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The relationship between social skills and challenging behaviors in children with autism spectrum disorders

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THE RELATIONSHIP BETWEEN SOCIAL SKILLS AND CHALLENGING BEHAVIORS IN
CHILDREN WITH AUTISM SPECTRUM DISORDERS

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ABSTRACT

The autism spectrum disorders (ASD) are among the most serious and debilitating conditions with onset in early childhood. Deficits in social interaction skills are considered to be the hallmark set of symptoms and are given the most weight in current diagnostic systems. Although not considered among the core symptoms of ASD, challenging behaviors in the form of physical aggression, property destruction, and self-injury also commonly occur. Challenging behaviors of this nature are a salient feature of ASD because of their potential to cause harm to self and others as well as limit a child's access to opportunities in community and academic settings. However, at this point little is known about the relationship between these two variables. In the present study, the relationship between social skills and challenging behavior in children with ASD was explored through a series of correlational and regression analyses. In Study 1, it was demonstrated that this relationship was stronger for children with ASD than typically developing controls and that measures of social skills could significantly predict variance in measures of challenging behavior. This relationship was explored in further detail for the ASD group in Study 2, where it was determined that the social skills deficits/excesses exhibited by these children predicted variance in challenging behavior above and beyond that of ASD symptom severity, most notably with regard to repetitive, self-injurious, and overall levels of challenging behaviors. Implications of the results and directions for future research are discussed.

INTRODUCTION

The autism spectrum disorders (ASD) encompass five related conditions believed to be neurodevelopmental in origin (Lam, Aman, & Arnold, 2006). Although symptom presentations are often rather heterogeneous across individuals, the disorders are all characterized by onset in early childhood and deficits in social interaction and communication along with the presence of restricted or repetitive behaviors (Wing, 1997). Over the years researchers have proposed many possible etiologies of autism and the other ASD, with those involving genetic factors receiving the most empirical support (Matson & Minshawi, 2006). The ASD were once thought to be quite rare (approximately 4 out of 10,000; Lotter, 1966; Wing & Gould, 1979). Currently, the prevalence is usually reported to be about 1 in 150 with more precise rates at 20.5 to 38.9 per 10,000 for autism and 53.6 to 116.1 per 10,000 for the entire ASD spectrum (Baird et al., 2006; Gillberg, Cederlund, Lamberg, & Zeijlon, 2006). Reasons for this apparent increase in prevalence have been attributed to the broadening of the autism spectrum and changes in diagnostic criteria (discussed in greater detail below). Wing and Potter (2002) also add several other reasons, including: variability across studies in methods of diagnosis; increased awareness of ASD among professionals and parents; the recognition that ASD can occur in persons with all levels of intellectual functioning, physical disability, or psychiatric disorder; increased development of specialized services for ASD; and a possible true increase in number.

Autism Spectrum Disorders: History and Symptoms

In the United States, the ASD are officially referred to as Pervasive Developmental Disorders (PDD) in the most current version of the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition, Text Revision; DSM-IV-TR; American Psychiatric Association [APA], 2000). Included among the PDD are Autistic Disorder (commonly referred to as autism),

Asperger's Disorder (also referred to as Asperger's syndrome [AS]), Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), Childhood Disintegrative Disorder (CDD), and Rett's Disorder. These latter two conditions are thought to be much rarer and have identifiable biological markers. The former three conditions, on the other hand, are more common and make up what is considered to be the "autism spectrum," which can be conceptualized as a continuum of symptom severity with Autistic Disorder at one end with the most severe symptom presentation, PDD-NOS in the middle, and Asperger's Disorder at the other end with the mildest symptom presentation. What follows is a discussion of the history and diagnostic criteria/core symptoms of each disorder.

<div align="center">Autistic Disorder</div>

History

The first description of what is known today as Autistic Disorder appeared in a 1943 paper by Leo Kanner, a psychologist of Austrian descent, who was working at Johns Hopkins University at the time. In his paper he described a set of behaviors that were exhibited by 11 children (8 boys and 3 girls) that differentiated them from having any other known psychiatric condition. These children all had difficulties with social interaction and forming relationships, lack of or delay in the acquisition of speech, abnormalities of speech after it had developed (e.g., echolalia, pronoun reversal, literal speech), a lack of imagination, repetitive and ritualistic behaviors, and an insistence on sameness in their environments. This list of behaviors mirrors the three core areas of impairment utilized in current classification schemes, such as DSM-IV-TR and the *International Classification of Diseases* (Tenth Edition; ICD-10; World Health Organization [WHO]). Kanner's descriptions encompassed both reports from parents describing their children's lack of interest in the activities of others as well as his own observations of the

children ignoring other's attempts to interact with them as they focused almost exclusively on the objects in the room. Additionally, in those situations where interaction was forced, the children reacted with annoyance, resentment, and anger. Kanner also believed that the disorder originated in infancy and had a biological etiology, both of which have remained consistent with current conceptualizations of the disorder.

Kanner referred to the disorder he observed as an "autistic disturbance of affective contact." His initial descriptions have led to our current conceptualization of Autistic Disorder, which in subsequent years has been referred to as "classic autism," "infantile autism," and "Kanner's autism." However, the use of the term "autism" led to some confusion because a Swiss psychiatrist named Paul Eugen Bleuler had previously used the term in 1910 (as cited in Rutter, 1978) to refer to the social withdrawal commonly exhibited by persons with schizophrenia. Bleuler believed that a person with schizophrenia was withdrawing into a world of fantasy, whereas Kanner was referring more to a lack of imagination and a failure to develop social relationships (Rutter, 1978). Despite the different meanings, the severity of the disorder described by Kanner and the use of the term autism led many clinicians to suggest that it was actually an early form of schizophrenia (Bender, 1946). The confusion continued as there are references to childhood schizophrenia appearing throughout the early autism literature. Additionally, one of the premiere ASD journals, *Journal of Autism and Developmental Disorders,* was previously called *Journal of Autism and Childhood Schizophrenia.* It is worth pointing out that autism can be distinguished from schizophrenia in several ways including onset patterns, course, and family genetics (Eveloff, 1960; Romancyk, Lockshin, & Harrison, 1993). Kanner, himself, recognized that these abnormalities were already present in infancy, which allowed for differentiation from childhood schizophrenia or psychosis.

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However, this did not prevent further confusion in nomenclature as the term "early childhood psychosis," came to be used interchangeably with Kanner's autism. Nine symptoms of early childhood psychosis were delineated by Creak in 1961. Many of these symptoms overlap with those described by Kanner, and the terms were often used interchangeably. The symptoms proposed by Creak include: 1) impairments in emotional relationships (e.g., aloofness, difficulty with social play), 2) lack of awareness with regard to personal identity (e.g., abnormal body postures, self-injurious behavior [SIB], difficulty using personal pronouns), 3) abnormal preoccupation with parts of objects, 4) insistence on sameness in the environment, 5) abnormal responding to perceptual experiences and environmental stimuli (e.g., pain insensitivity, hypersensitivity to sounds or smells), 6) acute or excessive anxiety typically in response to changes in the environment, 7) abnormalities in speech (e.g., failure to develop expressive language, loss of previously acquired speech, abnormal speech patterns such as echolalia or pronoun reversal), 8) distorted pattern of motility (i.e., abnormal gait, body posturing, and movements), and 9) intellectual impairment (although some may have normal or exceptional intellectual functioning). However, Creak was unable to indicate how these behavioral patterns constituted a distinct disorder. Still, many of these symptoms that do not fall within the three core areas of impairment of current diagnostic systems (e.g., abnormal gait, unusual perceptual experiences) have been incorporated into current ASD assessment measures (Matson & Minshawi, 2006).

Kanner's own conceptualization of the disorder would change over the years as well. Initially, he believed that symptoms were present at birth but later noted that a child could develop autism after 1 or 2 years of normal development (Eisenberg & Kanner, 1956). At this time, Kanner also decided that only two of the symptoms first described were essential to the

disorder – "extreme aloneness" and "preoccupation with the preservation of sameness (Eisenberg & Kanner, 1956). Over a decade later, Ornitz and Ritvo (1968) added the symptom of "disturbances in perception" to Kanner's original conceptualization of autism and emphasized that this was the hallmark symptom of the condition. However, the notion of these specific symptoms being more important than others failed to make much of an impact in later diagnostic systems.

Although Kanner's original paper laid the groundwork for our current conceptualization of Autistic Disorder, the view that autism was defined by three classes of symptoms was not suggested until the 1970s. It was Michael Rutter who described these three broad groups of symptoms as 1) "a profound and general failure to develop social relationships;" 2) "language retardation with impaired comprehension, echolalia and pronominal reversal;" and 3) "ritualistic or compulsive phenomena" (Rutter, 1978). The DSM-IV-TR describes these three classes of symptoms as qualitative impairments in social interaction; qualitative impairments in communication; and restricted, repetitive and stereotyped patterns of behavior, interests, and activities; respectively (APA, 2000). Rutter chose his symptoms in an effort to highlight those behaviors that differentiated autism from other psychiatric disorders. He also added the criterion that symptom onset must occur before an age of 30 months (currently it is 3 years of age; Rutter, 1978).

Around the same time as Rutter's work, Edward Ritvo, who was chairman of the National Society for Autistic Children (NSAC), put forth his own conceptualization of the core symptoms of autism. NSAC formed in the 1960s during a time when professionals and parents of children with autism were beginning to organize for the purpose of advocating for the right to education and treatment services (Wing & Potter, 2002). The NSAC definition included four

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clusters of symptoms: 1) disturbances in the development of physical, social, and language skills; 2) abnormal sensory responses including sight, hearing, touch, pain, balance, smell, taste, and/or posture; 3) a lack of speech or delay in its acquisition as well as unusual speech patterns (e.g., in terms of rhythm, word use, limited understanding of ideas); and 4) abnormal relating to people, objects, and events (i.e., typically not responding in an appropriate manner to others or using toys in ways in which they weren't intended to be used; Ritvo & Freeman, 1977). Ritvo and Freeman (1977) also proposed that approximately 80% of those with autism also had intellectual disability (ID; i.e., an IQ score less than 70) and that challenging behaviors such as SIB, aggression, and stereotypical motor movements were common among those with severe symptom presentations.

The definitions proposed by Rutter (1978) and the NSAC (Ritvo & Freeman, 1977) are similar in their emphasis on deficits in social interaction and communication and symptom onset prior to 30 months of age. However, the definitions differ in terms of the third major class of symptoms (i.e., ritualized behaviors). For example, in Rutter's (1978) definition, such behaviors constitute a distinct category, whereas in Ritvo's work (e.g., Ritvo, 1978; Ritvo & Freeman, 1977), they are conceptualized more as a disturbance in relating to other people, events, and objects. The definitions also differed in terms of their authors' motivations. For example, Rutter's intentions were more scientific in that he wanted to re-examine and summarize the existing autism literature, whereas Ritvo and NSAC's motivation was more political – he wanted to provide a definition that would most benefit children with autism and their families in terms of social and political recognition (Schopler, 1978).

Before autism would appear in an edition of the DSM, Wing and Gould (1979) proposed their own categorization scheme based on the results of an epidemiological survey. The authors

identified 122 children and adolescents under the age of 18 who exhibited symptoms in one or more symptom areas (i.e., impaired social interaction, abnormal language development, and stereotypical behaviors) and/or had ID. The authors then conducted follow-up structured interviews and observations for these young people. Based on the results, Wing and Gould (1979) proposed that the children and adolescents in their sample could be grouped reliably based on the quality of their social interactions, which corresponded to variations in behavioral, psychological, and medical factors. These three groups were labeled "aloof," "passive but odd," and "sociable." The majority of young people in the sample exhibited some form of social impairment ($n = 74$; i.e., categorized as either "aloof" or "passive but odd"). The participants in the two socially impaired groups also exhibited repetitive or stereotyped behaviors, with most being nonverbal or having some abnormality in their speech. The children and adolescents in the "aloof" subgroup could be further differentiated in that they were more likely to exhibit mutism and stereotyped activities and have an earlier age of onset (before 3 years of age). Those in the "passive but odd" subgroup, on the other hand, were more likely to exhibit repetitive speech and be able to engage in symbolic activities. Because only 17 of the children and adolescents with social impairments had been previously diagnosed with autism based on Kanner's original description of the condition, the authors suggested that the definition should be broadened. Along with Rutter's work, Wing and Gould (1979) also get credit for delineating the triad of impairments now used by current classification systems to diagnose Autistic Disorder, as they noted that certain symptoms usually clustered together – absence or impairment in social interaction, absence or impairment in language usage and/or comprehension, and impairment in flexible or imaginative activities.

Autism was not officially recognized by the APA until the publication of the third edition of the DSM in 1980. In DSM-III it was labeled Infantile Autism, and along with several related conditions, was classified as disorders of childhood under the category of PDD – a term, which as mentioned above, has been retained in subsequent revisions of the DSM (APA, 1980). The other PDD in DSM-III were Residual Infantile Autism, Childhood Onset Pervasive Developmental Disorder (COPDD), and Atypical Pervasive Developmental Disorder. The definition put forth for Infantile Autism was heavily informed by Rutter's (1978) work. For cases when a child was previously diagnosed with Infantile Autism but no longer met criteria, the Residual Infantile Autism diagnosis would be used. The category of COPDD was reserved for individuals whose symptoms developed after an age of 30 months. Atypical PDD is the precursor to what is now called PDD-NOS and covered those children who exhibited PDD symptoms but who did not meet criteria for any specific disorder. The authors of DSM-III also made sure to eliminate any further confusion with childhood schizophrenia by stating that hallucinations and delusions were exclusionary criteria for a diagnosis of one of the PDD.

The revision of DSM-III (DSM-III-R) was published in 1987, and bearing the influence of Wing and Gould (1979), the definitions of autism and PDD were broadened; the authors also attempted to make the language more objective and concrete in comparison to the previous version (Volkmar & Klin, 2005). These changes indicate that the authors were embracing more of a developmental perspective and the recognition that autism was a lifelong condition. For example, the name Infantile Autism was changed to Autistic Disorder and the age of onset criteria was dropped. However, the changes were not without their own problems as the rate of false-positives increased to approximately 40%. In addition, removing the age of onset from the diagnostic criteria went against Kanner's original descriptions as well as the findings of current

research. The broadening of symptom descriptions also resulted in difficulty making comparisons to studies conducted outside of the US which used WHO's (1977) ICD-9 to diagnose autism and also employed much more conservative diagnostic criteria (Volkmar & Klin, 2005).

The fourth edition of the DSM was published in 1994 and included, for the first time, the five conditions now referred to as the "autism spectrum disorders" (see above). This classification scheme also allowed DSM-IV to be more compatible with the tenth edition of ICD. This DSM revision was undertaken with the goals of increasing its clinical utility, reliability, and validity of the diagnoses. In preparation for the revision, the authors conducted extensive literature reviews, reanalyzed the DSM-III-R data, and conducted a large multinational field trial. For the field trial, raters with varying experience with autism provided case ratings of children with ASD and other disorders of childhood such as Attention Deficit-Hyperactivity Disorder (ADHD). The age of onset for autism was set at 36 months because this criterion increased sensitivity, and overall reliability of the diagnostic criteria was found to be in the good to excellent range (Volkmar & Klin, 2005). This age criterion also allowed for greater compatibility with ICD-10. The five disorders constituting the PDD in DSM-IV (Autistic Disorder, PDD-NOS, Asperger's Disorder, CDD, and Rett's Disorder) covered a wide range of symptoms that were applicable across the lifespan. In addition, it was with this edition of the DSM where greater emphasis was first placed on the symptoms pertaining to deficits in social interaction skills; this newfound emphasis on social deficits solidified the shift to the current view of social impairment being the most critical feature of the disorder (Charman et al., 1997; Stella, Mundy, & Tuchman, 1999). Previously, the DSM-III had regarded the three symptom categories as equally important in diagnosing autism. Such an emphasis was important in that it both helped curb the over-

diagnosis of autism in persons with ID and was consistent with Kanner's original emphasis on difficulties in social relationships (Volkmar & Klin, 2005).

Diagnostic Criteria/Core Symptoms

DSM-IV-TR criteria for Autistic Disorder are as follows: 1) qualitative impairment in social interaction, 2) qualitative impairment in communication, and 3) restricted, repetitive, and stereotyped patterns of behavior, interest, and activities (APA, 2000). As mentioned above, the symptoms of social dysfunction are given the most weight in diagnosing the disorder, which is exemplified by the requirement of at least two symptoms needed, whereas only one is required in the other two domains. Altogether, a total of at least six symptoms must be evident to the point of causing functional impairment, and the deficits need to have emerged before an age of 36 months.

Social Interaction. The symptoms of social impairment are described as: 1) impairment in multiple nonverbal behaviors; 2) failure to develop peer relationships appropriate to developmental level; 3) a lack of spontaneous seeking to share enjoyment with others; and, 4) a lack of social and emotional reciprocity (APA, 2000). Some of the early indicators of these symptoms of social impairment include a lack of attachment behavior, failure to bond with caretakers, not seeking comfort when hurt or upset, and lack of or abnormal use of eye-to-eye gaze (Rutter, 1978). Another commonly discussed early social marker in children with autism is nonverbal joint attention skills (Mundy & Crowson, 1997). Joint attention involves looking at another person and then nonverbally drawing that person's attention to an object of interest by either looking at or gesturing towards the object. In typically developing children such behavior usually first occurs around the age of 10-12 months but is notably absent or impaired in a child with autism. Such children have marked difficulty in both the initiation and response to bids of

joint attention (Baron-Cohen, 1989; Mundy, Sigman, Ungerer, & Sherman, 1986). Responding to joint attention bids (but not initiating them) has also been proposed as a moderator in the relationship between amount of intervention and language gains in children diagnosed with autism (Bono, Daley, & Sigman, 2004). Deficits in these joint attention skills are considered to be precursors to many of the more overt social disturbances that become more pronounced as the disorder progresses (e.g., lack of sharing enjoyment, interests, or achievements with others; impairment in multiple nonverbal behaviors; Kasari, Sigman, Mundy, & Yirmiya, 1990).

The social deficits evinced by children with autism are rather pervasive, affecting their orientation, recognition, and overall response to social stimuli. As alluded to earlier, such deficits distinguish individuals with ASD from those with ID. For example, Dawson, Meltzoff, Osterling, Rinaldi, and Brown (1998) demonstrated that children with autism are significantly more impaired in terms of orienting to social stimuli in comparison to both children with Down's syndrome and developmentally-matched children without ID. Examples of social stimuli that children with autism typically fail to respond to include an adult asking for help or expressing distress (Bacon, Fein, Morris, Waterhouse, & Allen, 1998; Sigman, Kasari, Kwon, & Yirmiya, 1992). Impairments in social referencing (i.e., looking to an adult for cues in response to unfamiliar stimuli) are also evident in children with autism (Bacon et al., 1998). Collectively, these studies highlight that the social stimuli that children with autism fail to recognize or respond to appropriately are often related to the emotions of other people. For example, in the study by Sigman and colleagues (1992), the children with autism continued to play with their toys when an adult pretended to be hurt.

Such impairments in recognizing and responding to social stimuli are likely to manifest themselves in play situations, which is often the primary vehicle for social interaction in

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children. One aspect of play that is strikingly absent or impaired in children with autism is symbolic or pretend play (Jarrold, Boucher, & Smith, 1993). Even in comparison to children with ID, the play interactions of children with autism are shorter and much more unlikely to be initiated by that child (Jackson et al., 2003). However, deficits in peer-related social behaviors (e.g., being in close proximity to other children, receiving social bids, focusing on other children) are quite pervasive and are evident in all social activities, not just play (McGee, Feldman, & Morrier, 1997). It should also be noted that children with autism generally respond more positively to adults than to other children. This factor may be the result of such interactions with adults centering on need fulfillment and not being purely social, as would be the case with peer interactions (Jackson et al., 2003).

Another area of social interaction that often proves to be difficult for individuals with autism is inferring others' thoughts and feelings from indirect social cues (e.g., body posture, tone of voice) or what could be called "reading" other people. This is a skill that develops without conscious effort in typically developing children, but for individuals with autism, marked difficulties are apparent in picking up on other people's social and emotional cues as well as gleaning feelings and beliefs during conversation with others (Gillberg, 1990; Rutter, 1983). It is believed that these deficits are specific to autism and do not generalize to those with ID or other developmental delays. For example, children with autism have greater difficulty in discriminating social and emotional cues in comparison to same-age children with ID (Hobson, 1986a, 1986b). Additionally, persons with autism demonstrate impairment in expressing the appropriate emotion required for a given situation (Cohen, Paul, & Volkmar, 1986).

Children with autism will also actively avoid engaging with social stimuli and oftentimes show stronger attachments to objects than people – a symptom originally noted by Kanner. Such

avoidance of social stimuli has been observed even in infants; for example, in a study by Swettenham and colleagues (1998), children with autism spent significantly less time looking at people and significantly more time gazing at objects when compared to both developmentally delayed and typically developing infants. Some researchers have argued that this impairment is the result of a general deficit in orienting ability that is more pronounced for social stimuli (Dawson et al., 1998). Along with impaired joint attention skills, such deficits support the notion that social impairment exists at very young ages in children with autism.

