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Investigative Interviewing: A Team-level Approach

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INVESTIGATIVE INTERVIEWING: A TEAM-LEVEL APPROACH

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ABSTRACT

To date, the tandem interview approach has yet to be scientifically vetted as an investigative interviewing technique. Specifically, it is unclear what affect the application of two interviewers has on the investigative process. This is alarming considering that this approach is regularly applied under current law enforcement operations. Despite a dearth of research examining the tandem interview approach in investigative interviews, the extensive research on teams would lead us to believe that teams should benefit the overall investigative interview process and outperform individuals in detecting lies. Consequently, the goals of this research were to investigate these potential benefits. Findings from a laboratory study consisting of 90 simulated investigative interviews ($N = 225$) revealed several advantages associated with the application of the tandem interview approach. First, tandem interviewers found conducting the investigative interview to be less cognitively demanding and paid more attention to diagnostic cues to deception. Second, tandem interviewers conducted superior interviews than single interviewers. Specifically, they were able to obtain more information from interviewees, asked more open-ended questions, and asked a greater total number of questions. Despite outperforming single interviewers during the interview, tandem interviewers were unable to detect deception better than single interviewers. Still, overall detection rates were better than previous research. The general findings from this study suggest that tandem interviewers that adopt a rapport-based approach throughout the investigative interview can enhance investigative interviewing outcomes. Theoretical and practical implications, limitations, and future research are discussed.

For my mother, who inspired me to never settle for ordinary.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

A lie gets halfway around the world before the truth has a chance to get its pants on.

- Winston Churchill

At the Battle of Salamis in the year 480 BCE, Greek politician and Commander Themistocles send a loyal servant to Persian camps with a deception aimed at averting the fall of Greece: the Greeks were preparing to desert their position and the Greek aristocracy favored Persian victory. Outnumbered 3-ships-to-1, the Greeks cajoled the Persian fleet into the narrow strait of Salamis neutralizing their numbers and ultimately claiming victory.

In 1938, Adolf Hitler met with then-British Prime Minister, Neville Chamberlain, to discuss Germany's campaign to invade Czechoslovakia. Hitler assured Chamberlain that he would not mobilize his army against the Czech's. After their first meeting, Chamberlain penned a letter to his sisters declaring about Hitler; "I got the impression that here was a man who could be relied upon when he has given his word…" (cited in Ekman, 2009, pp. 15-16). In 1939, German forces occupied Czechoslovakia.

The Cuban Missile Crisis (October, 1962), a boiling point in the Cold War, was shroud in deception. As an example, the code name for the operation, ANADYR, was used to deceive both Soviet and foreigners alike about the destination of the Soviet supplies, as Anadyr was the site of a bomber base located on the Bering Sea (Hansen, 2002). Moreover, Hansen notes that "To strengthen the concealment, many [Soviet] units were outfitted with skis, felt boots, fleece-lined parkas, and other winter equipment" (pp. 50-51). Perhaps the grandest deception, and unbeknownst to the American public until 1992, Soviet forces in Cuba possessed 162 nuclear warheads – both tactical and strategic – prior to the escalation of the crisis (McNamara, 2005).

In 1972, the Democratic National Committee headquarters at the Watergate complex was broken into under the auspices of then-President Richard Nixon. Nixon denied any involvement. Later found guilty, he became the first and only president to resign from office in August of 1974.

Beginning in the early 1990's suspicions arose that Bernard Madoff was operating a Ponzi scheme. Madoff rejected accusations. In 2008, Mr. Madoff confessed to running a Ponzi scheme estimated at 50 billion dollars. In 2009, Mr. Madoff was sentenced to 150 years in prison.

In short, deception is a real threat to personal, national, and global security.

Problem Statement

The examples noted above highlight the need to better understand and detect deception. However, despite a centuries worth of scientific research on deception, relatively speaking, our understandings of the intricacies of deception are poor. The fundamental assumption of deception detection is that persons who lie betray cues to their deception, and these cues can then be used by observers to identify deceit. However, the ability to detect deception is dependent on various factors (e.g., stakes of a lie, difficulty of a lie, motivational forces, type of lie, individual differences, etc.). Moreover, deception detection is also reliant on the deceiver whose cues to deceit are dependent on the same factors which can combine in a myriad of ways to alter the reliability of the cues. In other words, diagnostic cues to deception may differ depending on a combination of factors. Understandably, this makes deception detection a very difficult task.

Numerous efforts illustrate the difficulties in detecting lies. An initial review by Kraut (1980) found deception detection accuracy amongst published studies to be 57%. Aldert Vrij (2008) reviewed studies conducted after Krauts review, and found detection accuracy to be just

above 54%. It is a widely cited phenomenon that lie deception abilities are equivalent to what would be expected by chance (i.e., 50%). In addition to these reviews, several meta-analyses have shed light on human lie detection abilities. Aamodt and Custer (2006), for instance, found that "professional lie catchers" were only marginally more accurate at detecting deception than were laypersons (55.51% vs. 54.22%). This finding parallels meta-analytic efforts by Bond and DePaulo (2006) who found accuracy detection rates of 54% for truth-lie judgments, and Bond and DePaulo (2008) who concluded that "virtually all individuals are barely able to detect lies, and that real differences in detection ability are miniscule" (p. 485-486).

In response to these disappointing results, researchers have heeded a call for the development of innovative methods of detecting deception (e.g., Porter & ten Brinke, 2010; Vrij, Granhag, & Porter, 2010). A large thrust of research has examined the effects of increasing the cognitive load of deceivers in order to elicit more reliable cues of deception (cf. Vrij, Granhag, Mann, & Leal, 2011). The results from this line of research have been encouraging. Additionally, researchers have begun to examine how deception unfolds amongst co-conspirators (i.e., two individuals attempting to deceive). In this line of research, the unit of investigation is on the dyad and identifying what Driskell, Salas, and Driskell (2012a) have termed social indicators of deception. Initial results are encouraging; indicating that there are characteristics of speech and behavior that are exhibited between suspects in truthful dyads and in deceptive dyads that reliably identify deception. Bearing in mind the importance of detecting deception for national security purposes, additional methods for unmasking deceit and reducing the difficulty of the deception detection task are needed.

Purpose of Current Study

The aim of this research is to identify the potential benefits of applying teams to detect individual deception and for enhancing the investigative interviewing process. In a recent article in *Science*, Bahrami et al. (2010) addressed the question of whether joint decision making can enhance performance on a perceptual decision making task, and found that interactive decision making between two individuals significantly improved perceptual sensitivity. Based on the assumption that two heads are better than one, research into team interviewing techniques in which two interviewers conduct suspect interviews may lead to improvements in the investigative process (e.g., types of questions asked) and on investigative outcomes (e.g., deception detection).

A typical investigative interview is a one-on-one interaction; a single interviewer engages a single respondent. We propose to extend current research beyond the scope of the individual interviewer to examine the use of teams – two individuals working together towards a shared outcome – in detecting deception. Research has indicated that there may be advantages to conducting what are called "tandem interviews," where two interviewers are present during an investigation (Kincaid & Bright, 1957). Moreover, recent research on investigative interviewing suggests that the anecdotal concern that tandem interviews may adversely affect rapport – which has been identified as an essential component of investigative interviews (Schollum, 2005) – is unfounded (Driskell, Blickensderfer, & Salas, 2012). Thus, if teams demonstrate better interviewing outcomes, such as more obtained information and better deception detection, we can begin to make a solid case demonstrating the benefits of tandem interviews. We believe that there are several key advantages to employing an interview team in investigative interviews.

First, tandem interviews can benefit from the traditional advantages of teams – the ability to pool resources, exchange information, coordinate actions, catch errors, and share responsibility for decisions (Driskell, Salas, & Hughes, 2010). For example, having two interviewers allows each interviewer to follow-up on the others' questions, fill in gaps, and check anomalies or inconsistencies that may not be caught by a single interviewer. Additionally, research on heuristics and biases (Tversky & Kahneman, 1974) has demonstrated that decision-makers routinely fall prey to debilitating cognitive shortcuts. Researchers have identified a bias called the *bias blind spot* which represents an individual's inability to accurately and reliably identifying when they use heuristics that result in biases. As West, Meserve, and Stanovich (2012) note "bias turns out to be relatively easy to recognize in the behaviors of others" (p. 1), suggesting that teamwork may help to mitigate bias during judgment and decision making tasks (e.g., lie detection).

Second, the task of an individual interviewer is a demanding one that places considerable burden on the ability of the individual to detect deception and conduct a comprehensive interview. If two interviewers are employed, for example, the workings and demands of the interview can be shared between them, thus reducing task demand and freeing up cognitive resources (Tremblay, Vachon, Lafond, & Kramer, 2011). The imposition of cognitive demand on interviewer performance has several important implications. Leveraging the literature on dual-process theories of judgment and decision making (cf. Evans, 2008) and persuasion (cf. Chaiken & Trope, 1999), research suggests that individuals possess two distinct modes for processing information: an effortful or systematic and an effortless or heuristic mode. The former mode requires greater cognitive capacity and results in a more comprehensive analysis of incoming information. Dual-process theories have begun to be applied to deception research (e.g., Forrest

& Feldman, 2000; Reinhard & Sporer, 2008; Reinhard, Sporer, Scharmach, & Marksteiner, 2011). Applying dual-process logic to what they term *credibility attribution*, Reinhard and Sporer (2008) found that "participants under low cognitive load followed the central route (systematic processing) and relied on both the verbal cues and the nonverbal cues to judge credibility. In contrast, participants under high cognitive load were uninfluenced by verbal cues." (p. 483). For the reason that verbal cues have been found to be more diagnostic of deception (Vrij, 2008b), this suggests that high levels of cognitive load may adversely affect deception detection. By the same reasoning, low cognitive load may facilitate lie detection. In this respect, if teams serve to attenuate cognitive load on a demanding task (e.g., an investigative interview), research suggests that this may have a facilitative effect on lie detection.

Third, the behaviors of the interviewee may systematically differ, or become enhanced, when being interviewed by two interviewers. A recent series of meta-analyses by Hartwig and Bond (2011) concluded that weak cues to deception are the dominant explanatory factor of poor lie detection. The presence of a second interviewer may serve to increase both interviewee arousal and cognitive load, resulting in enhanced cue salience or differential cue leakage. As Vrij, Fisher, Mann, and Leal (2008) reason, for example, liars are less likely than truthtellers to take their credibility for granted and thus may monitor the behaviors of the interviewer to evaluate if they are getting away with their lie(s). This, they note, consumes cognitive resources. Having two interviewers present may serve to increase cognitive load by the mere fact that the liar is required to monitor the behaviors of not one, but two interviewers. Moreover, the literature on social facilitation (Zajonc, 1965), derived from drive theory (Hull, 1943), suggests that a second interviewer may serve to increase the difficulty of the liars task and facilitate the performance of the truthtellers task (in the case that truthtelling is an easy task). A meta-analysis

conducted by Bond and Titus (1983) concluded that the presence of others (a) heightens arousal on complex tasks, (b) increases speed of performance on simple tasks and decreases the speed of performance on complex tasks, and (c) marginally enhances performance accuracy on simple tasks and degrades performance accuracy on complex tasks.

In brief, the extensive research on teams would lead us to believe that teams should benefit the investigative interview process. Specifically, research would suggest that teams can outperform individual interviewers both during and after the investigative interview.

Theoretical Approach

This dissertation spans several fields of study: research on deception, research on cognitive load and multitasking, and research on teams. Unsurprisingly, these fields of research adopt unique theoretical approaches, and as a result, these theoretical approaches will be differentiated in the literature review. Moreover, emblematic of scientific research, these fields of research do not adopt a solitary theoretical perspective. Consequently, the most predominant and relevant theories will be reviewed. Specifically, the field of deception can generally be divided into two principal theories: a cognitive load approach and an emotion-based approach. Although both perspectives will be reviewed, this research will explicitly adopt a cognitive load approach to deception. This dissertation will also discuss relevant theories related to cognitive load and multitasking. Additionally, theoretical perspectives of teams and decision making will be discussed.

It is important to note that in the most exact sense, the predominant theories of deception are not "true" theories. According to Cohen (1980), a theory is "a set of interrelated universal statements, some of which are definitions and some of which are relationships assumed to be true, together with a syntax, a set of rules for manipulating the statements to arrive at new

statements" (p. 171). Similarly, Bacharach (1989) refers to a theory as "a statement of relations among concepts within a set of boundary assumptions and constraints" (p. 496). According to Markovsky (1997), most of what passes for theory in the research literature is *quasi-theory*: general perspectives, empirical generalizations, and other less rigorous statements of opinion that are often insightful, but are imprecise enough that they are in essence unfalsifiable. Although both the cognitive load approach and an emotional-based approach to deception are theory-like; they point to the constructs that are deemed to be important, but lack the clarity of formulation that characterizes true theories. An ancillary aim of this dissertation is to better ground the deception literature to theory.

CHAPTER TWO: THEORETICAL BASIS

If you tell the truth, you don't have to remember anything.

- Mark Twain

Deception can be defined as "a successful or unsuccessful deliberate attempt, without forewarning, to create in another a belief which the communicator considers to be untrue" (Vrij, 2008, p. 15). As cited throughout Trovillo (1939), attempts to detect deception date back to the formation of early societies. For instance, Trovillo notes that by "(300-250 B.C.), we find very definite attempts to detect deceit and these, interestingly enough, appear relatively objective in method (i.e., feeling the pulse)" (p. 849). Additionally, Trovillo cites a Veda written circa 900 BCE which characterizes a liar as one who "does not answer questions, or they are evasive answers; he speaks nonsense, rubs the great toe along the ground, and shivers; his face is discolored; he rubs the roots of the hair with his fingers…" (p. 849). The fascination with deception and lie detection should not come as much of a surprise. Lying is not limited to the morally depraved. Research on the prevalence of lying in everyday life has illustrated that on average, people lie once or twice daily (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996). Moreover, research conducted by The Global Research Deception Team (2006) has shown deception to be a global phenomenon. In fact, lying is considered to be a fundamental characteristic of life (Ekman, 1985), and has been advanced as an explanatory factor in the evolution of unconscious mental states (Smith, 2004). Unconscious mental states have been proposed to have burgeoned from the need to successfully deceive others. Specifically, it was first proposed by evolutionary biologist Robert Trivers that self-deception – the ability to deceive oneself – evolved from the need to deceive others (cf. Trivers, 1985; von Hippel & Trivers, 2011). Additionally, as previously noted, deception may have severe consequences for persons,

nations, and society as a whole. For example, corporate fraud, a form of deception, is estimated to result in organizational losses of 5% of yearly earnings worldwide (Association of Certified Fraud Examiners, 2012). Extrapolating from the global financial figures for 2011, the Association of Certified Fraud Examiners estimates losses of more than $3.5 trillion per year.

The deception detection literature can generally be separated into two initiatives. The first initiative is the psychophysiological detection of deception (PDD), which attempts to uncover deception through physiological cues (e.g., skin conductance, heart rate, pupil dilation). This initiative typically involves cues to deception that cannot be seen or heard by the lay observer, and consequently requires instrumentation to assess these cues. The best known example of such a technology is the polygraph. According to Honts (2004), the relationship between lie detection, the polygraph, and psychological research can be traced back to the turn of the nineteenth century.

The second initiative – and the field of research this dissertation concerns itself with – is the detection of deception though behavioral or verbal cues. Typically, cues to deception examined within this field of research entail those that can be viewed or heard by the lay observer (e.g., fidgeting, hand adaptors, vocal cues, content cues, etc.) without the use of instrumentation.

As previously mentioned, the underlying assumption of deception detection is that (a) when people deceive, they may "leak" cues indicative of that deceit, and (b) if cues are "leaked," they can be encoded and used by observers to assess veracity. However, it has been noted that "The mere fact that people lie will not affect their behaviour, speech content or physiological responses" (Vrij, Granhag, & Mann, 2004, p. 1). Differentiation in deceptive responses can be explained by the various theoretical perspectives offered by the field.

Theories of Deception

In the following section, we identify and discuss the prevailing theories of deception. Specifically, we review Zuckerman, DePaulo, & Rosenthal's (1981) Four Factor model of deception, DePaulo and colleagues (DePaulo, 1992; DePaulo et al., 2003) self-presentational approach to deception, and Burgoon and Buller's (1994) interpersonal deception theory (IDT). Following this review, we present a more granular evaluation of the cognitive load approach to detecting deception.

Zuckerman et al. (1981) Four Factor Model

The Four Factor model of deception reflects four factors implicated in eliciting cues to deception. Over the years this model has, by some researchers, been reduced to three factors. Consequently, the field refers to this model by varying names (e.g., Four Factor model, multi-factor model). For the purposes of this research, we review each factor of the originally proposed model: attempted control, arousal, the affective approach, and cognitive load.

Attempted control. Research on impression management and self-presentation has illustrated that individuals control their own behavior during social interactions (Baumeister, 1982). In the case that an individual is engaged in a confabulation, he or she may attempt to control their behavior to appear truthful. This is the general premise behind the attempted control approach to deception. In describing the attempted control factor, Zuckerman et al. state that "Paradoxically, deceivers' attempts to control their behavior may serve as cues to deception. The controlled behavior may appear planned, rehearsed, and lacking in spontaneity" (p. 7). They also note the unlikely probability that deceivers are able to control all avenues of their behavior. Research conducted by Ekman and Friesen (1969, 1974) has illustrated that some channels (e.g., face) are more likely, and more easily, controlled than others (e.g., body). Moreover, some

channels have been found to be outside conscious control (e.g., saccades, minute facial expressions; ten Brinke & Porter, 2011). This research was founded on the original work conducted by Charles Darwin's (1872) in his landmark contribution to psychology, *The Expression of the Emotions in Man and Animals*. Zuckerman et al. note that a discrepancy may become present when individuals leak felt emotions or while attempting to feign unfelt emotions. Consequently, these discrepancies may give away an individual's deceit.

Arousal. Zuckerman et al. give credit to the view that lying produces arousal to the research on the PDD. The underlying assumption is that deceivers may become aroused when telling a lie, and that this arousal may be reflected in physiological activity (e.g., electrodermal response, pulse rate, pupil dilation, fMRI). For the reason that physiological responses are subject to less conscious control, this has been a particularly active area of pursuit. However, physiological responses are still subject to countermeasures (Honts, Raskin, & Kircher, 1994). Moreover, while lying may be associated with greater physiological arousal, deception may not be the singular cause. For example, other factors (e.g., a common cold, physical exertion, etc.) may affect both deceiver and non-deceiver physiological responses during measurement.

Zuckerman et al. cite the three theories presented by Davis (1961) for why lying is associated with autonomic responses: the conditioned response theory, the conflict theory, and the punishment theory. Zuckerman et al. notes that neither the conditioned response nor the punishment theory is particularly relevant to laboratory settings, thus only conflict theory is discussed here. Conflict theory posits that a large autonomic response occurs when two incompatible reaction tendencies are simultaneously aroused. During deception, for example, this occurs when one is faced with the conflicting tendencies to tell the truth and to lie. Additional approaches cited in Zuckerman et al. recognize autonomic responses to deception as a

function of either (a) an individual's "guilty knowledge", (b) their motivation to succeed, or (c) differential habituation curves shaped by the lie stimuli ("crucial question") contrasted with the truth stimuli ("control questions").

Affective approach. The affective, or emotional, approach is founded on Darwin's (1872) study of emotions and facial expressions. The assumption is that emotional expressions are generally universal in nature (*universality hypothesis*) and that specific emotions elicit specific expressions. The three emotions that are most likely to occur during deception are guilt, anxiety or fear, and "duping delight[1]." Specifically, individuals may feel guilty about deceiving someone, may feel anxiety about being caught, or may experience enjoyment in "pulling a fast one" on somebody. With each of these emotions arise specific expressions that may be leaked during deception. However, it is important to note that the likelihood that an individual experiences a certain emotion is dependent on a number of factors. Factors that may influence emotions include the type of lie being told (e.g., white lie or high-stakes lie), consequences of getting caught, who the lie is being told to, the preparation of the lie, amongst others. Moreover, recent research has begun to contest the general claims of the universality hypothesis (Jack, Blais, Scheepers, Schyns, & Caldara, 2009; Jack, Caldara, & Schyns, 2012; Jack, Garrod, Yu, Caldara, & Schyns, 2012). The three primary emotions are further expanded upon below.

Fear of being caught. The fear of being caught is referred to as *detection apprehension*. Detection apprehension may be highest when there are severe consequences to being caught, the liar is inexperienced, and the target of the lie is known to be suspicious. Ekman (2009) notes that it may be difficult to distinguish the innocent person's fear of being disbelieved from the guilty person's detection apprehension.

[1] Coined by Paul Ekman (1985)

Deception guilt. Deception guilt refers to the guilt felt stemming from the act of lying itself, not because one might get caught, but because lying is "wrong." Deception guilt can be mild or strong enough that it produces leakage or deception cues. However, Ekman (2009) states that "If the deceiver does not share social values with the victim, there won't be much deception guilt" (p. 67). That is, the liar may only experience deception guilt if he or she believes that the act is wrong and shares values with the target. For example, it may be against the beliefs of a devote follower to engage in deception. Many of the great world religions (e.g., Buddhism, Christianity, Islam, and Judaism) speak against the practice of deceit in their scriptures.

Duping delight. The act of lying may produce positive feelings related to the pleasure or excitement of duping the target. Duping delight may be present when (a) the target poses a challenge or is difficult to fool, (b) the lie is a challenging one, and/or (c) others may be watching or appreciate the liar's performance.

Cognitive load. Few would argue that lying can be a cognitively demanding task. The requirements to prepare or instantaneously fabricate a plausible lie, "keep up with" the lie, avoid contradictions, and evaluate whether or not one is getting away with the lie all impact the complexity of a lie. As Zuckerman et al. state, "To the extent that lying is a complex task, it may give rise to speech characteristics, pupillary responses, and gestures indicative of such complexity" (p. 10). Much research has adopted this perspective. In Zuckerman et al.'s (1981) meta-analysis of research on cues to deception, they found partial evidence supporting this position: Pupil dilation and increase in speech hesitations were significantly associated with deception, whereas illustrators (gestures) and response latency were not. Moreover, deceptive individuals may provide fewer details in their lies. Two reasons fewer details may be provided in deceptive statements are: (a) less detailed lies are easier to "keep up with" and (b) cognitive

resources may not be available to fabricate superfluous details. Empirical evidence supports this finding (DePaulo et al., 2003).

DePaulo et al.'s Self-Presentational Perspective

The self-presentational approach adopts the perspective that liars attempt to control or self-regulate their behavior to avoid detection. This approach is grounded in the sociology and social psychological research on self-presentation (cf. Baumeister, 1982; Goffman, 1959). Thus, the important point from this perspective is not that liars experience specific emotions when lying, but instead that liars deliberately attempt to control or self-regulate these emotions and it is these attempts at self-regulation that can giveaway their deception[2]. Vrij et al. (2004) hint at another important point from this perspective. Specifically, they identify that this approach assumes similarities between truthtellers and deceivers. In other words, emotional responses (e.g., fear) are not the sole proprietorship of deceivers. Truthtellers may also experience similar emotions. In an accusatory style police interview, for instance, truthtellers may experience fear of not being believed, which may be misconstrued by an observer as fear of being caught.

According to this theory, a discrepancy exists between a liar's truthful claim and what a liar knows to be false. DePaulo et al. (2003) derive two implications from this deceptive discrepancy. Specifically, they state "First, deceptive self-presentations are often not as convincingly embraced as truthful ones. Second, social actors typically experience a greater sense of deliberateness when their performances are deceptive than when they are honest" (p. 77).

[2] It can be noted here that there is significant overlap between and within varying theories of deception. In other words, theories of deception (e.g., emotional-based vs. cognitive load) are not mutually exclusive and impose significant influence on one another.

Burgoon and Buller's Interpersonal Deception Theory (IDT)

The vast amount of literature on deception has examined deception almost solely from the point of view of the deceiver. In other words, research has investigated deception and the accompanying cues without directly factoring in the social nature of deceptive interactions. The key impetus of IDT is that deception should not be taken out of the social context. As mentioned earlier, telling a successful lie requires one to assess the receiver of the lie in order to determine if the lie is being successfully "pulled off." Moreover, if a deceiver determines that the lie is not succeeding, he or she may be required to adapt the lie. Thus, this approach emphasizes the dynamic, interactive nature of deception and the reciprocal influence between sender and receiver in communication.

