverbal communication. Among the future glimpses portrayed in the foregoing chapters, we have selected six that seem to overshadow the others.

1 Getting a grip on the dynamics of actual interaction

The scholars who pioneered the study of nonverbal communication tried to understand and study behavior in the context of ongoing interaction – with varying degrees of success (Chapter 2). It didn’t take long for them to realize that they were dealing with a complex, puzzling, and labor intensive pursuit. The generation of scholars following these pioneers still sought answers to questions involving the role of nonverbal communication during human interaction, but many opted for methods that controlled the potentially irritating and confounding effects generated by the back and forth exchange of actual, ongoing behavior – even though that was frequently the target of their generalizations. So the current renewal of interest in studying the actual dynamics of social interaction does not signal a paradigm shift as much as a desire to meet the challenges of a long-standing goal for nonverbal scholars. As we move ahead, there will no doubt be a variety of approaches and disagreements about which approach is best for tapping the jointly constructed nature of behaviors in ongoing interaction. Some research will focus on single behaviors while others will examine multi-signal configurations; some

will focus on the dynamic process at a single point in time while others will look at a stream of behavior across several points in time. Still, if the interest indicated by the researchers writing for this volume is any indication, we are on the verge of learning a lot more about the communicative nature of nonverbal behavior.

When we planned this volume, we knew that a “dyadic perspective” was a good fit for some areas of nonverbal study and provided this designation for certain chapters in the table of contents. For example, the study of mimicry and synchrony is, by definition, the study of how communicators reciprocally affect each other (Chapter 18). What we were surprised to find, however, was how many chapters pursued some form of this dyadic perspective. Facial behavior, for example, is conceptualized as a communicative system, not just an expressive one (Chapter 6); interracial transactions are examined in the context of mutually influential behavior and perceptions (Chapter 22); research reported in Chapter 12 reveals instances in which the exchange of nonverbal behavior affects the physiology and physical health of both interacting parties; Chapter 25 documents the importance of analyzing the dynamic interplay of teacher/student nonverbal behavior; Chapter 14 makes the point that the “individual ability” to accurately send nonverbal cues also needs to be conceptualized as an interactive behavior that depends to a great extent upon the responses of receivers; and Patterson’s model of nonverbal interaction (Chapter 17) is deeply rooted in the interdependence of sender and receiver, accounting for the dynamic effects of each interactant’s behavior, goals, expectations, biology, culture, personality, and gender.

Because the behavior in ongoing interaction may take on a reality of its own, it will not be surprising if we find that some results from previous studies of uninvolved observers and self-reports of nonverbal behavior may be less predictive and/or accurate in describing social exchange than we previously thought. To illustrate the point, consider the ratings of an unknown person’s physical attraction based on a photo and ratings of the same person after a brief face-to-face encounter. The engagement in interaction can offset or exacerbate the pre-interaction perceptions, depending on how the rater’s interaction behavior is perceived. This doesn’t mean that non-interactive data can’t provide insights and explanations for interactive behavior. What transpires in actual interaction can be more than the responses to a partner’s manifest behavior. Supplemental information on communicator expectations, goals, perceptions of partner characteristics, and the like provide a basis for additional explanations of observed behavior. So observations of overt interactive behavior and self-report data supplement each other as long as the self-reports are anchored to the interaction context being studied.

2 Embracing new measures and methods

Rapid technological advances and creative researchers are increasingly capturing and analyzing nonverbal behavior in ways that an earlier generation of scholars

couldn't have imagined. One creative development for coping with the tedious and time consuming coding of nonverbal behavior is the study of "thin slices" of behavior. The results of studies predicting the outcomes of longer streams of ongoing behavior by collecting and analyzing only a small portion of it (thin slices) have been impressive in some situations and may bode well for future research (Chapters 3 and 25). While there are still questions about the ideal length and frequency of thin slices for optimum predictive validity and the contexts in which this measure is most effective, it is likely to be an important part of the future of nonverbal studies.