The origin of these social deficits is still being debated. At a very general level, it is more than likely that symptoms of social impairment stem from neurological abnormalities associated with the disorder (Mundy & Sigman, 1998). Rutter (1983) has suggested that the social deficits seen in autism arise from a cognitive defect in dealing with social and emotional cues. Supporters of this view point out that, for an individual with autism, only those areas of social interaction that require an individual to recognize and understand the emotions of other people are impaired (Braverman, Fein, Lucci, & Waterhouse, 1989), whereas other social capacities that only require perception of the observable world (e.g., face recognition) remain intact (Baron-Cohen, 1988; Gillberg, 1990). However, it should also be mentioned that children with ASD do have difficulty in matching tasks with faces and objects, above and beyond deficits in affect matching (Braverman et al., 1989; Hobson, 1986a, 1986b).

Communication. A deficit in communication is the second symptom domain used in diagnosing autism. The DSM-IV-TR requires at least one of the following impairments to be present: 1) delay in the development of or absence of spoken language; 2) in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others; 3) stereotyped and repetitive or idiosyncratic language; and, 4) lack of varied,

spontaneous make-believe play or social imitative play appropriate to the developmental level (APA, 2000). It's been estimated that 50% of children with autism never gain functional speech, and in those that do, echolalia or other abnormalities such as pronoun reversal (e.g., saying "You want a snack," instead of "I want a snack") are commonly observed (Rutter, 1978). Persons with autism have particular difficulty in both the production (Baltaxe, 1977; Baltaxe & D'Angiola, 1992; Stone & Caro-Martinez, 1990; Tager-Flusberg & Anderson, 1991) and comprehension of pragmatic language (Hewitt, 1998; Paul & Cohen, 1985). Given that conversation skills are significantly limited in this population, persons with autism have specific deficits with regard to responding to conversational questions that are either lengthy and/or requiring the person to draw inferences in order to respond appropriately (Hewitt, 1998). Additionally, when an individual with autism is engaging in conversation, he/she oftentimes gives the impression of talking at the conversational partner, rather than with the person (Rutter, 1978). Conversation topics are also usually restricted to the present situation or the special interests of the person with ASD (see below).

Restricted Behavior. This third and final symptom domain was originally conceptualized as an "insistence on sameness" (Kanner, 1943) and has also been described as a lack of "behavioral flexibility" (Wahlberg & Jordan, 1991). The symptoms in this domain cover a wide variety of stereotyped behaviors and routines, and behavioral presentations are heterogeneous and often idiosyncratic. According to the DSM-IV-TR, at least one of the following must be evident for a diagnosis of Autistic Disorder: 1) preoccupation with one or more stereotyped and restricted patterns of interest of abnormal intensity or focus; 2) apparently inflexible adherence to specific, nonfunctional routines or rituals; 3) stereotyped and repetitive motor mannerisms; and, 4) persistent preoccupation with parts of objects. Early indicators of such symptoms include rigid

and limited play patterns (usually related to a lack of imaginative or make-believe play; Rutter, 1978). As mentioned above, children with autism often show greater attachment to inanimate objects than to people; this attachment to objects can often be quite intense – to the point of causing marked distress if the child is separated from the object in some cases. When these children play with toys they often do so in bizarre or nonfunctional ways (e.g., twirling a toy around) and/or only focus on a particular part of the toy (e.g., spinning wheels on a toy car). Common ritualized or stereotyped motor mannerisms include such things as body rocking, handflapping, and SIB.

<center>Asperger's Disorder</center>

History

In 1944, independently and only one year later than Kanner, an Austrian psychiatrist named Hans Asperger described a group of four children 6-11 years of age who displayed symptoms similar to those observed by Kanner. In his paper, Asperger (1944) labeled the symptom pattern, which consisted of impairments in nonverbal communication, idiosyncratic verbal communication, impairment in social adaptation with special interests, intellectualization of affect, clumsiness and poor body awareness, and conduct problems, as "autistic psychopathy."

Asperger (1944) described these impairments in detail with respect to the three core classes of symptoms that would later be used in diagnosing the ASD. For example, in terms of social impairment, these children exhibited a lack of empathy or understanding for the thoughts and feelings of others; they also tended to intellectualize their own feelings. Such social deficits tended to result in behavioral problems such as aggression and noncompliance as well as children with the condition being the victims of bullying and teasing. The young people observed by Asperger displayed similar deficits in nonverbal communication as those described by

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Kanner. For example, facial expressions and gestures were very limited, and the children evidenced difficulty in understanding the nonverbal cues of others as well. Whereas the children described by Kanner had limited or repetitive speech, those observed by Asperger were often long-winded, incoherent, one-sided, pedantic, and tangential in their verbal communication with poor volume modulation (speaking too loud) and atypical fluency (jerky speech patterns) also observed. The children Asperger observed were also more likely to have all-consuming special interests (oftentimes related to science) as opposed to repetitive motor movements (such movements, such as object spinning, are commonly observed in AS as well). As Asperger noted, they would often develop encyclopedic knowledge of certain topics and would speak of little else; however, despite an excellent rote memory for factual knowledge, the children usually had a very superficial understanding of meaning and exhibited marked difficulty in applying or connecting what they had learned to real-world situations.

Discussion of Asperger's work did not appear in English-speaking journals until 1963 when Van Krevelen (1963, 1971) made an attempt to summarize and specify differences between Asperger's (1944) and Kanner's (1943) original papers. As mentioned above, both accounts had several similarities; however, as Van Krevelen (1963, 1971) pointed out Asperger's "autistic psychopathy" differed from Kanner's "early infantile autism" in several ways: 1) symptoms were not evident until the age of 3 years or later, 2) acquisition of speech and language acquisition were less often delayed, 3) there was no associated ID, 4) motor impairments related to coordination and visuo-spatial abilities were present, and 5) the children had a better prognosis due to their milder symptoms. However, there was little interest in Asperger's work until the publication of a paper by Lorna Wing in 1981 in which she discussed in detail the differential diagnosis of autism and AS. In her paper, Wing (1981) proposed some

additional symptoms of the disorder, including lack of interest in others as an infant or toddler (i.e., limited babbling, gesturing, and smiling at others) and limited imaginative pretend play (in terms of the involvement of other children and variety). She also differentiated AS from autism based on the quality of social impairment – children with autism were referred to as "aloof and indifferent," whereas those with AS were "passive or inappropriate" in regard to their interactions with others. Since Wing's (1981) paper, interest in the topic has increased dramatically, especially over the past decade – in fact more papers have been published in that time than from 1944-2000 (Matson & Wilkins, 2008).

<u>Diagnostic Criteria/Core Symptoms</u>

In DSM-IV-TR and ICD-10 classification schemes, differential diagnosis between Autistic Disorder and Asperger's Disorder is made primarily in terms of age of onset; if impairments in social interaction, communication, or restricted behavior are noted before the age of 3 years, then a diagnosis of Autistic Disorder or PDD-NOS would be given. According to the DSM-IV-TR, if there is concern about cognitive development, self-help skills, or adaptive behavior (excluding socialization), or if the child meets diagnostic criteria for Autistic Disorder, then a diagnosis of Asperger's Disorder would be ruled out (APA, 2000). Given that many individuals with higher functioning ASD appear to exhibit symptoms prior to the age of 3 years, the current diagnostic systems have been criticized for making it very difficult for a diagnosis of Asperger's Disorder to be applicable.

There continues to be much debate as to whether DSM-IV-TR criteria can actually differentiate Asperger's Disorder from Autistic Disorder or what has been termed high-functioning autism (HFA; i.e., autism without ID; Freeman, Cronin, & Candela, 2002; Khouzam, El-Gabalawi, Piruani, & Priest, 2004; Schopler, Mesibov, & Kunce, 1998) with most research

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failing to support the current DSM classification criteria (e.g., Mayes & Calhoun, 2001a; Tryon, Mayes, Rhodes, & Waldo, 2006). Other research has demonstrated that for children with normal intelligence, the presence of delays in the development of speech does not seem to predict differences in ASD symptoms or later functioning in those with autism or AS (Eisenmajer et al., 1998; Mayes & Calhoun, 2001b). Elsewhere, it was shown that there were no differences in symptom presentation between these two disorders when IQ and age were controlled (Mayes & Calhoun, 2004). Howlin (2003) summarized 26 articles published in the preceding 15 years that directly compared AS and HFA. The conclusion reached was that the literature does not support the notion that the two are distinct conditions. Despite these findings, the prevailing consensus among researchers are that the two conditions are unique (although the proper way to differentiate the two remains elusive) and that a variety of different symptoms have been identified as being distinctive of AS across the three core ASD symptom classes (e.g., more interpersonal mishaps, greater range of activities) as well as in terms of other developmental (e.g., less likely to be floppy or irritable as an infant), sensory-motor (e.g., poorer performance on visual-motor tasks), intellectual (e.g., smaller discrepancy between verbal and performance IQ scores), and psychopathological differences (e.g., less likely to have social phobia, but higher levels overall; Matson & Wilkins, 2008).

Individuals with AS display impairments in the same three symptom domains as with autism, but symptom presentations are usually qualitatively different and oftentimes less severe. For example, even though there is no delay/absence of language acquisition, individuals with AS display other abnormalities in communication such as pedantic speech, speaking with an odd rhythm, or speaking in monotone. On the other hand, language development may even be accelerated in those with AS, with early acquisition of language and hyperlexia commonly

observed. Socially, individuals with AS desire relationships with others but lack the skills and understanding to achieve such relationships. People with autism, alternately, are usually not interested in social relationships. Other differences between the two conditions include for AS, a later age of onset (3 years of age or later), no associated ID or adaptive deficits, problems with coordination (e.g., clumsiness, odd gait), and visuo-spatial impairment (Gillberg, 1989).

Pervasive Developmental Disorder-Not Otherwise Specified

History

There are accounts in the early ASD literature of cases similar to Kanner's original description but falling short of his guidelines (e.g., Bender, 1946; Despert & Sherwin, 1958). The children described in these studies were noted to have an early-onset of symptoms and some social deficits in terms of relating to other people; however, they seemed to exhibit fewer difficulties with communication and repetitive behaviors. Although the term PDD appeared in DSM-III as the umbrella label for autism and related conditions, the diagnostic category of PDD-NOS did not appear until later. However, as mentioned above, the diagnosis of Atypical PDD in DSM-III served a similar role. The first description of PDD-NOS when it appeared in DSM-IV indicated that it was to be used for those who did not meet the age criteria for Autistic Disorder, did not exhibit all elements of autism or similar disorders, or whose symptoms were not of sufficient severity to meet criteria for a diagnosis of Autistic Disorder (APA, 1994).

Diagnostic Criteria/Core Symptoms

DSM-IV-TR provides no explicit criteria for PDD-NOS, instead it is described as a disorder of reciprocal social interaction associated with either impairment in verbal or nonverbal communication or repetitive behaviors (APA, 2000). This description does, however, preclude a diagnosis of PDD-NOS if there is no evidence of social impairment. Additionally, criteria for

other PDD, Schizophrenia, Schizotypal Personality Disorder, or Avoidant Personality disorder cannot be met (APA, 2000).

One would be hard-pressed to find a satisfactory definition in the literature for PDD-NOS; in most cases it is defined by what it is not (i.e., autism; Mayes, Volkmar, Hooks, & Cicchetti, 1993). Interestingly, although PDD-NOS has been studied far less than autism, it is in actuality the most prevalent and commonly diagnosed of the ASD (Matson & Boisjoli, 2007; Mayes et al., 1993). One major barrier in being able to effectively research the condition is that, at present, there are no systematic or reliable methods available for diagnosing PDD-NOS (Towbin, 1997), which begs the question as to how it is being diagnosed so frequently. Typically, a diagnosis of PDD-NOS is given when other ASD diagnoses do not fit or in cases of less severe presentations of autism (Tidmarsh & Volkmar, 2003); the overall symptom presentation may be subthreshold or symptoms are only pronounced in one or two areas. For example, children with PDD-NOS have been shown to possess better communicative and cognitive skills than those with autism (Cohen et al., 1986), as well as less severe disturbances in social relatedness (Mayes et al., 1993). However, such definitions are still somewhat vague and altogether unsatisfactory.

The existence of this diagnostic category has faced scrutiny as well. For example, the level of impairment needed to meet criteria for the three most common ASD (i.e., autism, AS, and PDD-NOS) is poorly operationalized in DSM-IV-TR and ICD-10, and commonly used diagnostic tests such as the Autism Diagnostic Interview-Revised (ADI-R) and Autism Diagnostic Observation Schedule-Generic (ADOS-G) do not have cut-off points to establish diagnoses among these disorders. Differentiating among autism, PDD-NOS, and AS must therefore be done based on experience, training, and clinical judgment. However, Mahoney and

colleagues (1998) found that experienced clinicians could reliably identify a case with ASD from one without ASD but had much more trouble differentiating among them, with PDD-NOS causing the greatest number of disagreements.

<div align="center">Childhood Disintegrative Disorder</div>

History

Although CDD was the first of the five ASD to be documented in the literature, it is far less common than either autism or AS and was not officially recognized until the publications of ICD-10 and DSM-IV. In 1908 an Austrian educator named Theodore Heller (as cited in Volkmar, Koenig, & State, 2005) described a group of six children who developed typically from birth but experienced a severe regression in their development around the age of 3-4 years. Heller originally called the disorder *dementia infantilis*, and in the past, CDD has also been referred to as Heller's syndrome and disintegrative psychosis. Not surprisingly, CDD has been confused with other similar disorders such as autism, schizophrenia, and COPDD (Volkmar et al., 2005).

Diagnostic Criteria/Core Symptoms

According to the DSM-IV-TR, for a child to be diagnosed with CDD, he or she must develop normally for at least the first 2 years after birth as evidenced by age-appropriate communication, social interaction, play, and adaptive behavior skills (APA, 2000). This period of normal development is followed by a clinically significant loss of previously acquired skills before the age of 10 years in at least two of the following areas: expressive or receptive language, social skills or adaptive behavior, bowel or bladder control, play, or motor skills. Abnormalities must also be present in at least two of the three symptom domains seen in autism

(i.e., social interaction, communication, and restricted patterns of behavior). Finally, the child's symptoms cannot be better accounted for by another PDD or schizophrenia.

CDD is distinguished from autism by its later onset (typically between the ages of 3 and 5 years) and the loss of skills, which can either be gradual (occurring over a period of weeks or months) or abrupt (occurring over a period of days or weeks). Children with CDD usually do not recover the lost skills, and other unusual behaviors, such as stereotypies, problems with transitions, and overactivity, also commonly occur (Malhotra & Singh, 1993). The disorder is quite rare (prevalence is estimated at 1 case per 100,000 children) and appears to occur more frequently in males. Not surprisingly, the classification of CDD as a separate diagnosis from autism has been debated in the literature. Compared to children with later-onset autism, children with CDD were found to be more likely to be nonverbal, have more severe levels of ID, and be more likely to require specialized residential placement (Volkmar & Cohen, 1989). Children with CDD also appear to have higher rates of epilepsy and EEG abnormalities compared to children with autism (Kurita, Osada, & Miyake, 2004).

<div align="center">Rett's Disorder</div>

History

The fifth and final of the ASD, Rett's Disorder, is named for another Austrian, a neurologist by the name of Andreas Rett who in 1966 first identified the disorder. In his paper, Rett (1966) described a group of 22 girls who all exhibited similar symptoms, which included repetitive hand movements, dementia, autistic behavior, cortical atrophy, and hyperammonemia (i.e., an excess of ammonia in the blood, which was later found to only occur in rare instances of the disorder). In reference to these latter two symptoms, Rett originally called the disorder *cerebroatrophic hyperammonemia*; however, little attention was given to his findings. Several

years later in 1980, Bengt Hagberg of Sweden, who was unaware of Rett's original paper, presented a paper at the European Federation of Child Neurology Societies, which described a group of his patients with similar symptom profiles. Hagberg's work led to a renewed interest in the disorder, which was then named after its discoverer (Van Acker, Loncola, & Van Acker, 2005).

Diagnostic Criteria/Core Symptoms

Similar to CDD, children with Rett's Disorder experience a period of normal development (through at least the first 5 months for Rett's Disorder), which is then followed by deceleration of head growth between 5 and 48 months of age, loss of previously acquired purposeful hand skills between 5 and 30 months of age (followed by the development of stereotypical hand movements such as handwringing or hand-washing), loss of social engagement (social interaction skills may develop later), appearance of poorly coordinated gait or trunk movements, and severely impaired expressive and receptive language development with severe psychomotor retardation (APA, 2000). These rapid declines in skills typically result in severe to profound ID. Early signs of the disorder include excessive levels of hand patting, waving, and involuntary finger, hand, and arm movements; however, most parents do not recognize these early warning signs and report normal development for the first 6 to 8 months (Van Acker et al., 2005).

According to Hagberg and Witt-Engerstrom (1986), the disorder progresses in four stages. In stage 1, which begins at around 6 to 18 months, there is a decline in motor development, which is manifested as difficulties with crawling, standing, and walking, as well as hypotonia. The onset of stage 2 occurs between 1 and 4 years and is marked by a decline in previously attained skills such as social interaction, cognitive abilities, purposeful hand

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movements, and speech. This is the stage where stereotypical hand movements begin to emerge and respiratory difficulties (e.g., hyperventilation, pauses in breathing) are also common. Beginning between the ages of 2 and 10 years, social interaction skills begin to improve in stage 3. However, seizures often occur during this stage as well, and movements are described as jerky, clumsy, and stiff. Stage 4, which begins after 10 years of age, is marked by progressive muscle wasting, scoliosis, spasticity, rigidity, and decreased mobility. Cognitive functioning does remain stable though, and social skills and attentiveness continue to improve.

Although survival into adulthood is not uncommon, little is known about the course of Rett's Disorder beyond adolescence because of a lack of controlled studies and variability of symptoms (Kerr, Armstrong, Prescott, Doyle, & Kearney, 1997). In one recent study, Matson, Dempsey, and Wilkins (2008) compared six adults with Rett's Disorder living in residential placements to matched peers with either autism and ID or ID alone. Compared to those with autism, the individuals with Rett's Disorder exhibited less overall impairment and a lower rate of challenging behaviors but also exhibited greater levels of impaired hand functioning, mouthing of objects, and stereotypic tongue movements.

Rett's Disorder is caused by a mutation on the paternal X chromosome, which is why the syndrome occurs almost exclusively in females (such a mutation would be lethal in males). More specifically, it has been determined that mutations in the MECP2 gene are involved in the pathogenesis of the disorder (Amir et al., 1999). Mutations in this gene result in a failure to produce MECP2 protein, which functions to turn off or "silence" various genes during development of the central nervous system.

Assessment of ASD

There are a variety of measures available for use in the assessment of autism. One major criticism of these measures, however, is that most are not able to differentially diagnose among the ASD. Of particular use would be an instrument that could differentiate reliably among the three most common ASD: autism, PDD-NOS, and AS (CDD and Rett's Disorder having biological markers that makes their differential diagnosis less of an issue). There are also several instruments available that were specifically designed for AS (for a review see Campbell, 2005). These scales have been less extensively researched (and thus psychometric properties are limited) than those that measure autism, largely due to the ongoing debate regarding appropriate diagnostic criteria and how AS is best differentiated from autism (Matson, 2007). The assessment instruments available for autism take the form of observation schedules, interviews, and checklists, and cover the entire lifespan. Those scales that are both commonly used and have well-established psychometric properties will be reviewed here.

Observation Schedules

Childhood Autism Rating Scale (CARS)

The CARS was developed in North Carolina to assist in the eligibility screening of children for the TEACCH program (Treatment and Education of Autistic and related Communication handicapped CHildren; Schopler, Reichler, & Renner, 1988). This measure is completed by integrating information from parent or teacher interviews with direct observation of the child made by the clinician. The CARS contains 15 independent subscales: 1) relating to people; 2) imitation; 3) emotional response; 4) body use; 5) object use; 6) adaptation to change; 7) visual response; 8) listening response; 9) taste, smell, and touch response and use; 10) fear or nervousness; 11) verbal communication; 12) nonverbal communication; 13) activity level; 14)

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level and consistency of intellectual response; and 15) general impressions. Each of these subscales can be rated on a scale from 1-4, with a score of 1 reflecting the behavior of a typically developing child and a score of 4 reflecting "severely abnormal" behavior. A score in the range of 30-35.5 suggests mild autistic behavior, while a score of 37-60 suggests severe autism.