The Cognitive Load Approach to Detecting Deception

As briefly mentioned, lying can be a more cognitively demanding task than truthtelling. However, it is important to note that this is not always the case. From the early works of Hugo Munsterberg (1908) and William Marston (1920), through more recent efforts by Zuckerman and colleagues (1981) and Vrij and colleagues (e.g.,Vrij, Fisher, Mann, & Leal, 2008; Vrij et al., 2011), cognition has played a central role in deception research.

In respects to the cognitive load approach to detecting deception, Vrij et al. (2010) claim that "The premise here is that lying is mentally more taxing than truth telling" and further argue that "In verbal and nonverbal lie detection, the emphasis has moved in recent years from emotion-based lie-detection techniques to cognitive-load lie-detection techniques…" (p. 91).

According to the cognitive load approach, lying is more cognitively demanding than truth-telling when the following six principles are in effect (cf. Vrij, Fisher, et al., 2008; Vrij et al., 2011; Vrij, Mann, et al., 2008):

1. The liar must fabricate a story and monitor the fabrication so that it is plausible and in line with other known facts and previous statements. Liars must remember what has been stated to maintain consistency. Finally, liars must refrain from providing new information.
2. Liars are not expected to take their credibility for granted, and thus may be more prone to monitor and control their behavior in an attempt to appear honest, which is cognitively demanding.
3. Liars must also monitor the interviewer's reactions to assess whether their fabrication is successful, which is cognitively demanding.
4. Liars may expend effort on the task of reminding themselves to act and role-play, which is cognitively demanding. This phenomenon can be linked to self-awareness theory (Carver & Scheier, 1978; Duval & Wicklund, 1972; Scheier & Carver, 1977) which suggests that acting in front of an audience may enhance self-focus, thereby increasing distraction and decreasing performance (Forsyth, 1983).
5. Liar are required to suppress the truth when they are lying, which is cognitively demanding.
6. Lastly, whereas activation of the truth may occur automatically, activation of a lie is deliberate, which is cognitively demanding.

Moreover, researchers note that truthtelling may also be a cognitively demanding task (DePaulo et al., 2003; Vrij, Fisher, et al., 2008). If this were the case, based on the cognitive-load approach the discrepancies between liars and truthtellers would diminish resulting in smaller differences in displayed cues. Truthtelling may be demanding if the event to be recalled is unclear, or occurred in the not so recent past, requiring the truthteller to more demandingly reconstruct the event from

memory. Additionally, if the truthful event is related to a traumatic experience (e.g., child sexual abuse cases) the truthteller may attempt to suppress this memory resulting in a more demanding reconstruction of the event during recall.

Vrij, Fisher et al. (2008) aver that there are two formulations of cognitively-based approaches to deception. The first is called the "mere cognitive load" approach and accepts that the act of lying generates signs of cognitive load. They state that this approach stems from the work of Zuckerman et al. (1981). The second approach, which they state originates from their own work, is called the "increasing cognitive load" approach, and this approach argues that interviewers can increase the cognitive load that liars experience when they lie by inducing additional cognitive load. Introducing additional cognitive load has been accomplished by means of recalling events in reverse order (Vrij, Mann, et al., 2008), maintaining eye contact (Vrij, Mann, Leal, & Fisher, 2010), asking unanticipated questions (Liu et al., 2010; Vrij et al., 2009), adopting a devil's advocate approach (Leal, Vrij, Mann, & Fisher, 2010), using drawings as tools to detect deception (D. Leins, Fisher, Vrij, Leal, & Mann, 2011; Vrij, Mann, Leal, & Fisher, 2012; Vrij, Leal, et al., 2010) and having individuals engage in secondary task performance (Patterson, 2009). Vrij, Fisher et al. (2008) claim:

> People require more cognitive resources when they lie than when they tell the truth to produce their statements, and therefore will have fewer cognitive resources left over to address these mentally taxing interventions when they lie than when they tell the truth. This should result in more pronounced differences between lying and truth-telling in terms of displaying signs of cognitive load – e.g. more stutters and pauses, slower speech, slower response times, less quality details, inconsistencies, fewer movements – when these cognitively demanding interventions are introduced than when such interventions are not introduced. (p. 41)

Vrij, Fisher et al. (2008) argue that "A lie detection method can be effective only if it is based on sound theory" (p. 39) and "increasing cognitive load" presents an "alternative, theory-driven approach to discriminate between truth-telling and lying that is based on cognitive theory"

(p. 40). However, the theoretical rationale, or the extent to which this approach is based on existing theories of cognitive load, is not expounded beyond the six principles listed above. That is, the question of *why* or *how* fabricating a lie may be more cognitively demanding is not elaborated in light of extant theories of cognitive load. This is not particularly surprising in that the literature on deception (DePaulo et al., 2003; Vrij, Granhag, et al., 2011; et alia) and the literature on cognitive load and multitasking (Lavie, 2010; Navon & Gopher, 1979; Salvucci & Taatgen, 2008; Sweller, 1988; Wickens, 2002; et alia) are distinct literatures. Moreover, we note that the deception literature is surprisingly insular considering its direct relations to social and cognitive psychology. However, given that the broader cognitive load literature provides the theoretical foundation for the cognitive load approaches to deception, it is necessary to examine it in further detail. Moreover, this literature can help provide insight beyond what has been gleaned in the deception literature.

Theories of Cognitive Load and Multitasking

As Salvucci and Taatgen (2008) note, our ability to carry out multiple concurrent tasks is an extraordinary aspect of human cognition. The view of one's ability to multitask is perhaps best described by William James (1890, p. 409) when he wrote: "If you ask how many things or ideas one can attend to at once, the answer is not very easily more than one, unless the processes are very habitual" (cited in Wickens, 2012). The cognitive load approaches to deception outlined by Zuckerman et al. (1981), Vrij et al. (2011), and others are general statements that relate cognitive complexity to deception, but, by and large, do not explicitly tie these approaches to grounded theories of cognition (for notable exceptions see, for example, Forrest & Feldman, 2000; Reinhard & Sporer, 2008; Reinhard, Sporer, Scharmach, & Marksteiner, 2011; Sporer & Schwandt, 2006, 2007). Certainly the cognitive load approaches are established via these

theories; however, deception researchers do not do a good job detailing the actual theoretical rationale underling these approaches. Especially considering comprehensive theories of cognitive load or multitasking are available in the literature. In the following section, a review of extant theories of cognitive load and multitasking is presented. Moreover, implications are drawn from the theories and their relation to deception.

Task load is defined as performing two or more tasks concurrently. This construct is related to a number of other terms, including multitasking, dual-task performance, and workload. Typically, the term *workload* refers to the individual's perception of the work demands imposed by a task environment, although the term has also been used to describe the demands of the task environment itself in terms of the volume and pace of the work to be performed (cf. Young & Stanton, 2005). *Multitasking* is defined as managing and executing multiple concurrent tasks (Salvucci & Taatgen, 2008) or performing multiple tasks within a limited time period (Fischer, Morrin, & Joslyn, 2003).

Task load has also been investigated as divided attention or dual-task performance. The dual-task paradigm is a standard methodology for assessing workload. This methodology is based on the assumption that available attentional resources are limited, but can be flexibly allocated (Baddeley & Logie, 1999; Baddeley, 1986). In the dual-task paradigm, an individual is required to perform two concurrent tasks. If both tasks require similar cognitive resources, then these resources have to be divided between the two tasks. Therefore, fewer cognitive resources are available for performing each task than would be available for performing a single task. If one task is prioritized (that is, there is a primary task and a secondary task), then individuals typically allocate limited attentional resources to the primary task and secondary task performance suffers (Kahneman, 1975; Mcleod, 1977; Neisser & Becklen, 1975). If both tasks

have equal priority, errors may be observed on both tasks, although some research has shown that practice may result in more accurate time-sharing (Schumacher et al., 2001). In brief, research within the dual-task paradigm indicates that concurrent tasks interfere with one another because of the increased demands on limited attentional and processing capacity.

Research further suggests that the negative effect of task load on performance is greater when the tasks performed are similar and when the tasks are novel, unfamiliar, or difficult. There is a substantial body of research suggesting that the degree of similarity between two tasks is of great importance in determining the impact of task load on performance. Eysenck (1984) distinguished between three types of similarity: (a) similarity of stimuli involved in the task, (b) similarity of internal processing operations, and (c) similarity of responses.

Multiple Resource Theory

Multiple resource theory (Wickens, 1984, 1991, 2002, 2005; Wickens & Liu, 1988) presents one approach to understanding how well each task in a multi-task set will be performed in combination relative to how each is performed alone, and to understanding the mechanisms by which decrements in performance are produced. According to multiple resource theory, three factors are important in determining how well or poorly multiple tasks can be performed:

1. The resource demand, or difficulty, of the tasks. In brief, two simple or easy tasks can be performed concurrently with no decrement, but as one or both tasks increase in difficulty, they compete for limited resources. Thus, multitasking performance is a function of the difficulty of the tasks to be performed.
2. Resource allocation. This refers to how limited resources are allocated between multiple tasks. Thus, multitasking performance is determined by executive control processes such as resource allocation, task switching, and interruption management.

3. Resource multiplicity. Individuals do not possess a single pool of resources that various tasks compete for, but possess multiple resources. Thus, multitasking performance is dependent on the extent to which different tasks demand common or separate attentional resources.

Resource demand. Wickens notes that tasks that are automatic, either because of extensive practice or because the task is exceedingly simple, require minimal attentional resources to be performed. In this sense, an "expert liar" may be able to produce a plausible story with minimal attentional resources expended, thus allowing additional resources to be available for performing concurrent tasks (e.g., monitoring the interviewer for feedback or controlling behavior). Two primary factors that increase resource demand are lack of experience at the task and the intrinsic difficulty of the task. Increased demand leaves the task performer with less residual attention or spare capacity to perform concurrent tasks.

The intrinsic difficulty of a task is related to a number of factors, including: (a) task structure, including the rate at which information is presented and the length of time the task must be performed, (b) the requirements for speed or accuracy (i.e., almost any task can be made more difficult by increasing the demands for additional speed or accuracy), and (c) task complexity such as the number of alternative choices to be considered and the ambiguity and novelty of information presented (Huey & Wickens, 1993). Moreover, task difficulty can be influenced by extrinsic factors such as fatigue, stress, and other external demands.

Resource multiplicity. The multiple resource theory proposes that any given task can be represented by demands on either dichotomous level of three resource dimensions: (a) processing stages (perception and working memory vs. response), (b) processing codes (verbal vs. spatial), and (c) processing modalities (auditory vs. visual). To the extent that two tasks demand separate

resources along these dimensions, multitasking is enhanced. However, to the extent that two tasks demand the same resources on any of the three dimensions, there will be greater interference and multitasking will be more difficult.

The first dimension reflects *processing stages*. Wickens (2012) suggest that the attentional resources required for perceptual and cognitive activities (such as working memory) appear to be similar to one another, and are distinct from the resources required for the execution of responses. For example, Shallice, McLeod and Lewis (1985) investigated dual-task performance on tasks involving speech recognition, a perceptual activity, and speech production, a response execution, and concluded that the resources underlying these processes were separate. Thus, two tasks both demanding either (a) response processes or (b) perceptual or cognitive processes (e.g., decision making, working memory, information integration) will interfere with each other to a greater extent than will two tasks, one of which requires perceptual or cognitive processes and the other requiring response processes.

The second dimension reflects *processing codes*, representing a distinction as whether a task is processed verbally or spatially. Thus, research indicates that spatial and verbal processes leverage separate processes, whether operating in perception, cognition, or response (Wickens, 1980). Therefore dual-task interference is less if one task is responded to verbally and the other task requires a manual response. Conversely, if multiple tasks require verbal cognition or processing, multitasking is more difficult.

The third dimension is *perceptual modalities*, representing a distinction between auditory and visual modes of processing. It is more difficult to divide attention between two visual inputs or two auditory inputs, whereas dual-task interference is less likely if one has to divide attention between a visual task and an auditory task.

Figure 1, from Wickens (2012), presents a three-dimensional cube representation of these three resource dimensions. Any specific task may occupy one or more of the cells in this cube. To the extent that a second task occupies the same cell, there is likely to be dual-task interference based on competition for common resources. In brief, the increased cognitive load from performing concurrent tasks is a joint function of difficulty (resource demand) and shared processing mechanisms (resource multiplicity).

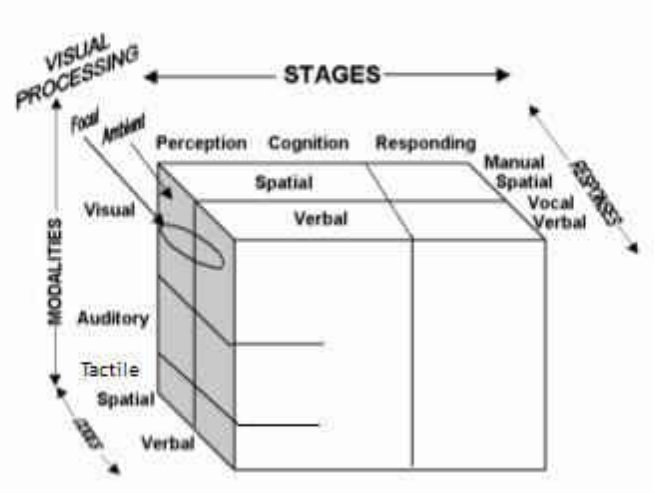

Figure 1. A three-dimensional cube representation of the multiple resource model (from Wickens, 2012).

If, according to multiple resource theory, performance decrement is a function of task demand and resource competition, then how is this decrement managed? The third component of multiple resource theory, as shown in Figure 2, is *resource allocation* or resource management. Allocation of resources is performed by the executive control system (Baddeley, 1983, 1995), by which tasks are prioritized, attention is switched between tasks, and interruptions are managed. Wickens (2012) notes that task management itself is a source of high cognitive workload or resource demand, competing with task demands.

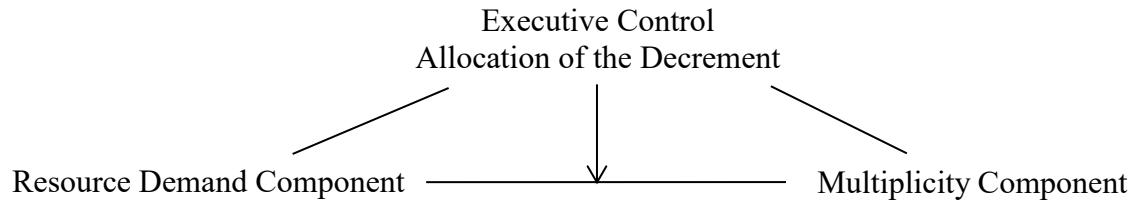

Figure 2. The three primary mechanisms of multiple resource theory (from Wickens, 2012).

An interesting related perspective on task demands is provided by research on *performance pressure* (Baumeister, 1984; Hardy, Mullen, & Jones, 1996). This research has examined how the desire to perform well under conditions of high importance or consequence can paradoxically lead to performance decrement. The term *choking under pressure* has been used to describe conditions under which performance pressure can disrupt the performance of skilled tasks. One explanation for this decrement argues that performance pressure fills working memory with thoughts about the task, the situation, and its' importance, thus reducing the resources available for task execution. Performance pressure produces a dual-task environment wherein regulating task execution and concerns about performance compete for the attentional capacity that would normally be allocated to primary task performance (Beilock, Kulp, Holt, & Carr, 2004).

Threaded Cognition

The *threaded cognition* theory of multitasking (Salvucci & Taatgen, 2008) proposes that each task to be performed can be viewed as a separate task thread. For example, a professor may have several cognitive threads operating at a time, including a thread related to grading classwork, a thread of ensuring students aren't cheating on an exam, and a thread of listening to a student's question. Therefore, multiple threads can be active at a time, in parallel. However, conflicts or bottlenecks can occur when multiple threads or tasks either demand the same resource (such as when two tasks both require vision or retrieval from memory) or when multiple

tasks require attention from the central procedural resource (in this example, the professor). Thus, multiple threads or tasks can be active at any time, but only one thread can use an available resource such as declarative memory at any time, and only one task can use the central procedural processing (akin to attentional resources) at one time.

The primary predictions of this approach are that when two tasks require similar resources (e.g., perceptual, motor, etc.); dual-task performance for one or both tasks suffers. Second, when two tasks demand procedural resources (or demands on central cognitive processing), then dual-task performance for one or both tasks will suffer.

Fischer and Mautone (2005) argue that the requirement to interleave multiple tasks under time constraints is a key distinguishing characteristic of multitasking. Oswald, Hambrick, Jones, and Ghumman (2007) note that multitasking environments do not simply involve multiple tasks, but also require shifting of attention from one task to another.

Fischer, Morrin, and Joslyn (2003) identify eleven key characteristics of multitasking environments. The characteristics that define different types of multitasking environments include: they (a) have multiple discrete tasks, (b) require that tasks must be interleaved and cannot be performed simultaneously, (c) require that tasks cannot be shed or significantly postponed, (d) do not signal or cue task initiation, (e) are dynamic and include interruptions, (f) present tasks that differ in priority, difficulty, and time needed for completion, (g) do not provide feedback for some tasks, (h) require that tasks be performed in seconds to minutes, (i) are time pressured, (j) include tasks that demand different kinds and amounts of cognitive resources, and (k) require extensive training or education. These characteristics are described in Table 1.

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Table 1. Characteristics of Multitasking Environments (from Fischer, Morrin, & Joslyn, 2003).

Characteristic of MT Environment	**Cognitive Operations Required**	**Rationale for Cognitive Operations**
1. Multiple discrete tasks.	Mental Set Switching STM storage STM rehearsal	Mental set must be changed when alternating between tasks. STM storage is necessary to remember completed tasks. STM storage typically requires rehearsal. May also require planning to organize multiple tasks in time and sequence.
2. All the necessary tasks cannot be simultaneously performed.	Mental Set Switching	Tasks must be sequenced in some way (serially, interleaved, or overlap) Requires task switching, hence mental set switching.
3. Tasks cannot be shed or significantly postponed because they are important or urgent.	Prospective Memory	If tasks cannot be shed or postponed, and they vary in priority or duration, then they must be interleaved. If interleaving is used as a strategy, prospective memory is required to remember incomplete and future tasks.
4. Environment does not signal or cue task initiation.	Prospective Memory	If tasks are interleaved and there is no cue to get back to or initiate a task, worker must use prospective memory.
5. The environment is dynamic and includes interruptions.	Divided Attention Selective Attention WM Updating and Monitoring	Interruptions are a form of dynamic environment where information is coming in from a variety of sources. These would demand either selective or divided attention, or both. Dynamic environment where worker continuously receives information.
6. Tasks differ in terms of priority, difficulty, and length of time.	Prioritization Deductive Logic	This requires prioritization because some of the tasks are more urgent. Prioritization in turn uses deductive logic to establish priorities.
7. Feedback is not provided for some tasks.	Classification Judgments LTM Retrieval	People must make judgments or classifications of adequacy of their performance. It would also require LTM retrieval on which to base judgments.
8. Most tasks are performed in the order of seconds to minutes.	Prospective Memory	Must use prospective memory because tasks must be interleaved because they must be performed within minutes.

Characteristic of MT Environment	Cognitive Operations Required	Rationale for Cognitive Operations
9. Environment is time pressured.	Prospective Memory	Must use prospective memory because tasks must be interleaved because they must be performed quickly.
10. Tasks vary in the amount of cognitive resources they demand.	Automatic Response Monitoring Prioritization	Some tasks are automatic, as execution has been proceduralized while others require focused attention. This means that task execution of automatic responses must be monitored and tasks that are demanding cannot be time shared and must be prioritized.
11. Performance requires training or education.	LTM Retrieval	LTM produced by training must be retrieved.

It is useful to examine the extent to which these characteristics describe or "fit" the task of formulating a deception in an interview environment:

1. Multiple discrete tasks: The task performer must perform several tasks (e.g., formulating a lie, monitoring the other for feedback, managing discrepancies, etc.).
2. All tasks cannot be simultaneously performed: That is, the cognitive demand is such that it exceeds attentional capacity.
3. Tasks cannot be shed or postponed: The multiple tasks cannot be scheduled or arranged so that one can be postponed while the other is performed.
4. The environment does not signal task initiation: That is, the tasks are not scheduled externally so that the performer is signaled when to switch from one to the other.
5. The environment is dynamic and includes interruptions: The environment is uncertain and dynamic.
6. Tasks differ in terms of priority, difficulty, and length of time: That is, the multiple tasks to be performed usually differ in terms of importance or priority.

7. Feedback is not provided for some tasks: Although the deceiver monitors the other for feedback regarding his or her performance, clear feedback on adequacy of performance is not provided.
8. Most tasks are performed in the order of seconds to minutes: The performer does not have an unlimited period of time to perform the tasks.
9. The environment is time-pressured: The performer must perform multiple tasks within an abbreviated time period.
10. Tasks vary in the amount of cognitive resources they demand: Some of the multiple tasks to be performed may be fairly automated (e.g., monitoring another for feedback) whereas other tasks (e.g., managing discrepancies or inconsistencies) may require greater attention.
11. Performance requires training or education: This refers to the requirement for the task performer to access task information from long term memory. What this would mean in a deception setting is that, in formulating a lie, some details or facts would need to be retrieved from long term memory.

Additionally, Fischer and Mautone (2005) note that multitasking environments may also differ along several dimensions. The characteristics that define different types of multitasking environments include:

- Consequences for error or failure. Multitasking environments may differ in the consequences for failure to perform the task successfully, from minimal to severe.
- Intensity. Some tasks may require more tasks per unit time, are more rapidly paced, and include more uncontrollable interruptions.

- Task characteristics. Important task distinctions include complex vs. routine decision making, ill-defined vs. well-defined problems, and autonomous vs. forced task shifting.

As noted previously, investigative interviewing is a demanding task requiring interviewers to carry out multiple tasks simultaneously. Consequently, the literature on multitasking applies directly to an investigative interviewer's performance. Specifically, the requirements to carry out tasks simultaneously can negatively impact an interviewer's performance during an interview. However, the demands of the investigative interview should be less in tandem interviews because the intricacies of the investigative interview noted by Tedeschini (2008) are distributed across the dyad. For instance, Tremblay et al. (2011) suggest that collaborative work can be advantageous "by virtue of the reduced individual workload when responsibilities are distributed across team members" (p. 81). The weight of existing evidence in cognitive psychology suggests that performance suffers on cognitively demanding tasks (Wickens, 2012). Thus, reducing the cognitive demand of the interview task can serve to free up resources that can be devoted to conducting the investigative interview. Moreover, research conducted on deception detection has demonstrated that increased cognitive load is negatively associated with deception detection accuracy (Reinhard & Sporer, 2008). Based on this research hypothesis 1a is as follows:

Hypothesis 1a: *Tandem interviewers will report less cognitive demand associated with conducting the investigative interview than single interviewers.*

Dual-Process Theories

Dual-process theories of human behavior emerging from the social and cognitive psychology literatures have been advanced for reasoning, social cognition, and judgment and decision making (Evans, 2008). Despite nuances between dual-process theories, each adopts the

general supposition that information is processed via an effortful or analytic mode and a less effortful or intuitive mode. Although commonalities exist across theories, there are two dual-process theories particularly germane to deception: the heuristic-systematic model (HSM; Chen & Chaiken, 1999) and the elaboration likelihood model (ELM; Petty & Wegener, 1999) of persuasion. These dual-process theories seek to understand the processes underling persuasive communications, such as those involving deception. For ease of understanding, the following section will apply the ELM to deceptive communications for the following reasons: (a) the ELM and HSM theories are similar enough theoretically to allow a general overview of the topic under consideration (Kruglanski, Thompson, & Spiegel, 1999), (b) the ELM allows for straightforward discussion and predictions for deception detection, and (c) the ELM has been successfully applied within deception research (Reinhard & Sporer, 2008, 2010).

The ELM proposes that persuasive communications are processed by one of two routes: a central or a peripheral route. The central route is analogous to analytic thinking, and in persuasive communications, reflects a receiver's focus on issue-relevant information (e.g., verbal content). The peripheral route corresponds to intuitive thinking whereby a receiver focuses less on issue-relevant information and more on peripheral cues such as sender attractiveness (Petty & Cacioppo, 1986). The use of either the central or the peripheral route has important implications for deception detection. First, it suggests that deception detection may be enhanced for individuals employing the central processing route due to an increased reliance on the content of a persuasive message. As previously noted, research on deception detection has argued the value of paying attention to message content over nonverbal behaviors (Vrij, 2008b). Second, it suggests that deception detection may get worse for individuals employing the peripheral processing route due to heuristic-driven attributions. For example, research has demonstrated

that attributes such as attractiveness benefit the deceiver for the reason that attractive individuals are generally deemed more credible than less attractive individuals (Vrij et al., 2004).

