

Seattle Pacific University Digital Commons @ SPU

Clinical Psychology Dissertations

Psychology, Family, and Community, School of

Spring June 3rd, 2019

The Roles of Pragmatic Language and Theory of Mind in the Adaptive Communication Skills of Children with Autism Spectrum Disorder

Taja Estrada Seattle Pacific University

Follow this and additional works at: https://digitalcommons.spu.edu/cpy_etd Part of the <u>Clinical Psychology Commons</u>

Recommended Citation

Estrada, Taja, "The Roles of Pragmatic Language and Theory of Mind in the Adaptive Communication Skills of Children with Autism Spectrum Disorder" (2019). *Clinical Psychology Dissertations*. 45. https://digitalcommons.spu.edu/cpy_etd/45

This Dissertation is brought to you for free and open access by the Psychology, Family, and Community, School of at Digital Commons @ SPU. It has been accepted for inclusion in Clinical Psychology Dissertations by an authorized administrator of Digital Commons @ SPU.

The Roles of Pragmatic Language and Theory of Mind in the Adaptive Communication

Skills of Children with and without Autism Spectrum Disorder

Taja Estrada

A dissertation submitted in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

In

Clinical Psychology

Seattle Pacific University

June 3, 2019

Approved by:

Reviewed by:

Beverly J. Wilson, Ph.D. Professor of Clinical Psychology Seattle Pacific University Dissertation Chair Amy Mezulis, Ph.D. Associate Professor of Clinical Psychology Seattle Pacific University Chair, Clinical Psychology

Lynette Bikos, Ph.D. Professor of Clinical Psychology Seattle Pacific University Committee Member Katy Tangenberg, Ph.D. Dean of the School of Psychology, Family & Community Seattle Pacific University

Elizabeth Viney, Ph.D. Licensed Psychologist Eastside Psychological Associates Committee Member

Table of Contents

List of Tables
List of Figures
Abstract
Chapter I: Introduction
Autism Spectrum Disorder11
Theoretical Framework of Social Communication14
Adaptive Functioning16
Development of Adaptive Functioning19
Pragmatic Language
Theory of Mind
Current Study
Hypotheses
Chapter II: Method
Participants
Procedure
Enrollment Visit
University Visit
Measures

ADAPTIVE COMMUNICATION IN ASD

Chapter III: Results	
Data Entry and Preparation	52
Power Analyses	53
Missingness, Outliers, and Assumptions of Multiple Regression	
Direct Effects and Mediational Relations	
Statistical Analyses	
Post Hoc Analyses	66
Chapter IV: Discussion	
Interpretation of Results	
Clinical Implications	
Strengths and Limitations	
Conclusions and Future Directions	77
References	80

List of Tables

Table 1. Descriptions of Theory of Mind Scaling Tasks

Table 2. Descriptive Statistics for Study Variables: Means, Standard Deviations, Range,

t-tests, and Effect Sizes by Group

Table 3. Pearson's Bivariate Correlations among Study Variables

Table 4. Direct, Indirect, and Total Effects of Status on Adaptive Communication

through Pragmatic Language (M₁) and Theory of Mind (M₂)

List of Figures

Figure 1. The proposed indirect effects of developmental status on pragmatic language through pragmatic language and theory of mind.

Figure 2. The proposed indirect effect of developmental status on adaptive communication through pragmatic language.

Figure 3. The proposed indirect effect of developmental status on adaptive communication through theory of mind.

Figure 4. Statistical diagram of the indirect effects of developmental status on adaptive communication through pragmatic language and theory of mind.

Figure 5. Serial mediation of pragmatic language and theory of mind on the relation between status and adaptive communication with unstandardized path coefficient values and confidence intervals at the 95% level.

Figure 6. Scatterplot depicting individual participant theory of mind total scores

overlaying a bar graph depicting the means of the theory of mind total scores by group.

Figure 7. Scatterplot depicting individual participant adaptive communication and

pragmatic language scores by group with clinical importance values depicted.

Taja Estrada Word Count: 345

Abstract

Children with autism spectrum disorder (ASD) exhibit marked social communication impairments. Research suggests that these deficits often lead to delays in adaptive behavior, such as adaptive communication. In this study, I examined the roles of two social constructs, pragmatic language and theory of mind (ToM), in the adaptive communication abilities of young children with and without ASD. Thirteen children with ASD (31% female; M age = 58.08 months) and 24 children with typical development (58% female; M age = 52.42 months) between the ages of 3:0 and 6:5 were assessed. Adaptive communication was measured by the Functional Communication subscale of the Behavior Assessment System for Children, Second Edition (Reynolds & Kamphaus, 2004). Pragmatic language ability was assessed by the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999). ToM was measured through a battery of laboratory tasks. Results indicated significant direct effects of status on adaptive communication [F(1, 35) = 28.61, p < .001], status (i.e., TD vs. ASD) on pragmatic language [F(1, 35) = 8.17, p = .001], and pragmatics on ToM [F(1, 35) = 7.03, p = .001]p = .01]. Results did not support the hypotheses that the relation between status and adaptive communication would be mediated by pragmatic language alone, ToM alone, or pragmatic language predicting ToM. Post hoc analyses showed scores on each measure were trending in the predicted directions when compared to past literature. This indicates promise for future research replicating the study. Additionally, exploratory analyses showed that only children with ASD had at-risk or clinically significant pragmatic and/or adaptive communication skills. While it has been previously shown that older children

with ASD (ages six through adolescence) demonstrate pragmatic language deficits than children with TD, this relation has not been examined in younger children. These results may help inform therapy goals for young children with ASD. It may be beneficial for children with ASD as young as three years old to begin working on improving their pragmatic language skills. The study's strengths include the population sampled (i.e., young children with ASD compared to children with TD who have average or greater verbal abilities).

Chapter I

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that is characterized by a pattern of social communication deficits and restricted and repetitive behaviors (American Psychiatric Association [APA], 2013). Impairments in these two domains vary widely among children with ASD, which result in similarly diverse functional outcomes (Kjellmer, Hedvall, Fernell, Gillbert, & Norrelgen, 2012; Rojahn, Wilkins, Matson, & Boisjoli, 2010; Wilkins & Matson, 2009). Despite the heterogeneous symptom severity among individuals with ASD, the social communication deficits inherent to the ASD diagnosis often lead to poorer outcomes throughout development. One such outcome frequently observed in children with ASD is adaptive functioning deficits.

Adaptive functioning broadly refers to an individual's ability to independently and successfully interact within the environment (Ashwood et al., 2015; Matthews et al., 2015; Milne & McDonald, 2015). Compared to children with typical development (TD), children with ASD have consistently demonstrated lower adaptive functioning skills across development, regardless of their ASD symptom severity (de Bildt, Sytema, Kraijer, Sparrow, & Mindera, 2005; Klin et al., 2007; Liss et al., 2001; McDonald et al., 2016). Research has shown that one area of adaptive functioning that is particularly impaired in children with ASD is adaptive communication (Freeman et al., 1991; Freeman, Ritvo, Yokota, Childs, & Pollard, 1988; Green et al., 2000; Mahan & Matson, 2011; Perry et al., 2009). Adaptive communication refers to an individual's ability to communicate effectively within their environment (Meinzen-Derr et al., 2014; Reynolds & Kamphaus, 2004). Children with ASD who demonstrate lower communication skills have been shown to exhibit greater deficits in social skills and overall adaptive behavior and greater ASD symptom severity throughout adolescence and adulthood (Billstedt et al., 2007; Gillberg & Steffenburg, 1987). As such, it is important to explore factors associated with these adaptive communication deficits in order to clinically address the mechanisms through which these negative outcomes arise.

Research has identified several factors that may contribute to the adaptive functioning deficits observed in children with ASD, such as language ability (Bennett et al., 2013) and social perception (Hale & Tager-Flusberg, 2005; Kimbi, 2014). Both of these factors share a significant social component; language is often learned by imitating and modeling others and continues to develop in many social settings, such as through interactions with peers and caregivers, while social perception is in itself a social construct, as it involves understanding and interpreting others' perceptions (Cardon, 2012; Leigh, Nievar, & Nathans, 2011). The most frequently used measure of social perception is theory of mind (ToM). Mastery of ToM tasks means an individual has the ability to take on the perspective of others to determine their beliefs, thoughts, and emotions (Tager-Flusberg, 2007). While research has demonstrated a universal trajectory of ToM development for children with TD, children with ASD have been shown to exhibit deficits in ToM abilities across childhood, adolescence, and adulthood (Baron-Cohen, 1995; Baron-Cohen, Leslie, & Frith, 1985; Peterson, Slaughter, & Paynter, 2007). These deficits have been linked to delays in language abilities, such as pragmatic skills (Lam & Yeung, 2012; Tager-Flusberg, 2007).

Pragmatic language refers to the ability to use and interpret language appropriately across social contexts (Milligan, Astington, & Dack, 2007). Research has established that many children with ASD present with pragmatic language deficits compared to their typically developing peers (Lam & Yeung, 2012; Reichow, Salamack, Paul, Volkmar, & Klin, 2008). This impairment in pragmatic language has been shown to be independent of structural language abilities, such as expressive and receptive skills, indicating that pragmatic skills demonstrate a unique challenge for this population (Volden, Coolican, Garon, White, & Bryson, 2009). Research has revealed that pragmatic language predicts adaptive behavior in children with ASD, even when controlling for structural language (Landa, 2000; Tager-Flusberg & Joseph, 2005; Young, Diehl, Morris, Hyman, & Bennetto, 2005). Additionally, the small body of literature examining the relation between pragmatics and ToM has found that pragmatic language deficits are associated with lower ToM abilities (Eisenmajer & Prior, 1991; Whyte & Nelson, 2015). However, the relation between these two constructs has largely been under-examined.

Therefore, the proposed study aims to expand upon the current literature of the social factors that contribute to these adaptive communication deficits in children with ASD by examining the potential mediating roles of pragmatic language and ToM in children ages 3:0 to 6:11 with and without ASD. Significant findings would not only add to this limited body of research, but would also suggest new pathways for interventions targeting adaptive behavior in young children with ASD. The following sections provide an overview of ASD, the theoretical framework for the development of social communication, operational definitions of the adaptive communication, pragmatic

language, and ToM constructs, and a review of the current literature that relates to the current study.

Autism Spectrum Disorder

Overview

ASD is a lifelong neurodevelopmental disorder that affects one in 68 children in the United States (Center for Disease Control, 2014). ASD is characterized by categories of symptoms that fall into one of two domains: social communication deficits and restricted, repetitive patterns of behavior (APA, 2013). Some of the social deficits observed in children with ASD include lack of social-emotional reciprocity, deficits in nonverbal communication behaviors used for social interaction, and impaired ability to develop and maintain relationships appropriate to developmental level (APA, 2013). Restricted and repetitive behaviors observed in children with ASD include stereotyped or repetitive motor movements or speech (e.g., simple motor stereotypies, echolalia, idiosyncratic phrases), insistence on sameness, highly restricted, fixated interests, and unusual interest in sensory aspects of the environment (APA, 2013).