The most recent reporting of the psychometric properties of the CARS was based on data from 537 children enrolled in TEACCH over a period of 10 years (Stone et al., 1999). Interrater reliability of most items was above .50 and ranged from .68 to .80 for total score. The internal consistency of the scale ranged from .73 to .94, while the criterion-related validity (agreement with clinical diagnosis) ranged from .63 to .64 for children 2-3 years of age. The major limitation of the CARS is that it was developed based on DSM-III criteria for autism, and the symptoms it measures do not directly match up with those of the DSM-IV-TR. Another limitation is that it often overestimates the number of autistic symptoms in children with severe to profound ID (Pilowsky, Yirmiya, Shulman, & Dover, 1998; Van Bourgondien, Marcus, & Schopler, 1992). Finally, as with most scales that assess autism, the CARS does not differentiate autism form other forms of ASD (Matson, 2007).

Autism Diagnostic Observation Schedule-Generic (ADOS-G)

This semi-structured observation schedule was designed to aid in the diagnosis of autism and provide a measure of current functioning (Lord et al., 2000). The ADOS-G can be administered to children and adults of different levels of development and language ability and is composed of four modules: 1) preverbal/single words, 2) flex phrase speech, 3) fluent speech child/adolescent, and 4) fluent speech adolescent/adult. For these modules, the child being assessed is placed in situations that require him/her to do such things as request help, engage in symbolic play, take turns, perform simple tasks, tell a story, discuss tasks that occurred earlier in

the assessment, and discuss social and emotional situations. Each module takes approximately 30 minutes to complete. Unlike the CARS, the ADOS-G does include a diagnostic algorithm for diagnosing PDD-NOS; however, there is not one available for diagnosing AS. Items are scored on a 3-point scale from 0 (no evidence of abnormality) to 2 (definite evidence of abnormality). The authors report adequate interrater, test-retest, and internal reliabilities, and the scale has been demonstrated to have good construct validity with DSM-IV criteria and good convergent validity with the ADI-R (Lord & Corsello, 2005).

<div align="center">Interview</div>

Autism Diagnostic Interview-Revised (ADI-R)

The ADI-R is a semi-structured interview that focuses on the three primary symptom domains used to diagnose ASD – communication, social interaction, and repetitive or stereotyped patterns of behavior (Lord, Rutter, & LeCouteur, 1994). This interview is quite lengthy, consisting of 93 items and taking approximately 2 hours or more to administer. Items are scored on a scale from 0 (normal behavior or development) to 2 (atypical behavior/development, or impairment). The ADI-R utilizes DSM-IV and ICD-10 criteria for autism, which is reflected in its diagnostic scoring algorithm. However, there are no cut-off scores for PDD-NOS or AS. Overall, the scale has sound psychometric properties with interrater reliability ranging from .62 to .89, adequate convergent validity with both the CARS and ADOS-G, and good construct validity with DSM-IV and ICD-10 criteria (Lord & Corsello, 2005). The main weaknesses of the ADI-R are that, as mentioned above, it only diagnoses autism, relies solely on parent report, is lengthy and time-consuming to administer, and requires a clinician experienced with autism to administer.

Autism Spectrum Disorders (ASD) Battery

The ASD Battery was designed to aid in the differential diagnosis of autism, PDD-NOS, and AS. It is unique in several different ways. First, in addition to the diagnostic component, the ASD Battery also contains measures of comorbid psychopathology and challenging behaviors. Second, the ASD Battery covers the entire lifespan with versions for toddlers (i.e., Baby and Infant Screen for Children with aUtIsm Traits [BISCUIT]; Matson et al., in press), children and adolescents (Matson, González, Wilkins, & Rivet, 2008), and adults with ID (Matson, Wilkins, & González, 2007). The toddler and adult versions have scoring algorithms for both autism and PDD-NOS, while the child version has cut-off scores for autism, PDD-NOS, and AS. The diagnostic portion of the child version is discussed in greater detail in the Methods section.

The item content of all three components of the ASD battery was derived by following steps outlined in the test construction literature (e.g., Crocker & Algina, 1986; DeVillis, 1991). This process included a review of relevant literature, current diagnostic guidelines (i.e., DSM-IV-TR and ICD-10), and critical incidents and observations noted by clinical psychologists experienced in working with developmentally disabled populations. The item pool generated from this process was then subjected to expert review and pilot tested with persons unfamiliar with mental health terminology in order to ensure that that the item descriptions were easy to understand. Finally, items with low interrater and/or test-retest reliability coefficients were dropped from the scales. As with all checklists, the major weakness of the ASD battery is that it relies solely on parent or caregiver report and is thus subject to rater biases.

Modified CHecklist for Autism in Toddlers (M-CHAT)

The M-CHAT represents an example of the more recent trend to develop measures that can identify autism at an early age. This scale is the first revision of the Checklist for Autism in Toddlers (CHAT; Baron-Cohen, Allen, & Gillberg, 1992). The CHAT and its revisions are, to date, one of the only methodologically sound measures developed specifically for early detection of autism. In the original study, the test was able to correctly identify ASD (either autism or PDD-NOS) at a rate of 83% in a sample of 16,000 young children. However, the CHAT was not able to differentiate between those two ASD. The CHAT was designed to be administered by the child's pediatrician or general practitioner and included interview and observation portions. The M-CHAT is an expanded, 23-item version of the CHAT (Robins, Fein, Barton, & Green, 2001). Similar to the CHAT, items are based on parent report (the observation component was dropped) and answered as either yes or no (scored "pass" or "fail"). The M-CHAT was designed for children ages 18-24 months of age, and the item content reflects symptoms of "classic autism." A child "fails" the test if two or more of the six critical items (e.g., does your child take an interest in other children, does your child ever bring objects over to you [parent] to show you something) or three or more total items are endorsed. The M-CHAT was designed as a screening instrument and not aimed at aiding in diagnosis – therefore, if a child "fails" it does not mean the child has ASD.

The CHAT was again revised more recently in an attempt to increase the sensitivity of the original scale. The Quantitative CHecklist for Autism in Toddlers (Q-CHAT) is a normally distributed screener and measure of autistic traits for children ages 18-24 months (Allison et al., 2008). The Q-CHAT is based on parent-report and contains 25 items, which are rated in terms of frequency along a 5-point scale. Items were derived from the original CHAT, DSM-IV and ICD-

10 criteria for ASD, and literature review. In the initial study, children with ASD under the age of 3 years were shown to score significantly higher than typically developing controls. Additionally, test-retest reliability was very good at .82. Criticisms of the CHAT and its revisions include low sensitivity for the original scale and limited follow-up data available for the two revisions (Mawle & Griffiths, 2006). There is also an ongoing debate as to how accurately ASD can be identified prior to the age of 3 years (Matson, Wilkins, & González, 2008).

Related Difficulties of ASD

Since its discovery and subsequent conceptualizations, there has always been the notion that certain symptoms or other difficulties were common to those with ASD but not essential in defining or diagnosing the disorders. For example, Rutter (1978) proposed that a short attention span, SIB, delayed bowel control, ID, and neurological deficits frequently co-occurred with autism and were more common than with other children. Interestingly, Kanner believed that autism was not related to other medical conditions. However, current evidence indicates that as many as 25% of children with autism also have a seizure disorder, for example (APA, 2000; Tidmarsh & Volkmar, 2003). Discussed here are the most common and well-researched related difficulties for those with ASD: ID, comorbid psychiatric conditions, sleep problems, and challenging behaviors (note: since challenging behaviors are a major focus of this paper they will be discussed in a separate section).

Intellectual Disability

Because the children Kanner observed had a normal physical appearance and good rote memory, he believed that ID was not part of the disorder. He actually viewed their poor functioning as stemming from their failure to develop relationships with others and not as a

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result of ID. Kanner also believed that children with autism's poor performance on parts of IQ tests, particularly the verbal subtests, was due to a lack of motivation. However, after it was determined that IQ scores held the same meaning for children with ASD as for other children, the current view that the two conditions (i.e., ASD and ID) can co-exist was adopted (Rutter, 1978). In fact, it is actually believed that most persons with ASD also have ID (approximately 75%), and all levels of ID (from mild to profound) are equally prevalent (APA, 2000; Jospeh, Tager-Flusberg, & Lord, 2002). However, this number is still being debated, and the percentage of those with both conditions has been reported to be between 67% and 90% (Edelson, 2006).

Although the two conditions commonly co-occur, differences in the pattern of intellectual/adaptive deficits have been observed between those with ASD and those with ID. For example, an individual with ID will usually display relatively even delays across all areas of development, whereas a person with ASD will usually present with a more uneven developmental or intellectual profile, with deviations in a few specific areas (e.g., expressive and receptive communication, motor skills; Cohen et al., 1986). An early study by Hermelin and O'Connor (1970) demonstrated that children with autism made less use of meaning in their memory processes, demonstrated an impaired use of concepts, and were limited in their coding and categorizing abilities in comparison to children with ID only. The authors concluded that children with autism have a specific cognitive deficit that involves language and central coding processes that those with ID do not. Other researchers have described a specific IQ profile on Wechsler intelligence tests for those with ASD (i.e., higher Performance IQ than Verbal IQ score, with Block Design having the highest subtest score; Happé, 1994; Lincoln, Allen, & Kilman, 1995). This discrepancy between performance and verbal abilities may lessen with age for children with both ASD and mild ID who possess functional language skills (Joseph et al.,

2002). Additionally, a greater discrepancy appears to be related to degree of social impairment with greater performance/verbal discrepancies being positively correlated with greater social impairment, independent of verbal ability (Joseph et al., 2002). Not surprisingly, overall level of intellectual functioning is also related to degree of social impairment – those with severe or profound ID are more likely to demonstrate greater social deficits and challenging behaviors than those in the mild to moderate range (Rutter, 1983; Wing & Gould, 1979).

<div align="center">Comorbidity</div>

Comorbidity or comorbid psychopathology will be defined here as the occurrence of a mental health disorder in an individual with ASD (Matson, 2007; Matson & Nebel-Schwalm, 2007a). Comorbidity is also referred to as dual diagnosis and includes ID as discussed above. To date, there has been comparatively little headway made in understanding this phenomenon and assessment methods are almost nonexistent. The disorders co-occurring with ASD that have appeared in the literature include ADHD, which is perhaps the most frequently reported of these conditions (Anderson, Williams, McGee, & Silva, 1987; Bird et al., 1988; Caron & Rutter, 1991), depression (Angold, Costello, & Erkanli, 1999; Ghaziuddin, Ghaziuddin, & Greden, 2002), specific phobias (Love, Matson, & West, 1990), Obsessive-Compulsive Disorder (OCD; Charlop-Christy & Haymes, 1996), anxiety (Woodard, Groden, Goodwin, Shanower, & Bianco, 2005), Tic Disorder (Gadow & DeVincent, 2005; Gadow, DeVincent, Pomeroy, Azizian, 2004), Conduct Disorder (Gilmour, Hill, Place, Skuse, 2004), and eating/feeding disorders (e.g., pica, rumination, food selectivity; Ahearn, Castine, Nault, & Green, 2001).

The co-occurrence of some of these conditions with ASD appeared in the earliest accounts of the disorder. For example, Kanner noted eating problems in his original paper and Asperger noted the occurrence of conduct problems in his. However, there has been much

discussion as to whether some of these comorbid conditions are distinct from ASD and are truly comorbid or just manifestations of ASD symptoms. Most notably, perhaps, are the repetitive actions or words of OCD and Tic Disorder which resemble some of the behavioral excesses characteristic of ASD. One major difference is that persons with ASD are typically not distressed by such behaviors, whereas the opposite is the case for those with compulsions or tics (Wing & Attwood, 1987). In the case of ADHD, children with ASD rarely exhibit activity levels within normal limits and are either hypo- or hyperactive (Gillberg & Billstedt, 2000). Even though activity level is not a core symptom of ASD it can still complicate the diagnostic picture. However, researchers have demonstrated that the two conditions can be differentiated, and that children with both ASD and ADHD are distinct from children with ASD alone; in one study, those children with both conditions also exhibited symptoms similar to children with ADHD alone, above and beyond their ASD symptoms (Goldstein & Schwebach, 2004). Elsewhere, Gilchrist and colleagues (2001) were able to differentiate adolescents with Asperger's or HFA from those with Conduct Disorder using measures of ASD symptomatology and IQ scores. Not surprisingly, those individuals with conduct problems evinced different IQ profiles, better reciprocal communication, and less social impairments (Gilchrist et al., 2001).

As with sleep disorders (see below) some of these co-occurring psychiatric conditions occur with greater frequency in children with ASD. For example, compared to age-matched peers with typical development as well as with Down's syndrome, children with ASD have been shown to have a greater incidence of phobias (particularly related to animals and medical procedures; Matson & Love, 1990; Evans, Canavera, Kleinpeter, Maccubbin, & Taga, 2005). Additionally, in children with Tourette's syndrome, those that also had ASD were thirteen times more likely to have additional comorbid mental health conditions than those with Tourette's

alone (Burd, Li, Kerbeshian, Klug, & Freeman, 2009). Altogether, the presence of comorbid mental health conditions in persons with ASD further compounds an already complicated diagnostic picture and also leads to more mental health referrals than for those with ASD alone (Mash & Dozois, 2003).

<div align="center">Sleep Problems</div>

It is believed that almost all children with ASD will experience sleep problems at some point in their life, particularly at younger ages (i.e., less than 8 years of age; Richdale & Prior, 1995). Prevalence rates of sleep disorders in this population have been reported to range from 44% to 83% (Richdale, 1999), and in a more recent study, be as high as 86% (Liu, Hubbard, Fabes, & Adam, 2006). Given these high rates, it is not surprising that children with ASD exhibit more sleep difficulties than their typically developing peers (Honomichl, Goodlin-Jones, Burnham, Gaylor, & Anders, 2002; Liu et al., 2006; Richdale, 1999; Schreck & Mulick, 2000; Wiggs & Stores, 1996). In one study, Cotton and Richdale (2006) found that children with developmental disabilities were four times more likely to exhibit disordered sleep patterns than those with typical development, and that those children meeting criteria for Autistic Disorder had the highest rate of these difficulties compared to other developmental disabilities such as Prader-Willi syndrome, Down's syndrome, or familial-based ID.

Specific etiologies of sleep disorders in those with ASD remain unclear at this point, and it remains to be seen if these pathways differ from those in typically developing children. What has been demonstrated, however, is that certain elements of sleep are fundamentally different in people with ASD. Specific areas identified in the literature include, longer sleep latency, frequent nocturnal awakenings, lower sleep efficiency, less time sleeping overall, and different durations of sleep stages (Limoges, Mottron, Bolduc, Berthiaume, & Godbout, 2005; Richdale & Prior,

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1995). Additionally, such differences in sleep patterns remain evident, regardless of the child's

level of intellectual functioning (Richdale & Prior, 1995). These same authors also hypothesize

that the sleep difficulties experienced by children with ASD may reflect a difficulty in

synchronizing the sleep/wake cycle to environmental cues, some of which would be social in

nature. This hypothesis makes sense given the core social deficits evidenced by those with ASD.

The onset and presentation of sleep difficulties in this population are therefore likely to be

idiosyncratic and may be the result of medications (e.g., anticonvulsants, antipsychotics),

hypersensitivity to environmental stimuli, and/or bedtime routines (e.g., sleeping with parents;

Liu et al., 2006). Sleep problems may also be a symptom (or the result of a symptom) of

comorbid psychiatric conditions (Liu et al., 2006), some of which commonly co-occur with ASD

(e.g., ID, depression, hyperactivity, anxiety; Chakrabarti & Fombonne, 2005; Evans et al., 2005;

Ghaziuddin et al., 2002; Goldstein & Schwebach, 2004).

<div align="center">Challenging Behaviors</div>

Although not considered a core symptom, challenging behaviors, such as aggression,

SIB, and property destruction, are a frequently occurring concern for those with ASD (Matson &

Minshawi, 2007; Matson & Nebel-Schwalm, 2007b; Myers & Johnson, 2007). However, it

should also be noted that repetitive or stereotypical behaviors such as body rocking or

handflapping, which are included in the diagnostic criteria for Autistic Disorder, are often

viewed as challenging behaviors from a treatment standpoint. For example, checklists that are

used to assess for challenging behaviors often contain subscales specifically pertaining to such

difficulties. It is also worth mentioning that challenging behaviors themselves often arise from

the other core deficits seen in ASD (i.e., social interaction and communication), and it can be

very difficult to change these behaviors when they are effective in accommodating for such

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deficits (e.g., a nonverbal child hits when told to do something he or she doesn't want to do and is then left alone; Buschbacher & Fox, 2003).

According to Smith and Fox (2003), challenging behavior can be defined as "any repeated pattern of behavior, or perception of behavior, that interferes with or is at risk of interfering with optimal learning or engagement in prosocial interactions with peers and adults" (p. 6). These behaviors are often severe in intensity and may place the child at risk to self or others as well as limit opportunities to participate in activities in educational and community settings (Sigafoos, Arthur, & O'Reilly, 2003). Not surprisingly then, such behaviors are more common in children with ASD and other developmental disabilities compared to same-age peers with typical development. For example, 13-30% of such children exhibit challenging behaviors severe enough to warrant formal intervention (Emerson, 1995).

Even when compared to other developmental disabilities, a diagnosis of Autistic Disorder in itself has been determined to be a risk factor for a host of challenging behaviors such as those mentioned above (McClintock, Hall, & Oliver, 2003). Because challenging behaviors are also common amongst persons with ID, it has been proposed that the high rates of these behaviors observed in those with ASD could be attributed to a co-occurring ID (see above). However, according to Mudford and colleagues (2008), persons with ASD are more likely to exhibit challenging behaviors than peers of the same level of intellectual functioning. Others have suggested that the mediating factor in the relationship between ASD and challenging behavior is a deficit in communication skills (Chung, Jenner, Chamberlain, & Corbett, 1995; Sigafoos, 2000). Nonetheless, those individuals presenting with both an ASD and ID are at the greatest risk for developing challenging behavior (Hill & Furniss, 2006; Holden & Gitlesen, 2006).

Although more prevalent in children with intellectual and developmental disabilities, challenging behaviors are also not uncommon in typically developing young children. For example, recent estimates suggest that 4-14% of these children exhibit moderate to severe challenging behaviors to the degree that they are functionally impairing, with those from low-income families being at greater risk (Campbell, 1995; Center for Mental Health in Schools, 2005; Lavigne et al., 1996; Qi & Kaiser, 2003). Such behaviors also commonly result in expulsion from school. For young, typically developing children, the presence of challenging behaviors jeopardize care and preschool placement, disrupt family functioning, and can spread into other areas of development such as adversely affecting socio-emotional growth (Powell, Dunlap, & Fox, 2006). These challenging behaviors can also be quite chronic with about half of boys exhibiting challenging behavior (e.g., oppositional and disruptive behaviors, hyperactivity) in preschool continuing to have significant behavior problems for as many as 6 years later (Marakovitz & Campbell, 1998; Speltz, McClellan, DeKlyen, & Jones, 1999).

<div align="center">Assessment</div>

There is a lack of agreement amongst researchers on how to best assess challenging behaviors in children with ASD (Matson & Nebel-Schwalm, 2007b). The methods that are generally used can be direct or indirect in nature. Direct methods include observation and experimental functional analysis (EFA), while indirect methods include rating scales, interviews, and checklist functional assessment (CFA). However, it is always important to conduct an assessment with the goal of understanding the maintaining functions of the behavior because most challenging behaviors in children with ASD have an etiology based in learning theory and operant conditioning (i.e., the behavior has been learned and is maintained through the presence or absence of reinforcement or punishment in the environment). Functional assessment,

therefore, can and should encompass both methods of assessment and is defined as the systematic assessment of those variables that maintain a particular behavior in a particular environment. Functional assessment proceeds through an analysis of the events preceding (antecedents) and following (consequences) the behavior. Understanding the antecedents and consequences of a behavior allows the clinician to gain an understanding of the potential reasons why a problem behavior is occurring or why a desired behavior is not occurring. Therefore, treatments that are constructed after carefully considering a target behavior's maintaining factors are more likely to be effective in reducing or eliminating the behavior, and can even be just as effective as punishment (Iwata et al., 1994).

Indirect Methods

Checklists. Rating scales assessing behavior problems specific to ASD are rare and not always of the best quality (Matson & Nebel-Schwalm, 2007b). There are two notable assessment measures of this nature available: the Behavior Problems Inventory (BPI; Rojahn, Matson, Lott, Esbensen, & Smalls, 2001) and Autism Spectrum Disorders-Behavior Problems for Children (ASD-BPC; Matson, González, & Rivet, 2008). The BPI, which assesses for the presence, severity, and frequency of a variety of self-injurious, stereotypical, aggressive, and disruptive behaviors, has been extensively researched and widely used with populations of persons with ASD and other developmental disabilities. The ASD-BPC is a newly developed scale that is unique in that it is part of a comprehensive assessment battery designed specifically to measure symptoms of ASD, comorbid psychopathology, and challenging behaviors in children with ASD (for more information refer to the Methods section below). Both the BPI and ASD-BPC are informant-based measures that were designed to identify target behaviors for intervention as well

as evaluate the outcome of these interventions. The functions of these target behaviors can then be determined via functional assessment.