Computers are also increasingly being used to code and analyze nonverbal behavior and there is every reason to believe this will continue. Eye tracking technology reveals how people scan faces (Chapter 9), but it can also provide valuable information about what other behaviors people perceive (or don't perceive) during an encounter. Gait, posture, head movements, and facial expressions (including micro-expressions) have all been subjected to automated analyses via computer technology (Chapter 24). The collection and analysis of data from vocal cues is also becoming increasingly sophisticated with advanced computer technology (Chapter 7). Computers can increase the ease of data collection and the efficiency of data analysis, but they also increase the opportunities for the micro-analyses of behavior. We are seeing applications of artificial intelligence, robotics, and immersive virtual reality. The use of technology to analyze nonverbal behavior is unquestionably a part of our future – even more so as its accuracy and unobtrusive use are perfected.

While social learning has, for decades, been the likely default explanation for nonverbal behavior, future studies by nonverbal researchers who focus on the biological and physiological foundations of behavior are likely to supplement and/or replace some of those explanations. The increasing availability of brain imaging machines provides nonverbal researchers with critical knowledge of how people process information linked to nonverbal behavior and control (or lack of control). In addition, the study of human physiological states and changes in those states during interaction can increasingly be tapped by remote and other less invasive methods (Chapter 10). For example, samples of saliva now provide data that previously required drawing blood.

3 Penetrating the nature of the behavior

Given the central role played by nonverbal behavior in so many crucial messages we exchange every day (intimacy, emotion, compliance, identity, interaction regulation, etc.) a detailed understanding of the behavior itself is a constant challenge. Each of the chapters in this volume demonstrates that the more we learn about the nature of nonverbal behavior, the more there is to learn. They forecast a relent-

less scrutiny and fine tuning of the structure and manifestation of nonverbal behavior in social interaction.

For example, behavioral measures of frequency and duration have been a staple of nonverbal studies, but focusing exclusively on one or the other may not always uncover the behavior's potential. As noted in Chapter 16, the frequency of head movements, adaptors, and illustrators may not predict deception as well as the duration of these behaviors. Other temporal features like when a behavior occurs relative to a partner's behavior and the timing of the behavior relative to co-occurring behaviors may be telling in other studies. To fully understand constructs like mimicry and interaction synchrony it may be necessary to make multiple observations at multiple points in time during a stream of interaction.

While some studies focusing on a single nonverbal behavior make an important contribution and continue to be a part of the literature, many authors in this volume recognize the value and need for more multi-signal and multi-channel studies. The interdependence of verbal behavior and gestures (Chapter 8) is only one indication that there may be more studies ahead that find value in combining observations of verbal and nonverbal behavior. Suspicion of deception, as noted in Chapter 16, often arises because of the contrast between verbal (affirmative statements) and nonverbal (negative head nodding) behavior. Inevitably, multi-channel and multi-signal studies within the same channel will raise difficult questions regarding the way these signals interrelate with one another and the relative impact of certain combinations over others.

Several authors reaffirmed the existence of two different types of nonverbal interaction behavior – one that is more controlled, conscious, and intentional and one that is more spontaneous, less conscious, and less intentional – and stressed the importance of making this distinction (e.g., Chapters 14 and 17). These differences are not limited to encoding behavior. Trait impressions from another person's physiognomy (Chapter 10), the emergent coordination of behavior during conversation (Chapter 18), and the ability to respond to micro facial expressions without being aware of the cues may be the result of more automatic processes associated with decoding. While there is little controversy about the existence of these phenomena, refinements will no doubt be forthcoming. We may learn to distinguish degrees of awareness, identify places where the level of awareness changes during a conversation, or establish communicator intentions via measures of persistence, effort, and emphasis exhibited nonverbally.