At its core, ASD is a social disorder, as areas of social development are severely impacted due to communication challenges and repetitive behaviors and restricted interests that limit opportunities for socialization outside of one's specific interests (Bernier & Gerdts, 2007). Consequently, children with ASD often exhibit more problematic behaviors than their peers with typical development (TD) because of these social difficulties (Crişan & Stan, 2013). Given these social deficits, research has found that children with ASD spend less time engaged in social activities with peers than children with TD, and therefore have fewer opportunities to learn and practice social skills (Humphrey & Symes, 2011; Kishida & Kemp, 2006). Due to their inherent social difficulties, children with ASD are often delayed in important skills that develop as a result of prosocial interactions, such as language knowledge (Baranek et al., 2013). Despite these characteristic social delays, children with ASD often report a desire for friendships (Bauminger & Kasari, 2000). However, these meaningful relationships are difficult to attain due to crucial differences in their understandings of friendship and ability to maintain social relationships. As a result, children with ASD are often bullied and isolated from social interactions (Bauminger & Kasari, 2000).

Specifiers

As individuals with ASD exhibit varied presentations of symptom severity and functional impairments, the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; APA, 2013) developed two distinct specifiers to better describe individuals with ASD. These specifiers include *with or without accompanying intellectual disability* and *with or without accompanying language impairment*. The severity level of each specifier is also rated, which include *Level 1: requiring support*, *Level 2: requiring substantial support, and Level 3: requiring very substantial support*. Each specifier is independently rated for severity level, allowing for a more comprehensive description of each individual with ASD that can help create targeted intervention goals and school services.

Epidemiology

The U.S. Centers for Disease Control and Prevention (CDC) reports ASD is diagnosed in 1 and 42 males and 1 and 189 females, with 1 female being diagnosed for every 4.5 males (2014). There has been a significant increase in the rates of ASD within the past 15 years, with rates currently around 123% higher than 2002 estimates (Baio et al., 2014). However, rates have maintained relatively stable (i.e., 1 in 68 children) for the past several years. There is some debate as to whether this increase in the prevalence of ASD reflects an actual increased risk in the population or changes in public awareness, diagnostic criteria, and early identification of ASD (Russell, Kelly, & Golding, 2010). While ASD reportedly occurs across all culture, ethnicity, and socioeconomic groups (Elsabbagh et al., 2012), those in lower socioeconomic groups often receive diagnosis later than those in higher socioeconomic groups (Hill, Zuckerman, & Fombonne, 2014). **Etiology**

Current research shows the etiology of ASD includes both genetic and environmental factors, including pre- and postnatal factors (Newschaffer et al., 2007). Research has shown that ASD is genetically hereditable through twin studies, which demonstrate an increased prevalence of ASD in families who have at least one family member who meets the diagnostic criteria for ASD (Bailey et al., 1995). Furthermore, siblings of children with ASD have a 20% increased risk of having ASD or ASD-related symptoms, further indicating a strong genetic component to ASD (Constantino et al., 2013).

Additionally, researchers have explored a range of environmental factors that may contribute to the development of ASD. Environmental factors such as socioeconomic status, ethnicity, maternal and paternal age, and pre- and perinatal environmental features have been shown to be associated with ASD (Burd, Severud, & Kerbeshian, 1999; Croen, Grether, & Selvin, 2002; Newschaffer et al., 2007; Wing, 1980). However, it is important to note one single environmental or genetic factor does not account for all individuals with ASD; it appears the social communication and restricted interests characteristics of ASD develop through diverse etiologies.

Theoretical Framework of Social Communication

As primarily social beings, humans are continuously rewarded for orienting to the social world (Chevallier, Kohls, Troiani, Brodkin, & Schultz, 2012). As such, we actively seek out social experiences to continue to receive internal and external rewards Chevallier et al., 2012). The inherently rewarding nature of social experiences allows for ample opportunities for individuals to participate in crucial social learning opportunities that result in improved social and communication skills (Schultz, 2005). Difficulties in social communication are thought to be a result of a lack of desire to participate in the social world, which is also referred to as social motivation (Pankert et al., 2014).

Social Motivation Theory

Chevallier and colleagues (2012) described social motivation as a combination of psychological and biological mechanisms that: (a) orient the individual to the social world; (b) allow the individual to seek and take pleasure in social interactions, resulting in social reward; and (c) keep the individual driven to maintain social relationships. Specifically, this model posits that individuals typically prioritize and attend to social information. This is evidenced in research that demonstrates infants are more likely to attend to face-like stimuli as opposed to unrecognizable stimuli (Gliga, Elsabbagh, Andravizou, & Johnson, 2009; Salva et al., 2011). Individuals also gain intrinsic and extrinsic rewards for orienting to the social world (Bowles, 2008; Chevallier et al., 2012). Additionally, individuals have a strong desire to be favorably compared to others and to maintain social relationships (Leary & Allen, 2010). These factors encompass what

ADAPTIVE COMMUNICATION IN ASD

Chevallier et al. described as social motivation. Socially motivated behaviors typically emerge during the preschool years, as evidenced by strong interests in engaging in positive self-presentation and the desire to maintain friendships (Fu & Lee, 2007; Ross et al., 2004). This theory provides an explanation for the importance of attending to social interactions to promote the development of communication and language skills.

Social motivation theory conceptualizes impairments in social communication as decreased desire to engage and learn from the social environment (Chevallier et al., 2012). Similarly, impairments in social and functional behaviors such as social perception and adaptive behavior may arise from a lack of engagement in the social world (Bennett et al., 2013). Impairments in orienting to the social world have been theorized to be a result of a lack of interest in social stimuli (Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998). The following section will describe how impairments in social motivation are thought to lead to delays in language and communication in children with ASD.

Social Motivation in Children with ASD

When considering social motivation theory in the social communication deficits in ASD, Pankert et al. (2014) noted that diminished responsiveness to social rewards, such as faces and spoken language, often result in impaired social communication skills. Social communication and language skills are primarily developed through social interactions, particularly in early childhood (Baranek et al., 2013). Young children with ASD often spend less time engaged in social activities than children with TD, and as a result, have fewer social opportunities to learn these pivotal social skills (Kishida & Kemp, 2006). In addition to diminished interest in the social world, the social motivation theory suggests children with ASD present with increased interest to nonsocial stimuli, such as objects and self-actions (Kohls, Chevallier, Troiani, & Schultz, 2012). Together, lack of social engagement coupled with interest for nonsocial stimuli contribute to a strong preference for nonsocial stimuli over social stimuli (Kohls et al., 2012). As such, it is theorized that children with ASD are less motivated by social factors than their typically developing peers (Kohls et al., 2012). As a result of having less social motivation, they are less likely to engage in social situations, which reduce their opportunities for social learning experiences. Ultimately, this leads to impaired language and social communication skills that are likely to persist due to the lack of interest in the social world (Chevallier et al., 2012; Pankert et al., 2014).

Research also indicates there is likely a biological mechanism linking social motivation theory for children with ASD. Specifically, individuals with ASD have been shown to exhibit disrupted oxytocin regulation and an abnormal orbitofrontal-striatum-amygdala circuit, which have been shown to be associated with decreased social motivation (Chevallier et al., 2012). In the subsequent sections, social motivation theory will be used as the theoretical framework for understanding the relation between language and social factors such as social perception and adaptive communication in young children with ASD. These following sections present pertinent background information related to these constructs.

Adaptive Functioning

Overview

The construct of adaptive functioning was initially introduced as one of the main criteria for diagnosing intellectual disabilities in 1959 (Doll). The original conceptualization of adaptive functioning defined the construct as marked deficits in social competency, social norms, autonomy, coping skills, adaptability to the environment, and social adjustment (Tassé et al., 2012). In the following years, researchers began to examine the factor structure of adaptive behavior scales in order to determine the common elements that create this construct. Factor analyses reported a three-factor solution of adaptive functioning: (a) conceptual skills, which involve language, reading, and writing abilities; (b) social skills, which incorporate communication, social participation, social reasoning, and social comprehension; and (c) practical skills, which involve completing household chores and daily living skills (Schalock, 1999; Thompson, McGrew, & Bruininks, 1999).

The construct of adaptive functioning was primarily used in the field of intellectual disabilities until it was federally defined in the Individuals with Disabilities Education Act (IDEA, 1975). Before this legislative measure, children with certain diagnoses, including those with intellectual disabilities, were excluded from public education (West, 2000). With the passing of IDEA, all children became eligible to receive public education in the least restrictive and supportive environment that is tailored to meet their needs (IDEA, 2004). A child's adaptive functioning abilities were included in the assessment of each child's eligibility for special education services in public education, regardless of whether he met the criteria for an intellectual disability. With adaptive functioning now being assessed for all children with specialized needs, research quickly began to examine the relation between adaptive functioning and other neurodevelopmental disorders, such as ASD, attention deficit/hyperactivity disorder (ADHD), and fetal alcohol spectrum disorders (FASD), in order to accurately define the construct across individuals with special needs.

Defining Adaptive Functioning

To federally operationalize adaptive functioning, the American Association on Intellectual and Developmental Disabilities (AAIDD, 2013) expanded upon the threefactor solution of adaptive functioning (i.e., conceptual, practical, and social skills). Specifically, the AAIDD defined conceptual skills as including communication abilities, directional skills, and the ability to use money. Social skills include interpersonal skills, self-esteem, social problem solving, and the ability to follow rules. Finally, practical skills are comprised of activities of daily living skills, occupational skills, and healthcare routines. These skills are assessed based on what behaviors are expected at each age (AAIDD, 2013). This definition, while lengthy and inclusive, is the most frequently cited definition of adaptive functioning.

Additional definitions of adaptive functioning adopt a similar format and understanding of the construct. For example, Milne and McDonald (2015) defined adaptive functioning as the age-appropriate skills and behaviors needed to function independently in daily life. Similarly, Matthews et al. (2015) defined adaptive functioning as a multifaceted construct that includes age-appropriate behaviors that are necessary for age-appropriate independent living. Ashwood and colleagues (2015) defined adaptive functioning as critical behaviors needed for independent daily living skills in terms of communication, socialization, self-help, and life skills. These definitions of adaptive functioning all contain three similar elements, such that adaptive functioning: (a) is a multidimensional construct; (b) includes age-appropriate skills; and (c) includes skills that are necessary for independent functioning (as appropriate for the individual's age). The following sections examine the developmental pathways of adaptive functioning in children with TD and ASD.

Development of Adaptive Functioning

During typical development, children display incremental gains in their adaptive functioning skills relative to their developmental level (Luckasson et al., 2002). As children cognitively mature, they display increasingly complex adaptive functioning abilities across all adaptive functioning domains (Luckasson et al., 2002). Specifically, within the practical skills domain, a child would be expected to perform certain personal care tasks proficiently in accordance with their current developmental level. For example, by two years of age, children are typically able to feed themselves with a spoon. By five years of age, children can typically brush their teeth without assistance from a caregiver. By 11 years of age, children are typically able to prepare a simple meal for themselves. These self-care tasks are graduated such that as a child developmentally progresses, his relative adaptive functioning skills also increase (Luckasson et al., 2002). Adaptive functioning skills continue to develop into adulthood. For example, by 25 years old, individuals are typically able to live independently, which encompasses multiple adaptive functioning domains, including paying for rent or a mortgage and maintaining a job.

Adaptive functioning is considered to be impaired if continual support is needed in one or more settings, such as the home, school, or community (APA, 2013). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) emphasizes the role of adaptive functioning in diagnosing neurodevelopmental disorders such as ASD, FASD, ADHD, and communication disorders (APA, 2013). In fact, the DSM-5 cautions against diagnosing a neurodevelopmental disorder when adaptive functioning impairments have not been observed. As adaptive functioning encompasses behaviors necessary to function independently in one's own environment, it continues to be a well-researched outcome among these populations with demonstrated adaptive functioning deficits, including children with ASD (Bennett et al., 2013; Hudepohl, Robins, King, & Henrich, 2015).