Use of the central route requires greater cognitive capacity (Reinhard & Sporer, 2008). Thus, cognitive resources must be available in order to exploit the central route; otherwise the peripheral route is utilized. For the reason that investigative interviewing should be considered a cognitively demanding task, this suggests that law enforcement officers engaged in active interviewing may not possess the additional cognitive resources required to employ effortful processing. This may explain the finding in the deception literature that active versus passive interviewing does not enhance deception detection ability (e.g., Buller, Strzyzewski, & Hunsaker, 1991; Burgoon, Buller, & Floyd, 2001; Dunbar, Ramirez, & Burgoon, 2003; Granhag & Strömwall, 2001a, 2001b; Hartwig, Granhag, Strömwall, & Vrij, 2004; Stiff, Kim, & Ramesh, 1992) despite professional (i.e., law enforcement officers, prosecutors, and judges) opinions to the contrary (Strömwall & Granhag, 2003). As noted by Vrij (2008a), "several experiments have shown that the accuracy rates of actual interviewers (layperson and professional lie catchers) are never higher, but sometimes lower, than the accuracy rates of passive observers" (p. 180).

Applying dual-process logic to deception attribution, Reinhard and Sporer (2008) directly examined the role of cognitive load on deception detection. In experiments two and three of a three experiment study, these researchers predicted that participants under high cognitive load would follow the peripheral route, and thus use nonverbal, as opposed to verbal information, to make credibility attributions. The findings demonstrated that "low cognitive capacity (Experiment 2 and 3) resulted in processing of information that is easier to use (e.g. nonverbal information), but not in processing of verbal information, which is more difficult to use" (p. 487). The researchers note that the findings are in direct agreement with dual-process models.

Research demonstrates that verbal content is more diagnostic of deception than nonverbal cues (Vrij, 2008a). Applying dual-process logic to deception attribution, research suggests that cognitive demand moderates the type of information an individual processes (see pp. 5 and 30). Specifically, under high cognitive demand, individuals process information that is easier use (e.g., nonverbal information). In contrast, under low cognitive demand, individuals employ a more effortful form of processing. This results in a greater amount of processing of verbal information. Research by Reinhard and Sporer (2008) has demonstrated this finding while manipulating cognitive load in individual judgments of deception. Hypothesis 1b predicts the following:

Hypothesis 1b: *When asked about what cues interviewers used to assess credibility, tandem interviewers will specify more verbal cues than individual interviewers.*

Summary

The cognitive load approach to deception detection is supported by comprehensive theoretical approaches to multitasking and cognitive load. These theories are well-supported, and although there are various perspectives offered by different researchers, the basic concepts and principles are clear and unambiguous. The cognitive load approach to deception is not linked closely to these more comprehensive theories, however, and there are a number of implications and insights that can be drawn from these broader theories that could inform cognitive load approaches to deception.

The preceding two sections discussed the relevant theory on deception and cognition. These sections were directed towards explaining the behaviors of the liars/truthtellers and the cognitive short comings associated with interviewing to detect deception. The following sections will outline the relevant literature with regard to teams and decision making.

Teams

A *team* can be defined as "a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively toward a common and valued goal/objective/mission, who have been assigned specific roles or functions to perform, and who have a limited life-span of membership" (Salas, Dickenson, Converse, & Tannenbaum, 1992, p. 4). The past several decades has witnessed an influx of research on teams. Considering the importance of teams in law enforcement, the military, and everyday life, this is not surprising. However, research on deception and investigative interviewing has, by and large, neglected the importance of teams. Much of the applied research on deception has focused on one individual's ability to assess another's veracity. While this is important, it limits the focus of existing research to the individual. As Driskell et al. (2012a) note, this "has resulted in an experimental paradigm in which one person (the truthteller or deceiver) sits across a table and is questioned by another person (the interviewer) in attempt to discern specific cues that distinguish truth from deception" (p. 2). In an attempt to expand the focus of existing research Driskell et al. (2012a) examined cues to deception that occur among pairs of persons, or at a social level. In addition to investigating what they coined social indicators of deception, it would also be valuable to examine the ability of teams to detect deception. As previously mentioned, extant research on teams would lead us to believe that teams should outperform individuals in detecting deception.

The following section will cover research on team processes, defined as "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing taskwork to achieve collective goals" (Marks, Mathieu, & Zaccaro, 2001, p. 357), and emergent states, defined as "constructs that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes" (Marks et al.,

2001, p. 357). Emergent states refer to the attitudinal, motivational, and cognitive states of teams. For the current effort, a focus on shared cognition and teamwork behaviors will be discussed.

Shared Cognition

As Tedeschini (2008) has argued, an investigative interviewer's task is an almost overwhelming one: Interviewers must "execute all the intricacies taught…which included analyzing the verbal and non-verbal behavior of the suspect, processing their verbal response and structuring the next question…" (pp. 3-4). In addition to these "intricacies," investigative interviewers also transcribe the events described by the individual being interviewed in order to structure future questions and refer back to interviewee's comments if necessary. In a conversation I had with a law enforcement officer (LEO), he stated that note taking during the interview distracted from the process and mired his ability to evaluate the interviewee. Although not discussed in the deception literature, loss of situation awareness (cf. Endsley, 1995) may play a significant role in real-world LEO's inability to accurately assess veracity.

Taking this into consideration, it is unsurprising that one's ability to detect deception rarely exceeds levels meaningfully greater than chance. Merely adding an additional interview can attenuate the cognitive demands that would be placed on the initial investigative interviewer. As previously noted, adding a second interviewer can allow the interviewers to share the intricacies and demands of the investigative interview. For instance, team interviews afford officers the ability to combine, or share, knowledge. However, sharing information is not always a straightforward process. For instance, research suggest that groups are more likely to share information that is common amongst the group, as opposed to unique information that each individual may possess (Gigone & Hastie, 1993; Stasser & Titus, 1985, 1987). It is important to

note that (a) this bias is reduced as group size decreases (Stasser, Taylor, & Hanna, 1989) and (b) this bias has been investigated and demonstrated in groups of three or more.

The role of shared cognition has been discussed in length by team researchers (Salas & Fiore, 2004; Salas, Fiore, & Letsky, 2011), and will be discussed below in light of deception. Specifically, we identify and discuss transactive memory, shared mental models, and shared situation awareness, three important and interrelated constructs.

Transactive memory. Transactive memory is an approach to understanding group behavior through comprehending how groups encode, store, and recall information about past events (Wegner, 1987). Compared to individuals, groups encode, store, and recall information transactively, that is, through a transactive memory system (TMS). Specifically, within TMSs information about past events is shared between the members of a group. This occurs for the reason that responsibility is split between the group members as opposed to the individual. Because information is shared transactively amongst the group, each member acts as an external memory storage facility for the group. Moreover, when information is recalled from memory, it is recalled in an interactive manner (Hollingshead, 1998). For instance, one member may recall a piece of information, which in turn stimulates the recall of another member. This process of shared recall can help to "fill in" pieces that individual recall may have left out. The empirical benefits of high-quality TMSs is well documented in the literature (DeChurch & Mesmer-Magnus, 2010).

In the investigative interview process TMSs serve two central purposes. First, during the interview, shared knowledge about the suspect and the situation can serve to stimulate a more comprehensive interview. For example, in an interview conducted by a single interviewer, he or she may forget aspects of a report or forget to follow-up on certain questions. In tandem

interviews these issues can be mitigated. Second, when judging veracity the interviews have a shared memory facility to draw upon, allowing them to develop a larger piece of the picture. Additionally, shared memory allows interviewers to "feed off" one another's knowledge. For example, one interviewer may note that after a certain question was asked, the suspect was vague in his or her response. Following this assertion, the second interviewer may recall that the suspect seemed to be "thinking hard" during his or her response or that details were inconsistent with previous responses. Combining this knowledge can assist in determining suspect veracity.

Shared mental models. Shared mental models (SMMs) are defined as "knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task, and, in turn, to coordinate their actions and adapt their behavior to demands of the task and other team members" (Cannon-Bowers, Salas, & Converse, 1993, p. 229). An extension of individual mental models, SMMs propose to explain how teams successfully adapt to and perform complex, dynamic, and unclear tasks (e.g., deception detection; Cannon-Bowers et al., 1993).

Early research on SMMs recognized that teams hold more than one type of mental model. Specifically, Cannon-Bowers et al. (1993) identified four types of mental models: equipment models, task models, team interaction models, and team member models. For reasons of parsimony, Mathieu, Heffner, Goodwin, Salas, and Cannon-Bowers (2000) argued that investigating all four SMMs in any one study is impracticable, suggesting that SMMs be collapsed into two primary types of mental models: task mental models and team mental models. Task mental models describe a shared understanding of the taskwork that must be performed, as well as how to perform these tasks in a given interaction. Mathieu et al. (2000) also note that task mental models comprise of "task strategies, likely contingencies or problems, and environmental

conditions" (p. 274). Team mental models reflect a shared understanding in regards to how team members are to interact with one another during a given interaction (Mathieu, Rapp, Maynard, & Mangos, 2009)

Within the investigative interviewing task of assessing interviewee credibility, for example, accurate SMMs may reflect the interviewers understanding of who has what tasks and which interviewer attends to what type of information (e.g., gestural, auditory, etc.). This understanding would, in turn, facilitate coordination and communication during the deception detection decision task. Accurate SMMs have been reliably associated with positive team outcomes (Mathieu et al., 2000; Mohammed, Ferzandi, & Hamilton, 2010).

Shared situation awareness. Endsley (1995) defined situation awareness as "the perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future" (Endsley, 1995, p. 36). As previously mentioned, at an individual level within the investigative interview setting, loss of SA may have detrimental effects. Within Endsley's conceptualization of SA, level 1 SA reflects the perception of elements in the environment. If for instance, perception is not accomplished, SA cannot be achieved. Originally studied as an individual-level construct, team researchers have adopted the concept and re-termed it team or shared situation awareness. Team SA reflects the degree in which team members possess the adequate SA required to successfully complete their responsibilities, in addition to each members' SA of the teams responsibilities (Prince, Ellis, Brannick, & Salas, 2007). The benefits of SA (i.e., individual-, team-) are well documented (Kaber & Endsley, 1998; Salas, Prince, Baker, & Shrestha, 1995). Moreover, mental models have been recognized as critical component of team SA (Artman, 2000; Mohammed et al., 2010; Nofi, 2000).

In the investigative interview, and specifically the deception detection task, a loss of SA may result in missed opportunities to identify cues to deception. Employing teams in the investigative interview can help mitigate this deficiency by creating redundancy. In other words, a loss of SA in interviewer A can be absolved by the SA of interviewer B. For instance, interviewer A may pick up a cue that interviewer misses because, for example, he or she jots down notes on a report.

Team Behavioral Processes

Shared knowledge is of little use if it can't be communicated. As previously mentioned, team processes describes how team inputs are converted to outputs (Marks et al., 2001; Mathieu et al., 2000). The taxonomy developed by Marks et al. (2001) delineates three subtypes of team processes: transition, action, and interpersonal processes. For the current effort, we are most concerned with action processes as they explicate the activities team members engage in *during* task performance. Moreover, action processes have received the most attention in team research, and subsequently their role in team performance has been well established (Mathieu, Maynard, Rapp, & Gilson, 2008). The behavioral processes concerned in this effort, and described below, are coordination and communication.

Coordination and Communication. Of the behavioral processes identified as central to team performance, Kozlowski and colleagues (Kozlowski & Bell, 2003; Kozlowski & Ilgen, 2006) identify coordination as the most important. Coordination has been defined as the "activities required to manage interdependencies with the team" (Kozlowski & Bell, 2003, p. 38). Coordination between team members can be either explicit or implicit in nature. Explicit coordination reflects overt behaviors such as communication and planning, whereas implicit

coordination reflects adjusting behaviors without being instructed (Salas, Shuffler, Thayer, Bedwell, & Lazzara, under review).

According to Zalesny, Salas, and Prince (1995), coordination is comprised of four key components and processes: goals (i.e., goal identification), activities/tasks (i.e., mapping goals to activities/task), actors/team members (i.e., mapping activities/tasks to actors/team members), and interdependencies (i.e., handling interdependencies). In a deception detection decision task, handling interdependencies is likely to be the most vital underling process. Specifically, being able to synchronize unique and shared information is vital for this task. In the deception decision task, coordination is best carried out through explicit communication.

Communication is a driver of coordination and a vital component of team decision making tasks (Kozlowski & Bell, 2003). For instance, Bahrami et al. (2010) found that "two heads were better than one" when dyads had the opportunity to communicate freely with one another. Clearly, exchanging information is a requirement for interviewers in a deception detection task.

For the reason that teams can pool resources, exchange information, coordinate actions, catch errors, and share responsibilities of the task, it is expected that tandem interviewers will outperform single interviewers. Specifically, they should be able to collect more pieces of information, and better quality of information, than individual interviewers. This hypothesis is founded on research demonstrating the benefits of teams and the impairments associated with cognitive load (see pp. see pp. 5, 19, and 34). As previously mentioned, teams afford teammates the opportunity to formulate follow-up questions and fill-in where an individual may have left something out. This can serve to increase the amount, and quality, of information obtained during the investigative interview. For example, Skipper and McCaghy (1972) found that

individually interviewing a "deviant" population interfered with the investigative process and made it more difficult to collect necessary information. These researchers found that this hindrance was attenuated when conducting tandem interviews. In the investigative interviewing task, the individual interviewer has multiple responsibilities. First, he or she must conduct the interview (e.g., pose questions, transcribe information, follow-up responses, etc.). Second, the interviewer needs to assess the veracity of the interviewees' responses throughout the interview process. As previously mentioned, the requirement to multi-task can degrade performance, especially on secondary tasks. Thus, the requirement to detect deception may intrude on the interviewer's ability to conduct a thorough interview, or vice versa. Hypothesis 2a-c is as follows:

Hypothesis 2a-c: *Interviews conducted by tandem interviewers will result in superior investigative outcomes, specifically (a) more pieces of information, (b) more open-ended questions, and (c) more overall questions than interviews conducted by individual interviewers.*

Presence of Others

Research on the presence of others demonstrates that an additional interviewer may adversely impact interviewee performance. Although negatively impacting performance is typically unwelcomed, making lying more difficult can be beneficial. Specifically, increasing the complexity of lying can aid lie detectors by producing more salient cues to deception.

Research stemming from Hull's (1943) drive theory suggests that it is possible to increase the arousal and difficulty of lying, while not effecting truth telling. For example, a meta-analysis on social facilitation by Bond and Titus (1983) found that the presence of others heightens arousal, but only on complex tasks. Moreover, as Mullen et al. (1997) note, the effect of "others" on arousal is likely dependent on several factors including the type of "other" and the

task setting. They note that arousal may be enhanced under condition that may "stimulate periodic social monitoring, engender apprehension about being evaluated, or generate attentional conflict" (p. 54). Considering that the addition of a secondary interviewer should constitute an additional evaluative other, we expect to observe an increase in arousal under these conditions. Thus, hypothesis 3a is as follows:

Hypothesis 3a: *Interviewees engaged in tandem interviews will report greater levels of arousal than interviewees engaged in single interviews.*

Additionally, the literature on social facilitation (Zajonc, 1965) suggests that tandem interviews may increase the difficulty of the liar's task, while facilitating, or not effecting, the performance of the truthtellers. For instance, the meta-analysis conducted by Bond and Titus (1983) found increased speed of performance on simple tasks and decreased speed of performance on complex tasks, and marginally enhanced performance accuracy on simple tasks and reduced performance accuracy on complex tasks; suggesting that the presence of others can serve to increase task difficulty. Second, Vrij et al. (2011) provide a list of six explanations for why telling a lie is more difficult than telling the truth (see section on *The Cognitive Load Approach to Detecting Deception*, p. 16). Amongst these explanations is the requirement for the liar to monitor the interviewer's reactions to assess if they are pulling off their lie. In the case where two interviewers are present, the liars are required to monitor two individuals, which is conceptually a more cognitively demanding task. Hypothesis 3b is as follows and is grounded in both social facilitation and cognitive complexity (see pp. 6, 16, and Theories of Cognitive Load and Multitasking, p. 19):

Hypothesis 3b: *Interviewees engaged in tandem interviews will report greater levels of cognitive demand than interviewees engaged in single interviews.*

The research on social facilitation and the research regarding the presence of others also suggest that a third party member may increase attentional conflict (see p. 6). According to Sander and Baron's (1975) distraction-conflict theory, the presence of others may serve to increase social drive via attentional conflict (i.e., distraction caused by relaying attention to others over primary task performance). In brief, the requirement to monitor two individuals can cause attentional conflict (Mullen et al., 1997), which may interfere with several tasks of the liar, for instance, the ability to keep up with a lie. Therefore, hypothesis 3c is as follows:

Hypothesis 3c: *Interviewees engaged in tandem interviews will experience greater attentional conflict than interviewees engaged in single interviews.*

The presence of two interviewers may serve to modify, or enhance, the behaviors exhibited by the interviewees. This notion is grounded in social facilitation (Baumeister, 1982; Zajonc, 1965) and cognitive complexity (Vrij, Fisher, Mann, & Leal, 2006). Moreover, extant research has shown that arousal, cognitive demand, and attentional conflict can moderate (i.e., enhance) cues to deception. That is, increasing an interviewee's level of arousal, making the task of lying more difficult, and creating an additional distraction while lying can enhance cues to deception. Therefore, hypothesis 3d is as follows:

Hypothesis 3d: *Verbal cues related to deception will be enhanced in tandem interviews.*

In order to investigate hypothesis 3d, we examine verbal cues to deceit related to cognitive processes that differentiate truth tellers from liars. Verbal cues to deceit will be examined because this class of cues has been shown to be the most diagnostic cues to deception. Specifically, we examine six of eight Reality Monitoring (RM) criteria outlined in Vrij (2008). Reality Monitoring is a verbal veracity assessment tool based on the influential work of Johnson and Raye (1981). Johnson and Raye (1981) refer to reality monitoring as "the process by which a

person attributes memory to an external **[i.e., an experienced event]** or and internal **[i.e., a fabricated event]** source" (p. 67). Reality monitoring has a strong theoretical foundation and seems to accurately distinguish between liars and truth tellers (Vrij, 2008). The specific criteria and the hypothesized directions are provided below in Table 2.

Table 2. Definitions of RM Criteria

Criteria	Definition	Direction
Clarity	The statement is clear and vivid.	T > L
Realism	The story is realistic and makes sense.	T > L
Reconstructability of the story	The event can be reconstructed with the information given.	T > L
Perceptual information	Information about what the examinee felt, smelt, heard or saw when the event took place.	T > L
Spatial information	Information about locations or the spatial arrangement of people and/or objects.	T > L
Temporal information	Information about when the event happened or explicitly describes a sequence of events.	T > L

Source: Nahari, Vrij, & Fisher, 2012

Decision Making

In the following section, a focused review of decision making pertinent to the current effort is presented.

Put simply, decision making is the act of choosing amongst alternative options. In respects to deception, this could be viewed as a binary choice (i.e., truthful or deceptive). However, researchers have argued that this may be an artificial dichotomization of deception (Anderson, DePaulo, & Ansfield, 2002; Burgoon, Buller, Ebesu, & Rockwell, 1994; Levine, 2001; McCornack, 1992). This view is reflected in the notion that deception lies on a continuum. For demonstration purposes Figure 3 represents a visual representation of this continuum. As may be deduced from the figure, truths can be presented with aspects of lies and vice versa.

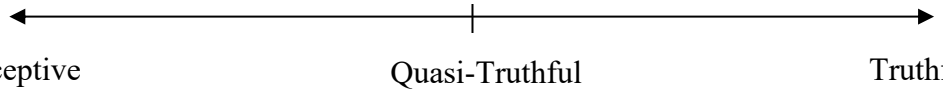

Figure 3. Deception continuum

The literature on decision making can generally be divided into two overarching classifications: classical (i.e., analytical) and naturalistic (i.e., intuitive) decision making. In the following sections, these two types of decision processes will be discussed in broad terms and in respects to the deception detection decision making task. Moreover, we develop a model of dyadic decision making that is an adaptation of Brehmer and Hagafors (1986) model of staff decision making and Hollenbeck and colleagues multilevel theory of team decision making (Hollenbeck et al., 1995; Hollenbeck, Ilgen, Lepine, Colquitt, & Hedlund, 1998). The models leveraged, as well as our own, are based on Social Judgment Theory (Hammond, Stewart, Brehmer, & Steinmann, 1975), and subsequently the works of Egon Brunswik (1952, 1955, 1956).

Classical Decision Making

Classical decision making was first established within the framework of rational decision making (e.g., Expected Utility Theory; Bernoulli, 1738/1954) and later expounded upon by others within the framework of bounded rationality (e.g., Kahneman & Tversky, 1979; Simon, 1955) . Original conceptualizations of rational decision making recognized decision makers as *homo economicus*, or economic man, whom analytically make choices amongst a set of alternatives by maximizing utility. The economic man is characterized by the "crucial fact …that he is rational" (Edwards, 1954, p. 381). Generally, the rational decision making process unfolds in the following steps: (a) problem identification and diagnosis, (b) identification of alternative choices, (c) weighing of alternative choices against an expected outcome, (d) selection of choice

that maximizes outcome, and (e) execution of selected choice. One of the most prominent models of rational decision making is Expected Utility Theory (Bernoulli, 1954; von Neumann & Morgenstern, 1944), which suggests that decision makers are rational agents that weight alternatives and choose the alternative that best maximized the *expected* utility of a decision. Criticisms of this approach, as well as other rational models of decision making, are widespread (e.g., Klein, Calderwood, & Clinton-Cirocco, 1988; Rabin, 2000; Simon, 1955; Tversky & Kahneman, 1974). One of the biggest drawbacks to this approach, especially in respects to the current research, is the assumption that decision makers have access to, and process, all of the relevant information in the environment in order to make a rational decision.

Identifying the limitations of rational decision making, Simon (Simon, 1955, 1956, 1959) introduced the notion of bounded rationality. Bounded rationality argues that decision makers employ rational decision making processes that are bounded by external (e.g., environmental) and internal (e.g., cognitive) constraints. The notions of bounded rationality led to Simon's Satisficing model of decision making. This model suggests that decision makers make choices amongst alternatives based on a satisficing heuristic. That is, an alternative is chosen if it reaches the decision makers predetermined criterion for selection.

Simon's decision making theory provided the foundation for Kahneman and Tversky's (Kahneman & Tversky, 1979; Tversky & Kahneman, 1974) research into decision making, which ultimately led to a Nobel Prize in Economics for Daniel Kahneman[3]. Prospect theory (Kahneman & Tversky, 1979) was developed under the notion that decisions under uncertainty are made under the cognitive limitations of the individual. While Prospect Theory and its successor Cumulative Prospect Theory have gained widespread support as the central theory of

[3] Amos Tversky passed away prior to their recognition by the Royal Swedish Academy of Sciences.

decision making under uncertainty, it is not without its detractors who suggest that it is an inadequate descriptive model of decision making (Birnbaum, 2008).

In addition to Prospect Theory, Tversky and Kahneman (Tversky & Kahneman, 1974) developed the heuristics and biases approach to explain the rules of thumb people use when making decisions. From the classical decision making literature, this general approach has been most widely adopted by deception researchers (e.g., Burgoon, Blair, & Strom, 2008; O'Sullivan, 2003). The most commonly identified bias in the deception literature is the *truth bias*. The truth bias is the finding that people are more accurate at judging truth than deception (Vrij & Baxter, 1999). Several explanations for this finding have been provided in the literature (cf. Vrij, 2008). Generally, people are more likely to judge communications as truthful, thus achieving a higher hit rate for truthful messages. The two most likely explanations for why communication is more likely to be judged as truthful are the availability heuristic and the fundamental attribution error. The availability heuristic (Tversky & Kahneman, 1974) states that people are most likely to make choices based on the ease of availability an event comes to mind. In explaining the truth bias, this reflects the fact that truthful communication is more common than deceptive communication, thus being judged as more likely to occur. The fundamental attribution error (Ross, 1977) states that individuals overestimate dispositional factors when judging others. To the extent that both truthtellers and liars act truthful (e.g., positive, forthcoming), they would be judged to be more truthful.