As mentioned above, CFA is a commonly used method of functional assessment. The two most notable checklists of this nature are the Motivation Assessment Scale (MAS; Durand & Crimmins, 1988) and the Questions About Behavior Function (QABF; Matson & Vollmer, 1995). At present, these are the only CFA measures with an extensive body of literature supporting their psychometric properties (Matson & Minshawi, 2007). The QABF contains 25 items reflecting the potential maintaining functions of attention, escape, nonsocial, pain, and tangible. It has been determined to be superior to other CFA methods and have high reliability for disruptive/destructive behaviors, which are often the types of behaviors that cannot be assessed via EFA (Nicholson, Konstantinidi, & Furniss, 2006; Singh, Matson, et al., 2006). The QABF has the additional benefit of a complimentary scale, the Functional Assessment for multiple CausaliTy (FACT; Matson et al., 2003), which presents the same questions in a forced-choice format and is useful when the QABF does not yield a clear function (i.e., no primary function or multiple functions). The MAS measures the frequency of challenging behaviors in terms of four motivating conditions: sensory reinforcement, escape, attention, and tangible. The psychometric properties of the MAS have not been demonstrated to be as strong as those of the QABF (e.g., Kearney, Cook, Chapman, & Bensaheb, 2006). As noted by Matson and Minshawi (2007), the major weakness of CFA is that because these scales measure behavior function indirectly, they are subject to rater misperceptions and biases.

Interview. One alternative to checklists is the Functional Assessment Interview Form (FAIF; O'Neill et al., 1997). The FAIF is a semi-structured interview consisting of a series of open-ended questions that allow the clinician to gather information about when the behavior is

most and least likely to occur, potential setting events, communicative functions, medical factors, and other potential mediating factors that are likely to result in the behavior. However, at this point, there is very little research regarding the reliability and validity of this interview.

Direct Methods

Observation. A more direct approach to assessing challenging behaviors is simply to observe their occurrence in the environment. An observational approach can be organized in terms of two commonly used methods: scatterplots and antecedent-behavior-consequence (ABC) data. Both of these approaches begin by operationally defining the behavior to be assessed. Scatterplots provide a graphical representation of the behavior's frequency as it occurs over the day (Touchette, MacDonald, & Langer, 1985). Although commonly used in applied settings, research attempting to demonstrate the reliability and validity of scatterplots has been scarce (Matson & Minshawi, 2007). Assessing a challenging behavior via the collection of ABC data involves the real-time recording of the antecedents, consequences, and topography of the behavior (Bijou, Peterson, & Ault, 1968). Although assessment techniques such as scatterplots and ABC data do not directly assess behavior function, the information they provide is useful for identifying potential factors that contribute to the expression of the behavior and its maintenance in the natural environment. However, these methods are not without their limitations, which include noncompliance and inaccuracy on the part of those individuals recording the data (Sturmey & Bernstein, 2004).

Experimental Functional Assessment (EFA). In 1982, Iwata, Dorsey, Slifer, Bauman, & Richman published their landmark paper in which a comprehensive approach for conducting EFA was first described. These authors outlined how four experimental conditions related to different maintaining factors (i.e., social disapproval, academic demand, unstructured play, and

alone) could be manipulated in an analogue setting so that the factors maintaining the behavior of interest could be determined. Since this time, an extensive body of literature documenting the effectiveness of EFA as applied to a wide variety of challenging behaviors has been made available, and it has even been described by some researchers as the hallmark of behavioral assessment (Hanley, Iwata, & McCord, 2003). However, as Matson and Minshawi (2007) point out, EFA is not without its own limitations. For example, EFA can be quite laborious and time-intensive (especially in instances where multiple functions are involved) and requires a high degree of expertise to perform. As a result, attempts have been made to decrease the timeliness of this method in what has been described as "brief functional analysis" (Northup et al., 1991; Wacker, Berg, & Harding, 2004; Wallace & Knights, 2003). A second limitation is that EFA is carried out in highly artificial, analogue settings, making generalization to real world situations difficult. Additionally, during an EFA session, the child is put in situations where the intention is to increase the rate of the challenging behavior being assessed, potentially putting the child and experimenters at risk for physical harm. Finally, behaviors such as physical aggression that can be of high intensity yet low in frequency are not likely to be observed during an EFA session.

Any assessment of challenging behaviors in children with ASD should also consider additional factors such as medical conditions that may be responsible for the behavior (Myers & Johnson, 2007). Such factors should always be ruled out during an assessment. For example, medical factors may cause or exacerbate a challenging behavior, which can be compounded by limitations in communication (e.g., not able to verbally communicate physical discomfort as a result of constipation, dental abscess, headache, gastritis, etc.).

<center>Treatment</center>

Historically, the primary means of intervention for the challenging behaviors of all children have involved learning-based models. The efficacy of behavioral treatment strategies has been well-documented in the literature. Children with ASD and other developmental disabilities have been one of the primary beneficiaries, especially with regard to reducing the frequency and severity of symptoms and challenging behaviors and facilitating the acquisition of adaptive skills (Rogers, 1998).

The prognosis is not good for challenging behaviors such as SIB and aggression. If those maintaining environmental contingencies are not modified, the behaviors will become even further entrenched and more difficult to manage as the child matures physically and enters adolescence and adulthood (Horner, Carr, Strain, Todd, & Reed, 2002; Matson & Minshawi, 2007). For example, results from the Camberwell Cohort (the Camberwell Cohort was a group of 91 children with intellectual and developmental disabilities first assessed in the 1970s. These follow-up studies described here analyzed longitudinal data 25 years later) studies indicate that repetitive and other abnormal behaviors (e.g., insistence on sameness, abnormal responses to sensory stimuli) are more likely to improve over time (from childhood/adolescence into adulthood), whereas aggressive and destructive behaviors seem to be more chronic in nature (Beadle-Brown et al., 2000; Murphy et al., 2005).

It should be mentioned that because the ASD behavioral phenotype is so broad and heterogeneous, there is no blanket intervention or cure-all for treating the challenging behaviors of children with ASD. However, as a rule of thumb, all interventions should be individually tailored to the child based on a thorough analysis of all biological and environmental events that maintain the behavior (Horner et al., 2002). As mentioned above, the primary and most effective

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treatments are behavioral in nature and include language/communication therapies, occupational

and sensory integration therapies, classroom instruction, and applied behavioral analysis

(Filipek, Steinberg-Epstein, & Book, 2006; Matson & Minshawi, 2006; Pelios, Morren, Tesch, &

Axelrod, 1999). Such interventions can be supplemented with additional components such as

parent education for parents of children considered to be at-risk for developing challenging

behaviors, social-emotional curricula for increasing social skills, and multicomponent

interventions (components for parents, teachers, and children; Powell et al., 2006).

The primary goals of any treatment for a child with ASD should include a decrease in

core symptoms and associated deficits, an increase in functional independence and quality of

life, and the alleviation of family distress (Myers & Johnson, 2007). Powell and colleagues

(2006) add that a behavior support plan should always include the following components:

operational definitions of all challenging and replacement behaviors, hypotheses about the

behavior's maintaining variables, prevention strategies for reducing instances of the behavior,

training of replacement behaviors, maintenance strategies, and outcome measurement. Treatment

goals should therefore be measurable and able to be accomplished within one year's time

(Filipek et al., 2006).

As discussed in the previous section, a thorough functional assessment is the essential

first step to any successful behavioral intervention. For example, a tantrum can be maintained by

escape in children with ASD – a child in this instance may not have learned a socially

appropriate way of letting a teacher or parent know that he/she does not want to do something.

Once the function of the behavior has been identified via some form of functional assessment

(i.e., escape), the treatment strategy employed will focus on replacing the challenging behavior

with another, more appropriate behavior that serves the same function (e.g., saying "I need a

break;" Iwata et al., 1994). This commonly used treatment procedure is known as functional

communication training (FCT; Carr & Durand, 1985; Fisher et al., 1993). In FCT (or any other

form of behavioral treatment), the desired response is reinforced by allowing the child to take a

break when this request is appropriately communicated, while instances when the child is

engaging in the challenging behavior are ignored. Such a procedure would generally be referred

to as the differential reinforcement of alternate behavior. Alternately, the child could be provided

with a break or given another form of reinforcement anytime he/she is not engaging in the

behavior, which is known as differential reinforcement of other behavior – all instances of

behavior other than the challenging behavior are reinforced. Behavioral treatments based on

functional assessment are most effective when the behavior is maintained by positive (e.g.,

attention or tangible function) or negative reinforcement (e.g., escape function) as opposed to

behaviors with nonsocial or no clear function (Fisher et al., 1993).

Horner and colleagues (2002) examined all of the research conducted over a five year

period pertaining to behavioral interventions for children with autism (8 years of age or younger)

and found that tantrums, aggression, property destruction, self-injury, and stereotypy were the

most common. In terms of treatment, they described a trend over the past 10 years toward

stimulus and instruction based procedures as opposed to punishment based procedures. They also

noted that all behavioral interventions, for the most part, were very effective, and conducting a

functional assessment beforehand increased the success rate of the intervention. Elsewhere, Carr

and colleagues (1999) reviewed 109 studies published from 1985-1996 in which behavioral

interventions were used to reduce challenging behaviors in a variety of populations. These

authors found that 68% of these studies demonstrated reductions of 80% or more from baseline.

Strategies for preventing challenging behaviors (before they occur) can be implemented at home and at school. For example, prevention strategies for parents include encouraging the expression of positive emotions, empathy for others, emotional self-regulation, friendship, and social problem-solving skills, which can be achieved by modeling these skills, interacting with the child in a positive manner, and using fair and consistent discipline techniques (Powell et al., 2006). In school, environmental arrangements can be made to provide opportunities for positive peer interactions; schedules and routines with the clear signaling of transitions and changes in activities are also important to preventing the occurrence of challenging behavior.

Mental health consultation is one recently proposed strategy for treating challenging behaviors in school settings. This treatment strategy involves an ongoing collaboration between a mental health professional and an early childhood provider with the intention of proactively addressing challenging behaviors and fostering healthy social-emotional development (Cohen & Kaufmann, 2000). Mental health consultation can either focus more on the individual needs of the family and child or on increasing the overall quality of the classroom environment. In a recent study by Perry, Dunne, McFadden, and Campbell (2008), mental health consultation was used to address the behavioral concerns of a sample of preschool children exhibiting behavioral concerns (aggression identified for 60%). Approximately 9% of the sample had ASD or ID listed as the primary diagnosis. At follow-up 4 years later, the children's social skills improved by an average of one standard deviation and challenging behaviors decreased by an average of half a standard deviation. Only a small percentage of these children were involuntarily removed from their preschool program in that time; however, there was no control or comparison group.

Another relatively recent intervention for challenging behavior is mindfulness training for parents (Singh et al., 2007). Citing research indicating that parental stress is an important factor

in both the development of and the success of interventions for challenging behaviors, these authors have found that mindfulness training for parents can result in transformational changes enabling caregivers to produce positive differences in the behavior, learning, and well-being of the children without the implementation of formal behavioral strategies. Singh and colleagues (2007) define mindfulness as "having a clear, calm mind that is focused on the present moment in a nonjudgmental way" (p. 752). Such a mindset allows the parent to respond to a child's challenging behavior in alternative ways that go beyond traditional behavior analytic techniques such as antecedent and contingency management. In this study, mindfulness training was taught to four mothers of children with developmental disabilities (as measured by significant deficits in adaptive skills). Target behaviors were physical aggression and social interaction with typically developing siblings. Results of this multiple-baseline treatment design indicated that for each parent-child dyad, frequencies of physical aggression showed some decrease during a mindfulness training phase (instructed to not yet implement mindfulness strategies), which was then followed by more systematic and pronounced decreases in the behaviors during a mindfulness practice phase. During this practice phase, there were larger increases in positive sibling interactions and decreases in negative sibling interactions compared to the training phase. Similar results were obtained in an earlier study with parents and their children who had autism, in which the target behaviors were aggression, noncompliance, and self-injury (Singh et al., 2006). Singh et al. (2007) also note that mindfulness training might be more appealing to parents because of its stress reducing potential and less effort required on their part, which could reduce possible treatment noncompliance.

Although the most appropriate and effective interventions for challenging behaviors are all based in learning theory, pharmacological interventions are also commonly used. Medications

should only be considered when the challenging behaviors are so severe and chronic that they endanger the child's safety and educational placement and all potential medical etiologies have been ruled out and all behavioral management techniques have been attempted (Filipek et al., 2006; Matson & Dempsey, 2008; Myers & Johnson, 2007). Even in these situations, however, pharmacological approaches should be combined with applied behavior analysis (Matson & Dempsey, 2008). Unfortunately this has not prevented the frequent use of medications in children with ASD (up to 45%; Myers & Johnson, 2007). Although there are currently no medications approved to treat a diagnosis of ASD, the antipsychotic drug risperidone has recently received approval from the Food and Drug Administration for treatment of specific behaviors that significantly interfere with daily function (i.e., "irritability" – aggression, self-injury, and tantrums) in children and adolescents with ASD.

Social Skills

Definition

In one of the first studies to deal specifically with social, skills, McFall and Marston (1970) helped shy male college students develop what the authors termed "appropriate assertiveness" as a means of getting dates. The strategies described in this paper were later modified and applied to clinical populations, specifically adults with schizophrenia and major depression (Hersen & Bellack, 1976). Soon after, these techniques were extended to persons with ID (Matson, Kazdin, & Esveldt-Dawson, 1980; Matson & Senatore, 1981) and those with other disabilities (e.g., visual impairments; Matson, Heinze, Helsel, Kapperman, & Rotatori, 1986; Van Hasselt, Hersen, & Kazdin, 1985).

The term "social skills" is generic and refers to a very heterogeneous set of interpersonal behaviors. Simply stated, social skills are specific, identifiable skills that result in socially

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competent behavior (Hops, 1983) and effective social interactions with other people (Gresham & Elliott, 1984). Many definitions describe social skills in terms of an interaction between the individual and his/her environment. For example, Argyris (1965, 1968, 1969) views social skills as those behaviors that enhance a person's ability to contribute to the larger social network to which he/she belongs. Within these networks, such skills not only enable an individual to adjust and respond appropriately to environmental cues but can also provide the person with a means of coping in stress-inducing situations as well as avoiding interpersonal conflict (Matson, 1994).

Social relationships with other people are necessary for healthy emotional functioning and psychological adjustment, and such relationships cannot be attained without the appropriate repertoire of social skills. Possessing such skills also allows an individual the opportunity to express both positive and negative feelings in interpersonal situations in ways that do not result in the loss of social reinforcement (Hersen & Bellack, 1977; Libet & Lewinsohn, 1973). Social skills can also be defined functionally, in terms of effectiveness – in any situation, an action can be termed skillful if it effectively coordinates appropriate verbal and nonverbal behaviors to, in turn, elicit a desired response from the environment (Christoff & Kelly, 1983). Although the majority of these definitions were not formulated with specific regard to children with ASD, their common themes can be applied to all populations.

<div align="center">Social Skills and ASD</div>

Impairments in social skills are perhaps the most pronounced set of symptoms for children with ASD and also perhaps the most likely to remain unimproved over time from childhood to adulthood (at least for those with co-occurring ID; as determined by results from the Camberwell Cohort follow-up studies, see above; Beadle-Brown, Murphy, & Wing, 2006; Beadle-Brown et al., 2002). Additionally, the portion of this sample demonstrating social

impairment (73%) was found to have a higher numbers of placements, spent more time in institutional care, and exhibited more challenging behaviors than those who were not socially impaired (Beadle-Brown et al., 2006). Interestingly, the participants who were socially impaired showed more pronounced improvements in some adaptive and communication skills during this time.

Many of the initial investigations into the nature of social impairment in children with autism examined differences in adaptive behavior skills. Measures of adaptive skills allow a clinician insight into the ways in which mental health conditions impact behavior, both at individual and group levels (Schatz & Hamdan-Allan, 1995). Social skills are considered to be one of the main components of adaptive behavior, which also includes communication, daily living, and motor skills. Multiple studies have compared the adaptive skills (including measures of communication and socialization) of children with autism to other demographic groups; however, there is comparatively little research specifically analyzing the social skills of children with ASD. A review of these studies follows.

Using the Vineland Social Maturity Scale, which was the precursor to the Vineland Adaptive Behavior Scales (VABS; a commonly used measure of adaptive behavior; Sparrow, Balla, & Cicchetti, 1984), Gould (1977) conducted the first study specifically examining the adaptive skills of children with autism. Children with "early childhood psychosis, including autism" and co-occurring ID were compared to children with ID only. The group with autism was found to have significantly poorer social functioning than the comparison group.

In a later study by Loveland and Kelley (1988), no significant differences were found between the adaptive skills of adolescents with autism and those with Down's syndrome of similar mental age. However, the researchers did find that the group with autism was

significantly delayed in the acquisition of behaviors on the Communication and Socialization domains of the VABS (e.g., interpersonal relationships, play and leisure skills, sensitivity to other people). These same authors conducted a similar study with preschoolers and found that the participants with autism had significantly lower socialization scores (in terms of both age equivalent and standard scores) than peers with Down's syndrome (Loveland & Kelley, 1991). These results were maintained when the mental age of the child was controlled. Overall, the results of this study indicate that social impairment can be observed in children with autism at young ages even when compared to peers with ID. Based on the results of these studies (Loveland & Kelley, 1988, 1991), the authors concluded that patterns of adaptive behavior vary depending on the age of the child with autism (from preschool to adult).

Fred Volkmar and colleagues (Burack & Volkmar, 1992; Volkmar, Carter, Sparrow, & Cicchetti, 1993; Volkmar et al., 1987) conducted several studies demonstrating that children with autism display greater deficits in social behavior compared to children with developmental disabilities (but not having autism). Children with autism were also found to score more than two standard deviations below what would be expected based on their mental age on the Socialization domain of the VABS, and the authors were able to use this ratio of actual to predicted social skills to correctly classify 94% of the sample with autism (Volkmar et al., 1993). Elsewhere, Burack and Volkmar (1992) looked at low- and high-functioning (based on a full-scale IQ cut-off score of 50) children with and without autism. The children with autism were more likely than the comparison group to display developmental regression and unevenness across developmental domains, which was most pronounced for those in the low-functioning group.

Rodrigue, Morgan, and Geffken (1991), in a similar study to the one by Loveland and Kelley (1988) described above, compared the adaptive skills of children with autism, Down's syndrome, and typical development matched on adaptive behavior age-equivalent score as well as on gender, race, birth order, family size, and socioeconomic status. The three primary domains of the VABS (Communication, Daily Living Skills, and Socialization) were used as the measure of adaptive skills. The autism group obtained significantly lower scores on the Socialization domain than both comparison groups (who were not found to significantly differ on this measure). The children with autism also obtained significantly lower scores on all three Socialization subdomains (Interpersonal Relationships, Play and Leisure Skills, and Coping Skills), indicating a pervasive deficit in social development. No significant differences were found on the Communication and Daily Living Skills domains among the three groups. The results of this study lend support to the notion that deficits in social functioning cannot simply be attributed to developmental level for children with ASD.

In one of the few studies that have attempted to differentiate between different ASD, Mayes and colleagues (1993) compiled a list of items from DSM-III and ICD-10 criteria for autism, the VABS, and the Autism Behavior Checklist in an effort to distinguish among children with autism, PDD-NOS, and language disorders. Seven items from this list were found to significantly differentiate those with autism and PDD-NOS, with the autism group evincing greater impairment on these items: chooses solitary activities, poor social signals, abnormal comfort seeking, lack of social usage, impaired make-believe, impaired conversation, and interest in nonfunctional aspects of objects. The first four of these items pertain directly to aspects of social functioning. In addition, the children with PDD-NOS demonstrated significantly greater impairment on 21 items compared to the children with language disorders,

which pertained mostly to difficulties with social relatedness and a greater need for routines and order.

Jacobson and Ackerman (1990) conducted a large-scale study comparing archival adaptive data for children (ages 5-12), adolescents (ages 13-21), and adults (ages 22-35) with ASD to matched (age, intellectual functioning, and living situation [family, community group home, or institution]) peers with ID. Interestingly, a different pattern of results emerged for the children and adolescents than for the adults. The children and adolescents with ASD were found to have more developed adaptive skills than their peers with ID, but the opposite trend was observed for the adults – adults with ID possessed better adaptive skills. These results suggest that persons with autism make fewer gains in adaptive ability as they grow older compared to those with ID. It should be noted, however, that the adaptive skills analyzed in this study referred primarily to the motoric and instrumental activities of daily living (e.g., toileting, grooming), language, and quantitative skills, and not explicitly to any social behaviors.