Distinguishing intentional and spontaneous behavior is only one important distinction called for by the authors in this volume. Several chapter authors have pointed out the need to make more precise distinctions between related constructs in order to clarify what is known about a particular phenomenon – e.g., power and dominance in Chapter 20; affectionate communication, positive involvement, immediacy, and flirtatious behavior in Chapter 19; and mimicry and interactional synchrony in Chapter 18. Sorting out the overlapping and distinctive nature of

these and other constructs is sufficiently frustrating in determining what is known that undertaking this conceptual work is surely on the agenda for the future of nonverbal studies.

Ironically, the more we make clear-cut distinctions that create separate categories of study, the greater the risk that these separate areas of study may grow a narrow, but substantial literature and establish a distinct identity apart from the larger field of nonverbal communication. Although the study of gestures is currently an integral part of nonverbal studies, it now has its own scholarly journal (*Gesture*) and holds international conferences specifically focused on the study of gestures.

4 Giving context its due

Research contexts give meaning to our findings and generalizations about the effects of nonverbal behavior. Context provides the boundaries for understanding and publicizing what we know about nonverbal communication. But the desire to make far-reaching conclusions is strong and can lead to the elimination of important contextual information associated with research findings. The results of a particular study, a literature review, or an account in a textbook are all subject to generalizations that exceed the research context. Given the repeated sensitivity to contextual issues implied and stated by the authors of this volume, we expect a future in which nonverbal scholars show greater care in generalizing beyond the contextual limits of their research and build research literatures that are sensitive to contextual limitations.

Perhaps the most infamous case of insensitivity to context, mentioned by several authors in this volume, concerned the studies of Mehrabian and his colleagues. They conducted two experiments that revealed the relative influence of different channels of communication and concluded that the influence was 7% verbal, 38% vocal, and 55% facial. Among other limitations, the experiments used a single word as the verbal stimuli, made vocal tone inconsistent with word meaning, and focused on perceived feelings. Many from academe and outside academe interpreted these findings as applicable to any interpersonal encounter and some even combined the vocal and facial percentages – concluding that 93% of the influence in human interaction is from nonverbal behavior. It is easy for the academic community to attribute the spread of this context-free interpretation to forces outside of academe, but the context framing of research findings is not always highlighted in academic literature reviews and meta-analyses either. One needn't look far to find a literature review or meta-analysis of the deception detection literature that cites the finding that people's ability to detect deception is slightly above chance without noting the conditions under which this occurs. Spreading the belief that deception detection is akin to flipping a coin omits the fact that

detection rates are far better than chance in certain contexts – contexts in which the observation of certain nonverbal behaviors can be very effective in detecting deception. In short, different predictions of detection accuracy are needed for different interpersonal contexts.

Needless to say, giving context its due isn't easy. Context is viewed in many ways – as institutional and social settings; as an arena of behavior like work or family; as characteristics that comprise a physical, psychological, and/or social environment; as message characteristics like a formal or informal style; and others. There is no need to agree on a single definition of context or prioritize one view over another as long as the parameters of the definition chosen for any particular line of research are clearly presented.

5 Letting theories emerge

The development of a theory can occur in several different ways, but many emerge out of behavioral observations and description. Since the observation and description of behavior is central to the work of nonverbal scholars, there is no reason to believe that the field will be theory poor in the future. In fact, given the theoretical history associated with nonverbal studies and the scores of theoretical perspectives put forth in this volume, the future looks theoretically rich.

Each of the pioneers like Birdwhistell (kinesics) and E. T. Hall (proxemics) who spearheaded the field of nonverbal communication had their own theoretical perspectives (Chapter 2); Argyle and Dean's equilibrium theory spawned numerous studies and subsequent modifications of their theory; Mehrabian's concept of nonverbal immediacy is central to many theories related to the exchange of warmth, intimacy, and affection; Rosenthal's blending of expectations with the self-fulfilling prophecy provided a theoretical stance that culminated in scores of studies examining nonverbal communication in teacher/student, doctor/patient, manager/employee, judge/jury, and psychotherapist/client interaction; numerous studies have tested the matching hypothesis (judging physical attraction), the shared signal hypothesis (effects of eye gaze direction) and the facial feedback hypothesis. Theories of emotion have been a dominant force in guiding research on facial expressions and the role of nonverbal behavior in computer mediated studies have been well served by social presence theory and media richness theory.