Taken as a whole, purely classical decision making models are unlikely to be used by individuals engaged in a deception detection task. In short, there is too much uncertainty, lack of information, and decisions are likely to be made using cognitive shortcuts (i.e., heuristics).

Naturalistic Decision Making

The naturalistic decision making (NDM) paradigm was developed in order to understand how people make decisions in real-world settings (Klein, 2008). Contrary to classical decision making processes (i.e., analytical), NDM researchers found that decision makers often rely on intuition to make decisions (Klein et al., 1988). Moreover, these intuition-based decisions were founded on the previous experiences of the individuals making the decisions. Subsequently, aside for the reliance on intuition, NDM also focuses on the role of expertise in the decision making process (Kahneman & Klein, 2009). The notion behind expertise is that experts develop more accurate and well developed mental models and schema, which in turn allow them to make quick accurate decisions without the need to scan alternatives and weigh options in order to choose a best course of action.

The NDM literature is comprised of a myriad of models (cf. Lipshitz, 1993). At the center of these models is the role of expert intuition. However, in respects to the deception literature the mediating role of expertise in decision judgments has been generally found to be nonsignificant (Vrij, 2008a). With the notable exception of one camp of researchers (Ekman, O'Sullivan, & Frank, 1999; O'Sullivan, Frank, Hurley, & Tiwana, 2009; Sullivan & Ekman, 2004), the general consensus is that experts (e.g., law enforcement officers) and lay persons are equally poor at detecting deception. Despite this finding, research has demonstrated that law enforcement officers are confident in their ability to detect lies (Kassin & Fong, 1999; Meissner & Kassin, 2002; Vrij, Mann, & Fisher, 2006).

There are several explanations for why experts fail to outperform lay persons in detecting deception. Prominent explanations include: (a) lie detection is not a well-practiced task and (b) feedback regarding accuracy is rarely, if ever, provided. The role of practice and feedback is

central to the development of expertise (Ericsson, Charness, Hoffman, & Feltovich, 2006; Ericsson, 2006). Of these explanations, lack of feedback is likely to be the most significant contributor to poor deception detection ability. Specifically, one can't improve his or her deception detection ability without knowledge of past performance. This view is supported by a recent meta-analysis demonstrating the effectiveness of training on detection accuracy (Driskell, 2011).

Dyadic Decision Making Model of Deception Detection

This section will focus on the process of team decision making. In doing such, we draw on the work of Egon Brunswik and his lens model approach. Figure 4 presents Brunswik's lens model in reference to deception detection.

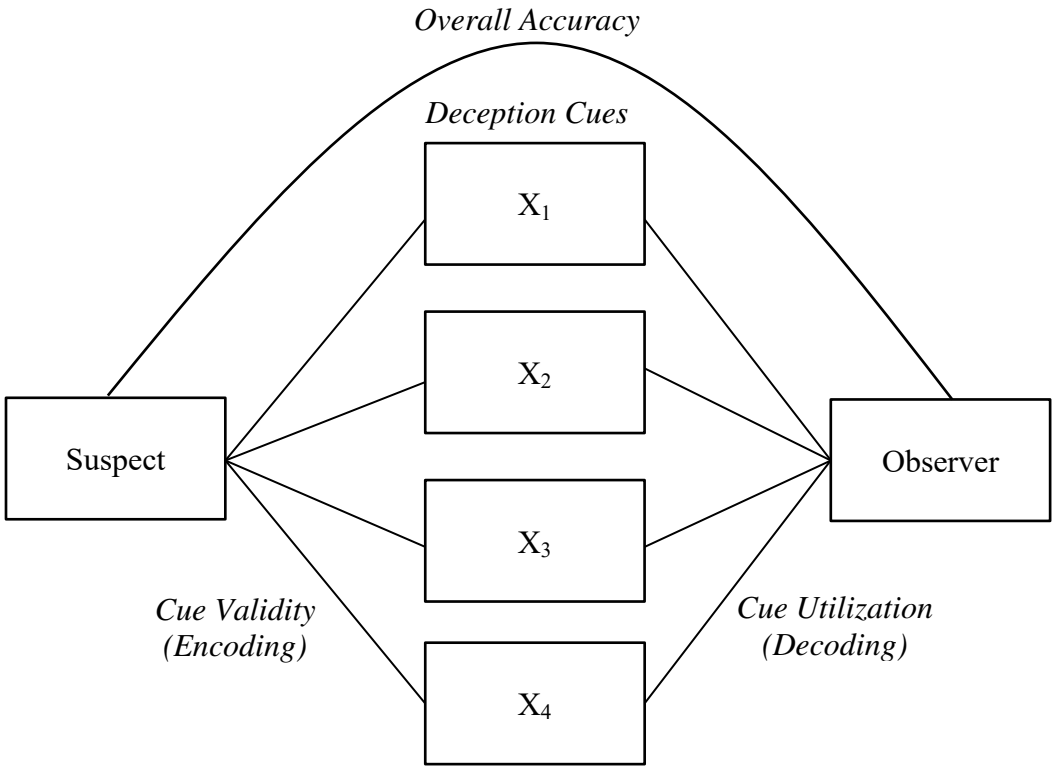

Figure 4. A Brunswikian lens model of accuracy in deception detection

The underlying tenet of this approach is that judgment accuracy is an outcome of the relationship between the environmental cues diagnostic, in this case, of deception and the cues used by the observer to make a veracity judgment. Thus, the more diagnostic cues an observer uses to detect deception, the more accurate are his or her judgments.

Similar to others (e.g., Brehmer & Hagafors, 1986), we have adopted and modified the lens model approach to meet our research needs (Figure 5). Specifically, we extended the breadth of the lens model to be able to incorporate a secondary observer. This descriptive model diverges from the original lens model in its inclusion of dyadic observers and the treatment of cue utilization in overall accuracy. This model also diverges from similar models in its treatment of how observers integrate information from the environment. Building on theory outlined throughout this dissertation, we propose that through shared cognition via behavioral processes observers make veracity judgments. The following paragraph will walk the reader through this descriptive model.

At the very left side of the model is the Suspect who "gives off" cues to deception. The cues are then encoded by both $Observer_1$ and $Observer_2$. Following encoding by the Observers, shared knowledge is communicated by means of the behavioral processes outlined above (i.e., coordination and communication). Following teamwork behaviors, a shared judgment regarding veracity is made.

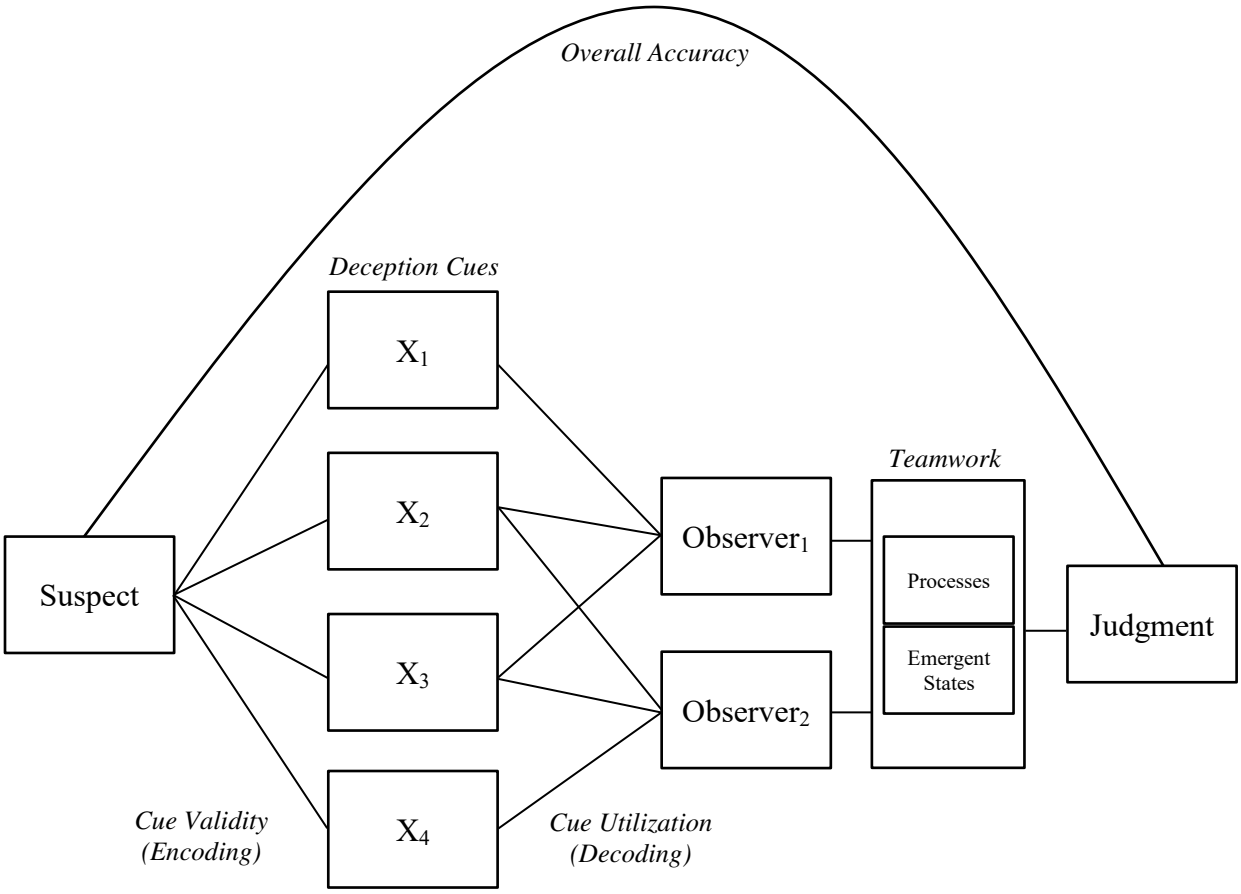

Figure 5. A dyadic decision making model of deception detection

Convergent evidence from the cognitive, social and team psychology literatures leads us to believe that teams should outperform individuals in detecting deception. For example, the comprehensive literature on teamwork suggests that teams outperform individuals on a myriad of tasks. Specifically, tandem interviews can profit from the traditional benefits of teams (e.g., ability to pool resources, exchange information, coordinate actions, catch errors, and share responsibility for decisions; Driskell, Salas, & Hughes, 2010). In respect to decision making, recent research demonstrates the advantages of teams (e.g., dyads) over individuals (Bahrami et al., 2010; Koriat, 2012; Mercier & Sperber, 2012). The following hypothesis is grounded in the literature presented throughout this dissertation (see pp. 5, 19, and 34):

Hypothesis 4: *Investigative interviews conducted by tandem interviewers will result in greater accuracy on a deception detection task than interviews conducted by a single interviewer.*

Decision-Making Biases

There are two primary decision making biases found in the deception literature that warrant investigation under the current study conditions. First is a rather pronounced overconfidence effect. As previously mentioned, research demonstrates that human lie detectors are not impressively accurate at deception detection. Despite this, they generally think they are (DeTurck & Miller, 1990; Elaad, 2003). This illusory confidence is obviously unwanted. However, the majority of research that has demonstrated this bias has involved passive observers (i.e., participants sitting at a computer and detect deception from short video-clips). It is a relatively easy task to sit at a computer and detect lies compared to actively interviewing an individual and then detecting from that information if they are lying. As mentioned earlier, the cognitive demands of interviewing are substantial. As a result, the difficulties associated with conducting an investigative interview are likely to temper interviewer confidence. This suggests that, in contrast to previous research, interviewers will not be overconfident in their truth-lie judgments. Moreover, if the findings from this research demonstrate that tandem interviewers find conducting investigative interviews to be less cognitively demanding, we would further expect truth-lie confidence to be higher than the confidence of individual interviewers. Hypotheses 5a-b are therefore as follows:

Hypothesis 5a: *Single and tandem interviewers will not be overconfident in their truth-lie judgments.*

Hypothesis 5b: *Tandem interviewers will be more confident in their truth-lie judgments than single interviewers*.

Second, the deception literature has demonstrated an exaggerated truth-bias (i.e., communication being judged more often as truthful than deceptive). Explanations for this bias are grounded in prototypical decision-making heuristics (see Vrij, 2008, pp. 148-150). Although this bias has garnered strong support, there are several important caveats. The most germane to this dissertation is the finding that an increased suspicion has been shown to mitigate the truth bias (McCornack & Levine, 1990). Under the current study conditions, we would expect suspicion to increase for both single and tandem interviewers for two primary reasons. First, this dissertation adopts an active interviewing approach. As opposed to passive observers, active interviewers should be more suspicions of interviewees on account of having more personal stake in the decision-making process. For example, passive observers are detecting lies of individuals who either told the truth or lied to an unknown person. In contrast, the active interviewer is detecting lies of individuals who either told the truth or lied directly to their face. Second, suspicion may increase due to the fact that interviewers will be aware that interviewees may be telling multiple truths and multiple lies. In prototypical deception research, interviewees tell either truths or lies. In this dissertation, they will be telling multiple truths and lies. This should function to increase suspicion on account that interviewer's should be less likely to give interviewees the benefit of the doubt. That is, interviewers will likely function under the assumption that interviewee communication will contain at least one lie. Therefore, hypothesis 6 is as follows:

Hypothesis 6: *Single and tandem interviewers will not demonstrate a significant truth-bias.*

Rapport

Rapport has been identified as a central, yet often overlooked, component of investigative interviews (Fisher, Milne, & Bull, 2011). A review of the currently employed investigative interviewing methods (e.g., PEACE model, Cognitive Interview, Reid Technique) identifies rapport-building as a central component in each. Rapport is sought in investigative interviews as it is assumed that (1) the attainment of rapport reduces an individual's (e.g., suspects) resistance to questioning and (2) rapport increases willingness to comply. However, the construct of rapport has seen much of its evolution within the fields of interpersonal relationships, and as a consequence, an emphasis has been placed on the mutuality of rapport. For example, rapport has been defined as a "harmonious, empathetic, or sympathetic relation or connection to another self" (Newberry & Stubbs, 1990, p. 14; cited in Collins, Lincoln, & Frank, 2002). This definition implies that a mutuality of rapport may negatively influence credibility attribution. For instance Vrij et al. (2004) note, positive and trustworthy impressions (two components of rapport) benefit the communicator, thus suggesting that rapport may enhance the truth-bias (i.e., propensity to judge communication as truthful). Surprisingly, the rapport-accuracy relationship has not been widely examined in the deception literature. Although the above cited definition of rapport suggests that rapport exists when two individuals mutually feel in rapport with each other, this view is limited from an operational perspective. Specifically, for investigative interviewing rapport should be considered instrumental. That is, rapport should be viewed as an influence strategy in which rapport is required for the interviewee, not the interviewer. By adopting this perspective, investigative interviewers should be able to mitigate potentially debilitating decision making biases. Although rapport may negatively affect detection accuracy, as previously mentioned, we may expect this effect to be tempered by an increased suspicion resulting from

actively interviewing interviewees. Instead of advancing a non-directional hypothesis, I simply put forth the following research question:

Research Question 1: *How does attained rapport impact deception detection accuracy?*

Additionally, it is important to examine the moderating relationship of teams on attained rapport. Recent research on investigative interviewing suggests that tandem interviews do not negatively affect attained rapport (Driskell et al., 2012). Replicating this finding would help substantiate this claim and would lend credence for the application of tandem interviews in applied settings. However, there are two conflicting maxims in respect to the effects of others (e.g., a second interviewer) on the establishment of rapport in investigative interviews: two heads are better than one and three is a crowd. The review provided throughout this dissertation has presented evidence demonstrating the beneficial effects of "two heads" on a variety of tasks. In respect to the investigative interview, the general notion is that two interviewers should be superior to a single interviewer in terms of interview outcomes (e.g., deception accuracy, information collection). However, on the other hand, research has demonstrated the adverse effects of others on the individual. For example, Mullen, Bryant, and Driskell (1997) found that the presence of an audience other (i.e., someone who monitors/evaluates the behavior of the individual) increases negative affect and perceptions of unease. This effect is unwanted in investigative interviews, as one goal of establishing rapport is to put the subject at ease. Moreover, the addition of a third party member alters the social dynamics. As Simmel (1964) suggests, the degree of closeness inherent in triads is less than that of dyads. Simmel (1964) states "This particular closeness between the two is most clearly revealed if the dyad is contrasted with the triad. For among three elements, each one operates as an intermediary between the other two" (p. 127). The research from Mullen et al. (1997) and Simmel (1964)

would suggest that the addition of a second interviewer may adversely affect rapport. Therefore, Hypothesis 5a-b is as follows:

Hypothesis 7a-b: *Interviewees engaged in in tandem interviews will report lower levels of (a) positivity and (b) coordination than interviewees engaged in single interviews*.

CHAPTER THREE: METHODS AND MATERIALS

Design

The research mirrored an investigative interview scenario in which an interviewer, or interviewers, conducted an interview of a potential suspect about a particular set of events. Specifically, this research represents a 2 (veracity: truthful, deceptive) x 2 (interview condition: single, tandem) mixed factorial design. *Veracity* is a within-subjects factor and *interview condition* is a between-subjects factor. Participants were recruited for both roles (i.e., interviewers and interviewees) and randomly assigned to either the interviewer or the interviewee condition. The following sections will delineate the experimental design.

Interviewers

There is one between-subjects independent variable: interview condition (single, tandem). A tandem interview is conducted by two interviewers, while a single interview is conducted by a single interviewer. The dependent measures for the interviewers include deception accuracy, cues used to determine veracity, information quantity, interviewer performance, and attained rapport.

Interviewees

Participants recruited to be interviewees were instructed to tell both truths and lies. Thus, *veracity* is a within-subjects independent variable. The dependent variables include cues to deceit, perceived arousal, perceived cognitive demand, perceived distraction, and perceived rapport. These are identified in the section on measures.

Participants

Participants were 225 (148 females, 77 males) undergraduate students recruited from a large southeast university. Participants were recruited through an online signup system for

university students looking to obtain research credit required for class. Participants ranged in age from 18 to 24 (M = 18.46, SD = 1.16).

G*Power analysis software (Faul, Erdfelder, Lang, & Buchner, 2007) was used to estimate a priori sample size required to achieve a power of .80, employing an alpha criteria of .05. In order to achieve the necessary power for answering this research's primary hypotheses, we estimated, using a medium effect size estimate for d, a sample size of approximately 150 (30 single interviews [30 interviewees; 30 interviewers] and 30 tandem interviews [30 interviewees; 60 interviewers]). This estimation was for a one-way MANOVA comparing two groups on four outcome variables. We chose this analysis for estimation purposes, as it was the more conservative approach given the main hypotheses. The data in this dissertation represents 45 single interviews (45 interviewees; 45 interviewers) and 45 tandem interviews (45 interviewees; 90 interviewers).

Procedure

Interviewers

Single Interviews. Participants assigned to the interviewer role were escorted to a 12 ft. x 12 ft. room where the interview was to be conducted. He or she was then seated on one side of an interview table where an informed consent form was waiting for review. After consent was obtained, the participant was then given the instructions for the study and instructed to view a brief presentation on a computer annotating the study instructions (Appendix A). After the presentation of the instructions ended, the experimenter summarized the instructions in order to ensure that the participant understood the instructions. Once the participant acknowledged that he or she understood the instructions for the study, they were given time to prepare for the

interview. This time was used to generate questions concerning the tasks outlined in the interviewee section below.

Once the interviewee completed the experimental tasks, they were escorted to the interview room. Before they entered the interview room, the interviewer was informed that the investigative interview was about to begin. The interviewee was then led into the interview room and seated across the table from the interviewer. The investigative interview was then conducted. The interview was semi-structured and proceeded on a task-by-task basis. Specifically, the interviewers interviewed the interviewee's one task at a time. The interviewers alerted the experimenter when they were ready to proceed to the next task, whereby the experimenter read aloud the following task description. At the conclusion of the interview, following the interviewees exit, the interviewer was provided a set of post-task measures to complete. Included in these post-task measures was a veracity assessment document requiring the participant to make four judgments regarding whether or not the interviewee was truthful or deceptive when describing each completed task and a confidence rating for each judgment. Moreover, several additional measures were completed. After the participant completed the post-task measures, they were debriefed and thanked for their participation. Additionally, they were provided a $5 bonus for taking part in the study.

Tandem Interviews. The experimental procedure for tandem interviews was the same as the procedure for the single interviews with the following exceptions: (a) two interviewers were present as opposed to one and (b) after the interview the participants were instructed to come to a joint decision with their partner regarding whether or not the interviewee was truthful or deceptive when describing each completed task and provide a joint confidence rating for each judgment. They were instructed to use a 2-3 minute period to discuss the interview and

communicate both shared and unshared information in order to come to a joint decision regarding overall veracity.

Interviewees

Participants assigned to the interviewee role were taken to a task room down the hall from the interview room. The participants were then provided with an informed consent form to review and seated at a computer. After consent was obtained, the interviewees were provided instructions for the study and watched a brief presentation of the instructions on the computer. The instructions were presented in two phases (see Appendix B). Phase 1 instructed the participants to complete two of four experimental tasks. Once these tasks were completed, the participant was instructed to return to the computer for the second phase of the instructions. The tasks completed in this experiment were similar to the tasks used by Leins, Fisher, and Vrij (2012). Specifically, the participants were instructed to complete two of the following four tasks: (1) assembling a puzzle, (2) locating an Apple device and getting information off of the device, (3) finding and describing a photograph, and (4) reading a chapter in a manual. The tasks that the interviewees performed were counterbalanced in the following manner: tasks 1 and 2, tasks 2 and 3, tasks 3 and 4, tasks 1 and 3, tasks 2 and 4, tasks 1 and 4, and repeat. This was done in order to prevent potential task order effects.

In phase 2 of the instructions, the participants were given brief descriptions of the two tasks they did not complete, explained their task, and explained the importance of the research. Specifically, participants were instructed to respond truthfully about the tasks that they, in fact, did perform and to fabricate responses to the tasks they did not perform. Participants were told to make the fabrications as believable as possible. As a result, participants were truthful to two lines of questioning and deceitful to two lines of questioning. In order to increase motivation to

perform, several incentives were provided. First, the practical significance of this research was stressed (e.g., the importance of this research for enhancing law enforcement performance and strengthening national security). For example, participants were told that improving investigative interviewing procedures can help prevent unwanted attacks, such as the recent Boston Marathon Bombings. Second, participants were told that the effective communication of *both* truths and lies is related to overall intelligence and career success. And third, participants were told that they would be provided a $5 bonus if they were successful in communicating both their truths and their lies.

Directly after the presentation of the instructions was finished, interviewees were taken to the interview room to be interviewed. After the interview was concluded, the participants were taken back to the task room to complete a set of post-task measures. These are discussed in the measures section. The participants were then debriefed and thanked for their participation. They were provided the $5 bonus regardless of whether their truths and lies succeeded.

Measures

The measures outlined below map directly to this dissertation's hypothesis testing. Moreover, the rationale behind these measures is provided below.

To begin, a confirmatory factor analysis (CFA) was conducted using LISREL 8.80 in order to determine if the 18 items examining interviewer cognitive demand (4-items), interviewer performance (4-items), interviewee arousal (3-items), interviewee cognitive demand (4-items), and interviewee attentional conflict (3-items) measure what they intended to measure (i.e., a five-factor structure). The results of the overall CFA, along with Cronbach's alphas for each scale, demonstrate acceptable fit with the data (see Table 3). Specifically, the model had

values on traditional fit indices (i.e., CFI, RMSEA, SRMR, and NNFI) that met thresholds indicating acceptable overall model fit.