Adaptive Functioning in ASD

Adaptive functioning is a well-researched topic in ASD research, with a multitude of studies documenting a significant discrepancy in adaptive and cognitive functioning when compared to their typically developing peers (Charman et al., 2011). While adaptive functioning seems to be more impaired in children with lower verbal and cognitive abilities (Liss et al., 2001), children with ASD who have greater verbal abilities also have significantly lower adaptive functioning abilities than children with TD (Charman et al., 2011; McDonald et al., 2015). As such, adaptive functioning appears to be impaired in children with ASD, regardless of verbal cognitive abilities.

Several factors that may contribute to the adaptive functioning deficits frequently observed in children with ASD have been researched, such as language ability (Bennett et al., 2013) and emotion perception (Hudepohl, Robins, King, & Henrich, 2015). Both of these share a significant social component; language skills are often learned by imitating and modeling others (Cardon, 2012) and continue to develop in many social settings, such as through interactions with peers and caregivers (Leigh, Nievar, & Nathans, 2011), while emotion perception is in itself social, as it involves understanding and interpreting others' emotional cues (Hudepohl et al., 2015). One component of adaptive functioning that appears to be particularly impaired in children with ASD is adaptive communication.

Adaptive communication in ASD. Adaptive communication falls under the social domain of adaptive functioning. This skill is defined as the ability to functionally communicate in ways that others can easily understand across multiple settings (Meinzen-Derr et al., 2014; Reynolds & Kamphaus, 2004). This requires both a demonstration of the functional use of language and the ability to be adaptable depending on your environment (Kamphaus, 1987). As such, adaptive communication serves as the intersection between language abilities and adaptive functioning.

Children with ASD display significantly greater challenges in adaptive communication skills than children with TD or other neurodevelopmental disorders (Mahan & Matson, 2010; Platt, Kamphaus, Cole, & Smith, 1991), indicating that adaptive communication remains a unique challenge for this population. Additionally, research has shown that greater cognitive functioning in children with ASD was not related to changes in their adaptive functioning skills, specifically in the area of adaptive communication (Volkmar, Sparrow, Goudreau, Cicchetti, & Cohen, 1987). Contrarily, greater cognitive functioning in children with intellectual disabilities was associated with gains in all domains of adaptive functioning (Platt et al., 1991). For children with intellectual disabilities, greater cognitive functioning allows them to engage functionally and independently in social contexts. However, the core social communication deficits in ASD preclude children with ASD from improving their adaptive communication skills as readily as children with intellectual disabilities (Bolte & Poustka, 2002). As these behaviors are often greatly impaired in children with ASD, adaptive behavior and communication remain a common treatment goal for children with ASD throughout their development (Howard, Stanislaw, Green, Sparkman, & Cohen, 2014; Scahill et al., 2016; Wallace et al., 2016). The following sections examine one social factor, pragmatic language, and its relation to adaptive behavior and communication.

Pragmatic Language

Differentiating Language and Communication as Separate Constructs

Language and communication are often used interchangeably in psychological research. However, these constructs represent independent, albeit frequently linked, skills. As such, it is key to operationally define each construct, as both will be examined separately in the current study. Specifically, language refers to a set of signals guided by society that are used to communicate with each other, whereas communication refers to the ability to comprehend and utilize verbal and nonverbal skills (Paul, 2008; Rapin, 2007).

Typical Development of Language

The acquisition of language is an important milestone in human development (Holmes & Willoughby, 2005). Language is a broad construct that represents multiple domains, such as structural and pragmatic skills. Typically, language first emerges in infancy with the development of structural language, which includes receptive and expressive language skills. Receptive language skills refer to the comprehension of the meaning and structure of speech (Hoff, 2009). Research has shown that the emergence of receptive language skills begins in infancy. Specifically, Bergelson and Swingley (2012) and Hoff (2009) have shown that children as early as six months of age are able to respond to their name and orient to familiar caregivers when hearing their name. Additionally, expressive, or spoken, language begins around six months as well with the emergence of babbling (J. Oller, S.D. Oller, & S.N. Oller, 2012). Babbling is a sequence of repetitive syllables, such as "dadadada." Typically, expressive language skills continue to progress until around four to seven years of age, when children have mastered language skills such as articulation, grammar, and conversation. Similarly, receptive language skills are also mastered in this time period, expanding upon skills such as following multi-step directions and comprehension of longer narratives (Hoff, 2009).

Once children master these structural language skills, they begin to develop pragmatic language skills. Pragmatic language skills refer to the appropriate use of language across multiple social settings (Oller et al., 2012). Pragmatic language requires children to not only demonstrate appropriate knowledge of the meaning of words (i.e., structural language), but to also understand the intent of communication within the social environment (Rapin, 2006; Whyte & Nelson, 2015). The typical and atypical development of pragmatic language is examined in the following sections.

Pragmatic Language Development in TD

Research has shown that pragmatic language is related to structural language, but still remains a distinct construct (Fujiki & Brinton, 2009). Mastery of pragmatic language involves three parts: (a) knowing when it is appropriate to speak, (b) knowing to whom it is appropriate to speak, and (c) knowing how much is appropriate to say in any given social situation (Bishop, 1997). For children with TD, pragmatic language skills continue to develop across childhood and adolescence (Whyte & Nelson, 2015). Precursors to pragmatic language skills include orienting to a familiar person, pointing to a desired object, using gestures, and appropriately integrated eye contact (Rapin, 2006). When children utilize these skills, they demonstrate a basic understanding of how language is used within a social context (Oller et al., 2012). Pragmatic language abilities continue to develop in childhood with the emergence of verbal skills such as appropriate word choices, social referencing, expressions of gratitude, and politeness and nonverbal skills such as turn-taking, a wide range of directed facial expressions, and gestures (Hoff, 2009; Rapin, 2006; Tager-Flusberg et al., 2001; Whyte & Nelson, 2015).

Delays in language acquisition and mastery, particularly within the pragmatics domain, affect multiple domains of development. These domains include social development (i.e., children's ability to interact with peers and adults in a prosocial manner), cognitive development, and adaptive functioning domains (Klin, Jones, Schultz, & Volkmar, 2003; Klin & Volkmar, 2003; Stefanatos & Baron, 2011).

Pragmatic Language Development in ASD

Independent of structural language abilities, research has shown children with ASD demonstrate a significant impairment in pragmatic language skills (Volden et al., 2009). Research has consistently demonstrated that some children with ASD present with delays in their pragmatic language abilities but intact expressive and receptive language skills (Grzadzinski, Huerta, & Lord, 2013; Landa, 2000; Young et al., 2005), while other children with ASD present with impairments in receptive, expressive, and pragmatic language skills (Tager-Flusberg, 2000). While the developmental trajectory of pragmatic language in ASD is still unclear (Whyte & Nelson, 2015), those with ASD typically perform worse than their typically developing peers on both observational and laboratory measures of pragmatic skills throughout childhood and adolescence (Lam & Yeung, 2012; Reichow et al., 2008), indicating a persistent impairment in this fundamental skill.

Additionally, recent research has indicated that children with ASD develop pragmatic language skills at a slower rate than children with TD (Whyte & Nelson, 2015). These researchers found that this difference in language development was specific to pragmatics, as the rate of development of other areas of language, such as vocabulary or syntax, did not differ between the ASD and TD groups, indicating a unique impairment in pragmatics.

Children with ASD demonstrate deficits in both verbal and non-verbal pragmatic skills. Verbal pragmatic difficulties observed in this population include providing insufficient or excessive information, making an irrelevant comment, abrupt topic changes, and limited reciprocal conversation (Philofsky, Fidler, & Hepburn, 2007; Volden et al., 2009). Nonverbal pragmatic deficits often seen in children with ASD include poor eye contact, limited facial expression, and a lack of utilizing gestures (Prutting & Kirchner, 1987).

Deficits in pragmatic language skills often serve as a discriminatory variable between children with ASD and children with other developmental delays (Rapin, 2006; Weismer, Lord, & Esler, 2010). According to Rapin (2006), when comparing children with ASD to children with developmental language disorders, children with ASD present with striking delays in their pragmatic skills. Specifically, the author noted that, even when compared to children with language disorders, children with ASD displayed significant impairments in both verbal and non-verbal pragmatic skills, a lack of interest in communicating with others, and often spoke for the sake of speaking rather than to communicate within a larger social context. These pragmatic deficits frequently observed in children with ASD have been found to lead to a variety of negative outcomes, such as lower adaptive behavior.

Pragmatic language predicts adaptive communication in ASD. Delays in early language acquisition have been found to predict adaptive communication and socialization (Lotter, 1974; Szatmari, Bryson, Boyle, Streiner, & Duku, 2003; Venter, Lord, & Schopler, 1992). Even when controlling for structural language, research has shown that pragmatic language also predicts adaptive behavior in children with ASD (Landa, 2000; Tager-Flusberg et al., 2005; Young et al., 2005). Specifically, Volden and colleagues (2009) studied the roles of structural and pragmatic language in the adaptive communication skills of children with ASD. The researchers examined 37 school-age children with ASD. They found that structural and pragmatic language accounted for 30% of the variance in adaptive communication for this sample. Importantly, Volden et al. remarked that pragmatic language acts as the intersection of language and social skills, thereby making it an essential factor in determining a child's ability to effectively function in his environment. In other words, these authors noted that the mastery of pragmatic language is necessary for the development of age-appropriate adaptive behavior. The following sections examine a second social factor, theory of mind, and its association to adaptive communication and pragmatic language.

Theory of Mind

Overview

Theory of mind (ToM) refers to the ability to understand that others' perspectives, intentions, emotions, attributions, and beliefs may differ from our own (Premack & Woodroof, 1978). Mastery of ToM indicates that an individual has the ability to take on

the perspectives of others to determine the other person's beliefs, thoughts, and emotions (Tager-Flusberg, 2007). This skill often involves aspects of social and emotion perception, such as affect recognition, and is often associated with language (Tager-Flusberg, 2007). ToM is widely recognized as a higher-level cognitive process that underlies the ability to function in complex social situations, including social relationships (Flavell & Miller, 1998; Frith, Happe, & Siddons, 1994; Perner, 1991).

Assessment of ToM

As the construct of ToM encompasses a wide range of social perception skills, researchers utilize a variety of measures for assessing ToM. ToM tasks such as diverse beliefs and false beliefs continue to be the primary measures of ToM abilities in young children (Wellman & Liu, 2004). Two common false belief tasks are described in the following section.

Assessment of false beliefs. ToM was originally measured through a series of false belief tasks. False belief tasks assess an individual's ability to recognize that people's beliefs may be different from her own and these beliefs may be false. Two of the most frequently used false belief tasks are the *unexpected locations task* (Wimmer & Perner, 1983) and the *unexpected contents task* (Gopnik & Astington, 1988; Hogrefe, Wimmer, & Perner, 1986). The most utilized unexpected locations task in research is the Sally-Anne Task. In this task, the child observes a doll (e.g., "Sally") place an object in Location A before leaving the scene. Then a second doll (e.g., "Anne") moves the object to Location B. The child is then asked to predict where the first character will look for the object when it returns. Children below three years of age typically fail this task by stating that Sally would look for the object in the location the object was moved, thus demonstrating an inability to recognize the false beliefs of others (Wellman & Liu, 2004; Wimmer & Perner, 1983). In contrast, typical four-year-old children would indicate that Sally would look for the object where she left it, rather than in its new location, thus demonstrating the presence of ToM.