Taking a cue from Jacobson and Ackerman (1990) and Burack and Volkmar (1992), Schatz and Hamdan-Allen (1995) conducted a study based on the notion that age and/or level of intellectual functioning may contribute to differences in adaptive behavior skills in children with autism compared to those with ID. These authors examined archival data collected from 1984-1991 for 109 children and adolescents (mean age of approximately 8 years; 72 of whom were diagnosed with autism) who were evaluated on an outpatient basis at the University of Iowa Department of Psychiatry. The comparison group consisted of children with ID, 30 of whom were dually diagnosed (e.g., ADHD, Oppositional Defiant Disorder [ODD]), matched on age, gender, and socioeconomic status. Because the participants had been administered a variety IQ tests (some of which were nonverbal measures of intelligence such as the Leiter), only

performance scores were used. It was found that the children with autism scored significantly lower on the Socialization domain of the VABS compared to the children with ID, and that there was an interaction between group and performance IQ score, indicating that children with autism evinced significantly lower gains in Socialization domain scores with increasing performance IQ scores than the children with ID. This pattern of results was only observed for IQ, and not age. As the authors note, the fact that the majority of the comparison group had an additional psychiatric condition supports the idea that the results are related specifically to autism and not due to the presence of a mental health condition in addition to ID. The authors also suggest that for lower functioning children with autism, measures of maladaptive social behavior may be more useful in attempting to quantify social deficits with this group since deficits on the Socialization domain of the VABS do not appear to easily distinguish such children from those with other disabilities.

The results of the Jacobson and Ackerman (1990) study beg the question of what the course of social impairment in ASD looks like. It would be presumed that the social impairments discussed earlier would persist into adulthood. On one hand, it does appear that as some individuals grow older their interest in socializing with others increases significantly (Mesibov, 1984). However, this appears to be more likely the case for adults with moderate to mild ID. In one study, Shattuck and colleagues (2007) administered the ADI-R to a sample of 241 adolescents and adults ages 10-52. Re-administering the ADI-R 4.5 years later, these authors reported that there was an improvement in overall autistic symptomatology over time, but that for more than half the sample, impairments in social reciprocity persisted. In addition, lack of friendships and impairment in conversational reciprocity were found to be the most prevalent deficits among the sample.

For adults with ID living in residential facilities, several studies have found differences in the patterns of social deficits between those with ASD and those with ID alone (no DSM Axis I mental health condition; Matson, Mayville, Lott, Bielecki, & Logan, 2003; Njardvik, Matson, & Cherry, 1999; Wilkins & Matson, 2009). The outcome measures in these studies included the Socialization domain of the VABS and the Matson Evaluation of Social Skills for Individuals with sEvere Retardation (MESSIER); the MESSIER is a checklist of social skills excesses and deficits for adults with severe to profound ID (Matson, 1995). Overall, the individuals with both ASD and ID exhibited the greatest levels of social impairment. In the study with the largest sample size ($N = 333$; Wilkins & Matson, 2009), it was determined that individuals with autism showed the greatest deficits followed by those with PDD-NOS and then participants with ID only. These deficits were most evident in the area of positive social skills, both verbal and nonverbal, and the presence of negative nonverbal social behaviors (e.g., isolates self). In addition, there was a larger spread between the ASD groups (autism and PDD-NOS) and controls than between the ASD groups themselves.

Taken together, the cumulative result of these studies clearly indicates that persons with ASD evidence greater impairments in social interaction skills than both typically developing and disabled comparison groups. These deficits also appear to persist across the lifespan. In the one study that did not find significant differences between children with autism and Down's syndrome (i.e., Loveland & Kelley, 1988), the children with autism were still significantly delayed in the acquisition of the social skills measured.

<div align="center">Assessment</div>

Identification of specific social skills deficits and excesses is an important component in assessing those with developmental and intellectual disabilities. Measures of social skills and

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adaptive behavior provide a wealth of information that is valuable in assisting the assessor in obtaining an overall picture of the individual's day-to-day functioning. Such measures are generally more useful with these populations than traditional IQ tests, which are rarely accurate beyond the mild range of ID. The deficits identified via social skill assessment can then be used as target or replacement behaviors in treatment planning. A variety of methods are available for quantifying social behavior, including sociometric techniques (i.e., comparison to peers), direct observation, role-play, behavioral interviews, and rating scales. For young people with ASD, rating scales and direct observation are the two most common techniques.

<u>Rating Scales</u>

Because of their ease of administration and interpretation, rating scales have become the most popular technique for assessing social skills in persons with developmental and intellectual disabilities (Marchetti & Campbell, 1990). Using such measures not only provides a reliable and valid means of assessment but can also save time and financial resources (Matson, Mayville, & Laud, 2003). As such, these instruments have proven to be more objective, reliable, and efficient than other frequently used methods for assessing social skills (Marchetti & Campbell, 1990; Matson & Wilkins, 2009). Although many commonly used broadband measures of children's emotional and behavioral difficulties (e.g., Child Behavior Checklist; Behavior Assessment System for Children, Second Edition) and adaptive behavior (e.g., VABS; Battelle Developmental Inventory, Second Edition) contain a subscale measuring social behavior, only the two most commonly used measures in children with developmental disabilities that specifically address social behavior will be reviewed in depth here. These scales are the Matson Evaluation of Social Skills with Youngsters (MESSY) and the Social Skills Rating System

(SSRS), which are the most studied scales of their kind in the literature (Matson & Wilkins, 2009).

Matson Evaluation of Social Skills with Youngsters (MESSY). The MESSY is a 64-item inventory that measures the social behaviors of children and adolescents (Matson, 1989). Items are rated in terms of frequency on a Likert-type scale ranging from (1) not at all, to (5) very much. There are two versions of the MESSY available, a teacher-report form, which can also be completed by caretakers, and a self-report form. The teacher/caretaker version contains population norms for ages 4-18 years and is composed of two subscales derived through factor analysis: 1) Inappropriate Assertiveness/Impulsiveness (e.g., threatens people or acts like a bully) and 2) Appropriate Social Skills (e.g., helps a friend who is hurt). Subscale scores are considered "problematic" if they fall one standard deviation below the normative mean, while scores are considered "very problematic" if they fall two or more standard deviations below the mean.

The MESSY has been shown to have very sound psychometric properties and has been validated for various disabled populations such as those with visual handicaps (Matson et al., 1986), hearing impairments (Matson, Macklin, & Helsel, 1985), and autism (Matson, Stabinsky-Compton, & Sevin, 1991). Among these populations the MESSY has been shown to have excellent split-half reliability (Matson, Rotatori, & Helsel, 1983; Matson et al., 1986), internal consistency (Matson et al., 1985; Matson et al., 1986), and validity (correlated with intelligence level and measures of emotional behavior; Matson et al., 1985). The MESSY has been extensively studied internationally as well; it has been translated into nine other languages and researched in both the UK and Australia.

Social Skills Rating System (SSRS). The SSRS is a norm-referenced rating scale that can be used for assessing the social functioning of children in preschool through grade twelve

(Gresham & Elliott, 1990). The items were derived from definitions of social behavior found in the literature. There are three different versions of the SSRS, including teacher, parent and student/self report forms. The length of these versions varies (34-55 items) depending on the rater and the grade level of the young person being assessed. All items are rated on a 3-point Likert-type scale in terms of frequency (never, sometimes, very often) and importance for classroom success (not important, important, critical). The SSRS is composed of three subscales: 1) Social Skills (teacher, parent, and student forms), Problem Behaviors (teacher and parent forms), and Academic Competence (teacher form only).

The authors of the SSRS have also established norms for elementary students with disabilities; on average these children score between one and two standard deviations below their typically developing peers (Gresham & Elliott, 1990). This discrepancy has also been observed with preschoolers with disabilities (Lyon, Albertus, Birkinbine, & Naibi, 1996). Although the SSRS has been shown to discriminate between broad groups of students with and without disabilities, it fails to distinguish among more specific groups such as children with learning disabilities, mild ID, and behavior disorders (Bramlett, Smith, & Edmonds, 1994; Gresham, Elliott, & Black, 1987). However, in the study by Bramlett and colleagues (1994), it was demonstrated that those children with ID were more likely than those with a learning disability to score within "at-risk" levels on teacher ratings of social skills and problem behaviors.

The teacher and parent forms of the SSRS have adequate to excellent internal consistency and test-retest reliability (Demaray et al., 1995; Gresham & Elliott, 1990). Although the student form has been shown to have good internal consistency (DiPerna & Volpe, 2005), its test-retest reliability for the Social Skills subscale was limited (Demaray et al., 1995). In addition, interrater reliability for the teacher and student forms was determined to be low for total score and even

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lower across subscales (DiPerna & Volpe, 2005). In terms of validity, a moderately strong

correlation was found between the total score of the SSRS teacher form and the Socialization

domain of the VABS, the Teacher Questionnaire (Lyon et al., 1996), the Walker-McConnell

Scale of Social Competence and School Adjustment, and the MESSY (Demaray et al., 1995).

However, examinations of the convergent validity of the student form have not been as

encouraging (DiPerna & Volpe, 2005).

Direct Observation

Simply observing a child's social behavior in either naturalistic or analog conditions is

another common method of assessing social skills. Naturalistic observations can occur in any

setting that the person being assessed commonly spends time in and can include observations

made by several raters based on pre-established target behaviors (Marchetti & Campbell, 1990).

An analog observation, on the other hand, would occur in an artificial environment with different

situational variables being manipulated in order to evaluate a person's overall repertoire of social

behaviors (Castles & Glass, 1986). Analog observations typically encompass a variety of role-

playing techniques, which generally tap into elements of both positive (e.g., giving compliments,

giving help, and sharing) and negative social interactions (e.g., response to threats or provocation

from peers; Wilkins & Matson, 2007)

Treatment

For typically developing children, much of the early acquisition of social interaction

skills comes in the context of prekindergarten programming (Logue, 2007). However, the quality

of such programming can vary dramatically. Logue (2007) defines a high quality program as one

that provides children an opportunity to "learn many of the social skills that help them participate

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in a group as a cooperative member and learn to use adults to gain information and assistance"
(p. 37).

In contrast, social skills training for children with ASD is usually tied to behavioral
interventions, or what is referred to as early intensive behavioral treatment (EIBT). EIBT is
typically very time-consuming (approximately 40 hours per week), individually tailored to the
child, and relies on behavioral techniques such as unambiguous instruction, shaping through
positive reinforcement of successful approximations, systematic prompting and fading
procedures, discrimination learning, and careful task analysis (Cohen, Amerine-Dickens, &
Smith, 2006). This is also known as the UCLA or Lovaas model (based on the work of Ivar
Lovaas). The three main components of this model are 1:1 home instruction, peer-play training,
and regular classroom inclusion; additionally social skills and parent training components are
also commonly added to the EIBT curriculum (e.g., Cohen et al., 2006). Several years of such
treatment has been shown to result in significant gains in IQ, language abilities, and adaptive
behavior (Cohen et al., 2006; Lovaas, 1987).

Commonly used EIBT treatment packages such as discrete trial training and pivotal
response training (PRT) have proven to be successful in leading to the acquisition of new skills.
For example, PRT has been demonstrated in single-case studies to increase play initiation with
peers (Harper, Symon, & Frea, 2008), joint attention skills (Vismara & Lyons, 2007),
communication skills (Koegel, Carter, & Koegel, 2003; Koegel, Symon, & Koegel, 2002), IQ
scores, VABS scores, decrease in CARS score (Sherer & Schreibman, 2005), and symbolic play
skills (Stahmer, 1995). In the study by Harper and colleagues (2008), the emergence of other
skills that were not specifically trained was also observed (e.g., asking peers to play, waiting in
line, appropriate refusal of social interaction, expanding of interest). Symbolic play skills were

also demonstrated to generalize to new situations, toys, and people (Stahmer, 1995). Elsewhere, analyzing a sample of 158 children with ASD and a mean age of 49.36 months, Baker-Ericzén, Stahmer, and Burns (2007) found that PRT trained to and then implemented by parents resulted in significantly increased VABS scores (composite, daily living skills, communication, socialization, and motor) over a period of 12 weeks, with those children under 5 years of age showing the greatest gains. In their study, Vismara and Lyons (2007) were able to use the perseverative interests of the three participants to increase joint attention skills.

One specific social skills training strategy worth mentioning here is Social Stories™ (Gray & Garand, 1993). Social Stories consist of a short script or story that describes and explains the social cues and appropriate responses required of a particular social situation. The content is individualized for that child's particular social deficits and target behaviors. Social Stories have been shown to be an effective intervention for increasing a wide variety of appropriate social behaviors and decreasing inappropriate ones in children with ASD (e.g., Kuoch & Mirenda, 2003; Scattone, Tingstrom, & Wilczynski, 2006). Such a treatment approach has also been used to decrease disruptive and aggressive behaviors in this population (e.g., Scattone, Wilczynski, Edwards, & Rabian, 2002; Swaggart et al., 1995). Social Stories can be implemented as a standalone intervention but are also commonly included as components in intervention packages along with other social skills training techniques (e.g., modeling, role-play; Chan & O'Reilly, 2008) and various reinforcement strategies (e.g., Swaggart et al., 1995). Social Stories have become one of the most commonly used interventions for children with ASD, and according to a recent survey of parents, are utilized almost as much as applied behavior analysis (Green et al., 2006). Although multiple single-case studies have demonstrated significant treatment gains for children with ASD using this technique, the long-term

maintenance and generalization of these gains have yet to be convincingly demonstrated (Reynhout & Carter, 2006).

<div align="center">Social Skills and Challenging Behaviors</div>

One group of authors has proposed a bench-mark for treatment of challenging behavior, which is tied to social interaction skills – an intervention can only be considered successful if it changes the social situation of the individual being treated so that he/she is no longer isolated from peers and has more opportunities to be successful at developing social relationships (Carr et al., 1994). This definition certainly underscores the important interrelationships between social skills and challenging behavior. Additionally, in school settings, challenging behaviors can distract the other children and lead to the exclusion of the child exhibiting the behaviors from those learning experiences needed to develop academically and socially (Logue, 2007).

As mentioned previously, social skills are often used as replacement behaviors in interventions for challenging behaviors. In such instances, it is important that the child be afforded multiple instances to practice the skills in natural settings to ensure generalization and complete acquisition of the skills (Smith & Gilles, 2003). Although there is no research at this point specifically investigating the relationship between these two variables for children with ASD, treatment studies of challenging behaviors have demonstrated that aspects of social behavior have also improved with decreases in challenging behavior (e.g., Perry et al., 2008; Singh et al., 2007). There are two methodologically sound studies, which will be discussed in depth here, that have specifically analyzed the relationship between these variables in disabled populations.

In the first study, White and Dodder (2000) analyzed database information for 3,780 children, adolescents, and adults with ID. They examined the relationships between social

variables and challenging behavior based on caregiver report. The social variables assessed included social interaction opportunities (e.g., frequency of community outings, hours of employment, family contact) and self-expression. A series of correlational analyses were performed, and for the overall sample, the frequency and severity of challenging behavior was not significantly associated with these social outcome variables. The sample was not stratified into age groups, and the authors note that the social variables were related to opportunities not actual social integration or social interaction skills.

In the other study, Matson, Fodstad, and Rivet (2009) examined the relationship between social skills and challenging behaviors in a sample of 257 adults with ID. There was a stronger relationship between these two variables for those participants with both ASD (autism or PDD-NOS) and ID than those with ID alone. Additionally, regression analyses indicated, that for those with ASD, social behaviors were significant predictors of aggressive/destructive behaviors (negative nonverbal and general negative social behaviors), stereotypical behaviors (negative nonverbal social behaviors), and overall total behavior problems (negative nonverbal and general negative social behaviors).

RATIONALE

Deficits in social interaction skills and the presence of challenging behaviors are among the most salient features of ASD. Both of these areas can be severe and debilitating for a person with ASD and are likely to persist over time without intensive intervention. The purpose of this study was to explore the relationship between impairment in social interaction skills and challenging behaviors for children with ASD. To accomplish this aim, the study was split into two parts. In Study 1, this relationship was tested in both children meeting criteria for ASD and typically developing controls. The procedure was similar to that employed by Matson et al. (2009; see above) with the intention of determining if the relationship between social skills and challenging behaviors is comparable for children and adults with ASD. In Study 2, a more in-depth analysis was conducted with only those children meeting criteria for ASD in order to determine which variables best predicted the presence of challenging behaviors. More specifically, the contribution of social skills, ASD symptom severity, age, and gender were examined.

STUDY 1

Method

<u>Participants</u>

Data were accessed from a database originally established to determine the psychometric properties of the ASD Battery (e.g., Matson, González, Wilkins, et al., 2008). Parents and other caretakers (e.g., grandparents) of children with and without developmental delays were recruited to participate in the original study. Participants were recruited from a variety of locations, which included centers specializing in developmental disabilities, parent support and advocacy/ community groups, outpatient clinics, and professional and participant-referrals in the following states: California, Connecticut, Georgia, Maryland, Michigan, Mississippi, New York, North Carolina, Texas, Mississippi, and Louisiana. Recruitment sites also included public and private elementary schools in Louisiana. The majority (90.3%) of data collected was from Louisiana.

Because children were recruited from several different locations and methods of diagnosis may vary between sites, group assignment was made based on a checklist of combined DSM-IV-TR and ICD-10 criteria for ASD (see below for more information). More specifically, to be included in the ASD group, an endorsement of at least three symptoms on the checklist was required (two deficits in social interaction and one in another area of functioning, either communication or repetitive/restrictive behavior). Such a symptom pattern corresponds to a DSM-IV-TR diagnosis of PDD-NOS, the ASD with the least stringent diagnostic criteria (APA, 2000). One hundred and fifty-three (55.8%) children met criteria as an ASD participant in the study, while 121 (44.2%) did not meet the research criteria for having an ASD, nor did they have any other psychopathology noted by the informant. Mean total item endorsement on the DSM-IV-TR/ICD-10 checklist for the ASD group was 11.56 (range = 3-19), whereas the mean for the

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control group was 0.46 (range = 0-5). Children who did not meet research criteria for ASD and had a previous diagnosis of other psychopathology or developmental delay were excluded from the study. The DSM-IV-TR/ICD-10 checklist is presented in Appendix A.

Four participants were excluded due to missing data (i.e., more than 5% of the MESSY) and 19 participants were excluded due to missing questionnaires (either ASD-BPC or MESSY), thus a total of 251 ratings of children remained for data analysis. All other missing data were imputed with the mean score for that particular item for the child's group (ASD or control). The following data reflect those who remained in the database after excluded cases were removed.

The participants ranged in age from 3 to 16 years, with an average of 7.81 years. Results of an independent t-test indicated that the groups did not significantly differ in terms of age. Two hundred children (79.7%) were White, 21 (8.4%) were Black, 10 (4.0%) were Hispanic, 7 (2.8%) were of another ethnic background, and 13 (5.2%) were of unidentified ethnicity. Chi-square analysis indicated that the groups did not significantly differ in terms of ethnicity. One hundred and fifty-nine children (63.3%) were male and 92 (36.7%) were female. Results of a chi-square analysis revealed that there were significantly more males in the ASD group than in the control group, X^2 ($df = 1$, $N = 251$) = 22.26, $p < .001$.

One hundred and twenty-nine (51.4%) informants indicated that the child had one or more previous diagnoses given by a mental health/medical professional at the time of the study. All but one of these children was in the ASD group; the diagnoses indicated for this control were Dyslexia and Dysgraphia. The diagnoses reported for the ASD group were as follows: Autistic Disorder, Asperger's Disorder, PDD-NOS, ADHD, Anxiety Disorder-NOS, Apraxia, Asthma, Bilateral Hearing Loss, Bipolar Disorder, Cerebral Palsy, Depression, Developmental Delay (unspecified), Down's syndrome, Dyslexia, Dyspraxia, Fragile X syndrome, Generalized

Anxiety Disorder, Hyperactivity, Hypersomnia, Hypotonia, Impulse Control Disorder, Iodine Deficiency Disorder, Microcephaly, Nocturnal Enuresis, Nonverbal Learning Disorder, OCD, ODD, Panic Attacks, Psychosis-NOS, Receptive/Expressive Language Disorder, Selective Mutism, Sensory Integration Disorder, Social Phobia, Specific Phobia, Tic Disorder, and Tourette's syndrome. One hundred and seven (42.6% of the entire sample, 81.1% of the ASD group) children were reported to have some form of ASD (i.e., Autistic Disorder, Asperger's Disorder, or PDD-NOS), and twenty-four of these children also presented with a comorbid mental health condition (range = 1-4). Eight children were identified by their informants as having ID (all eight children met criteria for the ASD group). Sixty-one (24.3%) children (58 were in the ASD group) were prescribed some form of psychotropic medication (Antidepressants, Antipsychotics, Anxiolytics, Mood Stabilizers/Anti-Epileptic Medications, and/or Psychostimulants) at the time of data collection. Seven children (2.8%) were identified as having seizures or epilepsy, and one child (0.4%) was identified as being confined to a bed or wheelchair; these eight children all met criteria for the ASD group. No other physical or medical difficulties were indicated by the informants. The children's demographic information by group is presented in Table 1.