Table 3. Confirmatory Factor Analysis Results

Item	Standard Factor Loading
Interviewer Cognitive Demand (α)	**(.85)**
1. I found conducting the investigative interview to be a difficult task.	.59
2. I found conducting the interview to be mentally demanding.	.83
3. I had to mentally work hard to accomplish my level of performance.	.86
4. I felt that interviewing required a lot of cognitive effort.	.79
Interviewer Performance (α)	**(.89)**
1. How competent did the interviewer(s) seem throughout the interview?	.83
2. How professional did the interviewer(s) seem?	.75
3. How thorough was(were) the interviewer(s) during the interview?	.83
4. Overall, how well do you think the interviewer(s) performed?	.90
Interviewee Arousal (α)	**(.94)**
1. Compared to telling the truth, I found it more stressful when I was lying.	.93
2. Compared to telling the truth, I felt more anxious when I was lying.	.96
3. Compared to telling the truth, I felt more nervous when I was lying.	.95
4. Compared to telling the truth, I felt more tense when I was lying.	.82
Interviewee Cognitive Demand (α)	**(.92)**
1. Compared to telling the truth, I found lying to be a difficult task.	.84
2. Compared to telling the truth, lying was more mentally demanding.	.93
3. Compared to telling the truth, lying took more cognitive effort.	.89
4. Compared to telling the truth, I had to mentally work hard to accomplish my level of performance when I was lying.	.83

Item	Standard Factor Loading
Interviewee Attention Conflict (α)	**(.88)**
1. Compared to telling the truth, I was more distracted by other thoughts and concerns when I was lying.	.75
2. Compared to telling the truth, it was more difficult keeping my attention on one thing at a time when I was lying.	.91
3. Compared to telling the truth, my attention was often focused on something other than the primary task when I was lying.	.86
χ^2	180.93
df	142
RMSEA	.056
CFI	.97
SRMR	.06
NNFI	.97

The results of the CFA, along with Cronbach's alphas, were used as criterion for the generation of composite measures of interviewer cognitive demand, interviewer performance, interviewee arousal, interviewee cognitive demand, and interviewee attentional conflict.

Interviewee motivation. A single item was added to the post-interview questionnaire to assess the level of the interviewee's motivation. The item was scored on a 7-point scale on which 1 = not at all and 7 = extremely. This item was added for the reason that deception research has shown motivation to moderate cues to deception (DePaulo et al., 2003).

Post-interview questionnaire: Interviewer. The post-interview questionnaire (Appendix C) comprises four-items aimed at assessing the interviewer's perceived cognitive demand with the interviewing task. Participants rated their perceived cognitive demand on a 7-point scale. These measures were adapted from items on the NASA-TLX representing mental

demand (Hart & Staveland, 1988). In tandem interviews, perceived cognitive demand was determined by aggregating both participants' responses using mean scores.

Cues used to determine deceit. To determine what cues or behaviors interviewers used in making their veracity judgments, we adapted the approach of Mann et al. (2004) by creating a checklist for participants to identify which cues they used to make lie judgments. The cues in this checklist represent cues from four main categories: story cues, vocal cues, body cues, and conduct cues. The number of cues used by interviewers in each cue category was determined by a simple count. For tandem interviews, the total number of cues included the shared and unique cues identified by each interviewer. For example, if Interviewer A identified evidence, response length and voice cues, and Interviewer B identified emotion and voice cues, then the total amount of cues used would be four (i.e., three unique cues and one shared cue). This checklist (shown in Appendix D) provides a detailed list of cues to deception.

Investigative outcomes. The following investigative outcomes were examined: *information quantity* and *interviewer performance*.

Information quantity. Information quantity was extracted from transcripts of the investigative interviews. Specifically, information quantity was measured as the total word count of the interviewees during the investigative interview.

Interviewer performance. Interviewer performance was assessed in several manners. First, we used the number of open-ended questions asked by the interviewer(s) during the interview as a proxy for performance. This measure has been used in past research as an objective measure of interviewer performance (Wright, Powell, & Ridge, 2007). The count for open-ended questions was assessed independently by two raters. Each rater was trained using a detailed criterion list developed by the primary researcher. Initial consensus between the two

raters was high (α = .98; ICC(1) = .96; ICC(2) = .98). Furthermore, the two raters met by conference to achieve perfect agreement. We also examined the total number of questions asked throughout the interview. Next, interviewer performance was measured by a homemade 4-item scale assessing the interviewee's perception of the interviewer(s) performance. These items asked interviewees to provide their view about how competent, professional, thorough, and how well the interviewer(s) performed overall. These items are measured on a 7-point scale (shown in Appendix E).

An additional item was included to assess the interviewer's perceived performance during the investigative interview. This item is measured on a 7-point scale. In tandem interviews, perceived performance was determined by aggregating both participants' responses using mean scores.

Post-interview questionnaire: Interviewee. The post-interview questionnaire (Appendix E) comprises three measures aimed at assessing the interviewees' perceived level of arousal, cognitive demand, and attentional conflict with the interviewing task. The measure of arousal contains 4-items, the measure of cognitive demand contains 3-items, and the measure of attentional conflict contains 3-items. Each measure is scored on a 7-point scale and specifically asks interviewees to provide their views about lying compared to telling the truth during the investigative interview.

The participants were also asked to identify which tasks they lied about and which tasks they told the truth about prior to filling out these measures. This was done to ensure that participants successfully followed instructions.

Verbal cues to deceit. Aspects of the verbal veracity assessment tool Reality Monitoring (RM) were used in the current research to examine differences between liars and truthtellers in

single and in tandem interviews. The criteria's used were defined in Table 2. We decided not to use two of the RM criteria. First the cognitive operations criterion was not used because it is weak both conceptually and in respect to rater reliability. Additionally, we did not use the emotions criterion as our experimental paradigm did not require participants to express emotional content.

These cues were coded by independent raters from interview transcripts. Raters attended a training session where they were provided with definitions, examples, and questions to consider for each criterion. They were also given five sessions to practice coding on and received feedback on each of the sessions. The coding scheme is presented in Appendix F. This type of approach has been successfully used by past researchers to examine cues to deception (Masip, Sporer, Garrido, & Herrero, 2005; Nahari, Vrij, & Fisher, 2012; Vrij, 2008).

Each interview transcript was coded by two raters and each rater coded the six RM criteria for both truthful and deceptive communication. We used the average Cronbach's alpha's, ICC(1)'s, ICC(2)'s, as well as the average $r^*_{WG(j)}$ for both truthful and deceptive ratings to examine interrater agreement and to justify data aggregation. Cronbach's alpha's and the intraclass correlation coefficient's (i.e., ICC(1) and ICC(2)) were calculated by standard SPSS output. The average $r^*_{WG(j)}$'s were calculated using SPSS syntax based on the equation provided for $r^*_{WG(j)}$ by Lindell, Brandt, and Whitney (1999). Moreover, we provide average $r^*_{WG(j)}$ estimates using both a uniform null distribution and a slight skew distribution based on a 7-point scale as identified in, and recommended by, LeBreton and Senter (2007). These interrater agreement indices for truthful and deceptive communications are presented in Table 4 and Table 5. Taken as a whole, the average Cronbach's alpha's, ICC(1)'s, ICC(2)'s, as well as average $r^*_{WG(j)}$ for both truthful and deceptive communications demonstrate moderate to strong

agreement (LeBreton & Senter, 2007). Overall, the results of the IRA estimates justify data aggregation between raters.

Table 4. Interrater Agreement Indices for RM Criteria in Truthful Communications

Criterion	**Cronbach's α**	**ICC(1)**	**ICC(2)**		
Clarity	.81	.68	.81		
Realism	.42	.09	.17		
Reconstructability of the story	.72	.56	.72		
Perceptual information	.79	.65	.79		
Spatial information	.84	.68	.81		
Temporal information	.78	.64	.78	**$r^*_{WG(6)}{}^1$**	**$r^*_{WG(6)}{}^2$**
Average	**.72**	**.55**	**.68**	**.83**	**.76**

Note: $r^*_{WG(6)}{}^1$ is calculated using a uniform null distribution; $r^*_{WG(6)}{}^2$ is calculated using a slightly skewed distribution.

Table 5. Interrater Agreement Indices for RM Criteria in Deceptive Communications

Criterion	**Cronbach's α**	**ICC(1)**	**ICC(2)**		
Clarity	.73	.57	.72		
Realism	.40	.23	.37		
Reconstructability of the story	.67	.46	.63		
Perceptual information	.72	.56	.72		
Spatial information	.82	.67	.80		
Temporal information	.68	.52	.68	**$r^*_{WG(6)}{}^1$**	**$r^*_{WG(6)}{}^2$**
Average	**.67**	**.50**	**.65**	**.80**	**.73**

Note: $r^*_{WG(6)}{}^1$ is calculated using a uniform null distribution; $r^*_{WG(6)}{}^2$ is calculated using a slightly skewed distribution.

Deception accuracy. We adopt the method employed by Mann et al. (2004) to measure accuracy. Specifically, accuracy was calculated by assigning a score of 1 when the participants correctly identified a truth or lie, and assigning a score of 0 when the participants incorrectly

identified a truth or lie. Lie accuracy is calculated by dividing the number of correctly identified lies by the total number of lies, and truth accuracy is calculated by dividing the number of correctly identified truths by the total truths. Overall accuracy is calculated by dividing the total correct judgments by the total number of judgments.

Interviewer confidence. Confidence was assessed via two approaches. First, after each credibility judgment, interviewer(s) were asked to provide a confidence level with each judgment. As the interviewer(s) made a total of four credibility judgments, there were four confidence judgments. Second, interviewer confidence was assessed with two-items included in the post-interview questionnaire. The items asked interviewers to rate the extent to which they felt they were accurate in detecting truths and accurate in detecting lies.

Interviewee rapport. The degree of rapport attained was determined by 11-items in the post-interview questionnaire eliciting interviewee's perception of rapport with the interviewer(s). This measure was adapted from previously used self-report measures of rapport (Drolet & Morris, 2000; Jap, Robertson, & Hamilton, 2011; Puccinelli & Tickle-Degnen, 2004) and was scored on a 7-point scale. This measure taps the three facets of rapport identified by Tickle-Degnen and Rosenthal (1990) – specifically, positivity, coordination, and mutual attention, (3-items each) – and an overall perception of rapport.

Confirmatory factor analysis (CFA) was conducted to examine the factor structure of our 9-item measure of rapport. Consistent with Tickle-Degnen and Rosenthal's (1990) three-component model of rapport, a CFA with one second-order factor (rapport) and three first-order factors (positivity, coordination, and mutual attention) was specified. The first-order factors were defined by the individual scale items with items 1-3 loading on positivity, items 4-6 loading on coordination, and items 7-9 loading on mutual attention. The fit indices are presented in Table 6.

The results of the overall CFA show acceptable fit with the data. Specifically, the model had values on traditional fit indices (i.e., CFI, RMSEA, SRMR, and NNFI) that met thresholds indicating acceptable overall model fit.

Table 6. Confirmatory Factor Analysis Results for Rapport

Item	**Standard Factor Loading**
Positivity (α)	**(.75)**
1. I liked the investigative interviewer(s).	.72
2. I felt that the interaction was positive.	.84
3. I felt that the interviewer(s) and I got along well.	.63
Coordination (α)	**(.85)**
1. I felt that the interviewer(s) and I were 'in synch' during the interview.	.78
2. I felt that the interaction was smooth and flowed well.	.75
3. I felt that the interviewer(s) and I were 'on the same wavelength.'	.89
Mutual Attention (α)	**(.65)**
1. I felt that the interviewer(s) paid attention to me during the interview.	.73
2. I paid attention to the interviewer(s) throughout the interview.	.58
3. I felt that the interviewer(s) and I maintained good eye contact throughout the interview.	.62
χ^2 26.75	
df 24	
RMSEA .04	
CFI .99	
SRMR .055	
NNFI .99	

CHAPTER FOUR: RESULTS

In order to examine potential differences between conditions on level of motivation, an independent t-test was run. There was a significant difference in reported motivation for interviewees in single interviews (M = 5.59, SD = 1.17) and interviewees in tandem interviews, M = 6.18, SD = 1.07; $t(87) = -2.47$, $p < .05$, eta squared = .06. Although we did not predict differences in motivation for interviewees in tandem interviews over interviewees in single interviews, this finding may be explained by Hull's (1943) drive theory of motivation. In other words, the presence of the second interviewer may have served to increase the interviewees drive to perform well. As a result of the differential level of motivation between conditions, motivation will be used as a potential control variable in the subsequent analyses where necessary.

An independent t-test was also run to compare the preparation time for single and tandem interviews. Due to experimenter error during the interview recording process, we were unable to determine preparation time for two sessions. The following t-test is conducted with 44 single interviews and 44 tandem interviews. As anticipated, there was not a significant difference in preparation time during single interviews (M = 7 minutes, 55 seconds, SD = 3 minutes, 11 seconds) and tandem interviews, M = 7 minutes, 40 seconds, SD = 2 minutes, 59 seconds; $t(86) = .37$, $p = .71$, eta squared = .00. Thus, both conditions had equal time to prepare for the investigative interview.

Hypothesis 1a: Cognitive Load

To test Hypothesis 1a (tandem interviewers will report less cognitive demand associated with conducting the investigative interview than single interviewers) an independent samples t-test was run with condition (single, tandem) as the between-subjects independent variable and a composite measure of cognitive load as the dependent variable. Results indicate, as expected,

that interviewers in tandem interviews reported less cognitive load associated with conducting the interview (M = 3.85, SD = 1.02) than single interviewers, M = 4.38, SD = 1.35; $t(81.9)$[4] = 2.12, $p < .05$, eta squared = .05. Therefore, Hypothesis 1a was supported.

Hypothesis 1b: Cues Used to Assess Veracity

Hypothesis 1b (tandem interviews will recognize more story cues to deceit than single interviews) was assessed via a one-way MANOVA with condition (single, tandem) as the between-subjects factor and the four major categories of cues (story, vocal, body, and conduct) as the dependent variables. The correlations between these cue categories are presented in Table 7. The moderate levels of correlations between these cue categories suggest that a MANOVA is an appropriate statistical technique to employ.

Table 7. Cue Category Correlations

Variable	Story	Vocal	Body	Conduct
Story	1			
Vocal	.53**	1		
Body	.54**	.47**	1	
Conduct	.37**	.26*	.25*	1

* $p < .05$, two-tailed ** $p < .01$, two-tailed

The results from the analysis indicate that there was a statistically significant difference between single interviewers and tandem interviewers on the combined dependent variables, $F(4, 85) = 13.08$, $p < .001$, Wilks' Lambda = .62, partial eta squared = .28. Examination of the univariate tests showed that, as predicted, tandem interviewers reported the use of more story cues (M = 4.84, SD = 1.40) than single interviewers, M = 2.93, SD = 1.70; $F(1,88) = 33.99$, $p <$ .001, partial eta squared = .28. Moreover, tandem interviewers reported using significantly more

[4] A correction for *df* was used because Levene's test for equality of variances was violated.

cues than single interviews for the other three categories: vocal, $F(1,88) = 20.78$, $p < .001$, partial eta squared = .19; body, $F(1,88) = 31.72$, $p < .001$, partial eta squared = .27; and conduct, $F(1,88) = 10.40$, $p < .01$, partial eta squared = .11.

As previously mentioned, the total number of cues used in tandem interviews included the shared and unique cues identified by each interviewer. One may argue that this type of count may overinflate the number of cues used by tandem interviewers, thus creating a "straw man" test of significance. Another way to examine the cues used to detect lies is to compare the individual responses of each interviewer in a tandem interview to those of single interviewers. To examine cues individually, we conducted separate independent samples t-tests with condition (single, tandem) as the between-subjects factor and the total number of cues used and the four cue categories as the dependent variables. We employed independent samples t-tests for the four cue categories because the correlations between the categories did not warrant their inclusion in a MANOVA (r's < .40). Overall, when examined independently, interviewers engaged in tandem interviews report using more cues to detect deceit ($M = 12.61$, $SD = 4.27$) than single interviewers, $M = 10.49$, $SD = 4.34$; $t(133) = -2.71$, $p < .01$, partial eta squared = .05. In order to control for multiple comparisons, a Bonferroni correction was applied to the t-tests for the four cue categories (i.e., adjusted $\alpha = .05/4 = .0125$). The only cue category to reach significant was story cues. Specifically, as predicted, tandem interviewers reported using more story cues ($M = 3.81$, $SD = 1.48$) than single interviewers, $M = 2.93$, $SD = 1.70$; $t(133) = -3.09$, $p = .001$, partial eta squared = .08.

When looking at which specific cues are used most often, the top three cues that tandem interviewers reported using include evidence (story cue: 45 out of 45 interviews), confidence (conduct cue: 44 out of 45 interviews) and vagueness (story cue: 43 out of 45 interviews). In

comparison, single interviews reported using confidence (conduct cue: 33 out of 45 interviews), facial (body cue: 32 out of 45 interviews), and hesitance/pauses (vocal cue: 32 out of 45 interviews) most often. A complete list of how often each cue was used by condition can be found in Appendix G. Overall, Hypothesis 1b was fully supported.

Hypothesis 2a-c: Investigative Outcomes

In order to test Hypothesis 2a-c (investigative outcomes will be better in the tandem condition) a multivariate analysis of variance (MANOVA) was conducted with condition (single, tandem) as the between-subjects factor and three investigative outcomes (information quantity, open-ended questions, and total questions asked) as the dependent variables. The correlations between these variables ranged from .33 to .72. The moderate levels of correlations between these cue categories suggest that a MANOVA is an appropriate statistical technique to employ. The results from the analysis indicate that there was a statistically significant difference between single interviewers and tandem interviewers on the combined dependent variables, $F(3, 85) = 3.19$, $p < .05$, Wilks' Lambda = .90, partial eta squared = .10. Examination of the univariate tests showed that, as predicted, information quantity, the number of open-ended questions, and the total number of questions asked were greater in tandem interviews than single interviewers; $F(1,87^{5}) = 5.13$, $p < .05$, partial eta squared = .06, $F(1,87) = 4.99$, $p < .05$, partial eta squared = .05, $F(1,87) = 9.23$, $p < .01$, partial eta squared = .10; respectively. Thus, Hypothesis 2a-c was fully supported. The means and standard deviations are reported in Table 8.

[5] The transcript of one interview (tandem interview condition) was found to be a significant outlier and subsequently dropped from the analyses involving this data point. Specifically, this data point had a Mahalanobis distance value of over 44 and a Cook's distance value greater than 1.1.

Table 8. Means and Standard Deviation for Interviewer Performance

Outcome		**Mean**	**SD**
Information Quantity	Single	402.78	276.40
	Tandem	559.57	370.86
Open-ended Questions	Single	10.76	4.69
	Tandem	13.20	5.62
Total Questions	Single	32.00	14.08
	Tandem	43.77	21.74

Perceived interviewer performance was evaluated via separate independent samples t-tests with condition (single, tandem) as the between-subjects factor and composite performance and interviewer perceived performance as the dependent variables. The results indicate that interviewees did not rate the performance of the tandem interviewers (M = 4.78, SD = 1.16) better than the performance of the single interviewers, M = 4.82, SD = 1.31; $t(88) = .17$, $p = .87$, eta squared = .00. Despite this, tandem interviewers rated their perceived performance better (M = 4.74, SD = .92) than single interviewers, M = 3.82, SD = .87; $t(88) = -4.84$, $p < .001$, eta squared = .21. The correlation between interviewee rated performance and interviewer rated performance was effectively zero ($r = -.03$).

Hypothesis 3a-c: Arousal, Cognitive demand, and Attentional Conflict

Hypotheses 3a, 3b, and 3c were assessed via a one-way MANOVA with condition (single, tandem) as the between-subjects factor and the composite measures of perceived arousal, cognitive demand, and attentional conflict as the dependent variables. Correlations between the dependent variables ranged from .60 to .77. The results indicate that there was not a statistically significant difference between single interviewers and tandem interviewers on the combined dependent variables, $F(3, 86) = .56$, $p = .62$, Wilks' Lambda = .98, partial eta squared = .02. Therefore, Hypotheses 3a-3c were not supported.

A secondary two-way MANOVA was conducted with condition (single, tandem) and gender (male, female) as the between-subjects factors and the composite measures of perceived arousal, cognitive demand, and attentional conflict as the dependent variables. The overall results were equivalent to the initial MANOVA for condition, $F(3, 84) = .65$, $p = .59$, Wilks' Lambda = .98, partial eta squared = .02. However, the main effect for interviewee gender was significant, $F(3, 84) = 5.05$, $p < .01$, Wilks' Lambda = .85; partial eta squared = .15. The interaction term was not significant, $F(3, 88) = 2.0$, $p = .12$, Wilks' Lambda = .93; partial eta squared = .07. An examination of the univariate analyses for interviewee gender indicated that males reported significantly lower levels of perceived arousal, cognitive demand, and attentional conflict than females (Table 9).

Table 9. Statistics for Interviewee Gender

Gender	**Measure**	***Mean***	***SD***	**F**	***p***	***partial eta*^{2}**
Male	Arousal	4.82	1.77	4.11	.046	.05
	Cognitive Demand	4.56	1.55	13.77	<.001	.14
	Attentional Conflict	3.47	1.61	12.07	.03	.05
Female	Arousal	5.52	1.46			
	Cognitive Demand	5.70	1.30			
	Attentional Conflict	4.23	1.57			

Additionally, the overall means reported for arousal ($M = 5.26$, $SD = 1.61$) and cognitive demand ($M = 5.28$, $SD = 1.50$) suggest that participants found lying to be more arousal inducing and difficult than telling the truth. The overall mean for attentional conflict ($M = 3.96$, $SD = 1.62$) suggests that participants did not find lying nor telling the truth attenionally conflicting.

Hypothesis 3d: Verbal Cues to Deceit

To begin, we examined the difference in word count provided from truthful and deceptive communication between conditions. A repeated measures ANOVA was conducted with

interview condition (single, tandem) as the between-subjects variable, veracity (truth, deception) as the within-subjects variable, and interviewee word count as the dependent variable. The multivariate interaction between truth/deception and condition was not significant, Wilks' Lambda = 1.00, $F(1,87) = 0.47$, $p = .50$, partial eta squared = .005. The multivariate main effect for veracity was significant, Wilks' Lambda = .94, $F(1,87) = 5.34$, $p < .05$, partial eta squared = . 06. The main effect for condition was also significant, $F(1,87) = 5.13$, $p < .05$, partial eta squared = . 06. Thus, in both conditions interviewees provided significantly more words when they told the truth than when they lied.

To test Hypothesis 3d (verbal cues to deceit will be greater in tandem interviews versus single interviews), data was analyzed via a repeated measures MANOVA with interview condition (single, tandem) as the between-subjects variable, veracity (truth, deception) as the within-subjects variable, and the verbal deception cues as the dependent variable. The multivariate interaction between truth/deception and condition was not significant, Wilks' Lambda = .94, $F(6,82) = 0.47$, $p = .53$, partial eta squared = .05. The multivariate main effect for condition was not significant, Wilks' Lambda = .88, $F(6,82) = 1.83$, $p = .10$, partial eta squared = . 12. The multivariate main effect for truth/deception was significant, Wilks' Lambda = .48, $F(6,82) = 14.57$, $p < .001$, partial eta squared = .52. Examination of the univariate tests showed that truths were rated as more clear, $F(1,87) = 34.13$, $p < .001$, partial eta squared = .28; realistic, $F(1,87) = 74.48$, $p < .001$; reconstructable, $F(1,87) = 24.66$, $p < .001$; and had more temporal information, $F(1,87) = 4.40$, $p < .05$, than lies. These findings do not support Hypothesis 3d.

The clarity, realism, and reconstructability items were found to be highly intercorrelated for truths (Cronbach's alpha = .95) and lies (Cronbach's alpha = .94), thus potentially masking differences between conditions on these items due to multicollinearity. Subsequently, we

combined these items to create a composite measure of general details. Next, we conducted separate independent samples t-tests with condition (single, tandem) as the between-subjects independent variable and the composite measure of the items as the dependent variables for both truths and lies. For truthful communications, tandem interviews were found to be more detailed, $t(87) = -1.88$, $p < .05$, eta squared = .04, than single interviews. For deceptive communications, a marginally significant difference was found, $t(87) = -1.62$, $p = .055$, eta squared = .03. It should be noted that this last set of analyses were post hoc and therefore should be interpreted with caution. Nevertheless, in addition to the findings for interviewee word count, these results would suggest partial support for Hypothesis 3d.

We also ran a discriminant function analysis in order to determine how well we could classify truth/deception using the RM criteria. We took two approaches to this analysis by examining the classification accuracy using all six criterion (i.e., enter independents together) and using the best set of predictors (i.e., stepwise method). When all variables are entered together, the overall prediction accuracy was 72.5%. The predictive accuracy for truths was 76.4% and 68.5% for lies. Using the stepwise method, the overall prediction accuracy was 69.7%. The predictive accuracy for truths was 73% and 66.3% for lies.

Hypothesis 4: Deception Accuracy

Before Hypothesis 4 was examined, a repeated measures analysis of variance (ANOVA) was conducted to ensure that there was not an overall effect for task order. Interview condition (single, tandem) was the between-subjects variable, task order (task 1, task 2, task 3, and task 4) was the within-subjects variable, and deception accuracy was the dependent variable. The overall multivariate test for Task was not significant, Wilks' Lambda = .98, $F(3,88) = .66$, $p = .58$, partial eta squared = .02. Therefore, we can conclude that there was not an order effect for Task.