In the *unexpected contents task* (commonly referred to as the "Smarties Task"; Gopnik & Astington, 1988; Hogrefe et al., 1986), children are presented with a container (e.g., a Smarties candy tube) and are asked what they think is inside. The children are then shown the actual contents, which differ from the box's pictured label. For example, the Smarties candy tube may contain pencils as opposed to Smarties. Next, children are asked what they had originally believed was in the box in order to assess their ability to recognize their own prior false belief. By recognizing their own false belief, children demonstrate the ability to make representational changes (i.e., the ability to change their representations or beliefs about the world based on new information and then recognize the difference between their past and present representations of the world, a skill that typically emerges after the age of three years; Gopnik & Astington, 1988; Muller, Miller, Michalczyk, & Karapinka, 2007). The contents are returned to the box and the box is closed. Then children are asked what another person, who has not seen inside the box, would believe is inside. This question assesses children's ability to understand that another person would form a false belief regarding the contents of the misleading box (i.e., other false belief; Muller et al., 2007). There is a dramatic increase in children's ability to recognize others' false beliefs between the ages of three and four years, with three-year-olds having a 21% success rate and four-year-olds having a 71% success rate on other false belief tasks (Hogrefe et al., 1986).

Recently, researchers have begun to assess ToM abilities beyond the standard false belief skillset. Other areas, such as diverse beliefs, have been explored as additional components of the larger ToM construct (Steele, Joseph, & Tager-Flusberg, 2003; Wellman & Liu, 2004). This ToM component will be reviewed in the following section.

Assessing diverse beliefs. Diverse beliefs are indicative of early ToM skills because they represent mental states that may differ from reality as well as among individuals (Wellman & Liu, 2004). Diverse beliefs tasks assess the ability to differentiate between one's own and another's beliefs. Peterson, Wellman, and Liu (2005) provide an example of this task. Children are shown a picture of a garage and bushes and told that a doll is missing her cat. They are told that the cat could be located in the bushes or in the garage. They are asked where they think the missing cat is located, and then told that the doll thinks the cat is in the opposite location. Finally, the children are then asked where the other person will look for the cat. Children pass the task when they respond correctly that the doll will look in the opposite location from them.

In a seminal meta-analysis of ToM, Wellman and Liu (2004) examined the sequence of and variations in ToM development in preschool-aged children. The researchers found a developmental progression in the acquisition of early ToM skills, which supports previous findings on the development of ToM (Peterson et al., 2005; Wellman, Fang, & Peterson, 2011). Using these findings, Wellman and Liu (2004) developed a ToM scale that measures the progressive development of children's ToM skills through diverse belief and false belief tasks, which increase in level of difficulty. These tasks are described in Table 1. This developmental progression will be examined in the following section.

ADAPTIVE COMMUNICATION IN ASD

Name of task	Objective	Percentage (%) of	Original authors*
		TD 3- to 7-year-	
		olds who pass the	
		task (from	
		Peterson, Wellman,	
		& Slaughter, 2012)	
Diverse Beliefs	Children are told that a		Wellman and Bartsch
	character has a belief that		(1989)
	differs from their own and		
	are asked to predict the		Wellman, Hollander,
	character's behavior based		& Schult (1996)
	on the character's diverse	87	
	belief.		
	In order to pass this task,		
	children must recognize		
	that beliefs can diverge		
	between people.		
False Belief	Children, who know the		Perner, Leekam, and
	truth, must (a) recognize		W1mmer (1987)
	that a person can have a		
	false belief and (b) predict		Wellman and Bartsch
	that character's behavior		(1989)
	based on the character's	56	
	false belief.		(1991)
	In order to pass this task,		
	children must recognize		
	that people's beliefs may		
	be different from their own		
	and these beliefs may also		
	be false.		

Table 1Descriptions of Theory of Mind Scaling Tasks

Note. These tasks were included in Wellman & Liu's (2004) ToM scale and are listed based on the developmental trajectory of earliest skill to latest. For a detailed description of each task's procedure and a comparison of tasks, see Wellman & Liu.

* Wellman & Liu (2004) adapted these authors' original tasks when creating their ToM scale.

Development of ToM in Young Childhood

In typical development, research findings support a universal developmental

trajectory of ToM between three and five years of age (Wellman & Watson, 2001). At

three years old, children are able to master diverse belief and true belief tasks, but still

typically fail false belief tasks (Wellman et al., 2001). This explicit understanding of

ToM typically develops by four years of age, which allows children to attribute false

belief to others (Gopnik & Astington, 1988; Hogrefe et al., 1986; Wimmer & Perner, 1983). By five years of age, children are usually able to master more advanced ToM skills, such as hidden emotion, which refers to children's ability to correctly identify another person's emotion, even when it differs from their own (Peterson et al., 2005; Steele et al., 2003; Wellman et al., 2011).

Several factors may influence the typical ToM trajectory, including experiences based on one's culture, family experiences, and individual child characteristics such as language abilities. For example, children from collectivistic cultures develop ToM somewhat later when compared to individualist cultures due to the emphasis on interdependency (Lillard, 1998). Finally, language difficulties, particularly deficits in expressive language skills, may also influence ToM development (Milligan et al., 2007).

In summary, ToM is the ability to infer the mental states of others in order to predict one's behavior. False belief tasks are a reliable way to measure ToM, and children with TD typically pass these tasks at four years (Wellman et al., 2001). True belief and diverse belief tasks also measure ToM and are typically passed earlier than false belief tasks (Peterson et al., 2005). ToM develops during the preschool years and most children show a similar trajectory of ToM development, although an exception is children with ASD, who show deficits in basic ToM understanding.

ToM Skills in ASD

Research has consistently shown that children with ASD show marked impairment in ToM abilities. As children with ASD often exhibit difficulties understanding another person's experience or mental states (Baron-Cohen, 1995), they exhibit significant difficulties understanding how other's feelings, thoughts, and desires differ from their own (Attwood, 2005). As most social situations require mastery of these ToM-related skills, ToM remains one of the most burdensome deficits observed in children with ASD. Many individual studies and meta-analyses have demonstrated that children with ASD often have lower scores on false belief tasks than children with TD (Baron-Cohen et al., 1985; Perner, Frith, Leslie, & Leekam, 1989; Slaughter et al., 2007; Yirmiya, Erel, Shaked, & Solomonica-Levi, 1998).

Research comparing children with ASD to children with other disabilities (e.g., Down Syndrome, language delays, and deaf and hard of hearing) have found that other at-risk children do not demonstrate significant ToM deficits, suggesting that delays in these skills may be specific to children with ASD (Perner et al., 1989; Peterson et al., 2005). For instance, in the original study comparing ToM abilities in children with ASD, Down syndrome, and TD, Baron-Cohen and colleagues (1985) found that 85% of the TD group and 86% of the Down syndrome group passed the unexpected false location false belief task (i.e., the Sally-Anne task). In contrast, only 20% of the ASD group passed this task, which suggests an inability to appreciate the discrepancy between their own belief and the doll's belief. Additionally, this study suggested these ToM deficits are independent of cognitive functioning, as even children with ASD who demonstrated average verbal and cognitive abilities exhibited false belief impairments. These findings suggest that significant impairments in ToM development are specific to ASD and cannot be better accounted for by cognitive delays.

These significant impairments in ToM skills may help explain the profound social skills deficits inherent in children with ASD (Happé & Firth, 1995). Specifically, the mastery of basic ToM skills supports children's ability to read social cues as well as

understand and apply social rules (Attwood, 2005). As one of the core features of the diagnosis, children with ASD demonstrate considerable challenges reading and responding to social cues across all settings. For example, young children with ASD may have difficulty understanding when not to tell the truth in order to protect other's feelings (Attwood, 2005). These pervasive difficulties appear to stem from an inherent inability to understand and predict the mental states of others.

Development of ToM in ASD. As opposed to children with TD, children with ASD do not exhibit a universal developmental trajectory of ToM mastery (Baron-Cohen et al., 1985; de Villiers & de Villiers, 2000). Research suggests that children with ASD fail to show the early precursors of ToM, such as joint attention and symbolic play (Baron-Cohen, 1995; Baron-Cohen et al., 1985; Schopler & Mesibov, 1995). Young children's ability to engage in pretend play has been shown to be foundational for future social and language development, including ToM.

Children with ASD have been shown to exhibit deficits in basic ToM skills even at four years or older (Perner et al., 1989; Williams & Happe, 2009). Some research suggests that individuals with ASD who have greater language and cognitive abilities are able to develop some ToM skills; however, this typically occurs at a later chronological age than individuals with TD (Baron-Cohen et al., 1985; Peterson et al., 2007). The relation between ToM and language will be examined in the following section.

Structural and pragmatic language delays predict ToM deficits in ASD. Prior research on ToM in children with ASD has primarily focused on the role of language in this association. A meta-analysis that analyzed the results of 104 studies with a total sample size of almost 9,000 children found that, even when controlling for age, overall

language ability predicts 10% of the variance in ToM abilities (Milligan et al., 2007). While this relation has been shown to be significant for children with TD as well, it is important to note the minimal language abilities required to pass ToM batteries have been shown to be much higher for children with ASD than children with TD (Happe, 1995). For example, Happe (1995) examined this relation and found that 80% of children with TD who had a verbal mental age of 4.5 passed the ToM battery, whereas only 50% of children with ASD with a verbal mental age of 9.2 passed the ToM battery. These results indicate that, while language abilities are related to ToM mastery for both children with ASD and TD, language appears to be a more significant variable in predicting ToM scores for children with ASD.

Over the past few years, much of the research on this relation focused on whether language ability affects ToM, ToM affects language ability, or if there was a bidirectional relationship among the constructs. Regarding this area of research, longitudinal studies have shown a unidirectional association such that early language abilities predict later ToM performance, indicating that language has a direct effect on developing an understanding of ToM (Jacques & Zelazo, 2007). Recently, researchers have begun to dissect the general language construct to determine if certain areas of language are more likely to predict ToM skills, such as pragmatic skills.

One of the first studies that examined the relation between language and ToM found that children with ASD who had superior pragmatic abilities were more likely to pass the ToM battery (Eisenmajer & Prior, 1991). More recent research discovered similar results; Whyte and Nelson (2015) found that children with ASD who demonstrated greater pragmatic language skills also exhibited greater ToM abilities. However, the relation between pragmatics and ToM is still largely under-examined in the current literature.

ToM skills predict adaptive communication in ASD. Limited research has demonstrated a link between ToM and adaptive communication in children with ASD. Hale and Tager-Flusberg (2005) examined this relation. They found that children with ASD significantly improved their adaptive communication skills across childhood and that ToM contributed unique variance in their adaptive communication abilities, above and beyond the contribution made by their language skills. Kimbi (2014) also noted that deficits in ToM intensified children's difficulties in taking on their peers' perspectives, which therefore interferes in their ability to engage in meaningful conversations. Furthermore, unpublished research has shown a significant link between ToM and overall adaptive behavior in young children with ASD. However, to my knowledge, there has been no research comparing the link between ToM and adaptive communication in children with ASD to children with TD.