Informants included mothers, fathers, foster parents, and grandparents of the children in the sample. The informants' socioeconomic status (SES) was examined using Hollingshead's (1975) Four Factor Index of Social Status, which is a commonly used measure of SES calculated from a parent's level of education and occupation. Hollingshead's levels of SES based upon education and occupation are as follows: scores in the range of 8-19 are considered "Low," 20-29 are "Low-Middle," 30-39 are "Middle," 40-54 are "Upper-Middle," and 55-66 are "Upper." Demographic information related to SES was collected for 156 participants (62.2%). This

Table 1

Demographic characteristics of the children in the sample ($N = 251$)

	ASD ($n = 132$)		Control ($n = 119$)	
	n	%	*n*	%
Mean Age	8.00		7.61	
3 to 5 years (preschool)	32	24.2	33	27.7
6 to 11 years (child)	63	47.7	71	59.7
12-16 years (adolescent)	37	28.0	15	12.6
Gender				
Male	102	77.3	57	47.9
Female	30	22.7	62	52.1
Ethnicity				
White	104	78.8	96	80.7
Black	13	9.8	8	6.7
Hispanic	5	3.8	5	4.2
Other	7	5.3	0	0
Unspecified	3	2.4	10	8.4
[a]Previous Diagnoses				
Autistic Disorder	54	40.9	0	0
Asperger's Disorder	14	10.6	0	0
PDD-NOS	39	29.5	0	0
ADHD	20	15.2	0	0
Anxiety Disorder-NOS	4	3.0	0	0
Apraxia	2	1.5	0	0
Asthma	3	2.4	0	0
Bilateral Hearing Loss	1	0.8	0	0
Bipolar Disorder	1	0.8	0	0
Cerebral Palsy	1	0.8	0	0
Depression	2	1.5	0	0
Developmental Delay (unspecified)	3	2.4	0	0
Down's syndrome	2	1.5	0	0
Dysgraphia	0	0	1	0.8
Dyslexia	1	0.8	1	0.8
Dyspraxia	1	0.8	0	0
Fragile X syndrome	2	1.5	0	0
Generalized Anxiety Disorder	1	0.8	0	0
Hyperactivity	1	0.8	0	0
Hypersomnia	1	0.8	0	0

(table cont.)

Hypotonia	2	1.5	0	0
Impulse Control Disorder	1	0.8	0	0
Iodine Deficiency Disorder	1	0.8	0	0
Microcephaly	1	0.8	0	0
Nocturnal Enuresis	1	0.8	0	0
Nonverbal Learning Disorder	1	0.8	0	0
OCD	4	3.0	0	0
ODD	2	1.5	0	0
Panic Attacks	1	0.8	0	0
Psychosis-NOS	1	0.8	0	0
Receptive/Expressive Language Disorder	1	0.8	0	0
Selective Mutism	3	2.4	0	0
Sensory Integration Disorder	2	1.5	0	0
Social Phobia	3	2.4	0	0
Specific Phobia	2	1.5	0	0
Tic Disorder	2	1.5	0	0
Tourette's syndrome	1	0.8	0	0
[b]Prescribed Medications				
Antidepressants	16	12.1	2	1.7
Antipsychotics	23	17.4	0	0
Anxiolytics	4	3.0	0	0
Mood Stabilizers/Anti-Epileptics	10	7.6	0	0
Psychostimulants	37	28.0	1	0.8
Verbal Ability				
Yes	115	87.1	119	100
No	17	12.9	0	0

[a]These were diagnoses given by professionals prior to the study. Informants were asked to list them on a background questionnaire. Some of these diagnoses do not conform to those recognized in the DSM-IV-TR. Thirty-six children had multiple diagnoses (range = 2-5).
[b]Twenty-four children were prescribed multiple medications (range = 2-4).

information was only obtained for a subsample of participants because a demographic

questionnaire soliciting this information (see Appendix B) was only added to the assessment

protocol several months after the onset of data collection. Based on this subsample of

participants, the majority of informants (67.3%) were of Upper-Middle class status. A chi-square

analysis revealed no significant difference between the ASD and control groups in terms of SES. Demographic and SES characteristics (as measured by the Hollingshead Index) of this subsample are presented in Table 2.

<div align="center">Measures</div>

Autism Spectrum Disorders-Behavior Problems for Children (ASD-BPC)

This measure is one of the components of the ASD Battery described earlier and was created with the intention that it be used as an initial screen to determine if further assessment of challenging behaviors would be warranted through the use of more extensive rating scales or clinical observations (including evaluation of frequency, intensity, duration, and maintaining function). The ASD-BPC consists of 18 items which pertain to those aggressive, disruptive, self-injurious, and stereotypic behaviors which are most common in children with ASD. These items are rated to the extent that each behavior has been a recent problem (i.e., within the past few months) as either: (0) not a problem or impairment; not at all, (1) mild problem or impairment, or (2) severe problem or impairment. The ASD-BPC was created using the same test construction procedures outlined above. The initial analysis of the scale's psychometric properties was encouraging and yielded an internal consistency alpha coefficient of .90, mean interrater reliability kappa value of .49, and mean test-retest reliability kappa value of .64 (Matson, González, & Rivet, 2008). The ASD-BPC's factor structure was also determined in this study, and two factors were identified that were labeled as externalizing (e.g., kicking objects, yelling or shouting at others) and internalizing behaviors (e.g., unusual play with objects, inappropriate sexual behavior).

Table 2

Demographic characteristics of primary informants (62.2% of the sample)

	Group			
	ASD (*n* = 96)		Control (*n* =60)	
Mean Age (Range)	38.02 (24-62)		36.83 (25-66)	
	n	%	*n*	%
Marital Status				
Never Married	8	8.3	3	5.0
Married	67	69.8	51	85.0
Separated	0	0	1	1.7
Divorced	20	20.8	5	8.3
Unspecified	1	1.0	0	0
Ethnicity				
White	81	84.4	54	90.0
Black	8	8.3	3	5.0
Hispanic	3	3.1	3	5.0
Asian	1	1.0	0	0
Native American	3	3.1	0	0
Education				
Junior High/Middle School	1	1.0	1	1.7
Partial High School	2	2.1	0	0
High School Graduate	11	11.5	13	21.7
Partial College or Specialized Training	32	33.3	13	21.7
University Graduate	34	35.4	20	33.3
Graduate Degree	14	14.6	12	20.0
Unspecified	2	2.1	1	1.7
SES Level[a]				
Upper	17	17.7	8	13.3
Upper-Middle	61	63.5	44	73.3
Middle	17	17.7	6	10.0
Lower-Middle	0	0	2	3.3
Lower	1	1.0	0	0
Biological Parent				
Yes	88	91.7	58	96.7
No	7	7.3	2	3.3
Unspecified	1	1.0	0	0

[a]Based on the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975).

This checklist was created for the purpose of validating the ASD Battery and consists of 19 items from DSM-IV-TR and ICD-10 used in the diagnosis of the three most common ASD (i.e., Autistic Disorder, PDD-NOS, and Asperger's Disorder; APA, 2000; WHO, 1994). These items are broken down into the three core symptom categories used for diagnosing ASD (i.e., social interaction, communication, and restricted/repetitive behaviors or interests). The scale also contains one additional item not used in group classification (item 4: delays or abnormal functioning present prior to age of 3). Informants are instructed to rate each of these symptoms as either "yes" or "no" with regard to whether or not the item applies to the child. A child is considered as meeting criteria for ASD if at least three items are endorsed, which must include two deficits in social interaction and one in another area of functioning (i.e., communication or repetitive behavior). These criteria served as a method of clearly defining the designation of ASD for earlier studies using the ASD Battery (e.g., Matson, González, Wilkins, et al., 2008).

The psychometric properties of the checklist were established in the initial study by Matson, González, Wilkins, et al. (2008). Interrater reliability is as follows: social interaction (kappa coefficients for items ranged from .43-.76, Pearson's *r* for total score was .82), communication (kappa coefficients for items ranged from .53-.92, Pearson's *r* for total score was .81), repetitive behavior (kappa coefficients for items ranged from .24-.71, Pearson's *r* for total score was .79), and total checklist score (Pearson's *r* was .90). Test-retest reliability is as follows: social interaction (kappa coefficients for items ranged from .57-.95, Pearson's *r* for total score was .92), communication (kappa coefficients for items ranged from .37-.84, Pearson's *r* for total score was .91), repetitive behavior (kappa coefficients for items ranged from .59-.94, Pearson's *r* for total score was .92), and total checklist score (Pearson's *r* was .97). The internal

consistency is as follows: social interaction (Cronbach's alpha was .85), communication

(Cronbach's alpha was .86), repetitive behavior (Cronbach's alpha was .85), and total checklist

score (Cronbach's alpha was .95).

Matson Evaluation of Social Skills in Youngsters (MESSY)

The MESSY was chosen as a measure of social skills because: 1) it taps into a wide

variety of positive and negative social behaviors and 2) has a longstanding history of use and

excellent psychometric properties for disabled populations, including children with ASD. See

above for a detailed description of the MESSY's psychometric properties.

Procedure

Parent informants for the original study were recruited in one of several ways: through

information distributed via hand-outs at schools or parent advocacy/support groups, when

seeking services at an outpatient clinic involved in the study, or from referrals made by word of

mouth from other participants in the study or professionals in the community. Those parents who

expressed interest in participating were provided with additional information about the study

including an informed consent form. Informants received the assessment measures, including the

ASD Battery-Child Version, MESSY, DSM-IV-TR/ICD-10 Checklist, and additional

demographic questionnaire (added later in data collection), through the mail or during a visit to

one of the clinics involved in the study. All questionnaires were completed independently by the

parents or caregiver of the child by rating each item according to the directions printed at the top

of the questionnaire. To ensure that all informants had the opportunity to ask questions to

administrators, follow-up phone calls and/or emails were sent to all those who received the

questionnaires via mail. Research assistants who had been trained in the scale administration and

procedures of the study (i.e., doctoral students in clinical psychology) made the follow-up phone

calls/emails. Further, these research assistants attended periodic research meetings to answer questions and resolve any problems that arose during data collection. All questionnaires sent out through the mail were returned via self-addressed stamped envelopes. Participants who completed and returned the questionnaires were provided with a written summary of results and recommendations from a licensed psychologist. These procedures were approved by the Institutional Review Boards at various sites of participant recruitment.

Approximately 14 months after data collection commenced, participants were provided with the option of completing the assessment measures online. The web address was included in the information packet given to those who expressed interest in the study. Participants who returned the consent forms were asked to indicate their preferred method of completing the questionnaires (paper or online). All the assessment measures and instructions were included on the website. Participants were able to create a log-in with their email address and save their progress if they chose to return later to complete the questionnaires. Research assistants checked the website weekly and made follow-up emails to give the participants the opportunity to ask questions or resolve any difficulties in using the website. Sixty-eight participants (29.8%) completed the questionnaires online.

<div align="center">Data Analysis</div>

The statistical analyses for Study 1 mirrored those employed in the study by Matson and colleagues (2009) described above. In order to examine the strength of the relationship between social skills and challenging behaviors in the sample, Pearson product correlations were computed between MESSY and ASD-BPC subscales (as well as total ASD-BPC score). These correlations were computed separately for each group as well as for the entire sample. The strength of these correlations was then measured against the criteria established by Cohen

(1988): correlations in the range of .10-.29 were considered small, .30-.49 were considered moderate, and .50 or above were considered large. Finally, in order to examine the contribution of social skills deficits/excesses to the expression of challenging behavior, standard multiple regressions were conducted. Three regression analyses were conducted for each group with the ASD-BPC subscale and total scores as the criterion variable and the MESSY subscale scores as the predictor variables. Measures of social skills were entered as the predictor and not the other way around to allow for comparison of results with the study by Matson et al. (2009) and because social impairment is a core symptom of ASD and will be present regardless of whether a child exhibits any challenging behaviors (which also tend to develop later). A Bonferroni correction was used to control for multiple comparisons (.05 alpha level/6 analyses = .008 corrected alpha).

Two ASD group samples were analyzed: 1) a naturalistic sample with all ASD participants included (i.e., more males than females in the ASD group compared to the control group at a ratio of approximately 3:1; n =132) and 2) a gender-matched sample in which a stratified sample of males was randomly selected so that there were no significant gender differences between groups ($n = 79$). The latter arrangement allowed for a comparison of social skills and challenging behavior between groups while holding the potential moderating effects of gender constant (i.e., males are more likely to engage in certain challenging behaviors).

In order to determine what sample size would provide sufficient power for the intended analyses, an a priori power analysis was conducted. GPower 3.0.10, a statistical computer program was used for this analysis. Following the instructions for multiple regression with two predictor variables outlined in an online tutorial for GPower (Faul, Erdfelder, Lang, & Buchner, 2007) and setting alpha at .008 with a medium effect size (0.15), a sample size of 102 was

determined to be necessary to achieve a power value of .80, which is the power value suggested

for the social sciences (Faul et al., 1997). Therefore, with the number of participants in the

naturalistic (total) sample ($N = 251$) and in the sample with equal gender distribution between

groups ($N = 198$), there is sufficient power to run the intended analyses.

<center>Hypothesized Results</center>

It was expected that the correlations between social skills and challenging behaviors

would be stronger for the ASD group than the control group. These correlations should be

significant and positive for the Inappropriate Assertiveness/Impulsiveness subscale of the

MESSY with the ASD-BPC subscales and total score, and significant and negative for the

Appropriate Social Skills subscale of the MESSY and the ASD-BPC subscales and total score. It

was also expected that the MESSY subscales would both be significant predictors of both ASD-

BPC subscale and total scores for the ASD group but not for the control group. Such a pattern of

results was predicted for both samples (naturalistic and gender-matched) analyzed.

<center>Results</center>

A post-hoc power analysis was conducted to calculate the observed power of the analyses

described below. Once again using GPower and following the instructions for multiple

regression with two predictor variables (Faul et al., 2007) and setting alpha at .008 with a

medium effect size (0.15), the power for a sample size of 251 (naturalistic ASD sample) was

determined to be 1.00 and 198 (gender-matched ASD sample) was determined to be 0.99.

The results of the correlational analysis between social skills and challenging behaviors

for the entire sample are presented in Table 3. Overall, the relationship was strongest for the

ASD group (both naturalistic and gender-matched samples). More specifically, five out of the six

correlations were statistically significant ($p < .05$) and three fell within Cohen's (1988) criteria of

<center>75</center>

moderate strength for the naturalistic sample. For the gender-matched ASD sample, the results were slightly less pronounced with four correlations meeting statistical significance and two that were moderately strong. In the control group, two out of six correlations were statistically significant and moderately strong. For the ASD group (both samples), the relationship was strongest in terms of a deficit in appropriate social skills being correlated with the presence of "externalizing" challenging behaviors and the presence of inappropriate social behaviors being correlated with the presence of "internalizing" challenging behaviors. For the control group, the strongest correlation was between the Inappropriate Assertiveness/Impulsivity subscale of the MESSY and the ASD-BPC's Internalizing subscale.

Table 3
Correlation coefficients for MESSY and ASD-BPC subscales by diagnostic group, including both ASD samples (naturalistic and gender-matched).

MESSY subscales	ASD-BPC subscales		
	Internalizing	Externalizing	Total
ASD-naturalistic ($n =132$)			
Appropriate Social Skills	-.20*	-.40**	-.35**
Inappropriate Assertive/Impulsive	.44**	-.03	.23*
ASD-gender-matched ($n = 79$)			
Appropriate Social Skills	-.08	-.36**	-.27*
Inappropriate Assertive/Impulsive	.54**	.00	.27*
Control ($n = 119$)			
Appropriate Social Skills	-.12	.01	-.07
Inappropriate Assertive/Impulsive	.39**	.12	.30**
Total ($N = 251$)			
Appropriate Social Skills	-.48**	-.59**	-.59**
Inappropriate Assertive/Impulsive	.43**	.08	.27**

*Correlation is significant at the $p < .05$ level.
**Correlation is significant at the $p < .01$ level.

Fisher's Z-test was used to compare the difference between the correlations by group. The Appropriate Social Skills subscale of the MESSY was correlated with the Externalizing subscale of the ASD-BPC for both ASD samples: naturalistic, $r(132) = -.40$, $p < .001$, and gender-matched, $r(79) = -.36$, $p = .001$, but not for controls, $r(119) = .01$, $p = .90$. The difference between these correlations for both ASD samples and the control group was statistically significant, $Z = -3.41$, $p < .01$ (naturalistic) and $Z = -2.64$, $p < .01$ (gender-matched). The Appropriate Social Skills subscale of the MESSY was also correlated with the ASD-BPC total score for the naturalistic ASD sample, $r(132) = -.35$, $p < .001$, but not for controls, $r(119) = -.07$, $p = .48$. The difference between these correlations was statistically significant, $Z = -2.32$, $p < .05$. No other correlations differed significantly between groups.

The results of the multiple regression analyses are presented in Table 4, including the unstandardized regression coefficients (B), the standard errors of B, R^2, the standardized regression coefficients (β), and significance levels for each MESSY subscale predicting the ASD-BPC subscales and total score for each diagnostic group including both ASD samples (naturalistic and gender-matched) and controls. Results of the regression analyses for participants with ASD in the naturalistic sample indicated that social behaviors, as measured by the MESSY were significant predictors of internalizing problem behaviors ($F[2, 129] = 31.96$, $p < .001$), externalizing problem behaviors ($F[2, 129] = 13.69$, $p < .001$), and overall total problem behaviors ($F[2, 129] = 22.08$, $p < .001$). Deficits in appropriate social skills contributed significantly to the prediction of internalizing, externalizing, and total problem behaviors, whereas the presence of inappropriate assertiveness/impulsiveness behaviors contributed significantly to internalizing and total problem behaviors for this group.

Table 4
Multiple regression analysis predicting ASD-BPC subscale scores from MESSY subscale scores.

ASD-BPC subscales	MESSY subscales	ASD-naturalistic (n = 132)			ASD-gender matched (n =79)			Control (n = 119)		
		R^2	B (SE)	β	R^2	B (SE)	β	R^2	B (SE)	β
Internalizing		.33			.41			.16		
	Appropriate Social Skills		-.10 (.02)	-.40**		-.09 (.02)	-.40**		-.01 (.01)	-.08
	Inappropriate Assertive/Impulsive		.07 (.01)	.58**		.08 (.01)	.71**		.03 (.01)	.38**
Externalizing		.18			.16			.01		
	Appropriate Social Skills		-.11 (.02)	-.44**		-.13 (.03)	-.45**		.00 (.01)	.03
	Inappropriate Assertive/Impulsive		.02 (.01)	.13		.03 (.02)	.19		.01 (.01)	.12
Total		.26			.26			.09		
	Appropriate Social Skills		-.21 (.04)	-.48**		-.22 (.05)	-.49**		-.01 (.02)	-.03
	Inappropriate Assertive/Impulsive		.08 (.02)	.39**		.10 (.02)	.49**		.04 (.01)	.30*

*Significant at the p < .01 level.
**Significant at the p < .001 level.

The regression analyses followed a similar pattern of results for the participants with ASD in the gender-matched sample. Social behaviors as measured by the MESSY were significant predictors of internalizing problem behaviors ($F[2, 76] = 26.80$, $p < .001$), externalizing problem behaviors ($F[2, 76] = 7.27$, $p = .001$), and overall total problem behaviors ($F[2, 76] = 13.60$, $p < .001$). As with the naturalistic ASD sample, deficits in appropriate social skills contributed significantly to internalizing, externalizing, and overall total problem behaviors, while the presence of inappropriate assertiveness/impulsiveness behaviors contributed significantly to internalizing and overall total problem behaviors.

For the control group, results of the regression analyses indicated that social behaviors, as measured by the MESSY were significant predictors of internalizing problem behaviors ($F[2, 116] = 10.79$, $p < .001$) and overall total problem behaviors ($F[2, 116] = 5.88$, $p = .004$) but not externalizing problem behaviors ($F[2, 116] = 0.83$, $p = .44$). The presence of inappropriate assertiveness/impulsiveness behaviors contributed significantly to internalizing and total problem behaviors for this group. Deficits in appropriate social skills were not a significant predictor for any of the ASD-BPC subscales for controls.

Discussion

In Study 1, the relationship between challenging behaviors and social skills was explored through correlation and regression analyses. As hypothesized, this relationship was most pronounced for the children in the sample meeting criteria for ASD (both naturalistic and gender-matched samples). Because the results were similar for both ASD samples, the group differences observed can safely be attributed to behavioral characteristics inherent to ASD and not a potentially confounding variable such as gender. For the ASD group, the strongest relationships were between the Internalizing subscale of the ASD-BPC and the Inappropriate

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Assertiveness/Impulsiveness subscale of the MESSY and between the Externalizing subscale of the ASD-BPC and the Appropriate Social Skills subscale of the MESSY. However, the two MESSY subscales significantly predicted scores on both ASD subscales as well as total score.

In terms of correlations, the strongest relationship (for both groups) was evident between the Internalizing subscale of the ASD-BPC and the Inappropriate Assertiveness/Impulsiveness subscale of the MESSY. Although it may seem counterintuitive that "internalizing" behavioral difficulties would have a strong relationship with the expression of impulsive and other more "externalizing" inappropriate social behaviors, the label "internalizing" in this case is somewhat misleading. For the ASD-BPC, which was created with specific regard to the challenging behaviors commonly evinced by children with ASD, this subscale reflects mostly self-injurious, repetitive, and other odd behaviors (i.e., behaviors that are not directed outwardly towards others). The Internalizing subscale of the ASD-BPC was also significantly related to deficits in appropriate social skills as indicated by low scores on that MESSY subscale (for the ASD group only). However, this correlation was not nearly as strong (low vs. moderate according to Cohen's [1988] guidelines) as with the Inappropriate Assertiveness/Impulsiveness subscale of the MESSY.