Given the variety and differences among nonverbal behaviors, an overarching theory that describes, explains, and/or predicts all of them is not realistic. Nor is a theory that predicts how any given nonverbal behavior will manifest itself in every situation. Instead, we will continue to grow theories based on the observation and description of nonverbal behavior in various contexts and borrow theories developed for other constructs within which we think nonverbal behavior plays an important role. Sometimes a theoretical perspective on communication will be

valuable (e.g., expectancy violations theory, accommodation theory) and sometimes the most useful theoretical perspective will focus on the subject under investigation (e.g., interpersonal deception theory, social identity theory, theory of mind). Sometimes theory will grow as we move from a simple main-effects understanding of a phenomenon (such as gender differences, Chapter 21) to a more nuanced one that acknowledges the existence of moderator variables; and sometimes we will advance our understanding by applying theoretical perspectives from one domain (e.g., power and dominance) to another (e.g., gender and ethnic differences).

6 Applying what we know

For many who study how people interact, there is an accompanying desire to use that knowledge to teach others the skills needed to achieve their goals. While the applied focus in some of the preceding chapters is more explicit than in others, the bridge between understanding and application is one that nonverbal scholars are prone to walk.

The outcomes associated with certain nonverbal behaviors have often been examined in the context of social interaction between strangers, but increasingly scholars are asking questions about the nature of outcomes associated with nonverbal behavior in other contexts. It is not hard to see how skills based on the effective use of nonverbal behavior would be useful to teachers, those in law enforcement, lawyers, judges, sales representatives, physicians, diplomats, therapists, marital partners, politicians, those who use and design new technologies, and others.

The ecological validity of the research results we proffer to practitioners becomes especially important. Mental illness characterizes many of the interviewees secret service officers interview, but this is a relatively unexplored area of deception detection. Professional con artists and liars agree that lies mixed with truthful statements are the most effective way to deceive others but we know little about messages combining truth and deception. The results of teacher immediacy behavior studied in humanities and social science classrooms may or may not comprise good advice in chemistry, biology, and engineering classrooms.

The standards for data applied to critical life situations need to be high. Our behavioral prescriptions need to be based on data from replicated studies and critical contingencies must be acknowledged or accounted for. It is not unreasonable to expect that the advice we give to a person interviewing a terrorist, to a teacher who desperately wants his or her students to learn, or to a physician who wants to be able to more accurately read the nonverbal cues of his or her patients must be derived from the kind of testing that drug manufacturers are expected to give to a new product.

7 Rolling the dice

The number of experts who have tried and failed to predict the future in all spheres of human endeavor are legion. We hope our reading of the crystal ball created by this volume's chapters is reasonably accurate, even though some of the ideas we extracted from them were no doubt affected by our own biases. All we really know about the future is that change, sometimes dramatic change, is in the offing. We have not attempted to identify all of the exciting new directions described in the chapters of this volume; we have tried only to illustrate certain general themes. But if we have accurately tapped some of the indicators embedded in the writings in this volume, the future of nonverbal studies appears to be a bright one, filled with unrelenting efforts to deal with complex issues.

Biographical sketches

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Michael Strom received his PhD from Brandeis University, where he also served as a lecturer in the Psychology department in Research Methods and Statistics. His research focuses on face perception as it relates to stereotyping and impression formation. It has the ultimate goal of decreasing race-based prejudice by understanding how facial variations relate to specific stereotypes, and exploring ways of training perceivers not to fall victim to utilizing these cues negatively.

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