In summary, children with ASD often display significant deficits in their ToM skills. Other social factors, such as pragmatic language, have been found to directly influence ToM abilities in children with ASD (Eisenmajer & Prior, 1991; Whyte & Nelson, 2015). These ToM deficits frequently observed in children with ASD have been found to be associated with poorer functional outcomes, such as adaptive communication skills (Hale & Tager-Flusberg, 2005). However, to my knowledge, the relation between these four variables has yet to be examined in children with and without ASD.
Current Study

The Relation between Adaptive Communication, Language, and ToM in Children with ASD

Functional outcomes vary significantly for children with ASD. For example, some individuals with ASD require support throughout their lives while others are able to eventually live independently. Despite this wide range of functional outcomes, individuals with ASD have been shown to consistently demonstrate lower functional skills than their typically developing peers (de Bildt et al., 2005; Klin et al., 2007; Liss et al., 2001; McDonald et al., 2016). These poorer functional outcomes have also been shown to be related to later social skills deficits and ASD symptoms severity (Billstedt et al., 2007; Gillberg & Steffenburg, 1987; Gillespie-Lynch et al., 2012; Kobayashi et al., 1992). As such, it is important to study factors that predict these characteristically low adaptive behavior outcomes in order to develop targeted interventions for these individuals.

Several factors such as early language abilities and ToM have been shown to be important predictors of later adaptive functioning (Bennett et al., 2013). Early language acquisition is particularly important for children with ASD, as research has shown that children with ASD rely more heavily upon language to understand social contexts than children with TD (Fisher, Happe, & Dunn, 2005). Similarly, research has shown that language and ToM are more strongly related in children with ASD than children with TD (Fisher et al, 2005; Tager-Flusbert & Joseph, 2005). This suggests that children with ASD rely more heavily upon language than children with TD in order to successfully complete social tasks in their internal (i.e., ToM) and external (i.e., communication) worlds. As such, language remains an important construct when examining functional outcomes in children with ASD.

While it is crucial to consider language as a predictor of later adaptive functioning, it alone does not account for all the variance in the functional outcomes of children with ASD. Researchers have proposed that children with ASD who have greater language abilities will likely be exposed to more complex social situations, where they will have greater opportunities to develop fundamental ToM skills, such as reading others' facial expressions, which will enhance their development of adaptive communication skills (Bennett et al., 2013). As such, ToM may serve an important role when examining the adaptive communication skills in children with ASD.

Only one study to date has specifically examined the roles of language and ToM in the adaptive communication deficits of children with ASD. In a longitudinal study, Bennett et al. (2013) showed that early structural language delays (measured at ages 6 to 8) predicted lower ToM abilities in late childhood (measured at ages 10 to 12), which predicted greater adaptive communication deficits in early adolescence (measured at ages 13 to 15) for children with ASD. The researchers noted that greater language skills during young childhood might scaffold later social development, which increases the social opportunities to develop ToM skills for children with ASD. This is consistent with the current literature that describes a unidirectional association where language skills predict ToM development (Hale & Tager-Flusberg, 2005).

Given this research, it appears that ToM may play a mediating role in the relation between early language skills and later adaptive communication skills for school-aged children with ASD. However, further research is needed to assess the role of pragmatic

37

skills in this association, as this domain of language is more impaired in children with ASD than structural language. Significant findings may help target interventions for improving adaptive communication in children with ASD (i.e., treatments specifically targeting pragmatic skills). Additionally, given the heterogeneity of adaptive outcomes among children with ASD, it is important to examine this relation in younger children with ASD in order to inform targeted early intervention for these children.

Hypotheses

In this study, I examined the roles of pragmatic language and ToM skills in the adaptive communication skills of children with ASD and TD.

Hypothesis 1. I hypothesized that children's developmental status (ASD versus TD) would predict adaptive communication skills, with children with ASD exhibiting lower adaptive communication scores. Impairment in social communication is a diagnostic feature of ASD and has been well documented by researchers (APA, 2013; Tager-Flusberg, 2001; Tager-Flusberg et al., 2001).

Hypothesis 2. I hypothesized that pragmatic language and ToM would serially mediate the relation between developmental status and adaptive communication, such that children with ASD would demonstrate lower pragmatic skills, which would predict lower ToM abilities, which would predict lower adaptive communication than their typically developing peers. The conditional indirect effects of developmental status on adaptive communication through pragmatic language and ToM was assessed. The relation between structural language and ToM in the adaptive communication skills of children with ASD has been previously examined, demonstrating a significant mediating relation among these variables (Bennett et al., 2013). However, this was the first study to my knowledge that examined the relation between pragmatics and ToM in the adaptive communication skills of children with and without ASD.



Figure 1. The proposed indirect effects of developmental status on pragmatic language through pragmatic language and theory of mind.

Hypothesis 3a. I hypothesized that pragmatic language would mediate the relation between developmental status and adaptive communication (see Figure 2). While the majority of research has focused on the role of structural language in the relation between developmental status and adaptive communication, several studies have shown that pragmatic language predicts general adaptive behavior in children with ASD, even when controlling for structural language skills (Landa, 2000; Tager-Flusberg et al., 2005; Young et al., 2005). However, no prior study to my knowledge has examined the role of pragmatic language in the adaptive communication skills of young children with ASD. Based on the previous research of pragmatic language skills and adaptive functioning in children with ASD, it was hypothesized that children with ASD would exhibit lower

pragmatic skills, which would predict lower adaptive communication skills when compared to children with TD.



Figure 2. The proposed indirect effect of developmental status on adaptive communication through pragmatic language.

Hypothesis 3b. I hypothesized that ToM would mediate the relation between developmental status and adaptive communication (see Figure 3). While the mediating role of ToM in the adaptive functioning deficits of children with ASD is supported in the current literature, to my knowledge, only one study has been conducted examining the association between ToM and adaptive communication in children with ASD. In this study, the researchers found that ToM contributed unique variance in the adaptive communication abilities of children with ASD (Hale & Tager-Flusberg, 2005). However, this study examined school-aged children with ASD and did not include a control group. As such, this was the first study to examine the relation between ToM and adaptive communication in young children with and without ASD.





Hypothesis 4a. I hypothesized that children with ASD would have significant impairments in pragmatic language when controlling for their expressive and receptive language skills. Consistent with prior research, pragmatic language was examined as an aspect of social language distinct from expressive and receptive language (Fujiki & Brinton, 2009). Research has documented impairments in pragmatic language in children with ASD over and above their verbal language ability (Tager-Flusberg, 2001, Volden et al., 2009, Young et al., 2005).

Hypothesis 4b. I hypothesized that children with ASD would have significant delays in their ToM abilities when compared to their TD peers. Research has documented significant impairments in ToM abilities in children with ASD across childhood, adolescence, and adulthood (Baron-Cohen et al., 1985; Perner, Frith, Leslie, & Leekam, 1989; Slaughter et al., 2007; Yirmiya, Erel, Shaked, & Solomonica-Levi, 1998).

Hypothesis 5. I hypothesized that children who demonstrate greater pragmatic language skills would display greater theory of mind abilities. Research has demonstrated a unidirectional relation between language abilities and ToM. Specifically, the current body of research posits that language has a direct effect on the development of ToM; however, the inverse has not been shown to be significant (Bennett et al., 2013; Jacques & Zelazo, 2007). Additionally, research has indicated that greater pragmatic skills predict greater ToM abilities in children with ASD (Eisenmajer & Prior, 1991; Whyte & Nelson, 2015). As such, the current study proposed that pragmatic skills would be positively related to ToM abilities.

Chapter II

Method

Participants

This study occurred as part of a larger project investigating self-regulation abilities in children with ASD and TD. Thirty-seven children ages 3:0 to 6:5 were included in the current study. Thirteen children comprised the ASD group, defined by a diagnosis of autism spectrum disorder, autistic disorder, Asperger's disorder, or PDD-NOS. The TD group included 24 children, a control group comprised of children who do not have any psychological diagnoses, a sibling with ASD, or demonstrate elevated ASD characteristics. One parent was also included in the current study.

Procedures

Recruitment

Children and their families were recruited for participation throughout the greater Seattle area through local autism organizations, schools, mental health centers, hospitals, and by placing advertisements in listservs. All recruitment material provided general information and enrollment criteria for the study as well as contact information for the enrollment coordinator who facilitated scheduling the family for the enrollment visit.

Enrollment Visit

The enrollment visit took place in the family's home, a local library, or the laboratory of the Study of Autism and Self-Regulation at Seattle Pacific University. The duration of the enrollment visit lasted approximately 60 to 90 minutes and was conducted by a graduate research assistant with the assistance of an undergraduate research assistant. Prior to the administration of the screening measures, the graduate student

obtained parental consent and child assent. Additionally, parents of children with ASD were asked to sign a medical release in order for the researchers to confirm the child's ASD diagnosis. With the help of an undergraduate research assistant, one parent completed a packet of questionnaires that included demographic information and screeners. Parents completed the Social Communication Questionnaire (SCQ; Rutter et al., 2003) to screen for ASD-related symptoms. Children with TD who scored below 15 on the SCQ were included in this study. During the enrollment visit, the child completed a series of tasks including two subtests of the Differential Abilities Scale – Version II (DAS-II; Elliot, 2007) to measure the child's receptive and expressive language abilities and assess whether they meet the verbal requirements necessary to complete the study. Children who scored above 85 on the DAS-II and who met criteria on the SCQ were eligible to enroll in the remainder of the study. Once the child's eligibly for the study was established, the researcher proceeded to schedule the university visit.

In addition to the demographic questionnaire and SCQ, one parent also completed an additional questionnaire pertinent to the current study. At the enrollment visit, one parent completed the Behavior Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004) to assess one component of the child's adaptive functioning skills. Specifically, the parent completed the Functional Communication subscale from the BASC-2, which was used in the current study to assess each child's adaptive communication abilities.

University Visit

The university visit lasted approximately 90 to 120 minutes and included a variety of tasks related to self-regulation that were video and audiotaped for subsequent coding.

For the purposes of this study, the ToM battery and CASL was administered during this visit. These tasks are explained in more detail below. As compensation for their participation, parents received \$50 and a \$5 coffee card and children received a small gift worth about \$5. Children also received stickers or other reinforcers throughout the assessment to promote task motivation.

Measures

Adaptive communication. Children's adaptive communication skills were assessed using the Behavior Assessment System for Children, Second Edition (BASC-2; Reynold & Kamphaus, 2004) Parent Rating Scale. Both the Preschool (ages 2-5) and Child (ages 6-11) were used in the current study based on the child's age. For the current study, the Functional Communication subscale was used to assess children's ability to functionally communicate in their environments. The Functional Communication scale consisted of 11 items in the Preschool form and 12 items in the Child form. All items were scored using a 4-point Likert scale on frequency of the behavior ranging from "never occurs" to "almost always occurs." The Functional Communication subscale has a norm-referenced mean of 50 (SD = 10). On this scale, higher scores indicate more positive adaptive communication behaviors. Scores from 41-59 are considered average, while scores between 31-40 are considered at-risk, and scores below 40 are considered clinically significant.

According to Reynolds and Kamphaus, the test-retest reliability coefficients for the Functional Communication subscale were reported to be .88 for the preschool age form and .84 for the child age form. Interrater reliability coefficients for clinical samples were reported to be .90 for the preschool age form and .82 for the child age form (Reynolds & Kamphaus, 2004). These results indicate the BASC-2 Functional Communication subscale has adequate psychometric properties.