In order to test Hypothesis 4 (tandem interviews will have higher deception accuracy rates than single interviews) a repeated measures ANOVA with interview condition (single, tandem) as the between-subjects variable, veracity (truth, deception) as the within-subjects variable and deception accuracy as the dependent variable was run. The interaction between truth/deception and condition was not significant, Wilks' Lambda = 1.00, $F(1,88) = 0.17$, $p = .68$, partial eta squared = .002. The multivariate main effect for veracity was not significant, Wilks' Lambda = .98, $F(1,88) = 1.52$, $p = .22$, partial eta squared = . 02. Moreover, the main effect comparing the two conditions on overall accuracy was not significant, $F(1,88) = .01$, $p = .91$, partial eta squared = .00. The means and standard deviations for both single and tandem interviewers on truth, lie, and overall accuracy are presented below in Table 10.

Table 10. Means and Standard Deviations for Truth, Lie, and Overall Accuracy

Condition		**Mean**	**SD**
Single	Truth	65.56%	29.81%
	Lie	62.22%	33.97%
	Overall	63.89%	24.75%
Tandem	Truth	66.67%	28.20%
	Lie	60.00%	27.39%
	Overall	63.33%	21.05%

Altogether, these results indicate that tandem interviewers are not any more accurate than single interviewers at detecting truth, lies, or on overall accuracy. Therefore, Hypothesis 4 is not supported.

Although significant differences were not found between conditions, we examined the obtained accuracy scores against those obtained from previous research. This approach is akin to the approach taken by Mann et al. (2004). In the following analyses, we compare the accuracy scores presented in Table 10 against the results from Bond and DePaulo's (2006) meta-analysis

examining accuracy rates across deception studies. The results from over 200 studies find overall hit rates of 54%, lie hit rates of 47% lies, and truth hit rates of 61%. The combined accuracy rates obtained in this study were significantly better for overall accuracy, $t(89) = 3.99$, $p < .001$, and for lie accuracy, $t(89) = 4.36$, $p < .001$. There was not a significant difference for truth accuracy, $t(89) = 1.68$, $p = .10$. These findings were equivalent (Table 11) when the experimental conditions were examined separately. The results indicate that for both single and tandem interviews, overall accuracy and lie accuracy was better than previous research.

Table 11. One-sample t-tests by Condition

Condition		***t***	**df**	***p***
Single	Truth	1.03	44	.31
	Lie	3.01	44	.004
	Overall	2.68	44	.01
Tandem	Truth	1.35	44	.18
	Lie	3.18	44	.003
	Overall	2.97	44	.005

Additionally, gender differences were examined for lie accuracy, truth accuracy, and overall accuracy. For the reason that truth accuracy and lie accuracy were not highly correlated ($r = .18$), we ran separate independent samples t-tests examining the effects of interviewee gender on the three types of detection accuracy. Because a priori predictions were not made, a two-tailed significance level was used. There were not significant differences between males ($M = 62.12$, $SD = 28.04$) and females ($M = 68.42$, $SD = 29.33$) on truth accuracy, $t(88) = -1.0$, $p = .32$, eta squared = .01. There was, however, a marginally significant difference between males and females on both lie accuracy, $t(88) = -1.93$, $p = .057$, eta squared = .04, and overall accuracy, $t(88) = -1.94$, $p = .056$, eta squared = .04 (see Table 12), indicating that males were more likely to get away with their lies and were overall more difficult to detect than females.

Table 12. Means and Standard Deviation for Lie and Overall Accuracy by Gender

Gender		Mean	SD
Male	Lie	53.03%	30.46%
	Overall	57.58%	22.08%
Female	Lie	65.79%	30.12%
	Overall	67.11%	22.74%

Hypothesis 5a-b: Confidence-Accuracy Relationship

In order to investigate the relationship between detection confidence and detection accuracy, several analyses were conducted.

First, we examined the correlations between the interviewer's confidence rating for each task and their detection accuracy for each task. The correlations were .12, .08, .14, and .16, respectively. Although these correlations are not significant, it is important to note that they are not significant and negative. As predicted, and contrary to previous research, interviewers were not overconfident in their ability to detect deception.

Second, we examine the correlation between the interviewers overall confidence in truth and lie detection and their overall accuracy in detecting truths and lies. As may be expected, the findings were comparable to those above. Specifically, interviewers confidence in detecting truths was not related to their actual ability to detect truths (r = .06) and their confidence in detecting lies was not related to their actual ability to detect lies (r = .04). Although the correlation for truth accuracy was the only correlation to research significance, the relationships between cognitive demand and truth accuracy (r = -.23) and lie accuracy (r = -.15) suggest that the demands of the interview did temper confidence judgments. These findings support Hypothesis 5a.

In order to investigate differences in confidence between conditions, we conducted a one-way MANOVA with condition (single, tandem) as the between-subjects factor and overall truth and lie confidence as the dependent variables. There was a statistically significant difference between conditions on the combined dependent variables, $F(2, 87) = 6.89$, $p < .01$, Wilks' Lambda = .86, partial eta squared = .14. As predicated, the univariate analyses indicate that tandem interviewers were more confident in their ability to detect truths than single interviewers, $F(1, 88) = 13.95$, $p < .001$, partial eta squared = .14. They were also more confident in their ability to detect lies, $F(1, 88) = 6.19$, $p < .05$, partial eta squared = .07. Thus, Hypothesis 5b was supported.

Hypothesis 6: Truth-Bias

Extant research demonstrates that persons judge messages more often as truthful (56%) than deceptive (44%; Bond & Depaulo, 2006). The findings from this research were similar to those found in previous research with 53% of communicated truth-lies being judged as truthful and 47% being judged as deceptive. However, despite communicated truth-lies were judged more often as being honest, a paired samples t-test showed this difference to be non-significant, $t(89) = 1.44$, $p = .15$. Moreover, there was not a significant difference in truth-bias between single interviewers ($M = 52.78\%$, $SD = 20.80\%$) and tandem interviewers, $M = 53.33\%$, $SD = 18.92\%$; $t(88) = -.13$, $p = .90$, eta squared = .00. Therefore, Hypothesis 6 was supported.

Hypothesis 7a-b and Research Question 1: Rapport

To examine Hypothesis 7a-b a one-way MANOVA was conducted with condition (single, tandem) as the between-subjects variable, the three composite measures of rapport (positivity, coordination, and mutual attention) as the dependent variables, and interviewee motivation as a control variable. Interviewee motivation was used as a control variable because

of the partial correlations with the three components of rapport when controlling for condition (r = .31, .43, .21). The omnibus test showed a main effect for condition, $F(3, 84) = 5.12$, $p < .01$, Wilks' Lambda = .85, partial eta squared = .16, and for interviewee motivation, $F(3, 84) = 6.41$, $p < .01$, Wilks' Lambda = .84, partial eta squared = .19. As predicted, the univariate tests indicate that interviewees participating in single interviews reported greater levels of positivity, $F(1, 86) = 10.35$, $p < .01$, partial eta squared = .11, and coordination, $F(1, 86) = 9.26$, $p < .01$, partial eta squared = .10, than interviewees which participated in tandem interviews. Mutual attention did not differ between conditions ($p = .76$). Therefore, Hypothesis 7a-b was fully supported. Motivation was shown to be a significant covariate for positivity ($p < .01$), coordination ($p < .001$), and mutual attention ($p < .05$), indicating a positive relationship between motivation and the three components of rapport.

Despite significant differences between conditions, interviewees in both conditions reported high levels of positivity, coordination, and mutual attention (Table 13). Furthermore, when asked to rate the overall degree of rapport experienced with the interviewers, there was not a significant difference between interviewees in single interviews ($M = 5.02$, $SD = 1.47$) and interviewees in tandem interviews, $M = 4.82$, $SD = 1.45$; $t(88) = .65$, $p = .52$, eta squared = .01.

Table 13. Means and Standard Deviations for the Three Components of Rapport by Condition

Measure	**Condition**	**Mean**	**SD**
Positivity	Single	6.01	.72
	Tandem	5.67	.89
Coordination	Single	5.45	1.12
	Tandem	5.01	1.12
Mutual Attention	Single	6.11	.77
	Tandem	6.14	.74

In order to investigate Research Question 1, we examined the rapport-accuracy relationship via separate hierarchical multiple regression analyses. Specifically, the Step 1 predictor variables in each regression model were condition (dummy coded) and the three components of rapport (positivity, coordination, and mutual attention), and the Step 2 predictor variables were their respective interaction terms. The dependent variables examined were overall accuracy, truth accuracy, and deception accuracy.

In the first regression analysis, the Step 1 variables only explained 2.6% of the variance in overall accuracy. After the interaction terms were entered in Step 2, the total variance explained was 8% and the overall model was not significant, $F(4,85) = 1.02$, $p = .43$.

In the second regression analysis, the Step 1 variables only explained 1.9% of the variance in overall accuracy. After the interaction terms were entered in Step 2, the total variance explained was 10.2% and the overall model was not significant, $F(4,85) = 1.02$, $p = .43$.

In the third regression analysis, the Step 1 variables explained 7.1% of the variance in deception accuracy. After the interaction terms were entered in Step 2, the total variance explained was 10.5% and the overall model was not significant, $F(4,85) = 1.37$, $p = .23$.

These results suggest that rapport does not negatively or positively impact detection accuracy.

CHAPTER FIVE: DISCUSSION

Two are better than one, because they have a good return for their toil.

- Ecclesiastes 4:9 –12

Very little is known about the advantages and potential disadvantages of applying a team of interviewers in the investigative interview. This is both surprising and unnerving considering this is common practice in law enforcement settings. Thus, the aim of this research was to investigate the application of a team of interviewers on various investigative outcomes. The following section presents the reader with a detailed discussion regarding the findings of this research. This section will advance sequentially through the studies hypotheses (see Table 14).

Table 14. Summary of Hypothesis Testing

Hypothesis		**Results**
H1a	Tandem interviewers will report less cognitive demand associated with conducting the investigative interview than single interviewers.	Supported
H1b	When asked about what cues interviewers used to assess credibility, tandem interviewers will specify more verbal cues than individual interviewers.	Supported
H2a-c	Interviews conducted by tandem interviewers will result in superior investigative outcomes, specifically (a) more pieces of information, (b) more open-ended questions, and (c) more total questions than interviews conducted by individual interviewers.	Supported
H3a	Interviewees engaged in tandem interviews will report greater levels of (a) arousal, (b) cognitive demand, and (c) attentional conflict than interviewees engaged in single interviews.	Not Supported
H3d	Diagnostic verbal cues to deception will be greater in the tandem interview condition than the individual interview.	Partially Supported
H4	Investigative interviews conducted by tandem interviewers will result in greater accuracy on a deception detection task than interviews conducted by a single interviewer.	Not Supported
H5a	Single and tandem interviewers will not be overconfident in their truth-lie judgments.	Supported
H5b	Tandem interviewers will be more confident in their truth-lie judgments than single interviewers.	Supported

Hypothesis		Results
H6	Single and tandem interviewers will not demonstrate a significant truth-bias.	Supported
H7a-b	Interviewees engaged in tandem interviews will report lower levels of (a) positivity and (b) coordination than interviewees engaged in single interviews.	Supported

Hypothesis 1a predicted that interviewers in tandem interviews would experience less cognitive demand when interviewing than single interviewers. The notion that teams can act as workload sponges is well established in the literature and was further substantiated here. As mentioned throughout this dissertation, interviewing is not a simple task. Interviewers must formulate relevant questions, take account of interviewee responses, while consistently attending to interviewee behavior. Additionally, they must manage their own behavior while exhibiting an air of professionalism. The ability of tandem interviewers to share responsibility for tasks is a great advantage as it affords them the opportunity to be more effective interviewers. It should be noted that in the current study, interviewers were not assigned to specific roles. Instead, they were given the opportunity to interview the interviewees by any strategy they saw fit. For example, in tandem interviews both interviewers may have taken turns asking questions. While we believe this accurately represents many real-world interviews, future research may want to examine different interviewer role-assignments.

Hypothesis 1b examined the types of cues interviewers reported using when assessing veracity. Given that teams can act as workload sponges, we predicted that interviewers in tandem interviews would pay more attention to story cues, which are notably difficult to pay attention to and process. We examined both the aggregated reported cues and the individual reported cues of tandem interviewers against single interviewers and found that, in both cases, tandem interviewers paid attention to more story cues. When the cues were aggregated, tandem

interviewers reported using significantly more cues in all four categories. Despite using more diagnostic cues (e.g., story cues) tandem interviewers also seem to be relying on more non-diagnostic cues (e.g., conduct cues). Although this concern disappeared when we examined the cues reported at the individual level (i.e., only story cues reached significance), it still begs the question to what degree the non-diagnostic cues cloud tandem interviewers decisions. However from a practical standpoint, this suggests that teams would benefit more from a training intervention designed to focus cue usage.

Hypothesis 2a-c posited that tandem interviews would demonstrate better investigative outcomes than single interviews. Specifically, we examined the amount of information that was obtained and both the number of open-ended questions and the total number of questions that interviewers asked. In all three cases, tandem interviews were superior to single interviews. This is an encouraging finding and suggests a particularly relevant advantage of tandem interviews. Specifically, tandem interviews benefited from the additional interviewers ability to ask follow-up questions. The tandem interviewers were also able to come up with more questions suggesting that, in this case, two heads are better than one. For example, Interviewer A may have come up with ten questions and Interviewer B may have come up with ten questions. If any of these questions are unique (i.e., one interviewer thought of a question that the other did not), then their combined performance should be better than either interviewer on their own.

Hypotheses 3a-3c proposed that interviewees in the tandem interviews would experience greater levels of arousal, cognitive demand, and attentional conflict than interviewees in single interviews. Differences were not demonstrated as predicted for any of these constructs. There are several potential explanations for these findings. First, interviewees in both conditions reported relatively high levels of arousal and cognitive demand associated with lying during the

interview. As such, the interviewee responses may have been reaching a ceiling effect. These findings suggest that lying is arousal inducing and difficult regardless of whether one is being interviewed by one person or two.

Second, interviewers in both conditions were instructed to adopt a rapport-based approach to interviewing. That is, they were instructed to be positive and friendly towards the interviewees throughout the interview. As Mullen et al. (1997) note, the effect of "others" on arousal is likely dependent on several factors including the type of "other" present. Considering the instructions provided to the interviewers (i.e., be positive) it is plausible that interviewees did not view the second interviewer as "evaluative" or "threatening."

Third, under the current paradigm interviewees told both truths and lies. Although this allows them to compare how it felt to tell lies versus telling the truth, this paradigm differs from typical research. In a typical study, interviewees tell flat-out lies in which they are aware that the interviewers know that they are either telling the truth or lying. In regards to monitoring their lies, interviewees have to manage this requirement throughout the entire course of the interaction. Moreover, people have a false belief that others are able to accurately recognize their internal or emotional states (Gilovich, Savitsky, & Medvec, 1998). When telling a flat-out lie, interviewees may feel as though they have nowhere to hide. However, under the current study's conditions, interviewees were able to hide their lies within their truth. This may have made it easier for interviewees, thus for instance, potentially reducing their need to monitor the interviewers. Consequently, this may have reduced potential differences between conditions. Related to the comment above, because interviewees told both truths and lies, each was of relatively short duration. This may also have reduced the potential differences between conditions.

Lastly, in respect to attentional conflict, recent research has demonstrated that when a passive secondary interviewer was added to an investigative interview, surprisingly interviewees hardly looked at them (Mann et al., 2012). Although the current study employed an active secondary interviewer, this finding is still germane. Mann et al. (2012) speculate that the interviewee didn't pay much attention to the second interviewer as a result of the second interviewer being silent throughout the course of the interview, and consequently not very relevant. Under the current conditions both interviewers in the tandem interview condition were clearly relevant, as both interviewers were asking questions. We speculate that interviewees may simply pay attention to whoever is asking the questions at a given time and generally ignore the other interviewer. As stated by William James (1890), "If you ask how many things or ideas one can attend to at once, the answer is not very easily more than one, unless the processes are very habitual" (p. 409). Considering the cognitive requirements of dividing ones attention while answering questions to both real and imagined tasks, it is not surprising that interviewees may have only attended to one interviewer at a time. In other words, interviewees may not have had the processing capacity to monitor or attend to the other interviewer in the tandem interview. This can explain the finding that tandem interviewers didn't experience greater attentional conflict, and potential cognitive demand, as they merely attended to one person at a time. In other words, as long as the interviewers do not simultaneously ask questions, there may not be a conflict of attention.

Hypothesis 3d predicted that verbal cues to deceit would be greater in tandem interviews than in single interviews. This prediction was not fully supported. Overall, tandem interviews were more detailed than single interviews (e.g., greater word count) for truthful communications and deceptive communications. Full support for this hypothesis would have been shown if truths

in tandem interviews were more, for instance, detailed than single interviews *and* less detailed than single interviews for deceptive communication. There are two primary explanations for this finding. The first explanation relates to how the raters were instructed to rate the RM criteria. Specifically, the raters were instructed to take into consideration transcript length when making their ratings. For example, a more verbose transcript that contained three temporal detail references would be rated lower on this criterion than a less verbose transcript that contained the same number of temporal references. If transcript length was not taken into consideration, we would expect greater differences between groups on the RM criteria. The second explanation related to the findings from Hypotheses 3a-3c. Specifically, disparate levels of arousal, cognitive demand, and attentional conflict between conditions were predicted to moderate cues to deception. For the reason that differences between groups on these variables were not found, it is not surprising that verbal cues to deceit did not differ between conditions. It is valuable to note however, that four of the six criterions significantly differentiated between truths and lies. Moreover, the two criterions that did not significantly differentiate between truths and lies were in the anticipated direction.

Hypothesis 4 predicted that a team of interviewers would more accurately detect truth-lies than single interviewers. The results of the study demonstrate that both tandem interviewers and single interviewers are equally equipped at lie detection (i.e., approximately 63%). We envision several explanations for this finding.

First, taking into consideration that tandem interviewers conducted objectively better interviews than single interviewers, found the task to be less cognitively demanding, and paid attention to more diagnostic cues; it seems that tandem interviewers were unable to translate these advantages into a better final outcome (i.e., detection accuracy). There are three primary

avenues by which we believe they may have had difficulty translating their performance. Despite acknowledging the use of more diagnostic cues (e.g., story cues), tandem interviewers may have over relied upon weak cues in making their final decisions. In other words, tandem interviewers may have given to much weight to the wrong cues when weighing their decision. This would lead tandem interviewers to make incorrect judgments regardless of mentioning more diagnostic cues. Second, the active decision making process may have suffered from communication omissions, errors, or a failure to systematically consider the evidence during discussion. In other words, tandem interviewers failed to make use of their information process gains. Forsyth (2010) identifies several group discussion pitfalls whereby a general theme arises in which groups fail to carefully consider all the information. Instead, groups may "satisfice" or come to a quick agreement without considering all of the alternatives. However, it should be noted that if tandem interviewers over relied on weak cues, a more careful consideration of the information would not likely have help. Third, and related to the previous discussion point, tandem interviewers may have suffered a shared information bias in which they failed to consider information that each member had independently. Although groups can recall, exchange, and process information better than individuals (Forsyth, 2010), they are more likely to discuss shared information (Stasser & Titus, 1985). However, this bias has been demonstrated with larger groups (e.g., 3 or more) and is thus, not likely to be a primary explanatory factor in this study. Nevertheless, sharing additional information – shared or unique – would likely have benefited the tandem interviewers. We expect that sharing additional information may have triggered additional recall in one or both the individuals, consequently leading to more information from which to draw conclusions.

A second and simpler explanation for why tandem interviewers failed to out detect single interviewers is that the task of detecting deception is equally difficult for both teams and individuals. At a group level the deception detection tasks represents a disjunctive task whereby, as Forsyth (2010) notes, groups are "better than the average and sometimes equal to the best" (p. 304). Given that people are generally ill equipped at detecting lies and "that real differences in detection ability are miniscule" (Bond & DePaulo, 2008, p. 485-486), it likely that under the current conditions tandem interviews were only "equal to the best," which in lie detection isn't typically very good.

Although this hypothesis was not supported, both tandem interviewers and single interviewers outperformed past research. Specifically, overall accuracy and lie accuracy was better for both conditions than in previous research. We advance two primary explanations for this finding. First, unlike the vast majority of previous research, interviewers were active judges – that is, they were able to openly interview the person whose communication they were judging. Over 95% of previous research examines passive judges – typically participants who sit in front of a computer and make veracity judgments from short video clips. Despite past research demonstrating that active versus passive interviewing does not enhance deception detection ability (e.g., Buller, Strzyzewski, & Hunsaker, 1991; Burgoon, Buller, & Floyd, 2001; Dunbar, Ramirez, & Burgoon, 2003; Granhag & Strömwall, 2001a, 2001b; Hartwig, Granhag, Strömwall, & Vrij, 2004; Stiff, Kim, & Ramesh, 1992), in the current study the interviewers were able to establish a quasi-baseline of the interviewee's behavior. That is, they were able to compare the interviewee's responses to the four tasks but still remained blind to which tasks were honest and which were deceptive. A baseline familiarity of truthful communication has been shown to improve lie detection ability (Feeley, DeTurck, & Young, 1995) and apparently a quasi-baseline

familiarity can also help. Although active interviewing is more cognitively demanding than making veracity judgments from videos, in the current paradigm, we believe active interviewing benefited the interviewers.

Second, interviewees in the current study had to tell both truths and lies. Typically, studies have interviewees tell one or the other. In the current study, interviewees were required to tell convincing stories to two tasks that they did not actually complete. Compared to telling the truth of actually experienced events, this was a tall order. Add in the ability for interviewers to establish a quasi-baseline, and the cards are almost stacked against the interviewees. As a result, lies were less detailed than truths, leaving a fairly recognizable cue for interviewers to leverage when making veracity judgments. We would also like to note that although the current paradigm has its limitations, we think that it is a real strength of the current research. Specifically our approach heeds the recent call for research that "should better mirror the situations in which practitioners assess veracity. In real life they do not passively watch video-clips. And in real life they often have background information about a case" (Vrij & Granhag, 2012, p. 115).

Past research has demonstrated that lie detectors have an illusory sense of confidence in detecting deception. Hypothesis 5a predicted that this effect would be mitigated as a consequence of the difficulties inherent in conducting an investigative interview. To examine this, we looked at this relationship in several manners and found that, as expected, interviewers were not overconfident in their lie detection ability. Moreover, the confidence-accuracy relationship for each task was positive, which means that interviewers were not over confident in their ability to detect deception. Hypothesis 5b predicted that tandem interviewers would be more confident that single interviewers. Specifically, this prediction was advanced on the notion that the difficulties of interviewing would be less in tandem interviews, consequently resulting in

increased confidence. As expected, tandem interviewers were more confident in their abilities to detect truths and lies.

Hypothesis 6 predicted that the truth-bias would be mitigated in active interviews. As previously mentioned, this bias has several explanations based on archetypal decision making heuristics (Tversky & Kahneman, 1974). As expected, no truth bias was founded. Moreover, there was no truth bias for either single or tandem interviews.

Hypothesis 7a-b predicted that interviewees in tandem interviews would report lower levels of positivity and coordination than interviewees in single interviews. The results supported this prediction. Specifically, the results indicated tandem interviews were rated as displaying less positivity and less coordination than single interviews. These findings can be explained by a potential process loss transpiring in tandem interviews. In an early model of team performance, Steiner (1972) proposed that performance was a function of potential productivity (i.e., individual contributions) minus process losses (e.g., coordination losses). Under the current conditions, coordination issues may have emerged in tandem interviews resulting from unfamiliarity with (1) working with a new partner and (2) conducting an investigative interview. The perceived coordination issues may also explain the positivity finding. For instance, research demonstrates that more fluent speech displays greater competence and that we view competent individuals more positively (Driskell, Olmstead, & Salas, 1993). Although the interviewers were provided ample time to prepare for the investigative interview, they cannot be expected to be as coordinated as seasoned professionals would be.

It should be noted that the overall degree of positivity, coordination, and mutual attention was high in both conditions. This is important as the current conditions were designed to mimic the cognitive demands of lying, but not the ecological setting of a criminal interview. In a

previous study Driskell et al. (2013) did not find significant differences between single and tandem interviews on the three components of rapport. Notably, these researchers used actual transcripts from police interviews which, as they note, were likely negatively valenced because of the type of interview (e.g., interviews regarding criminal misconduct). This study showed low levels of positivity and coordination relative to the current study. In short, under the current study conditions, single and tandem interviews demonstrated satisfactory levels of rapport. Nonetheless, more research is needed to examine the three-components of rapport and their subsequent effects on investigative outcomes.