One possible contributing factor to this relationship being the most pronounced is that these two subscales have more items and thus greater variability. For example, the Internalizing subscale of the ASD-BPC contains four more items than the Externalizing subscale, and the Inappropriate Assertiveness/Impulsiveness subscale of the MESSY contains 22 more items than the Appropriate Social Skills subscale. However, both MESSY subscales were significant contributors for those with ASD in the regression analyses conducted and the pattern of results

mirrors those of Matson et al. (2009; see below), lending support to the validity of the relationships described here.

For the regression analyses, the Inappropriate Assertiveness/Impulsiveness subscale was also the strongest predictor of scores on the Internalizing subscale of the ASD-BPC for both groups. This pattern of results indicates that children with ASD who exhibit inappropriate assertive and impulsive social behaviors are more likely to also engage in repetitive, self-injurious, and/or odd challenging behaviors. Overall, for the ASD group, socials skills as measured by the MESSY significantly predicted scores on both ASD-BPC subscales and total score. For controls, social skills only significantly predicted scores on the Internalizing subscale and ASD-BPC total score. However, the magnitude of these relationships was much less than for the ASD group. For example, R^2 ranged from .18 to .33 for the naturalistic sample and .16 to .41 for the gender-matched sample, meaning that social skills accounted for 18%-33% and 16%-41% of the variance in challenging behavior, respectively, whereas for the control group, R^2 ranged from .01 to .16. In terms of effect size (Wuensch, 2009), the regression analysis predicting ASD-BPC total and Internalizing subscale scores was large and the regression analysis predicting ASD-BPC Externalizing subscale scores was medium for the ASD group (both samples), whereas for the control group, only the effect size for the regression analysis predicting ASD-BPC subscale scores was medium, while the effect sizes for the other two regression analyses were small.

The second strongest relationship for the ASD group was between the Externalizing subscale of the ASD-BPC and the Appropriate Social Skills subscale of the MESSY. Although in the regression analyses, it was demonstrated that social skills as measured by both MESSY subscales significantly predicted scores on the ASD-BPC Externalizing subscale, the

standardized regression coefficient β was only significant for the Appropriate Social Skills

subscale. In sum, for the children in the sample with ASD, "externalizing" challenging behaviors

(i.e., challenging behavior directed towards another person or object such as physical aggression)

were significantly related to and predicted by deficits in appropriate social behaviors (e.g.,

complimenting others, showing emotions, making friends, etc.), meaning that when such skills

are absent or displayed infrequently, there is a greater likelihood that the child with ASD will

exhibit aggressive/destructive challenging behaviors. There was not a significant relationship

between social skills and externalizing challenging behavior for the control group.

The methods of Study 1 were modeled after the 2009 study by Matson and colleagues. In

that study, the relationship between social skills and challenging behaviors was examined in a

sample of institutionalized adults with ID. The measures used in that study included the adult

versions of the ASD-BPC (ASD-BPA) and MESSY (MESSIER). Part of the purpose of Study 1

was to determine if the relationships between these variables was similar for both children and

adults with ASD. Matson et al. (2009) found that, for the group with ASD, the presence of

negative social behaviors (general and nonverbal), as opposed to the lack of positive ones, was

found to be most predictive of challenging behavior, especially stereotypy, aggression, property

disruption, and overall levels of problem behavior. What parallels can be drawn then, is that for

both these populations (i.e., children and adolescents with ASD and institutionalized adults with

both ID and ASD), the presence of inappropriate or negative social behaviors are predictive of

the expression of stereotypical/repetitive behaviors and overall levels of challenging behavior. It

could also tentatively be stated that as children with ASD reach adulthood, deficits in positive

social behaviors become less predictive of challenging behaviors (especially

aggressive/destructive ones). Further research is required to confirm such a hypothesis for the reasons discussed below.

First, drawing too many parallels between the studies becomes problematic due to the inherent differences in the populations and the assessment measures used. Given that the Matson et al. (2009) sample consisted of institutionalized adults with severe or profound ID, it would be presumed that the overall symptom presentation was more severe in these individuals. Although it is estimated that at least two-thirds of all individuals with ASD present with comorbid ID (Edelson, 2006), the level of intellectual functioning was not available for the sample analyzed in the current study. Given that many of the children in the present sample were receiving outpatient services or no services at all, it could be presumed that symptom presentations were less severe in this sample.

Likewise, the item content of the measures used to assess social behaviors in these two populations follows a similar pattern. For example, because the MESSIER was designed and validated for adults with severe to profound ID (many of whom are nonverbal or possess very limited speech), it measures more basic skills such as "turns head in direction of caregiver," and "imitates simple movements," which could be considered precursors to the more subtle/complex social behaviors assessed by the MESSY. The MESSY, then, which was originally developed for typically developing children (although it has been normed and validated for multiple disabled populations including children with autism), measures social behavior with greater consideration for how the individual being assessed relates to others and to a degree that is more complex than assessed by the MESSIER.

However, compared to the subscales reflecting positive/appropriate social behaviors, the negative subscales of the MESSIER are closer in item content to the Inappropriate

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Assertiveness/Impulsiveness subscale of the MESSY and both contain items reflecting social intrusiveness (e.g., complaining, bothering others). One major difference is that the MESSIER reflects many more nonverbal behaviors (again, due to many individuals with severe to profound ID being nonverbal) and contains a Negative Nonverbal subscale with behaviors that reflect social withdrawal and inappropriate physical contact (e.g., holding on and not letting go, pushing), for example. Additionally, although the item content is similar between the child and adult versions of the ASD-Problem Behavior scale, the scales contain different factor structures. In sum, the MESSY and MESSIER are not perfectly parallel measures of social behavior, and thus the conclusions with respect to the present study being a continuation of the study by Matson and colleagues (2009) are somewhat limited. Regardless, both studies demonstrate that, overall, measures of social skills can significantly predict levels of challenging behaviors in both children and adults with ASD.

STUDY 2

Method

<u>Participants</u>

The participants for Study 2 were those from the original sample meeting criteria for

ASD as described above (*N* = 132).

<u>Measures</u>

<u>Autism Spectrum Disorders-Behavior Problems for Children (ASD-BPC)</u>

See above.

<u>Autism Spectrum Disorders-Diagnostic for Children (ASD-DC)</u>

The ASD-DC was created with the intention of aiding in the diagnosis of Autistic

Disorder, PDD-NOS, and Asperger's Disorder. As mentioned earlier, the ASD-DC is the first

component of the ASD Battery, which also includes measures of comorbidity and challenging

behaviors. The ASD-DC contains 40 items that are scored in a 3-point Likert-type format with

regard to how the child being assessed compares to typically developing peers: (0) not different;

no impairment, (1) somewhat different; mild impairment, or (2) very different; severe

impairment. Overall, the ASD-DC has very good reliability, with an internal consistency

coefficient of .99, mean interrater item kappa value of .69, and mean test-retest item kappa value

of .79 (Matson, González, Wilkins, et al., 2008). The validity of the scale was demonstrated

through the establishment of cut-off scores for differentiating children with ASD from those with

both typical development and those with developmental delays or other childhood mental health

conditions; a first attempt at establishing cut-off scores for differentiating among Autistic

Disorder, PDD-NOS, and Asperger's Disorder was also made but the authors cautioned that

these scores were best considered preliminary due to small sample sizes (Matson, González, & Wilkins, 2009).

Matson Evaluation of Social Skills in Youngsters (MESSY)

See above.

<div align="center">Procedure</div>

Same as Study 1.

<div align="center">Data Analysis</div>

Two sets of multiple linear regression analyses were conducted to determine which variables best predicted the presence of challenging behaviors in children with ASD. A Bonferroni correction was used to control for multiple comparisons (.05 alpha level/3 analyses = .017 corrected alpha). The criterion variables for these regression analyses were ASD-BPC total and subscale scores. The first set of analyses employed a stepwise regression model using the following variables: ASD-DC total score, MESSY subscale scores, age, and gender. Such an analysis was chosen to determine which variables contributed most to the expression of challenging behaviors based solely on the strength of statistical relationships. The second set of analyses employed a hierarchal model, in which ASD-DC score was entered in step one and MESSY subscale scores were entered in step two. Such an analysis was chosen to determine if level of social skills contributed to the variance in ASD-BPC scores above and beyond that of overall ASD symptomatology.

An a priori power analysis was again conducted using GPower 3.0.10 in order to determine the sample size needed to achieve a power value of .80, which is the power value suggested for the social sciences (Faul et al., 1997). Following the instructions for multiple linear regression with five (stepwise) and then three (hierarchal) predictor variables outlined in the

online tutorial for GPower (Faul et al., 2007) and setting alpha at .017 with a medium effect size (0.15), sample sizes of 116 and 99, respectively, were determined to be necessary for a power value of .80. Therefore with the number of participants ($N = 132$), it was determined that there was sufficient power to run the intended analyses.

<center>Hypothesized Results</center>

It was predicted that social skills as quantified by MESSY subscale scores would significantly contribute to the variance in ASD-BPC scores above and beyond the contribution of overall ASD symptom severity. It was expected that the presence of negative social behaviors would be a stronger predictor than the absence of positive ones. These hypotheses were based on the research summarized above indicating that deficits in social interaction skills seem to be uniquely related to the expression of challenging behaviors. Finally, it was also predicted that age and gender would not contribute as much variance in predicting the expression of challenging behaviors as MESSY or ASD-DC scores. It was unclear what effect these variables would have. Challenging behaviors do tend to be more severe in males; however, some challenging behaviors such as stereotypical motor movements improve with age (from childhood/adolescence to adulthood) while others (e.g., destructive behaviors seem to worsen; Beadle-Brown et al., 2000; Murphy et al., 2005). Age, then, would likely have differential effects on the Internalizing and Externalizing subscales of the ASD-BPC given that they pertain to stereotypical/other odd behaviors and aggressive/destructive behaviors, respectively.

<center>Results</center>

A post-hoc power analysis was conducted to calculate the observed power of both regression analyses described below. Once again using GPower and following the instructions for multiple regression with five (stepwise) and three (hierarchical) predictors and setting alpha

at .017 with a medium effect size (0.15), the power for a sample of 132 was determined to be 0.87 for the stepwise regression analyses and 0.92 for the hierarchal regression analyses.

<center>Stepwise Model</center>

In the first set of multiple regression analyses, ASD-DC total score, MESSY subscale scores, age, and gender were entered as predictor variables with ASD-BPC total and subscale scores as the criterion variables for each of the three analyses. Once again, these analyses employed a stepwise model of regression.

For the first multiple linear regression analysis with ASD-BPC total score entered as the criterion variable, ASD-DC total score was entered first. In this model, overall ASD symptom severity accounted for a significant amount of variability in ASD-BPC total scores, $R^2 = .23$, $F(1, 129) = 38$. The results of this multiple linear regression analysis are presented in Table 5, including R^2, the significance level, and F statistic for each model, as well as the regression coefficients (B), the standard errors of B, the standardized regression coefficients (β), correlations between predictor variables and the criterion variable, and partial correlations (correlations between predictor variables and the criterion variable controlling for other predictors) for each predictor. ASD-DC total score was entered in step one and accounted for a significant amount of variability in ASD-BPC total scores as the sole predictor. When the two MESSY subscales were entered in steps two (inappropriate) and three (appropriate), the amount of variability accounted for in ASD-BPC total scores was 37% ($p < .001$). Gender and age did not contribute significantly to the final model and were excluded.

The results of the next multiple linear regression analysis with the ASD-BPC Internalizing subscale entered as the criterion variable are presented in Table 6. The MESSY

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Table 5
Results of stepwise multiple regression analysis with ASD-BPC total score as criterion variable.

Model	Step Entered	Predictor	R^2	F (df)	B (SE)	β	Correlation between predictor and criterion	Partial correlation
1			.23	38.30** (1, 129)				
	1	ASD-DC (ASD severity)			.17 (.03)	.48**	.48**	.48**
2			.28	31.44** (2, 128)				
	1	ASD-DC (ASD severity)			.20 (.03)	.54**		.54**
	2	MESSY Inappropriate			.07 (.02)	.32**	.23*	.36**
3			.37	24.77** (3, 127)				
	1	ASD-DC (ASD severity)			.15 (.03)	.41**		.39**
	2	MESSY Inappropriate			.08 (.02)	.38**		.41**
	3	MESSY Appropriate			-.11 (.04)	-.25*	-.35**	-.24*
Excluded		Age				-.12	-.06	-.14
		Gender				-.02	-.08	-.03

*$p < .01$
**$p < .001$

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Inappropriate Assertiveness/Impulsiveness subscale was entered in step one and accounted for a significant amount of variability in ASD-BPC Internalizing subscale scores. However, when ASD-DC total scores were entered in step two and MESSY Appropriate Social Skills subscale in step three, the final model accounted for 38% of the variability in ASD-BPC Internalizing subscale scores. Again, gender and age were excluded from the final model.

The results of the final multiple regression analysis with the ASD-BPC Externalizing subscale entered as the dependent/criterion variable are presented in Table 7. The ASD-DC total score was the only variable retained in the final model that contributed significantly to variance in ASD-BPC Externalizing subscale scores. Both MESSY subscales, age, and gender were excluded from the final model.

<div align="center">Hierarchal Model</div>

The second set of multiple regression analyses used ordered sets of variables in a hierarchal model to predict ASD-BPC total scores from ASD-DC total score and MESSY subscale scores. For ASD-BPC total score, the results of this analysis indicated that overall ASD symptom severity as measured by the ASD-DC accounted for a significant amount of the variability in ASD-BPC total score, $R^2 = .23$, $F(1, 130) = 38.71$, $p < .001$, indicating that those children with ASD who had higher levels of overall behavior problems tended to have higher levels of overall ASD symptom severity as well. A second analysis was conducted to evaluate whether the MESSY subscale scores predicted ASD-BPC total scores over and above ASD-DC total scores. The two MESSY subscales accounted for a significant proportion of the variability in ASD-BPC total score, R^2 change $= .14$, $F(2, 128) = 14.22$, $p < .001$. These results suggest that children with similar levels of ASD symptom severity are more likely to exhibit problem behaviors if they

Table 6

Results of stepwise multiple regression analysis with ASD-BPC internalizing score as criterion variable.

Model	Step Entered	Predictor	R^2	F (df)	B (SE)	β	Correlation between predictor and criterion	Partial correlation
1			.19	30.14** (1, 129)				
	1	MESSY Inappropriate			.05 (.01)	.44**	.44**	.44**
2			.34	33.57** (2, 128)				
	1	MESSY Inappropriate			.06 (.01)	.51**		.52**
	2	ASD-DC (ASD severity)			.08 (.02)	.40**	.31**	.44**
3			.38	26.31** (3, 127)				
	1	MESSY Inappropriate			.07 (.01)	.57**		.56**
	2	ASD-DC (ASD severity)			.06 (.02)	.27*		.28*
	3	MESSY Appropriate			-.06 (.02)	-.25*	-.21*	-.24*
Excluded		Age				-.10	-.01	-.12
		Gender				.01	-.01	.02

*$p < .01$
**$p < .001$

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Table 7

Results of stepwise multiple regression analysis with ASD-BPC externalizing score as criterion variable.

Model	Step Entered	Predictor	R^2	F (df)	B (SE)	β	Correlation between predictor and criterion	Partial correlation
1			.28	49.42* (1, 129)				
	1	ASD-DC (ASD severity)			.11 (.02)	.53*	.53*	.53*
Excluded								
		MESSY Inappropriate				.08	-.02	.09
		MESSY Appropriate				-.15	-.40*	-.15
		Age				-.11	-.10	-.13
		Gender				-.06	-.13	-.07

*$p < .001$

exhibit high levels of inappropriate social behaviors and low levels of appropriate social behaviors.

For the ASD-BPC Internalizing subscale, the results of this analysis indicated that overall ASD symptom severity as measured by the ASD-DC accounted for a significant amount of the variability in ASD-BPC Internalizing subscale score, $R^2 = .10$, $F(1, 130) = 13.57$, $p < .001$, indicating that those children with ASD who had higher levels of internalizing problem behaviors tended to have higher levels of overall ASD symptom severity as well. A second analysis was conducted to evaluate whether the MESSY subscale scores predicted ASD-BPC Internalizing subscale scores over and above ASD-DC total scores. The two MESSY subscales accounted for a significant proportion of the variability in ASD-BPC total score, R^2 change = .29, $F(2, 128) = 29.83$, $p < .001$. These results suggest that children with similar levels of ASD symptom severity are more likely to exhibit internalizing problem behaviors if they exhibit high levels of inappropriate social behaviors and low levels of appropriate social behaviors.

For the ASD-BPC Externalizing subscale, the results of this analysis indicated that overall ASD symptom severity as measured by the ASD-DC accounted for a significant amount of the variability in ASD-BPC Externalizing subscale score, $R^2 = .28$, $F(1, 130) = 50.15$, $p < .001$, indicating that those children with ASD who had higher levels of externalizing problem behaviors tended to have higher levels of overall ASD symptom severity as well. A second analysis was conducted to evaluate whether the MESSY subscale scores predicted ASD-BPC externalizing subscale scores over and above ASD-DC total scores. The two MESSY subscales did not account for a significant proportion of the variability in ASD-BPC total score, R^2 change = .03, $F(2, 128) = 2.74$, $p = .068$. The results of these analyses are summarized in Table 8, including R^2, the change in R^2 when MESSY subscales were added, regression coefficients (B),

the standard errors of *B*, standardized regression coefficients (β), correlations between predictor variables and the criterion variable, partial correlations, and descriptive statistics (mean and standard deviation) of the predictor variables.

Discussion

The purpose of the stepwise multiple regression analyses was to determine which variables were most important in predicting challenging behaviors based simply on statistical relationships. The variables of interest for these analyses were ASD-DC total score, MESSY subscale scores, age, and gender. All variables were entered together and only those variables that significantly contributed to the variance in ASD-BPC scores were retained in the final regression models. For total ASD-BPC total score and the Internalizing subscale, these variables included the two MESSY subscale scores and ASD-DC total scores. For the Externalizing subscale, only ASD-DC scores were included in the final model, indicating that for the children with ASD in the sample, the expression of externalizing challenging behavior (i.e., challenging behaviors directed toward other people/objects) was only predicted by high levels of ASD symptomatology and not deficits in social skills. Age and gender were excluded from all three final regression models, meaning that these variables did not significantly contribute to the variance in ASD-BPC scores. Therefore, for the children with ASD in the sample analyzed here, their age and gender did not predict whether or not they exhibited challenging behavior.

This first model established that social skills and ASD symptom severity significantly predicted measures of challenging behavior in terms of purely statistical relationships. The primary purpose of Study 2, then, was to compare those results to a model based on theory (i.e., deficits in social skills should predict levels of challenging behavior over and above the contribution of ASD symptom severity given that social impairment is regarded as the most

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Table 8

Results of hierarchal multiple regression with ASD-BPC subscales as criterion variables.

Criterion	Predictor	Mean (SD)	R^2	R^2 Change	B (SE)	β	Correlation between predictor and criterion	Partial Correlation
Internalizing		3.75 (3.40)	.38	.29				
	ASD-DC (ASD severity)	49.45 (16.93)			.06 (.02)	.27**	.31**	.28*
	MESSY Appropriate	45.31 (14.11)			-.06 (.02)	-.25**	-.20*	-.24*
	MESSY Inappropriate	85.62 (29.10)			.07 (.01)	.57**	.44**	.56**
Externalizing		4.35 (3.62)	.28	.03				
	ASD-DC (ASD severity)				.09 (.02)	.44**	.53**	.40**
	MESSY Appropriate				-.05 (.02)	-.20*	-.40**	-.19*
	MESSY Inappropriate				.02 (.01)	.12	-.03	.14
Total		8.10 (6.16)	.37	.14				
	ASD-DC (ASD severity)				.15 (.03)	.41**	.48**	.39**
	MESSY Appropriate				-.11 (.04)	-.25**	-.35**	-.24*
	MESSY Inappropriate				.08 (.02)	.39**	.23*	.41**

*$p < .05$

**$p < .01$

salient feature of ASD). Results of these hierarchal regression analyses indicated that social skills deficits accounted for a significant amount of variance in internalizing and overall challenging behaviors above and beyond that of ASD symptom severity. However, this relationship was not evident for externalizing challenging behaviors.