Developmental status. Parents confirmed their child's ASD diagnosis by providing the original diagnostic report or providing written consent for the diagnostic clinic to release the report.

Pragmatic language. Children's pragmatic language was measured using the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999). The CASL is an oral assessment of children's linguistic abilities between the ages of 3:0 and 21:0 years. This study utilized the Pragmatic Judgment subtest of the CASL, which assessed children's pragmatic language abilities. Specifically, the Pragmatic Judgment subtest measures the ability to use and interpret language appropriately in social and communicative interactions (e.g., "The telephone is ringing and you pick it up. What do you say?"). The Pragmatic Judgment subtest contains 4 example items, 60 test items, and yields a raw score based on correct responses. The raw score was converted into a standard score (M = 100; SD = 15), which was used for subsequent analyses.

The CASL was standardized using 1,700 individuals with and without disabilities. Previous research has supported the use of this subtest for measuring pragmatic language ability in young children (Bates, 1976; Prinz, 1982). Split-half reliabilities range from .79 to .90 for the ages of the participants in this current study.

Theory of mind. Children also completed a ToM battery consisting of three tasks: one diverse beliefs task and two false belief tasks. The diverse belief task assessed children's ability to recognize that others may have different beliefs than their own. The false belief tasks measured children's ability to understand that others' beliefs may be

46

incorrect. These ToM abilities typically occur in a developmental progression, where children first develop an understanding of diverse beliefs and then false beliefs (Wellman & Liu, 2004). According to Wellman and Liu (2004), a scaled set of ToM tasks is useful for examining ToM development in young children, as it provides a broader measure of the ToM construct and better examines variations in scores. Following the recommendations of these researchers, two false belief tasks were selected in an effort to compare children's false belief performance across different types of formats, one in which children are asked to choose between two options and one in which children are asked to make predictions based on the contents of a container. However, performance on these two tasks is expected to be comparable, because the conceptual content of these tasks is similar. The three ToM tasks utilized in this study are described below. All of the children's responses were recorded on the ToM Record Form.

Children completed the *Diverse Beliefs Task* (Peterson et al., 2005), which assessed their ability to recognize that other people may possess different beliefs than their own. In this task, children were told that a doll was looking for her missing cat. Children were shown a picture of a house and bushes and told that the cat could be hiding in either of these places. Then the children were asked where they would look for the missing cat ("Own Belief" question). Next, the assessor stated that the doll thought the cat was in the location opposite of the children's response. For example, if a child stated that she would look in the house for the cat, the assessor stated that the doll thinks that the cat is in the bushes. The assessor then asked the children where the doll would look for her missing cat ("Diverse Belief Target" question). To correctly pass this task, children had to answer the Diverse Belief Target question opposite from their answer to the Own Belief question. If they passed this task, they received a score of "1" for the Diverse Beliefs Task. They received a score of 0 for giving any other response.

The Unexpected Contents Task (Hogrefe et al., 1986) assessed children's ability to recognize and predict others' false beliefs. First, children were shown an M&Ms container and asked what they thought was inside of it (the "Self False Belief" question). The assessor then showed the children that the container actually held crayons. Next, the assessor asked the children what was actually in the container (the "Reality Test" question) and what they originally believed to be inside it (the "Memory Control question). The assessor then asked the children what they thought the doll, who did not see the contexts of the container, would think was inside of it (the "Other False Belief Target" question). Finally, children were asked how the doll felt when she saw what was really inside of the tube (the "Emotional Attribution" question). In order to correctly pass this task, children had to correctly answer both the Memory Control question and the Other False Belief Target question. If both of these items were answered correctly, children received a score of "1" for the Unexpected Contents Task. All other response sets were scored as a 0.

The *Unexpected Locations Task* (Wimmer & Perner, 1983) measured children's ability to recognize others' false beliefs. First, the assessor showed children two dolls: Sally and Anne. Then the assessor asked the children to identify who was Sally and who was Anne (the "Identification" questions). Next, the children observed Sally place her favorite teddy bear in the basket and then leave the scene. Then the children observed Anne move the bear to a box while Sally was gone. Children were then asked to predict where Sally would look for the bear when she returned (the "Other False Belief Target" question). Next, children were asked where the bear was actually located (the "Reality" question) and where the bear was located in the beginning (the "Memory Control" question). Children were then be asked to identify how Sally would feel about Anne moving her favorite teddy bear (the "Emotional Attribution" question). In order to correctly pass this task, children had to correctly answer both the Memory Control question and the Other False Belief Target question. If both of these items are answered correctly, children received a score of "1" for the Unexpected Locations Task. All other response sets were scored as a 0.

The graduate examiner documented all of the children's scores on the ToM Record Form. The three ToM task scores were totaled to create a composite ToM score, ranging from 0-3.

The psychometric properties of ToM tasks have been examined. False belief tasks have good internal consistency across equivalent tasks, $\alpha = .84$ (Wellman, Cross, & Watson, 2001). Additionally, Mayes, Klin, Terycak, Cicchetti, and Cohen (1996) found an adequate reliability coefficient of .78 for children's performance across three false belief tasks. Furthermore, diverse and false belief tasks are considered a valid assessment of ToM in children with ASD and reliably measure developmental progress based on Guttman and Rasch scaling analyses (Peterson et al., 2005). Additionally, Wellman and colleagues (2001) found that the specific types of materials (e.g., doll, puppet, or real person) or format (e.g., pictured storybook or a videotaped person) did not affect children's performance. The use of diverse belief and false belief tasks within a wide range of cultures across the world has demonstrated the utility of these measures crossculturally (Wellman et al., 2001). The full ToM battery was completed within approximately two to three minutes.

Demographic variables. Parents completed a demographic questionnaire assessing child and family characteristics including child age, gender, and pre- and perinatal experiences as part of the larger self-regulation study. Correlational analyses were conducted to examine potential covariates. For the purposes of the current study, previous research suggests gender and age may be related to the association between ASD and ToM abilities (Bennett et al., 2013). Therefore, this information was collected from the demographic questionnaire.

ASD symptomatology screener. To assess the presence of ASD-related symptoms in the TD group, parents completed the Social Communication Questionnaire -Current Form (SCQ; Rutter et al., 2003). This screener assessed ASD symptomatology across three core domains: communication, socialization, and restricted interests or repetitive behaviors. The SCQ consists of 40 items that are rated on a scale of 0 to 1, with 0 indicating a response of "no" and 1 indicating a response of "yes." The total scores range from 0 to 40, with a cutoff score of 15 or greater indicative of ASD symptomatology. This screener took approximately 10 minutes to complete.

When using a cutoff score of 15, the SCQ has a sensitivity of 85% and specificity 75% (Berument, Rutter, Lord, Pickles, & Bailey, 1999). The SCQ is considered a reliable measure with an internal consistency α ranging from .84 to .93 (Rutter et al., 2003). Additionally, the SCQ has high discriminate validity (.088), indicating that it serves as a strong measure to screen for ASD (Berument et al., 1999).

Verbal ability. Children's verbal ability was assessed using the Differential Abilities Scale – Second Edition (DAS-II; Elliott, 2007). The DAS-II is an assessment of

children's cognitive abilities between the ages of 2:6 and 17:11 years. This study utilized the Verbal Reasoning Cluster of the DAS-II Early Years Cognitive Battery, which assessed children's verbal knowledge and vocabulary skills. This cluster included two subtests: The Verbal Comprehension subtest, an assessment of receptive language abilities, and the Naming Vocabulary subtest, an assessment of expressive language abilities. The sum of the two subtest scores was converted into a standard score with a mean of 100 and a standard deviation of 10. Inclusion criteria for the larger self-regulation study required a score of above 85 on this assessment. For the current study, the DAS-II was used for calculating verbal ability, which previous research has shown to be related to ToM abilities (Bennett et al., 2013).

The DAS-II was standardized using 3,480 individuals. The verbal ability internal consistency reliability coefficients of the early years battery for the lower age range is .93. The DAS-II was also tested against other measures of intelligence and achievement and received an average mean correlation of .80 (Elliot, 2007). These results indicate the DAS-II has adequate psychometric properties.

Chapter III

Results

Data Entry and Preparation

Data were entered in Statistical Package for the Social Sciences (SPSS) Version 25.0 and analyzed using SPSS and the PROCESS macro add-on Version 3.3 (Hayes, 2008). The following demographic variables were entered: (a) child ethnicity was entered as a dichotomous variable (White/Caucasian = 1; minority/mixed = 2), (b) combined parent income was entered as a continuous variable, and (c) parent education was entered as a dichotomous variable (some college/bachelor's degree = 1; master's or professional degree = 2). Based on previous research, possible covariates were entered as potential control variables. The following control variables were entered: (a) gender was entered as a dichotomous variable (male = 0, female = 1), (b) child chronological age was entered as a continuous variable, and (c) child verbal ability was entered as a continuous variable. The following variables of interest in this study were entered: (a) developmental status was entered as a dichotomous variable (TD = 0; ASD = 1), (b) adaptive communication was entered as a continuous variable with T-scores ranging from 25 to 66, (c) pragmatic language was entered as a continuous variable with standard scores ranging from 74 to 131 and (d) ToM was entered as a continuous variable with scores ranging from 0 to 3. Gender and age were significantly correlated with study variables and were controlled for in analyses (see Table 3). Although verbal ability was not significantly correlated with study variables, it was still controlled for in analyses to measure pragmatic language skills above and beyond structural language skills.

Power Analyses

An a priori power analysis was conducted using a statistical calculating software entitled G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) to determine an adequate sample size for the current study. The power analysis was conducted using a multiple regression design. The following variables were controlled for in the analysis: gender, chronological age, and verbal ability. All six predictor variables (developmental status, ToM, pragmatic language, gender, chronological age, and verbal ability) were entered as predictors in the subsequent power analysis. A conventional, large Cohen's f^2 effect size was set at .20. The alpha level was set at .05 and the power level was set at .80. Based on these criteria, a minimum of 48 participants was necessary in order for the analyses to be adequately powered.

After the hypotheses were tested, a post hoc power analysis was conducted using G*Power to determine achieved power. The power analysis was conducted using a multiple regression design with the six predictor variables of the study: (a) developmental status, (b) ToM, (c) pragmatic language, (d) gender, (e) chronological age, and (f) verbal ability. The effect size (f^2) was determined using the R^2 of the overall model ($R^2 = .6444$), $f^2 = 1.697$. The total sample size (N = 37) was also entered. The alpha level was set at .05. Based on these study parameters, the power level of the current study was determined to be very good (power level = .999). These results indicate that the study was adequately powered. However, due to the unequal status subgroup sizes (i.e., TD = 24; ASD = 13) analyses, there is an increased risk of Type II error. Therefore, in addition to significant values, I also reported confidence intervals and attended to the size and direction of the

Beta weights (β) of the indirect effects, which may be more meaningful in this context as they can add value to future replications of this study.

Missingness, Outliers, and Assumptions of Multiple Regression

Prior to statistical analyses, data were assessed for missingness, outliers, and possible violations of the assumptions of multiple regression. All participants completed the BASC-2 Functional Communication subscale, CASL Pragmatic Judgment subtest, ToM battery, DAS-II Verbal Reasoning Cluster, and demographic questionnaire variables. As a result, no missingness was detected.