Research question 1 examined the relationship between attained rapport and detection accuracy. The findings demonstrate that the establishment of rapport does not adversely affect detection accuracy. This is an interesting and practically important finding as the establishment of rapport is critical in investigative interviews and the absence of a negative impact is positive. However, caution should be taken when interpreting the results of the rapport-accuracy relationship as the specific relationship examined was between interviewee's perceptions of rapport and interviewers detection accuracy. It is possible that interviewers observed different levels of rapport than the interviewees.

Theoretical Implications

This dissertation advances current theory in several ways. First, we sought to better ground deception research to current theory. The deception literature is fraught with discrepant theories and, as we have argued, could be better tied to existing theory. Specifically, this research aimed to ground the cognitive load approach to existing theories of cognitive load and multitasking. By doing such, this strengthens the cognitive load approach to detecting deception and helps guide future research that leverages this approach.

Second, this study provides valuable insight into an understudied aspect of deception research, the active interview scenario. While we note the importance of studying deception from different viewpoints, it is surprising that such little research has examined lie detection in an active interview scenario. The findings from the current research demonstrate that several of the longstanding findings from the deception literature do not hold up. Specifically, overall detections rates were shown to be better than previous research and there was neither a confidence-accuracy relationship nor truth bias.

Third, this research further develops our understanding of rapport development in investigative interviews. More specifically, this research lends to the theoretical development of rapport by examining its development under varying conditions (i.e., single versus tandem interviews). This is pertinent to police efforts as many investigative interviews are conducted using the tandem interview approach without a complete understanding of its impact on the investigative interview process.

Fourth, and most importantly, this research applied theory from small group and team research to a field in which it hadn't been applied before. Only recently has the deception literature gone beyond an individual level perspective to examining a team-based structure. Moreover, the empirical literature examining the efficacy of teams in investigative interviewing is noticeably lacking. In this research, we applied theories of team cognition and team process to predict advantages associated with tandem interviews. Although the findings demonstrate that tandem interviewers have difficulty in detecting deception, they were clearly shown to demonstrate superior investigative outcomes. The application of team theory to deception detection and investigative interviewing is novel and a principal strength of this research.

Practical Implications

There a number of practical implications of the current research that pertains to both this study's significant and non-significant findings. Given that Hypothesis 1b demonstrated that tandem interviewers pay attention to more relevant cues, one practical implication is that they may be better equipped to be trained than single interviewers. Additionally, the reduction in cognitive demand associated with conducting tandem interviews suggests that the interviewers may have additional resources, or at the very least more resources, to devote to lie detection and investigative interviewing than single interviewers.

The results of Hypothesis 3d suggest that the same cues to deceit that can differentiate lying in one-on-one interviews also differentiate lying on tandem interviews. This is valuable for training as our results suggest that deception cues generalize across interview approaches. Thus, differential training does not seem to be required.

The results of Hypothesis 4 suggest that during investigative interviews, a second interviewer will not adversely affect lie detection. Although it is unclear how often and to what degree an interviewer actually detects deception after an interview, it is beneficial to know that, at least under the current conditions, a second interviewer can be applied without adverse consequences. The findings of Hypothesis 2a-c clearly demonstrate the benefits of tandem interviews. Coupled with the neutral findings of Hypothesis 4, this suggests that there is a tangible benefit to applying a team of interviewers in an investigative interview.

Given the confidence-accuracy findings (Hypothesis 5b), if a tandem interview approach is applied, it may be beneficial to temper the interviewers confidence when detection deception. On the same note, this would probably be a good idea regardless of whether a single or tandem approach is being applied.

The findings regarding rapport (Hypothesis 7a-b) suggest caution in respect to the application of tandem interviewers. However, notably the degree of positivity, coordination, and mutual attention were high for both conditions. Nevertheless, empirical research is required to determine at what level of degraded rapport investigative outcomes become impacted. Given the high degree of established rapport in both single and tandem interviews, under the current conditions, either condition should be well suited to establish a constructive level of rapport. Moreover, bearing in mind the performance of the tandem interviewers, it doesn't seem that that their lesser attained rapport negatively impacted their performance.

In short, the general implication of the current research is that tandem interviewers that adopt a rapport-based approach throughout the investigative interview can enhance investigative outcomes.

Limitations

Several limitations of the current research should be addressed. First, the stakes of the lie (e.g., consequences of getting caught) were low. This is a typical criticism of laboratory-based deception research as it is unethical to create a truly high-stakes paradigm. There are generally two major issues noted with low-stakes lies. First, cues to deceit are weaker in these circumstances, thus making it more difficult for lie-catchers to detect lies. And second, some suggest that low-stakes lies provide a good investigation of everyday lies (e.g., white lies) but do not necessarily accurately investigate high-stakes lies, which are a central concern for forensic psychological research. Although the current study would be considered "low-stakes" by real-world standards, we employed several strategies to increase the stakes for the interviewees. Specifically, we provided a monetary incentive, stressed the importance of this type of research for national security, and told interviewees that successful communication of truths and lies was

related to intelligence and career success. These types of motivation inducement strategies have been shown to enhance cues to deception in past research (DePaulo et al., 2003). Moreover, considering the accuracy rates obtained in this study, given the current experimental paradigm, we would expect accuracy rates to increase for higher-stakes lies. Additionally, increasing the stakes of a lie would most significantly increase the communicator's level of arousal. For the reason that the focus of this research was on the cognitive demands associated with lying, we don't think that enhanced arousal would have significantly altered the results of this study.

A second limitation, related to the first one, is the type of lie that was being told. Although it may be argued that all laboratory based deception studies are "low-stakes," researchers attempt to enhance the ecological validity of their findings by making the lies that are told similar to those that are told by criminals. For example, a study may have an interviewee forge a check and then deny having done so. Although this may increase the face validity of the task for the interviewee, it does not necessarily increase their motivation to get away with their lie or the consequences associated with being caught. Moreover, the cognitive complexity of communicating this type of lie would likely be less complex than the lies told in the current study. In our study, interviewees told both truth and lies. When lying, they fabricated responses to random questions in an attempt to appear as though they actually completed a specific task. Although the lies were not about a transgression, they are arguably more cognitively demanding as interviewees were required to transition between truthful and deceptive communication in regard to unknown questions. It should also be noted that this procedure was similar to Leins et al. (2012) who note that this approach "mirrors a context in which a suspect/interviewee may report a fabricated alibi."

A third limitation of this research is that the lies told in this study were sanctioned. In other words, interviewees were instructed to lie about two specific tasks. Addressing ecological validity, lies told in typical "real-world" circumstances are unsanctioned. As Feeley and deTurck (1998) note, "Unsanctioned lies seek to capture the necessary elements that characterize heightened arousal and increased cognitive effort." (p. 191). As previously mentioned, heightened arousal was not the focus of our experimental paradigm. Instead, we created a paradigm intended to increase the cognitive demands associated with lying. To do this, interviewees we not given time to prepare their lies and were required to tell multiple lies to interviewers about multiple tasks in an interactive interview. For example, interviewers were awarded the freedom to ask any questions they desired, thus requiring interviewees to fabricate responses to the tasks they did not complete on the spot. By heightening the cognitive demands of the interviewees, we believe we were able to mitigate this limitation.

A fourth limitation of this research was the population used. We used undergraduate students as participants for both interviewers and interviewees. Obviously, police officers interviewing suspects and suspects involved in police interviews are characteristically different from undergraduate students. In regards to the interviewers, police officers would be expected to be much more skilled in interviewing than undergraduate students who received a brief training about how to conduct an investigative interview. As a result, the difference in performance shown in the current research may not be as pronounced if the interviews were conducted by trained interviewers. However, this is an empirical question that should be addressed in future studies. It may also be the case that trained interviewers (e.g., police officers) would be able to extract more information from the interviewees thus making their deception judgments easier. Despite previous research demonstrating that police officers and laypersons do not differ in

detecting low-stakes lies, we would expect trained interviewers to perform better in the current paradigm because of past experience, situational familiarity, the ability to develop baseline comparisons, and the ability to be actively involved in the interview.

In regards to interviewees, the distinction between criminal suspects and undergraduate students is less clear. On the one hand, criminal suspects may be more skilled at lying because they may lie more often. Moreover, they may find the act of lying to be less arousal inducing and experience less guilt. For the current study, this would suggest that criminals might be more successful at getting away with their lies. On the other hand criminal suspects are, on average, much less intelligent than college students (Vrij & Mann, 2004), thus suggesting that they may have more difficulty fabricating believable responses to interviewer questioning. As a result, there may be more pronounced differences in imagined versus experienced responses for the criminal population. For the current study, this would suggest that it would be easier to differentiate truthful from deceptive communications. This too is an empirical question.

Future Research

There are several directions we believe future research should go. First and foremost, we think there is great potential value in tandem interviews. However, before concrete conclusions and recommendations can be made, more research needs to examine the benefits, disadvantages, and moderating variables of applying a team of interviewers in investigative interviews. Given that the few empirical studies that have examined this approach have been positive, this should be a particularly fruitful area of research.

Given that the current findings demonstrate that a team of interviewers rely on more diagnostic cues of deception, but seem to fail to use them, we would like to see a study that investigates the effects of training a team of interviewers on deception detection. Specifically, if

a team of interviewers can be trained to ignore extraneous cues (e.g., body language) and employ diagnostic cues when diagnosing veracity, they should in turn be more accurate in detecting truths and lies. On a similar note, a team of interviewers could also be trained to better take advantage of a tandem approach (i.e., how the tandem interview should be conducted). This type of training would likely result in superior investigative outcomes and could greatly benefit from the teams and training literatures.

As previously mentioned, it would be beneficial to use participants from the target populations. By using both trained interviewers, such as police officers, and individuals from the criminal population researchers would be able to develop a better understanding of the events under investigation and increase the generalizability of the findings.

It would also be beneficial to examine the potential benefits of a team of interviewers in different deception paradigms. In the current research we looked at individuals telling multiple truths and lies. Future studies may want to examine the ability of a team of interviewers in detecting a single lie. Moreover, other deception paradigms (e.g., mock crimes, naturalistic, simulated job interviews) should be investigated.

In the current research there were higher levels of positivity and coordination in single interviews. Although the interviewees in the tandem interviews still reported high levels of positivity and coordination, it is important to better understand this finding. Rapport is paramount in investigative interviewing and if in fact rapport is more difficult to achieve in tandem interviews, researchers must take several steps. First, it must be determined if the difference in attained rapport effects performance. And second, if it adversely affects performance, then steps should be taken to mitigate the effect. It would also be advisable to investigate rapport in a more ecologically valid setting (e.g., real-world police interview). As

Driskell et al. (2013) note, investigative interviews may be inherently negatively valenced, thus making rapport more difficult to establish.

Lastly, we think that there is a great advantage in the ways a team of interviewers can be employed in an investigative interview. As Vrij and Granhag (2012) encourage, future research should focus on "how to interview suspects in order to elicit and enhance cues to deception." We agree with this statement and would extend this encouragement to include how to interview suspects to elicit more accurate and reliable information. Moreover, we believe that the introduction of a second interviewer allows for greater versatility for interviewing suspects. Although we do not advocate a "good cop/bad cop" approach, this does provide a good example of how two interviewers can be applied. An example more relevant to lie detection would be to have one interviewer focus on a set of specific cues and the other interviewer focus on a different set of specific cues.

Conclusion

To date, the tandem interview approach has yet to be scientifically vetted as an investigative interviewing technique. Specifically, it is unclear what affect the application of two interviewers has on the investigative process. This is alarming considering that this approach is regularly applied under current operations. Moreover, there has been a persistent call throughout the literature for research to examine novel approaches to intelligence gathering given its increased importance in the post-9/11 era (Brandon, 2011; Loftus, 2011). Subsequently, the aim of the current research was to examine the potential advantages of the tandem interview approach on lie detection and other investigative outcomes in an investigative interview setting. The results are encouraging, demonstrating several advantages associated with the application of the tandem interview approach, perhaps most notably, more collected information. While this

may seem trivial, more information could mean the difference between crisis averted and crisis management. As Loftus (2011) suggests, “the smallest details can be important” (p. 532). Although more research is needed to substantiate the current findings and further shed light on this approach, the results suggest that the tandem interview approach can be a valuable tool at law enforcements disposal.

APPENDIX A: INTERVIEWER INSTRUCTIONS

Single Interviewer Instructions

Overview

In several minutes, a potential suspect is going to enter the room and be seated across the table from you. Your task will be to conduct an investigative interview to assess what the suspect knows and how credible the information is that he or she gives you. The following information is intended to prepare you for the investigative interview. Please read the information carefully and take notes if desired.

Investigative Interviews

- The aim of an investigative interview is to **gather as much accurate and reliable information as possible** from the suspect.
- Investigative interviewing is a **fact-finding mission**.
- When conducting the interview, adopting a **rapport-based approach** is best (*Think: "you catch more flies with honey than you do with vinegar"*).

Stages of an Investigative Interview: The PEACE Model

Planning and Preparation

- The process of getting ready to interview:
    - Understanding the purpose of the interview, defining its aims and objectives, evaluate available background information.

Engage and Explain

- Establish rapport with the interviewee and explain the reason for the interview:
    - Create a good first impression, treat the suspect as an individual, understand the feelings of the suspect, and explain the aim and structure of the interview.

Account

- Having the interviewee provide a full account of events:
    - Obtain an uninterrupted account, ask questions to expand and clarify account, challenge account when necessary.

Closure

- Finishing and closing the investigative interview:
    - Review and summarize interviewees account, verify that the interviewee provided all relevant information.

Evaluation

- Evaluation of the information obtained during the interview:
    - Determine if aims and objectives were achieved.

Background Information

The person you are about to interview has just carried out several tasks in a room down the hall. These tasks may include:

Task 1: Assembling a puzzle

Questions that you may want to ask about this activity include: *what was the subject matter of the puzzle, how long did it take, how large was the puzzle, and so on*.

Task 2: Locating an Apple device and getting information off of the device

Questions that you may want to ask about this activity include: *specifics about the device itself, what application they used, what information they found, and so on.*

Task 3: Finding and describing a photograph

Questions that you may want to ask about this activity include: *specifics about the photograph, what they found, where they found it, and so on.*

Task 4: Reading a chapter in a manual

Questions that you may want to ask about this activity include: *the name of the manual, the content of the manual, the information that was presented, and so on*.

You only have a general description of the tasks that were carried out. Your job is to collect as much specific information as possible about what the interviewee did while in that room. This is the type of information you are looking to collect.

It is important to note that you will be questioning the interviewee about the 4 tasks listed above. Some of these tasks they actually performed and some of these tasks they have not performed, but will be trying to convince you that they did. We want you to determine at the end of the interview which tasks they are being truthful about and which tasks they are being untruthful about.

Tips

- Follow-up questions are a good way to get complete information.
- Allow interviewees sufficient time to answer your questions.
- Use the "5 Ws" (**w**hat, **w**here, **w**hen, **w**hy, and **w**ho) to question the interviewee.
- Try to ask questions that help you determine whether or not they are being truthful.
- Try to create a positive interaction with the suspect.

After reading these instructions please begin to prepare for the investigative interview. You have a few minutes before the interview starts, you may want to go over what questions you plan to ask during the interview.

Tandem Interviewer Instructions

Overview

In several minutes, a potential suspect is going to enter the room and be seated across the table from you and your partner. You and your partners' task will be to conduct an investigative interview to assess what the suspect knows and how credible the information is that he or she gives you. The following information is intended to prepare you and your partner for the investigative interview. Please read the information carefully and take notes if desired.

Investigative Interviews

- The aim of an investigative interview is to **gather as much accurate and reliable information as possible** from the suspect.
- Investigative interviewing is a **fact-finding mission**.
- When conducting the interview, adopting a **rapport-based approach** is best (*Think: "you catch more flies with honey than you do with vinegar"*).

Stages of an Investigative Interview: The PEACE Model

Planning and Preparation

- The process of getting ready to interview:
    - Understanding the purpose of the interview, defining its aims and objectives, evaluate available background information.

Engage and Explain

- Establish rapport with the interviewee and explain the reason for the interview:
    - Create a good first impression, treat the suspect as an individual, understand the feelings of the suspect, and explain the aim and structure of the interview.

Account

- Having the interviewee provide a full account of events:
    - Obtain an uninterrupted account, ask questions to expand and clarify account, challenge account when necessary.

Closure

- Finishing and closing the investigative interview:
    - Review and summarize interviewees account, verify that the interviewee provided all relevant information.

Evaluation

- Evaluation of the information obtained during the interview:
    - Determine if aims and objectives were achieved.

Background Information

The person you and your partner are about to interview has just carried out several tasks in a room down the hall. These tasks may include:

Task 1: Assembling a puzzle

Questions that you may want to ask about this activity include: *what was the subject matter of the puzzle, how long did it take, how large was the puzzle, and so on*.

Task 2: Locating an Apple device and getting information off of the device

Questions that you may want to ask about this activity include: *specifics about the device itself, what application they used, what information they found, and so on.*

Task 3: Finding and describing a photograph

Questions that you may want to ask about this activity include: *specifics about the photograph, what they found, where they found it, and so on.*

Task 4: Reading a chapter in a manual

Questions that you may want to ask about this activity include: *the name of the manual, the content of the manual, the information that was presented, and so on*.

You and your partner only have a general description of the tasks that were carried out. Your job is to collect as much specific information as possible about what the interviewee did while in that room. This is the type of information you are looking to collect.

It is important to note that you will be questioning the interviewee about the 4 tasks listed above. Some of these tasks they actually performed and some of these tasks they have not performed, but will be trying to convince you that they did. We want you to determine at the end of the interview which tasks they are being truthful about and which tasks they are being untruthful about.

It is important that you and your partner work together as a team. As a team, you are expected to work together on asking questions and following up on questions. This means that both you and your partner should work together to question the interviewee regarding the tasks.

Tips

- Follow-up questions are a good way to get complete information.
- Allow interviewees sufficient time to answer your questions.
- Use the "5 Ws" (**w**hat, **w**here, **w**hen, **w**hy, and **w**ho) to question the interviewee.
- Try to ask questions that help you determine whether or not they are being truthful.
- Try to create a positive interaction with the suspect.

After reading these instructions please begin to prepare for the investigative interview with your partner. You have a few minutes before the interview starts, you may want to go over what questions you plan to ask during the interview.

APPENDIX B: INTERVIEWEE INSTRUCTIONS

Example Interviewee Instructions

Part 1:

The research staff member will describe to you the procedures that we would like you to follow. In the study room there are four tasks that you can perform. Two of the tasks we would like you to complete and the other two you will not complete.

Tasks A and Task B are the two tasks we would like you to do.

Task A. Assemble the puzzle located on the table and sketch the puzzle on a blank sheet of paper once the puzzle is completed.

Task B. Locate the iPad in one of the desks drawers, activate the iPad, and check the weather for the two cities identified next to the device in the weather application. Also, open the Pandora application on the device and identify the current station. Once completed, put the iPad back in the drawer.

Once you complete the two tasks, please signal to the research staff that you are through.

Part 2:

In a moment you will be interviewed about the two tasks you have completed. The task of the interviewer is to collect accurate information from you regarding how you performed these tasks.

For example, the interviewer may ask how you put the puzzle together or what you thought the most difficult part of the puzzle was to put together. Your job is just to answer these types of questions truthfully.

There are also two tasks, Task C and Task D that we did not ask you to complete. The interviewer will ask you questions about Task C and Task D. For questions about these tasks we want you to answer as if you actually completed them. In other words, your job for these two tasks is to tell a compelling story to convince the interviewer that you actually did them.

For example, Task C requires you to identify and describe a picture. In this case, your job will be to answer questions regarding this task as if you did this type of task, but you will be forced to make up the details about how you did it. The interviewer will not have any specific information about these tasks, so your job is to answer in a manner that seems believable.

To help with this, we will describe Task C and Task D (which you did not do) below:

Task C. Find a picture that is placed somewhere in the room. Once located, describe in as much detail the subject matter of the photo. Return the photo to where it was found.

Task D. Locate a specific manual and read the marked chapter. Put the manual back when finished.

This is the only information that you will receive about Task C and Task D; again when you are asked about these tasks, just describe the task as if you have completed it. This will require you to make up a believable story during the interview.

Part 3:

We want to take a moment to explain to you why this research is important.

First, these findings will help improve how people are interviewed in situations such as the Boston Marathon Bombings. It is important to be able to accurately interview suspects about things they may or may not have done. By having you attempt to describe a task that was actually completed and describe a task in which the information was made up, we can examine how interviewers are able to distinguish between this information. Eventually this type of information can save lives. Therefore, it is important that you try to perform your best during this research.

You may also be interested to know that the ability to effectively communicate *both* truths and lies is related to overall intelligence and career success. For example, the capacity to describe truthful events, as well as to generate believable stories, is a valuable skill in many professions.

Additionally, you will be given a $5 bonus if you are perceived as truthful for both Task A and Task B and for Task C and Task D.

After the interview is concluded, signal to the research staff that you are you finished. We will then provide you with a short questionnaire and answer any questions you may have.

APPENDIX C: INTERVIEWER QUESTIONNAIRE

Post-Interview Questionnaire: Interviewer (Single)

Name:_____

Age:_____

Gender:_____

Instructions:

The following questions ask you for your opinions about the investigative interview you just conducted. Please take your time and answer each question as honestly as possible. Circle a single value to answer each question. For example, in the question below if you "somewhat agree" that the instructions were clear, you would circle the number 5.

Question A. I felt that the instructions were very clear.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	(5)	6	7

Set 1: The following questions ask you to indicate whether you think the interviewee was telling the truth or lying about the specific tasks they performed.

You are also asked to provide a confidence rating and a difficulty rating with each decision. The rating is on a scale of 1 to 7, with 1 being *not at all* and 7 being *extremely*.

Task 1: Assembling a puzzle.

1. Was the interviewee telling the truth or lying about having assembled a puzzle (check box)?

Truthful ☐

Deceptive ☐

2. How confident are you in your decision?

Not at all confident		Somewhat confident		Quite confident		Extremely confident
1	2	3	4	5	6	7

3. How difficult was it to get useful information from the interviewee about Task 1?

Not at all difficult		Somewhat difficult		Quite difficult		Extremely difficult
1	2	3	4	5	6	7

Task 2: Locating an Apple device and getting information off of the device

4. Was the interviewee telling the truth or lying about having located an Apple device and getting information off of it (check box)?

Truthful ☐

Deceptive ☐

5. How confident are you in your decision?

Not at all confident		Somewhat confident		Quite confident		Extremely confident
1	2	3	4	5	6	7

6. How difficult was it to get useful information from the interviewee about Task 2?

Not at all difficult		Somewhat difficult		Quite difficult		Extremely difficult
1	2	3	4	5	6	7

Task 3: Finding and describing a photograph

7. Was the interviewee telling the truth or lying about having found a photograph (check box)?

Truthful ☐

Deceptive ☐

8. How confident are you in your decision?

Not at all confident		Somewhat confident		Quite confident		Extremely confident
1	2	3	4	5	6	7

9. How difficult was it to get useful information from the interviewee about Task 3?

Not at all difficult		Somewhat difficult		Quite difficult		Extremely difficult
1	2	3	4	5	6	7

Task 4: Reading a chapter in a manual

10. Was the interviewee telling the truth or lying about having read a chapter in a manual (check box)?

Truthful ☐

Deceptive ☐

11. How confident are you in your decision?

Not at all confident		Somewhat confident		Quite confident		Extremely confident
1	2	3	4	5	6	7

12. How difficult was it to get useful information from the interviewee about Task 4?

Not at all difficult		Somewhat difficult		Quite difficult		Extremely difficult
1	2	3	4	5	6	7

On a scale of 1 to 7, with 1 being *not at all* and 7 being *extremely*, please rate how accurate you believe you were in detecting lies and truths.

13. Overall, how accurate do you think you were in detecting lies?

Not at all accurate		Somewhat accurate		Quite accurate		Extremely accurate
1	2	3	4	5	6	7

14. Overall, how accurate do you think you were in detecting truths?

Not at all accurate		Somewhat accurate		Quite accurate		Extremely accurate
1	2	3	4	5	6	7

Please proceed to the next page…

Set 2: In the checklist below, please check the cues that you used to determine if the interviewee was lying. Examples of each cue are provided next to the cue identifier. Check all that apply. For example, if you think the cue of hand movements helped you distinguish whether or not the interviewee was lying, then you would want to check that cue.