These results again underscore the importance of deficits in social interaction skills in the overall behavioral profile of ASD. Specifically, the results of the hierarchal multiple regression analyses support the hypothesis that it is deficits in social skills that seem to explain the results of previous research indicating that children with ASD are at a greater risk for evincing problem behaviors (e.g., McClintock et al., 2003). Interestingly, in the present study social skills deficits were more predictive of levels of "internalizing" challenging behaviors as opposed to "externalizing" challenging behaviors. Therefore, a child with ASD who exhibits inappropriate social behaviors as well as deficits in appropriate ones is significantly more likely to exhibit inappropriate behavior directed towards him/herself (e.g., self-injury) compared to a child with similar levels of ASD symptom severity but with less pronounced deficits in social interaction skills. Although neither the internalizing nor externalizing behaviors measured by the ASD-BPC are entirely unique to children with ASD, it could be argued that those behaviors on the Internalizing subscale are more indicative of a diagnosis of ASD given the overlap between repetitive/self-injurious behaviors and the repetitive behavior/interest symptom category used in diagnosing ASD. On the other hand, challenging behaviors such as physical aggression or property destruction could just as likely be exhibited by a child with Conduct Disorder or ID.

Age and gender did not significantly contribute to the variance in ASD-BPC scores in the stepwise regression analysis. In the population study of persons with intellectual and developmental disabilities conducted by Holden and Gitlesen (2006), there was no significant

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difference in rates of challenging behavior between genders. However, only a small fraction of that sample presented with ASD (6.4%). Elsewhere, McClintock and colleagues (2003) found that males with ASD were more likely to engage in aggression than females, but found no difference in rates of self-injury. As such, future research should explore any potential gender differences in topographies of self-injury. That being said, there were no significant differences between ASD-BPC total and subscale scores for males and females meeting criteria for ASD in the present sample. However, there were substantially more males than females (102 to 30), which is unsurprising given the 3:1 ratio of males to females often cited for persons with ASD. In terms of age, McClintock et al. (2003) found higher rates of challenging behavior in adolescents (10-20) than in children (0-9) and highest in the age range of 20-40 years. In the present sample, there was no significant difference in levels of challenging behavior by age (3-9 vs. 10-16). Again, the groups were uneven with more children in the younger age range (93 vs. 39).

The statistical analyses employed in the present study used two sets of regression models to delineate the contribution of social skills and other variables to the expression of challenging behavior in children with ASD. An additional method of data analysis would be to examine the relative importance of the predictors in the multiple regression analyses. One such method for analyzing the importance of predictors is called dominance analysis. Dominance analysis is a relatively new statistical procedure that determines the relative importance of predictors in a multiple regression analysis through a pair-wise comparison of all predictors in the model (Budescu, 1993). This procedure has been determined to be superior to other methods of determining relative importance (LeBreton, Ployhart, & Ladd, 2004). Such a level of analysis is beyond the scope of the present study, which was more preliminary in nature, but would have

provided a good supplementary analysis to the multiple regression analyses conducted here. Dominance analysis could have shown whether or not social skills "dominated" symptoms of ASD in predicting challenging behavior. However, in the specific model examined, which was arranged based on theory, the hypothesis being investigated was if social skills contributed to the expression of challenging behavior above and beyond ASD symptom severity and both measures of social skills were entered in the same step. Given the preliminary nature of the present study, not having this supplementary analysis does not detract from the findings, but does present an interesting avenue for future research.

IMPLICATIONS AND FUTURE DIRECTIONS

To summarize, in Study 1 it was demonstrated that the relationship between social skills and challenging behavior was more pronounced for children and adolescents with ASD compared to their typically developing peers. Additionally, it was shown that social skills deficits/excesses predicted the presence of certain challenging behaviors in these individuals. The results of Study 2 revealed that social skills deficits/excesses predicted the presence of challenging behavior (internalizing and total problem behavior scores) above and beyond levels of ASD symptom severity.

The results of these analyses contribute to our knowledge of the behavioral presentation of ASD by extending the results of previous research with adults (i.e., Matson et al., 2009) through an examination of the relationship between two salient features of ASD (social skills deficits and challenging behavior) in children and adolescents. This study also represents a promising first step in understanding the contribution of other factors to this relationship (i.e., ASD symptom severity, age, and gender). However, the sample consisted of only a narrow subset of individuals with ASD and thus the generalizability of the results to other samples and groups of persons with ASD is therefore unknown.

Further, the nature of the data collection procedures prevented the sample from being random, which decreases the likelihood that the findings are representative of the total population. Many of the children in the ASD group were recruited from outpatient clinics specializing in the treatment/assessment of ASD and related difficulties. As mentioned earlier, the majority of the sample was recruited from Louisiana (90.3%) through outpatient clinics, participant and professional referrals, support/advocacy groups, and schools. It is possible that some participants self-selected to participate in the study for reasons such as obtaining

professional feedback or additional services for their child. Additionally, the majority of the sample consisted of children from upper-middle class families. An ideal sample would comprise children randomly selected from the population and equally distributed across SES and location. Practically speaking, such a sample is rarely, if ever, achieved in this type of research. However, replicating the study across different samples and demographic groups would help remedy questions about the generalizability of the results. Although the demographic homogeneity of the sample is a limitation, the sample size of 132 children with ASD represents an overall strength. For example, published studies examining symptom profiles of persons with ASD rarely obtain sample sizes greater than 50.

It should also be mentioned that informants were not blind to the purpose of the original study (i.e., developing a new assessment measure for children with autism) and this knowledge may have influenced their responses. The informants were aware that they would be receiving recommendations based on the results. There exists the possibility that informants may have inflated or deflated their endorsements based on previous knowledge of ASD as opposed to their actual observations of the child being assessed.

Another major limitation of the sample was the manner in which group assignment was made. Because the study utilized an archival database, group assignment had already been determined. The rationale for the method of group assignment is as follows. Because the database consisted of participants recruited from multiple locations across the United States, the method of diagnosis more than likely differed from site to site. In order to ensure consistency of diagnoses, a checklist was created to identify those meeting criteria for an ASD. This checklist was based on DSM-IV-TR/ICD-10 criteria for ASD, which is the current standard used by professionals around the world for diagnosing these conditions. Such a checklist created a

standardized and efficient method of group assignment that made it possible to assess a large sample without having each participant be seen in person, which would have been a very time-consuming process and impossible for many of the families. There were no inherent problems with the checklist itself, its psychometric properties had previously been established as sound (see above).

However, the use of such a checklist is problematic for several reasons. For example, in most cases the diagnoses were not confirmed, and thus, relied entirely on parent report. As such, there may have been instances where parents were over-reporting symptom severity in an attempt to get services for their children. Secondly, the group assignment procedures were not very stringent and thus the ASD group was somewhat heterogeneous in terms of symptom severity. Additionally, children with previous diagnoses of the three ASD were included with children who had been diagnosed with other mental health conditions as well as those having no previous psychiatric diagnosis. The results may have been stronger if only more severe cases had been included in the sample. Likewise, the checklist did not differentiate among ASD and more than likely included a mix of the three most common ASD (i.e., Autistic Disorder, PDD-NOS, and Asperger's Disorder). Altogether, although differential diagnosis can be challenging in some cases and some children in the sample may have never been formally assessed, this issue still limits the generalizability of the findings.

As such, future studies should employ more rigorous forms of diagnosis and compare groups within the ASD diagnostic umbrella to allow for a more fine-grained analysis. For example, the relationship between social skills and challenging behavior could be compared across the three most common ASD mentioned above. To achieve such a research design, group assignment should be made based on the results of a standardized diagnostic workup in which

each participant was individually assessed using more conservative and rigorous measures of ASD such as the ADOS-G and ADI-R (see above) in conjunction with examination by a licensed psychologist. Additionally, reliability of diagnoses should be obtained in such a study. It would be presumed that the relationship between challenging behavior and social skills would be less pronounced in those children with PDD-NOS compared to Autistic Disorder, given that symptoms of social impairment are likely to be more severe in those with Autistic Disorder and research indicating that for adults with ASD, those with this diagnosis exhibit higher rates of challenging behavior compared to those with PDD-NOS (Matson & Rivet, 2008). Additionally, it would be useful to utilize other comparison groups, such as children not meeting criteria for ASD but presenting with other psychiatric difficulties or ID.

Once again, the results described here represent a good initial step towards understanding the way in which the relationship between social skills and challenging behaviors develops over the lifespan. Although age was not a factor in the present analyses, previous research (e.g., the Camberwell studies; McClintock et al., 2003) has indicated that the severity and topography of challenging behavior changes from childhood to adulthood in persons with ASD. Therefore, it would be rather illuminating to conduct a longitudinal study of persons with ASD and assess them at certain points over the lifespan (e.g., as young children, adolescents, young adults, older adults, etc.). Such a research design would determine whether or not the relationship between these two variables was stable over time, changed with age (e.g., skill deficits and/or challenging behavior may have improved with treatment), or manifested differently for different topographies of challenging behavior. For example, we do know from the Camberwell studies that stereotypical behaviors (as opposed to aggressive/disruptive behaviors) are more likely to improve from childhood to adulthood (Beadle-Brown et al., 2000;

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Murphy et al., 2005). However, the progression of the relationship between those variables and social skills for persons with ASD is unknown at this time (the sample for those studies was not limited to those with ASD and included persons presenting with a variety of disabilities).

An additional factor to consider for such a study would be the effect of intervention. Although it would be difficult to control for the type, intensity, and length of treatment, it would be interesting to analyze this variable as a potential covariate. One might predict that the relationship between social skills and challenging behavior would become weaker with more intervention. Practically speaking, however, it might be more efficient to replicate the present study with a sample of adults with HFA living in the community. Such a sample would represent a more appropriate comparison group than the institutionalized adults with ID used in the study by Matson and colleagues (2009) in terms of determining if the relationship between social skills and challenging behavior is similar from childhood to adulthood without having to conduct a longitudinal study.

Some other variables to consider as potential covariates in future research include the presence of co-occurring ID and/or other comorbid mental health conditions, verbal ability, and treatment with psychotropic medications. For example, in the present sample, the informants of 18.2% of those meeting criteria for ASD indicated that the child had been diagnosed with an ASD and at least one other mental health condition. This number is likely an underestimation given that the majority of diagnoses were unable to be confirmed by the researchers.

There is evidence that children with ASD and a comorbid mental health or medical condition exhibit more pronounced difficulty with socially inappropriate behavior. For example, one recent study found that children with both ASD and epilepsy presented with more severe social impairment and higher levels of challenging behavior than those with ASD alone (Turk et

al., 2009). However, the challenging behaviors assessed in this study pertained to more inappropriate or odd behavior in public as opposed to the aggressive, destructive, and repetitive behaviors analyzed in the present analyses. Elsewhere, it has been hypothesized that children with ADHD who present with greater symptoms of autism are more likely to exhibit disruptive behaviors (Mulligan et al., 2009). Interestingly, there is also evidence for a link between adults with Asperger's Disorder and comorbid psychiatric difficulties and violent crime (Newman & Ghaziuddin, 2008). Future research could therefore compare children with ASD alone and children with ASD and an additional diagnosis in terms of the present analyses. It could be predicted that the relationship between social skills and challenging behavior would be more pronounced in this latter group. Furthermore, this comorbid group could be split into two groups based on the nature of the comorbid condition – internalizing (e.g., anxiety, depression) vs. externalizing (e.g., ODD, ADHD), for example.

An additional factor to consider is treatment with psychotropic medication. For example, 43.9% of the present sample meeting criteria for ASD was prescribed at least one type of psychotropic medication at the time of data collection. In two recent studies analyzing large-scale samples, the number of children with ASD who were prescribed at least one psychotropic medication was 56% (Mandell et al., 2008) and 83% (Oswald & Sonenklar, 2007). Furthermore, in a recent study by Gerhard, Chavez, Olfson, and Crystal (2009) it was reported that the proportion of outpatient visits for children with ASD that resulted in prescription of psychotropic medication increased from 39% from 1996-2000 to 79% from 2001-2005. Future research should explore the potential mediating effects treatment with psychotropic medication may have on the relationship between social skills and challenging behavior as well as the effect such medication has on behavioral treatments targeting inappropriate social behaviors.

One additional potential avenue for future research would be to examine the relationship between social skills and challenging behavior using another measure of challenging behavior. Given that the ASD-BPC was designed as more of a screener and only contains 18 items, a scale with a greater breadth of item content might yield more in-depth results. For example, the BPI-01 (Rojahn et al., 2001) contains 52 items spread across three subscales. The results in the present study were discussed in terms of externalizing and internalizing challenging behaviors. Utilizing the BPI-01 would not only confirm the results of the present study with another commonly used and well-validated measure of challenging behavior but would also allow for another dimension of analysis, that is the "internalizing" behaviors of the ASD-BPC are split between two subscales on the BPI-01: Self-Injurious Behavior and Stereotyped Behavior. It would be interesting to see if one had a stronger relationship with the Inappropriate Assertiveness/Impulsiveness subscale of the MESSY over the other (in Study 1 the relationship between this MESSY subscale was strongest with the Internalizing subscale of the ASD-BPC, which is composed of both self-injurious and stereotyped behaviors). In fact, in one recent study the BPI-01 showed good convergent validity with the adult version of the ASD Battery's challenging behavior scale, the ASD-BPA (Rojahn, Wilkins, Matson, & Boisjoli, in press). Although as mentioned previously, the child and adult versions of the ASD-Behavior Problems contain different factor structures.

Additionally, future research could determine if social skills deficits/excesses were more predictive of certain behavior functions rather than topographies. The QABF (see above), which is a quick and efficient method of determining the maintaining factors of challenging behaviors, contains five subscales pertaining to attention, escape, pain, nonsocial, and tangible functions. It would be interesting to see if social skills deficits/excesses were more significantly related

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certain functions over others. Behavior function could also be entered as a covariate in replications of the present research design.

One important implication of the present study is that given the finding that social skills deficits are predictive of challenging behavior in children with ASD, social skills training could potentially decrease the likelihood of a child developing challenging behavior in the first place. Such a treatment strategy is appealing on several levels. First, some form of social skills training should always be included in treatment packages for children with ASD, given that deficits in social interaction skills are a core symptom, and as argued throughout this paper, the defining characteristic of these disorders. The benefits of such a treatment strategy become twofold given the results of the present analyses and previous research indicating that children with ASD present such a great risk for developing challenging behavior. In this scenario, social skills training could function as a preventative measure against the development of challenging behavior in young children with ASD.

Although up to this point there has been no research specifically investigating the relationship between social skills and challenging behavior in children with ASD, treatment studies of challenging behaviors have demonstrated that aspects of social behavior have also improved with decreases in targeted challenging behaviors (e.g., Perry et al., 2008; Singh et al., 2007). Likewise, treatment studies examining the effect of Social Stories (see above) have reported decreases in challenging behavior (e.g., Scattone et al., 2002; Swaggart et al., 1995). However, Social Stories do require a certain level of language and comprehension skills, meaning that the effectiveness of this treatment for lower functioning individuals is somewhat questionable. Additionally, because many social skills training strategies are components of treatment packages or are paired with other treatment strategies (most notably, various

reinforcement procedures), it is unclear which component is responsible for decreasing challenging behavior. The present findings provide evidence that decreases in challenging behavior in these instances result from the acquisition of social skills and the remediation of inappropriate social behaviors. It would be interesting to attempt to isolate which treatment components were responsible for improvements in both variables.

In conclusion, the results of the present analyses represent a promising first step in understanding the relationship between social skills and challenging behavior in children with ASD. This research also contributes to our understanding of how these variables, which are among the most salient in persons with ASD, persist across the lifespan. Additionally, the results may have important implications for treatment strategies in children with ASD and provide a springboard for many potential future studies.

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DSM-IV/ICD-10 CHECKLIST

Please indicate "yes" if the following applies to your child/client. Indicate "no" if the item does not apply to your child/client.

1. Impairment in social interaction, such as:
_____ a. Impairment in the use of multiple nonverbal behavior, such as eye-to-eye gaze (e.g., eye contact), body postures, or gestures).[a, b]
_____ b. Failure to develop peer relationships appropriate to developmental level (e.g., little to no interest in forming friendships or lacks understanding of how to interact with others).[a,b]
_____ c. Lack of spontaneous seeking to share enjoyment, interest or achievements with others (e.g., not showing, bringing, or pointing out objects of he/she finds interesting).[a]
_____ d. Lack of social or emotional reciprocity (e.g., not actively participating in social play or games, preferring solitary activities).[a,b]
_____ e. Rarely seeking or using others for comfort in times of stress or offering comfort or affection to others in stress.[c]

2. Impairments in communication, such as:
_____ a. Delay in development or lack of spoken language (i.e., not accompanied by an attempt to communicate through alternative ways to communicate such as gestures or mime).[a,b]
_____ b. In those with adequate speech, impairment to initiate or sustain conversations with others.[a,b]
_____ c. Stereotyped and repetitive use of language or idiosyncratic language (e.g., using words in a peculiar or odd way).[a,b]
_____ d. Lack of varied, spontaneous make-believe play (e.g., pretend play) or social imitative play (e.g., imitating adults) appropriate to developmental level.[a]
_____ e. Lack of emotional response to others' verbal or non-verbal communication.[c]
_____ f. Lack of variation in the rhythm or emphasis of speech (e.g., speech is monotone; without change).[b]
_____ g. Impaired use of gestures to aid spoken communication.[c]

3. Restrictive, repetitive, and stereotyped patterns of behavior, interest, or activities, such as:
_____ a. Preoccupation with one or more stereotyped and restricted patterns of interest of abnormal intensity or focus (e.g., few interests).[a,b]
_____ b. Inflexible adherence to specific, nonfunctional routines or rituals.[a,b]
_____ c. Stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or other complex whole-body movements such as rocking, dipping or swaying).[a,b]
_____ d. Persistent preoccupation with parts of objects (e.g., buttons, parts of the body).[a,b]
_____ e. Specific attachments to unusual objects (e.g., string).[c]
_____ f. Distress over changes in small, non-functional details of the environment.[b]

4. _____ Delays or abnormal functioning in at least one of the previous areas (#1-3) was present prior to age of 3.[a,b]

[a]DSM-IV-TR diagnostic criteria; [b]ICD-10 diagnostic criteria; [c]Items are included in descriptions of ICD-10 for clinical use, but not included as specific diagnostic criteria.

APPENDIX B

DEMOGRAPHIC QUESTIONNAIRE REGARDING SES

Information About You and Your Family
Please answer the following questions about you and your family. Read each question carefully.

Relation to child: _____   **Are you the biological parent of your child?** _____ Yes _____ No

Your Age: _____

Your Spouse's Age (if relevant): _____

Your Race (indicate with an X below):   **Marital Status:**
_____ White   _____ Never Married
_____ Black   _____ Married
_____ Hispanic   _____ Separated
_____ Asian   _____ Divorced
_____ Native American   _____ Widowed
_____ Pacific Islander
_____ Other

Education: What is the highest level of education completed (indicate with an X below)

<u>Yourself</u>   <u>Your Spouse (if applicable)</u>

_____ 6th grade or less   _____ 6th grade or less
_____ Junior High/Middle School (7th, 8th, 9th grade)   _____ Junior High/Middle School (7th, 8th, 9th grade)
_____ Partial High School (10th or 11th grade)   _____ Partial High School (10th or 11th grade)
_____ High School Graduate   _____ High School Graduate
_____ Partial College (at least 1 year) or specialized   _____ Partial College (at least 1 year) or specialized
    training   training
_____ University Graduate   _____ University Graduate
_____ Graduate degree (Master's or Doctorate)   _____ Graduate degree (Master's or Doctorate)

Occupation: Please indicate your current job position or title. NOT the name of your employer. If you are retired, please write "retired" and your past occupation. If you are not currently employed, write "unemployed". If you are a full time student, write "student".

What is your occupation? _____

What is your spouse's occupation? _____

Information About Your Child
Did you notice anything unusual about your child's early development? _____ Yes _____ No

If yes, briefly describe _____

Was there a period of time during development that your child lost skills (unable to do something that he/she previously was able to do)? _____ Yes _____ No

If yes, what types of skills were lost? _____

If yes, at what age did this skill loss occur? (age in months) _____ months

If yes, how long did your child continue to lose skills before he/she stopped losing skills (skills stabilized)? (indicate with an X)

_____ less than 1 month

_____ 1-3 months

_____ more than three months → How long did he or she continue to lose skills? _____ (number of months)

VITA

Jonathan Wilkins was born in January 1980 in Cleveland, Ohio. He earned his Bachelor of Arts degree in psychology and graduated magna cum laude in June of 2002 from Carleton College in Northfield, Minnesota. He enrolled in the clinical psychology graduate program at Louisiana State University in August of 2005. His research and clinical work focused on the assessment and treatment of autism spectrum disorders. He completed his master's thesis entitled *A Comparison of Social Skills Profiles in Intellectually Disabled Adults with and without ASD* and received his Master of Arts degree in 2008. He completed his pre-doctoral internship at University of Nebraska Medical Center's Munroe-Meyer Institute. While training at Munroe-Meyer, he further developed his clinical skills and knowledge of applied behavior analysis while working at the Severe Behavior Disorders Program and Pediatric Feeding Disorders Program. Presently, he is completing a post-doctoral fellowship in intellectual and neurodevelopmental disabilities at Nationwide Children's Hospital in Columbus, Ohio.