Data were also examined for outliers using boxplots. Two cases were detected as outliers within the ASD group on the BASC-2 (T-scores of 25 and 60). Cook's distance (D_i) was used to determine the influence of these two cases on the model parameters. According to Field (2013), values greater than 1 may be a cause of concern that the case exerts undue influence over the model. Cook's distance for both cases were lower than 1 (BASC T-score of 25, $D_i = .21$ and BASC T-score of 60, $D_i = .36$). The outlier identified as the BASC-2 T-score of 25 was interpreted to be a true score of variability within the clinical population sampled, as the parent consistently reported low scores on all measures for this participant. Additionally, the outlier identified as the BASC-2 T-score of 60 was also interpreted to be a true score of variability within the sampled clinical population, as the parent consistently reported average to above-average scores on all measures for this participant. Thus, these cases were included in analyses. Bootstrapping was used in analyses as this method is robust to outliers (Field, 2013, Hayes, 2013).

Additionally, the data were examined for the assumptions of multiple regression. These include linearity, homoscedasticity, independence, normality, and multicollinearity. These are described below.

Linearity

The assumption of linearity requires the relation between the independent variable (IV) and the dependent variable (DV) to be linear. To assess the assumption of linearity, the data were examined graphically to impose a best fitting line in order to confirm the data does not follow a quadratic or cubic trajectory. A scatter plot of the residuals and predicted values was also assessed to examine the linearity of the relations between the variables. As the IV (i.e., status) was a categorical variable, data were analyzed for each group (i.e., TD = 0; ASD = 1). Data were visually inspected utilizing scatter plots by group between predictor variables (i.e., TOM and pragmatic language) and the outcome variable (adaptive communication). The data points were randomly and evenly dispersed around zero for both predictor variables. As a result, the assumption of linearity was met.

Homoscedasticity

The assumption of homoscedasticity refers to the variance of the residuals being constant across all values of the IV (Field, 2009). This assumption was tested by interpreting the graphical partial plots for each IV in relation to the DV by group. The assumption of homoscedasticity will be met if the data appear evenly dispersed around the line without apparent outliers. The data did not adhere to a funneling pattern and appeared evenly dispersed around the line without any apparent outliers. As a result, this assumption was met.

Independence

The assumption of independence requires that a given residual from one observation be not related to the residual of another observation. To test the serial dependence between residuals, I conducted the Durbin-Watson test (Field, 2009). Within the sample, values less than one or greater than three are indicative of residual dependence. The results of the Durbin-Watson test indicated values were independent. As a result, this assumption was not violated. (Cohen et al., 2003; Field, 2009).

Normality

The assumption of normality states that the distribution of residuals should follow a normal distribution. Field (2009) recommended that categorical predictors be examined separately. To assess this, I visually inspected the data for each group graphically with both a histogram and a probability-probability plot (P-P plot). The histogram of the residuals appeared normally distributed in a bell-shaped curve and the P-P plot showed the z-scores plotted closely along the diagonal line, indicating the data was normally distributed. As such, this assumption was met.

Multicollinearity

Multicollinearity refers to high covariance between two predictor variables (Field, 2009). Multicollinearity was assessed through correlational analyses (see Table 3) and collinearity diagnostics, specifically the variance inflation factor (VIF) and tolerance statistics. Correlational analyses revealed that the predictor values were not highly correlated with one another (r > .80). VIF values ranged from 1.26 to 1.75. Tolerance values ranged from .57 to .79. As the VIF values remained lower than 10, the tolerance values remained greater than .20, and the predictors were not highly correlated with each other, this assumption was not violated (Field, 2009).

Direct Effects and Mediational Relations

I assessed the hypothesized relations between developmental status, adaptive communication skills, pragmatic language skills, and ToM abilities through a serial mediation analysis. Data analysis was conducted using the SPSS PROCESS macro (Hayes, 2013). The overall conceptual model was examined using Model 6 of PROCESS. This model produced 95% confidence intervals for the indirect effects. The statistical diagram of Model 6 is represented below in Figure 4. This model allowed for the direct effects of the categorical predictor variable, developmental status (ASD vs. TD; X), on the continuous outcome variable, adaptive communication, (Y) to be examined. Model 6 also analyzed the indirect effects of status on adaptive communication through two mediators, pragmatic language (M_1) and ToM (M_2) . These mediators were analyzed individually as well as serially on the relation between status and adaptive communication. PROCESS provided indirect effects through output containing direct and indirect effects, which allowed for interpretation of regression coefficients and their standard errors, p-values, R^2 , and 95% confidence intervals for the indirect effects. To reduce the impact of bias and to maximize statistical power, I used the resampling technique non-parametric bootstrapping within the PROCESS macro (Preacher et al., 2007). Bootstrap resampling was set to 5000. The null hypothesis of no indirect effects would be rejected if the confidence intervals (CI) do not contain zero.

First, I examined the direct effect between status (ASD = 1 vs. TD = 0) and adaptive communication (*Hypothesis 1*). Next, I examined the direct effects between status and pragmatic language (*Hypothesis 4a*) and status and ToM (*Hypothesis 4b*). Then I examined the direct effect between pragmatic language and ToM (*Hypothesis 5*).

57

The indirect effects were examined next. Specifically, I examined the indirect effect of status on adaptive communication through pragmatic language (*Hypothesis 3a*). Similarly, I examined the indirect effect of developmental status on adaptive communication through ToM (*Hypothesis 3b*). Finally, I examined the indirect effects of developmental status on adaptive communication through pragmatic language and ToM in a serial fashion.



Figure 4. Statistical diagram of the indirect effects of developmental status on adaptive communication through pragmatic language and theory of mind.

Statistical Analyses

Descriptive Analyses

Descriptive statistics including means, standard deviations, *t*-tests and effect sizes are included for the study variables (see Table 2). To maximize power for the independent-samples *t*-tests, the bootstrap resampling method was used to obtain bias-corrected and accelerated (BCa) confidence intervals at the 95% level. Field (2009)

describes BCa as a slightly more accurate method of bootstrapping. Bootstrap resampling was set at 5000. Children with ASD exhibited significantly lower pragmatic language and adaptive communication scores than children with TD. Cohen's *d* was used to evaluate the effect sizes for these analyses. These group differences displayed very large effect sizes (i.e., Cohen's d > 1). There were no significant group differences for ToM or verbal ability.

Table 2

Descriptive Statistics for Study Variables: Means, Standard Deviations, Range, t-tests, and Effect Sizes by Group, N = 37

			St	atus						
	TD (<i>n</i> = 24)			ASD (<i>n</i> = 13)						
Variable	Mean	SD	Range	Mean	SD	Range	t	Lower	Upper	Cohen's d
CASL	114.71	11.65	86, 130	96.23	18.74	74, 131	3.71**	8.36	28.60	1.18
ToM	1.63	.88	0, 3	1.54	.97	0, 3	.28	55	.72	.10
BASC	53.00	6.11	42, 66	40.08	8.48	25, 60	5.35**	8.02	17.83	1.75
DAS	113.67	14.79	86, 149	113.92	16.32	91, 144	05	-10.97	10.46	.02

Note. BCa = bias-corrected and accelerated confidence intervals; CASL = Comprehensive Assessment of Spoken Language Pragmatic Judgment standard score; ToM = Theory of mind total score; BASC = Behavior Assessment System for Children, Second Edition Functional Communication T-score; DAS = Differential Ability Scales, Second Edition Verbal Ability Cluster standard score. **p $\leq .001$

Correlational Analyses

Preliminary bivariate correlational analyses were conducted to isolate potential

covariates relating to the outcome variable (i.e., parent-reported adaptive communication

skills). The demographic variables tested were child gender and chronological age.

Consistent with the literature (Young et al., 2005), these variables were significantly

correlated with the outcome variable. As such, these variables were controlled for in

subsequent analyses. However, verbal ability was not found to be significantly correlated with study variables, and as a result, was not controlled for in analyses. Pearson's bivariate correlations were used to examine the relations of the study variables. Please refer to Table 3 for the correlation matrix.

Table 3

	Variable	1	2	3	4	5	6	7	8	9
1.	Verbal Ability									
2.	Age in Months	01								
3.	Gender	12	16							
4.	Annual Salary	19	.06	.01						
5.	Parent Education	.12	08	.09	.34*					
6.	Ethnicity	04	.06	.20	01	20				
7.	Adaptive Comm	.11	47**	.45**	09	.23	.07			
8.	Status	.01	.23	26	01	20	15	67**		
9.	Pragmatic	.20	23	.06	21	.08	03	.46**	53**	
10.	ToM	.29	.16	04	32	08	10	.01	05	.41*

Pearson's Bivariate Correlations among Study Variables, N = 37

Note. Adaptive Comm = Behavior Assessment System for Children, Second Edition Functional Communication T-score; Status = TD vs. ASD; Pragmatic = Comprehensive Assessment of Spoken Language Pragmatic Judgment standard score; ToM = Theory of Mind total score. *p<.05

**p<.01

p<.01

Tests of Hypotheses

Hypothesis 1. Hypothesis 1 tested the direct effect between status (ASD versus

TD) and adaptive communication skills, such that children with ASD would exhibit

lower adaptive communication scores than children with TD. Results showed a

significant relation between status and adaptive communication, $R^2 = .64$, F(1, 35) = 9.06,

p < .001 with a large effect size, $f^2 = 1.78$. The unstandardized slope coefficient was -9.12

 $(CI_{95} = -14.51, -3.73)$. Results supported the hypothesis, indicating that, on average,

children with ASD demonstrated an adaptive communication score that was 9.12 points lower than the adaptive communication scores of children with TD. Results indicated that the mean adaptive communication scores of children with ASD fell between 3.73 and 14.51 points lower than the mean adaptive communication scores of children with TD. These results also suggest that status explains 64% of the variance in adaptive communication skills.

Hypothesis 2. Hypothesis 2 tested the indirect effect of pragmatic language and ToM on the relation between developmental status and adaptive communication while controlling for verbal ability, age, and gender, such that children with ASD would demonstrate lower pragmatic skills, which would predict lower ToM abilities, which would predict lower adaptive communication than their typically developing peers (see Figure 1). A model of serial multiple mediation was analyzed examining the degree to which pragmatic language and ToM mediated the relation of status on adaptive communication. According to Hayes (2013), this model is recommended over simple mediation models as it allows for all mediators to be examined simultaneously. Using the PROCESS macro, coefficients for specific indirect, total indirect, direct, and total were computed. Path coefficients refer to regression weights, or slopes, of the expected changes in the dependent variable given a unit change in the independent variables.

Results are presented in Table 4 and depicted in Figure 5. Results of the indirect effect of status on adaptive communication through pragmatic language and ToM were examined by evaluating the 95% confidence intervals for the unstandardized regression (*B*) and standardized Beta (β) coefficient values of the indirect effect. The confidence intervals contained zero, *B* = -1.101, CI₉₅ [-5.159, 1.955]; β = -.057, CI₉₅ [-.261, .096]. As

these ranges contain zero, these results are not statistically significant. As such,

Hypothesis 2 was not supported.



Figure 5. Serial mediation of pragmatic language and theory of mind on the relation between status and adaptive communication with unstandardized path coefficient values, significant *p*-values, and confidence intervals at the 95% level.