Cue	Example	Used
Changes	Changes in behavior/attitude	☐
Confidence	Confidence/nervousness	☐
Contradictions	Contradictions in story/consistent	☐
Covering face	Hands over face/hiding mouth	☐
Defensive	Sitting defensively/legs or arms crossed	☐
Demeanor	Demeanor/relaxed/attitude	☐
Emotion	Crying/upset/happy	☐
Evidence	Facts of the case	☐
Facial	Facial expression/smiling/frowning	☐
Fidgeting	Fidgeting/nervous movements/twiddling	☐
Gaze aversion	Averting gaze/eye contact	☐
Gut feeling	Gut feeling/intuition	☐
Hands	Hand movements/still hands	☐
Head movements	Shaking/nodding/moving head	☐
Hesitance/pauses	Hesitation/pauses in speech/fluent speech	☐
Misc. speech	Anything about speech that does not fit into "speech content," e.g., pleading/minimizing offense or "uncertain replies"	☐
Movements	Body language and movements	☐
Nail-biting	Biting the nails/chewing fingers	☐
Physiological	Sweating/blushing/blinking	☐
Posture	Upright posture/slouched	☐
Props	Playing with other things, e.g., cup/cigarette	☐
Repetitions	Repeating the question/buying time	☐
Response length	Lengthy reply/one-word reply	☐
Self-corrections	Corrected self/corrected officer	☐
Self-manipulation	Touching/fiddling with self—excluding nails	☐
Speech content	Story content/specific words	☐
Speech fillers	Lots of "ems" and "ahs"/no "ems"	☐
Stammering	Stammered/stuttered	☐
Vagueness	Vague reply/lots of detail	☐
Voice	Voice pitch/volume/harshness/soft	☐

Set 3: The following questions ask you your opinion about carrying out the investigative interview.

On a scale of 1 to 7, with 1 being *not at all* and 7 being *extremely*, please rate how successful you felt you were in conducting the investigative interview.

15. How successful do you feel that you conducted the investigative interview?

Not at all successful		Somewhat successful		Quite successful		Extremely successful
1	2	3	4	5	6	7

On a scale of 1 to 7, with 1 being *strongly disagree* and 7 being *strongly agree*, please rate your level of agreement with the following statements.

16. I found conducting the investigative interview to be a difficult task.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

17. I found conducting the interview to be mentally demanding.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

18. I had to mentally work hard to accomplish my level of performance.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

19. I felt that interviewing required a lot of cognitive effort.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

This is the end of the Post-Interview Questionnaire. Please give the completed questionnaire to the experimenter who will then debrief you about the study. Thank you.

Post-Interview Questionnaire: Interviewer (Tandem)

Name:_____

Age:_____

Gender:_____

Partner's name:_____

Partner's age:_____

Partner's gender:_____

Instructions:

The following questions ask you for your opinions about the investigative interview you just conducted. Please take your time and answer each question as honestly as possible. Circle a single value to answer each question. For example, in the question below if you "somewhat agree" that the instructions were clear, you would circle the number 5.

Question A. I felt that the instructions were very clear.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	(5)	6	7

Set 1: The following questions ask you to indicate whether you think the interviewee was telling the truth or lying about the specific tasks they performed. You are also asked to provide a confidence rating and a difficulty rating with each decision. The ratings are on a scale of 1 to 7, with 1 being *not at all* and 7 being *extremely*.

For each decision, you and your partner should work together to come to a joint decision regarding whether the interviewee was lying or telling the truth. In order to come to a decision, you and your partner should discuss the information you gathered during the investigative interview. It's important to discuss each of your opinions and for each of you to provide information that you think is important to make your decision.

If you and your partner cannot come to an agreement about whether the interviewee was telling the truth or lying, then you have to use your best judgment to select the best joint decision.

Task 1: Assembling a puzzle.

1. Was the interviewee telling the truth or lying about having assembled a puzzle (check box)?

Truthful ☐

Deceptive ☐

1. How confident are you in your decision?

Not at all confident		Somewhat confident		Quite confident		Extremely confident
1	2	3	4	5	6	7

2. How difficult was it to get useful information from the interviewee about Task 1?

Not at all difficult		Somewhat difficult		Quite difficult		Extremely difficult
1	2	3	4	5	6	7

Task 2: Locating an Apple device and getting information off of the device

3. Was the interviewee telling the truth or lying about having located an Apple device and getting information off of it (check box)?

Truthful ☐

Deceptive ☐

4. How confident are you in your decision?

Not at all confident		Somewhat confident		Quite confident		Extremely confident
1	2	3	4	5	6	7

5. How difficult was it to get useful information from the interviewee about Task 2?

Not at all difficult		Somewhat difficult		Quite difficult		Extremely difficult
1	2	3	4	5	6	7

Task 3: Finding and describing a photograph

6. Was the interviewee telling the truth or lying about having found a photograph (check box)?

Truthful ☐

Deceptive ☐

7. How confident are you in your decision?

Not at all confident		Somewhat confident		Quite confident		Extremely confident
1	2	3	4	5	6	7

8. How difficult was it to get useful information from the interviewee about Task 3?

Not at all difficult		Somewhat difficult		Quite difficult		Extremely difficult
1	2	3	4	5	6	7

Task 4: Reading a chapter in a manual

9. Was the interviewee telling the truth or lying about having read a chapter in a manual (check box)?

Truthful ☐

Deceptive ☐

10. How confident are you in your decision?

Not at all confident		Somewhat confident		Quite confident		Extremely confident
1	2	3	4	5	6	7

11. How difficult was it to get useful information from the interviewee about Task 4?

Not at all difficult		Somewhat difficult		Quite difficult		Extremely difficult
1	2	3	4	5	6	7

On a scale of 1 to 7, with 1 being *not at all* and 7 being *extremely*, please rate how accurate you believe you were as a team at detecting lies and truths.

12. Overall, how accurate do you think you were in detecting lies?

Not at all accurate		Somewhat accurate		Quite accurate		Extremely accurate
1	2	3	4	5	6	7

13. Overall, how accurate do you think you were in detecting truths?

Not at all accurate		Somewhat accurate		Quite accurate		Extremely accurate
1	2	3	4	5	6	7

Set 2: In the checklist below, please check the cues that you used to determine if the interviewee was being truthful or lying. Examples of each cue are provided next to the cue identifier. Check all that apply. For example, if you think the cue of hand movements helped you distinguish whether or not the interviewee was lying, then you would want to check that cue.

Cue	Example	Used
Changes	Changes in behavior/attitude	☐
Confidence	Confidence/nervousness	☐
Contradictions	Contradictions in story/consistent	☐
Covering face	Hands over face/hiding mouth	☐
Defensive	Sitting defensively/legs or arms crossed	☐
Demeanor	Demeanor/relaxed/attitude	☐
Emotion	Crying/upset/happy	☐
Evidence	Facts of the case	☐
Facial	Facial expression/smiling/frowning	☐
Fidgeting	Fidgeting/nervous movements/twiddling	☐
Gaze aversion	Averting gaze/eye contact	☐
Gut feeling	Gut feeling/intuition	☐
Hands	Hand movements/still hands	☐
Head movements	Shaking/nodding/moving head	☐
Hesitance/pauses	Hesitation/pauses in speech/fluent speech	☐
Misc. speech	Anything about speech that does not fit into "speech content," e.g., pleading/minimizing offense or "uncertain replies"	☐
Movements	Body language and movements	☐
Nail-biting	Biting the nails/chewing fingers	☐
Physiological	Sweating/blushing/blinking	☐
Posture	Upright posture/slouched	☐
Props	Playing with other things, e.g., cup/cigarette	☐
Repetitions	Repeating the question/buying time	☐
Response length	Lengthy reply/one-word reply	☐
Self-corrections	Corrected self/corrected officer	☐
Self-manipulation	Touching/fiddling with self—excluding nails	☐
Speech content	Story content/specific words	☐
Speech fillers	Lots of "ems" and "ahs"/no "ems"	☐
Stammering	Stammered/stuttered	☐
Vagueness	Vague reply/lots of detail	☐
Voice	Voice pitch/volume/harshness/soft	☐

Set 3: The following questions ask you your opinions about carrying out the investigative interview.

On a scale of 1 to 7, with 1 being *not at all* and 7 being *extremely*, please rate how successful you felt you were in conducting the investigative interview.

14. How successful do you feel that you conducted the investigative interview?

Not at all successful		Somewhat successful		Quite successful		Extremely successful
1	2	3	4	5	6	7

On a scale of 1 to 7, with 1 being *strongly disagree* and 7 being *strongly agree*, please rate your level of agreement with the following statements.

15. I found conducting the investigative interview to be a difficult task.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

16. I found conducting the interview to be mentally demanding.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

17. I had to mentally work hard to accomplish my level of performance.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

18. I felt that interviewing required a lot of cognitive effort.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

This is the end of the Post-Interview Questionnaire. Please give the completed questionnaire to the research staff. Thank you.

APPENDIX D: CUE CHECKLIST

Cue Categories Checklist (adapted from Mann et al., 2004)

Cue	Example	Used
Changes	Changes in behavior/attitude	☐
Confidence	Confidence/nervousness	☐
Contradictions	Contradictions in story/consistent	☐
Covering face	Hands over face/hiding mouth	☐
Defensive	Sitting defensively/legs or arms crossed	☐
Demeanor	Demeanor/relaxed/attitude	☐
Emotion	Crying/upset/happy	☐
Evidence	Facts of the case	☐
Facial	Facial expression/smiling/frowning	☐
Fidgeting	Fidgeting/nervous movements/twiddling	☐
Gaze aversion	Averting gaze/eye contact	☐
Gut feeling	Gut feeling/intuition	☐
Hands	Hand movements/still hands	☐
Head movements	Shaking/nodding/moving head	☐
Hesitance/pauses	Hesitation/pauses in speech/fluent speech	☐
Misc. speech	Anything about speech that does not fit into "speech content," e.g., pleading/minimizing offense or "uncertain replies"	☐
Movements	Body language and movements	☐
Nail-biting	Biting the nails/chewing fingers	☐
Physiological	Sweating/blushing/blinking	☐
Posture	Upright posture/slouched	☐
Props	Playing with other things, e.g., cup/cigarette	☐
Repetitions	Repeating the question/buying time	☐
Response length	Lengthy reply/one-word reply	☐
Self-corrections	Corrected self/corrected officer	☐
Self-manipulation	Touching/fiddling with self—excluding nails	☐
Speech content	Story content/specific words	☐
Speech fillers	Lots of "ems" and "ahs"/no "ems"	☐
Stammering	Stammered/stuttered	☐
Vagueness	Vague reply/lots of detail	☐
Voice	Voice pitch/volume/harshness/soft	☐

APPENDIX E: INTERVIEWEE QUESTIONNAIRE

Post-Interview Questionnaire: Interviewee

Name:_____

Age:_____

Gender:_____

Instructions:

The following questions ask you for your opinions on the investigative interview you were just engaged in. Please take your time and answer each question. Circle a single value to answer. For example, in the question below if you "somewhat agree" that the instructions were clear, you would circle the number 5.

Question A. I felt that the instructions were very clear.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	(5)	6	7

Set 1: The following questions ask your opinions about the interviewer(s) that conducted the investigative interview.

On a scale of 1 to 7, with 1 being *not at all* and 7 being *extremely*, please rate how competent, professional, thorough, and well the interviewer(s) performed during the investigative interview.

1. How competent did the interviewer(s) seem throughout the interview?

Not at all competent		Somewhat competent		Quite competent		Extremely competent
1	2	3	4	5	6	7

2. How professional did the interviewer(s) seem?

Not at all professional		Somewhat professional		Quite professional		Extremely professional
1	2	3	4	5	6	7

3. How thorough was(were) the interviewer(s) during the interview?

Not at all thorough		Somewhat thorough		Quite thorough		Extremely thorough
1	2	3	4	5	6	7

4. Overall, how well do you think the interviewer(s) performed?

Not at all well		Somewhat well		Quite well		Extremely well
1	2	3	4	5	6	7

On a scale of 1 to 7, with 1 being *strongly disagree* and 7 being *strongly agree*, please rate your level of agreement with the following statements.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7
5. I liked the investigative interviewer(s).						
1	2	3	4	5	6	7
6. I felt that the interaction was positive.						
1	2	3	4	5	6	7
7. I felt that the interviewer(s) and I got along well.						
1	2	3	4	5	6	7
8. I felt that the interviewer(s) and I were 'in synch' during the interview.						
1	2	3	4	5	6	7
9. I felt that the interaction was smooth and flowed well.						
1	2	3	4	5	6	7
10. I felt that the interviewer(s) and I were 'on the same wavelength.'						
1	2	3	4	5	6	7
11. I felt that the interviewer(s) paid attention to me during the interview.						
1	2	3	4	5	6	7
12. I paid attention to the interviewer(s) throughout the interview.						
1	2	3	4	5	6	7
13. I felt that the interviewer(s) and I maintained good eye contact throughout the interview.						
1	2	3	4	5	6	7
14. I felt a high degree of rapport with the interviewer(s).						
1	2	3	4	5	6	7
15. I felt that interviewers experienced rapport with me.						
1	2	3	4	5	6	7

Set 2: The following questions ask you about your experiences throughout the investigative interview.

16. What two tasks did you *lie* to the interviewer(s) about performing?

_____

17. What two tasks did you *tell the truth* about?

_____

On a scale of 1 to 7, please rate how motivated you were to perform well for the investigative interview.

18. How motivated were you to perform well during the investigative interview?

Not at all motivated		Somewhat motivated		Quite motivated		Extremely motivated
1	2	3	4	5	6	7

On a scale of 1 to 7, with 1 being *strongly disagree* and 7 being *strongly agree*, please rate your level of agreement with the following statements.

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

19. Compared to telling the truth, I found it more stressful when I was lying.

1 2 3 4 5 6 7

20. Compared to telling the truth, I felt more anxious when I was lying.

1 2 3 4 5 6 7

21. Compared to telling the truth, I felt more nervous when I was lying.

1 2 3 4 5 6 7

22. Compared to telling the truth, I felt more tense when I was lying.

1 2 3 4 5 6 7

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

23. Compared to telling the truth, I found lying to be a difficult task.

1 2 3 4 5 6 7

24. Compared to telling the truth, lying was more mentally demanding.

1 2 3 4 5 6 7

25. Compared to telling the truth, lying took more cognitive effort.

1 2 3 4 5 6 7

26. Compared to telling the truth, I had to mentally work hard to accomplish my level of performance when I was lying.

1 2 3 4 5 6 7

27. Compared to telling the truth, I was more distracted by other thoughts and concerns when I was lying.

1 2 3 4 5 6 7

28. Compared to telling the truth, it was more difficult keeping my attention on one thing at a time when I was lying.

1 2 3 4 5 6 7

29. Compared to telling the truth, my attention was often focused on something other than the primary task when I was lying.

1 2 3 4 5 6 7

On a scale of 1 to 7, with 1 being *not at all confident* and 7 being *extremely confident*, please rate how confident you are that the interviewer(s) believed your truths and lies.

30. How confident are you that the interviewer(s) believed your lies?

Not at all confident	Low confidence	Slightly confident	Neutral	Moderately Confident	Very Confident	Extremely confident
1	2	3	4	5	6	7

31. How confident are you that the interviewer(s) believed your truths?

Not at all confident	Low confidence	Slightly confident	Neutral	Moderately Confident	Very Confident	Extremely confident
1	2	3	4	5	6	7

This is the end of the Post-Interview Questionnaire. Please give the completed questionnaire to the research staff who will then debrief you about the study. Thank you.

APPENDIX F: OBSERVER RATING FORM

Experimenter Rating Method

Criteria and Definitions

1. **Clarity**: This statement refers to the clarity and vividness of the statement. The degree to which this criterion is present depends on how clear, shaper, and vivid the statement is (instead of dim and vague).

    a. Possible information for this criterion to achieve a rating of high would include details regarding amount of visual details, accuracy, comprehensibility (i.e., of the sequence) and vividness of the representation.

    Questions to consider:

    - In your opinion, the event remains how clear in the memory of the person telling the story?
    - How vividly is the event described?
    - Are details described only superficially or very precisely?
    - How comprehensible is the order of events described?
    - How well does the person seem to remember the event?

2. **Realism**: This criterion examines whether the story is plausible, realistic and makes sense.

    a. Possible information to include for this criterion to achieve a rating of realistic would include details concerning likeliness of the event, extraordinariness, incredible details and believability.

    Questions to consider:

    - How realistic is the storyline? Does it appear bizarre or realistic?
    - Could an event story like this have happened to you in a comparable way?
    - To what extent is the story surprising, unpredictable or extraordinary?
    - To what extent does the story contain incredible details?
    - If someone else told you the story as the storyteller did, is it likely that you would believe it?

3. **Reconstructability of the story**: This criterion examines whether it is possible to reconstruct the event on the basis of the information given.

a. Possible information to include for this criterion to achieve a rating of precise would include details concerning the complexity of the action, actual and assumed consequences, and no doubt about their own memory.

Questions to consider:

- How simple or complex is the story line?
- Does the storyteller have any doubts about the accuracy of the memory for the event or is he/she rather sure?
- Do you think you could accurately reconstruct the event given what the interviewee said?

4. **Perceptual information**: This criterion refers to the presence of sensory information in a statement. Does the statement include sensorial experiences such as sounds ("he really shouted at me"), smells ("it had a smell of rotten fish"), tastes ("the chips were very salty), physical sensations ("it really hurt"), and visual details ("I saw the nurse entering the ward").

    a. Possible information to include for this criterion to achieve a rating of many include details about colors, sounds, and touch.

    Questions to consider:

    - Are objects, persons, or the environment described without color or are colors described?
    - How often or how intensely is something described when it is being touched?
    - How many visual details are described?

5. **Spatial information**: This criterion refers to information about locations ("it happened in a park") or the spatial arrangement of people and/or objects ("the man was sitting to the left of the wife").

    a. Possible details to include for this criterion to be rated as `precise' could be `about the environment', `the specific location of the core action', and/or `the spatial arrangement of persons and objects'.

    Questions to consider:

    - How clearly is the location of the event described?
    - How familiar does the environment and the setting of the event appear to be to the person?
    - How clearly is the spatial arrangement of objects described?

6. **Temporal information**: This criterion refers to information about when the event happened "it was early in the morning") or explicitly describes a sequence of events ("when the visitor heard all that noise, he became nervous and left")

    a. Possible information to include for this criterion to achieve a rating of precise would be details concerning the time and the duration of the event.

Questions to consider:

- How clearly is the time of the event described?

Rating Form

Instructions: The following questions ask you to rate the extent to which the following verbal behaviors of the **interviewee** were present during the investigative interview.

1. Clarity

This statement refers to the clarity and vividness of the statement. The degree to which this criterion is present depends on how **clear**, **shaper, and vivid** the statement is (**instead of dim and vague**).

- Possible information for this criterion to achieve a rating of high would include details regarding amount of visual details, accuracy, comprehensibility (i.e., of the sequence) and vividness of the representation.

Questions to consider:

- In your opinion, the event remains how clear in the memory of the person telling the story?
- How vividly is the event described?
- Are details described only superficially or very precisely?
- How comprehensible is the order of events described?
- How well does the person seem to remember the event?

Not at all clear, sharp, and vivid		Somewhat clear, sharp, and vivid		Quite clear, sharp, and vivid		Extremely clear, sharp, and vivid
1	2	3	4	5	6	7

2. Realism (plausibility)

This criterion examines whether the story is **plausible, realistic and makes sense**.

- Possible information to include for this criterion to achieve a rating of realistic would include details concerning likeliness of the event, extraordinariness, incredible details and believability.

Questions to consider:

- How realistic is the storyline? Does it appear bizarre or realistic?
- Could an event story like this have happened to you in a comparable way?
- To what extent is the story surprising, unpredictable or extraordinary?
- To what extent does the story contain incredible details?
- If someone else told you the story as the storyteller did, is it likely that you would believe it?

Not at all plausible		Somewhat plausible		Quite plausible		Extremely plausible
1	2	3	4	5	6	7

3. Reconstructability of the story

This criterion examines whether it is possible to reconstruct the event on the basis of the information given.

- Possible information to include for this criterion to achieve a rating of precise would include details concerning the complexity of the action and no doubt about their own memory.

Questions to consider:

- How simple or complex is the story line?
- Does the storyteller have any doubts about the accuracy of the memory for the event or is he/she rather sure?
- Do you think you could accurately reconstruct the event given what the interviewee said?

Not at all	Somewhat	Quite	Extremely

reconstructable		reconstructable		reconstructable		reconstructable
1	2	3	4	5	6	7

4. Perceptual information (Perceptual details)

This criterion refers to the presence of sensory information in a statement. Does the statement include sensorial experiences such as sounds ("he really shouted at me"), smells ("it had a smell of rotten fish"), tastes ("the chips were very salty), physical sensations ("it really hurt"), and visual details ("I saw the nurse entering the ward").

- Possible information to include for this criterion to achieve a rating of many include details about colors, sounds, and touch.

Questions to consider:

- Are objects, persons, or the environment described without color or are colors described?
- How often or how intensely is something described when it is being touched?
- How many visual details are described?

Not at all detailed		Somewhat detailed		Quite detailed		Extremely detailed
1	2	3	4	5	6	7

5. Spatial information (Spatial details)

This criterion refers to information about locations ("it happened in a park") or the spatial arrangement of people and/or objects ("the man was sitting to the left of the wife").

- Possible details to include for this criterion to be rated as `precise' could be `about the environment', `the specific location of the core action', and/or `the spatial arrangement of persons and objects'.

Questions to consider:

- How clearly is the location of the event described?
- How familiar does the environment and the setting of the event appear to be to the person?
- How clearly is the spatial arrangement of objects described?

Not at all detailed		Somewhat detailed		Quite detailed		Extremely detailed
1	2	3	4	5	6	7

6. Temporal information (Time details)

This criterion refers to information about when the event happened "it was early in the morning") or explicitly describes a sequence of events ("when the visitor heard all that noise, he became nervous and left")

- Possible information to include for this criterion to achieve a rating of precise would be details concerning the time and the duration of the event.

Questions to consider:

- How clearly is the time of the event described?

Not at all detailed		Somewhat detailed		Quite detailed		Extremely detailed
1	2	3	4	5	6	7

APPENDIX G: CUES USED BY CONDITION

Cue	Category	Single	Tandem
Changes	Body	27	36
Covering face	Body	3	4
Emotion	Body	4	13
Facial	Body	32	34
Fidgeting	Body	13	36
Gaze aversion	Body	24	37
Hands	Body	17	29
Head movements	Body	14	22
Movements	Body	19	33
Nail-biting	Body	0	1
Physiological	Body	4	11
Posture	Body	10	25
Props	Body	2	4
Self-manipulation	Body	1	2
Confidence	Conduct	33	44
Defensive	Conduct	3	10
Demeanor	Conduct	26	41
Gut feeling	Other	20	38
Contradictions	Story	20	33
Evidence	Story	31	45
Misc. speech	Story	14	27
Repetitions	Story	7	13
Self-corrections	Story	5	22
Speech content	Story	22	38
Vagueness	Story	31	43
Hesitance/pauses	Vocal	32	39
Response length	Vocal	28	37
Speech fillers	Vocal	15	28
Stammering	Vocal	8	18
Voice	Vocal	7	19

APPENDIX H: IRB APPROVAL OF HUMAN RESEARCH

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **James E. Driskell**

Date: **May 22, 2013**

Dear Researcher:

On 5/22/2013, the IRB approved the following minor modifications to human participant research until 03/24/2014 inclusive:

Type of Review:	IRB Addendum and Modification Request Form
Modification Type:	Study instruments have been revised and a revised protocol that reflects changes in experimental procedures and monetary compensation has been uploaded in iRIS. Participants will be given $5 in compensation at the end of the study, but will not be informed of this during consent process. A revised Informed Consent with minor wording changes has been approved for use.
Project Title:	INVESTIGATIVE INTERVIEWING: A TEAM-LEVEL APPROACH
Investigator:	James E. Driskell
IRB Number:	SBE-13-09227
Funding Agency:	American Psychology-Law Society: Division 41 of the American Psychological Association(AP-LS)
Grant Title:	
Research ID:	1055307

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 03/24/2014, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Joanne Muratori

IRB Coordinator

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