Table 4

Direct, Indirect, and Total Effects of Status on Adaptive Communication through Pragmatic Language (M_1) and Theory of Mind (M_2) , N = 37

Effect			B (unstandardized path coefficient and produ					ient and product)	SE	95%	95% CI		
												Lower	Upper
Status	\rightarrow	CASL	\rightarrow		BASC		-18.246		X .065	= -1.186	1.693	-5.114	1.686
Status	\rightarrow	ToM	\rightarrow		BASC		.340		X483	=164	.741	-2.044	1.040
Status	\rightarrow	CASL	\rightarrow	ToM	\rightarrow BASC	2	-18.246	X .028	X483	= .247	.825	-1.104	2.296
Total effect of X on Y (c)									-10.223	2.168	-14.639	-5.807	
Direct effect of X on Y (c')									-9.122	2.640	-14.513	-3.731	
Total ind	irect ef	fect								-1.101	1.731	-5.159	1.955

Note. Status = TD vs. ASD; CASL = Comprehensive Assessment of Spoken Language Pragmatic Judgment standard score; BASC = Behavior Assessment System for Children, Second Edition Functional Communication T-score; ToM = Theory of Mind total score.

Hypothesis 3a. Hypothesis 3a tested the indirect effect of pragmatic language on the relation between developmental status and adaptive communication, such that children with ASD would exhibit lower pragmatic skills, which would predict lower adaptive communication skills when compared to children with TD. Results of the indirect effect of status on adaptive communication through pragmatic language were examined by evaluating the 95% confidence intervals for the unstandardized regression (*B*) and standardized Beta (β) coefficient values of the indirect effect. The confidence intervals contained zero, *B* = -1.186, CI₉₅ [-5.11, 1.69]; β = -.061, CI₉₅ [-.275, .086]. As these ranges contained zero, these results are not statistically significant. As such, Hypothesis 3a was not supported. Results are presented in Table 4.

Hypothesis 3b. Hypothesis 3b tested the indirect effect of ToM on the relation between developmental status and adaptive communication, where children with ASD would demonstrate lower ToM skills, which would predict lower adaptive communication skills when compared to children with TD. Results of the indirect effect of status on adaptive communication through ToM were examined by evaluating the 95% confidence intervals for the unstandardized regression (*B*) and standardized Beta (β) coefficient values of the indirect effect. The confidence intervals contained zero, *B* = -.16, CI₉₅ [-2.04, 1.04]; β = -.013, CI₉₅ [-.057, .123]. As these ranges contained zero, these results are not statistically meaningful. As such, Hypothesis 3b was not supported. Results are presented in Table 4.

Hypothesis 4a. Hypothesis 4a examined the direct effect between status and pragmatic language skills while controlling for structural language skills. Specifically, I hypothesized that children with ASD would exhibit lower pragmatic language scores than

children with TD. Results showed a significant relation between status and pragmatic language when controlling for verbal ability, $R^2 = .343$, F(1, 35) = 4.18, p < .01 with a large effect size, $f^2 = .52$. These results suggest that status explains over 34% of the variance in pragmatic language skills over and above structural language skills. The slope coefficient for status was -18.25 (CI₉₅ = -28.98, -7.51). Results support the hypothesis, indicating that, on average, children with ASD exhibited a pragmatic language score that was 18.25 points lower than the pragmatic language scores of children with TD even when controlling for structural language ability. Results indicated a 95% confident level that the mean pragmatic language scores of children with ASD were between 7.51 and 28.98 points lower than the mean pragmatic language scores of children with TD.

Hypothesis 4b. Hypothesis 4b examined the direct effect between status and ToM abilities, such that that children with ASD would exhibit lower ToM scores than children with TD. Results showed a nonsignificant relation between status and ToM, F(1, 35) = .34, p = .33 with an effect size that did not reach levels of significance, $f^2 = .002$. As a result, Hypothesis 4b was not supported.

Hypothesis 5. Finally, Hypothesis 5 examined the direct effect between pragmatic language and ToM, such that children who demonstrated greater pragmatic language skills would display greater theory of mind abilities. Results showed a significant relation between pragmatic language and ToM, $R^2 = .30$, F(1, 35) = 2.626, p <.01 with a large effect size, $f^2 = .43$. The slope coefficient for pragmatic language was .028 (CI₉₅ = .008, .048). Results support the hypothesis, indicating that, on average, children with higher pragmatic language scores exhibited a ToM score that was 0.028 points higher than children with lower pragmatic language scores. Results indicated a 95% confident level that the mean ToM scores for children with higher pragmatic language scores were between .008 and .048 points higher than those the mean ToM scores for children who had lower pragmatic language scores. Additionally, these results suggest that pragmatic language explained 30% of the variance in ToM skills.

Post Hoc Analyses

Due to the lack of significant findings of the indirect effect within the proposed model, exploratory analyses were conducted to examine group mean differences in the ToM measure to investigate potential trends in the data. Additionally, exploratory analyses were conducted to further examine the characteristics of the variables that showed statistically significant group differences (i.e., adaptive communication and pragmatic language). Specifically, clinical importance for these variables was investigated in these post hoc analyses.

Comparing Groups

As the study had an increased risk of Type II error due to the unequal group sizes, group mean comparisons were examined for the predictor variable that did not show significant group differences, ToM, to examine the potential trends in these data. The literature shows that children with ASD demonstrate lower ToM abilities than children with TD (Attwood, 2005; Baron-Cohen et al., 1985; Perner, Frith, Leslie, & Leekam, 1989; Slaughter et al., 2007; Yirmiya, Erel, Shaked, & Solomonica-Levi, 1998). However, results of the current study did not show statistically significant differences between group means (See Table 2). When examining these trends, results showed a small non-significant difference in group means. Specifically, the ToM total score group mean for the TD group was 1.63, whereas the ASD ToM group had a slightly lower mean (M = 1.54). Individual participant data points also showed a scatter of ToM scores for both the TD and ASD group. Refer to Figure 8 for a visual presentation of these results.



Mean and Individual Participant Theory of Mind Scores by Status

Figure 6. Scatterplot depicting individual participant theory of mind total scores overlaying a bar graph depicting the means of the theory of mind total scores by group.

Levels of Clinical Importance

As there were statistically significant group differences for adaptive communication and pragmatic language that were in the predicted direction based on the current literature, exploratory analyses were conducted to examine the clinical importance of these variables. Scores that were one or more standard deviations below the mean were considered clinically important. When interpreting pragmatic language scores, CASL Pragmatic Judgment standard scores at or below 85 were considered clinically important. For adaptive communication scores, BASC-2 Functional Communication *T*-scores at or below 40 were considered clinically important. Results are visually depicted below in Figure 9. Results of clinical importance are indicated at or below the black dotted line. Results of the exploratory analyses showed that eight out of the 13 children with ASD demonstrated either pragmatic language scores or adaptive communication scores that fell in the range of clinical importance. Three of those eight participants exhibited both clinically important pragmatic language and adaptive communication scores. Additionally, children in the ASD group whose scores did not fall at or below the levels of clinical importance still exhibited either pragmatic language or adaptive communication scores that fell closer to the levels of clinical importance than children with TD. In contrast, all participants in the TD group demonstrated scores that were above the levels of clinical importance on either measure. These results indicate that children with ASD who demonstrated average or higher structural language scores (as evidenced by the DAS-II verbal ability study inclusion criteria) still exhibited significant challenges with adaptive communication skills and/or pragmatic language skills.



Figure 7. Scatterplot depicting individual participant adaptive communication and pragmatic language scores by group with clinical importance values depicted.

Chapter IV

Discussion

The current study examined the relations between adaptive communication skills, pragmatic language skills, and ToM ability in children with and without ASD. Specifically, I sought to investigate the direct and indirect effects of pragmatic language and ToM on the relation between status and adaptive communication. In the overall conceptual model for this study, I hypothesized that children with ASD would have lower pragmatic language skills, which would predict lower ToM abilities, which would in turn predict lower adaptive communication skills. Due to unequal subgroup sizes within the status variable (i.e., TD = 24; ASD = 13) as well as the very small standardized beta weights for the indirect effects (i.e., β of indirect effects = -.057, -.061, and -.009), the risk of Type II error was inflated. As a result, in addition to reporting significance values, I also reported confidence intervals for my analyses, as they add additional meaning in the context of data that inflate Type II error. However, despite the inflation in the risk of Type II error, several statistically significant findings were gained from this research. Additionally, post hoc analyses revealed the data were trending in the direction that previous literature suggests for ToM scores. The following sections include a summary and interpretation of the analyses of my hypotheses as well as a summary and interpretation of my exploratory analyses. I will also review the strengths and limitations of this study and the implications for future research.

Interpretation of Results

Initial Findings

Adaptive communication skills in children with ASD. The current study found that children with ASD exhibited significantly lower adaptive communication scores than children with TD, supporting *Hypothesis 1*. Specifically, the results indicated that children with ASD demonstrated adaptive communication T-scores that were, on average, 9.12 points lower than the scores of children with TD. Additionally, these results had a large effect size ($f^2 = 1.78$) and also indicated that status explains a large percentage (64%) of the variance in adaptive communication skills. These results support the strong body of literature in the field of adaptive functioning ASD, as deficits in social communication is a diagnostic feature of ASD (APA, 2013) and impairments in the adaptive communication skills in children with ASD has been well-documented by researchers (de Bildt et al., 2005; Mahan & Matson, 2010; Platt et al., 1991; Scahill et al., 2016; Wallace et al., 2016).

Pragmatic language skills in children with ASD. This study did not find statistically significant results when examining the indirect effects of pragmatic language on the adaptive communication skills of children with and without ASD (*Hypothesis 3a*). This is likely due to increased Type II error due to unequal group sizes and very small beta weights for the indirect effects, as described above. However, when examining the direct effect of status on pragmatic language, I found that children with ASD exhibited significantly lower pragmatic language scores than children with TD, supporting *Hypothesis 4a*. Specifically, I found that children with ASD exhibited pragmatic language standard scores that were, on average, 18.25 points lower than the scores of children with TD.
This result is notable, as this indicates that on average the ASD group scored over one standard deviation lower than the TD group on this pragmatic language measure (i.e., CASL Pragmatic Judgment subtest). Additionally, these results had a large effect size (f^2 = .52) and suggested that status contributed over 34 percent of the variance in pragmatic language. This result is similar to research findings from Young and colleagues (2005) who examined older children (ages 6 to 14) and found that children with ASD demonstrated pragmatic language skills that were 1.5 standard deviations lower than their TD comparison group. The current study adds to the greater understanding of pragmatic language of children with ASD. Specifically, the current study's results indicate that the pragmatic language deficits observed in older children and adolescents with ASD may also be present during young childhood. To my knowledge, this is the first study that has examined this relation in this younger age group.

ToM abilities in children with ASD. To my knowledge, this was the first study to examine the effects of ToM on the relation between status and adaptive communication. Past research has shown that ToM contributed 8% of the variance in the adaptive communication skills of children with ASD (Hale & Tager-Flusberg, 2005). However, in the present study, I did not find statistically meaningful results when examining the mediational role of ToM on the relation between status and adaptive communication (*Hypothesis 3b*) or when examining the direct effects of ToM and status (*Hypothesis 4b*). In addition to inflated Type II error, low variability in the ToM Total scores (0-3) likely contributed to these nonsignificant results. A larger sample size with even subgroup sizes would help mitigate this issue in future studies.

Pragmatic language skills, ToM abilities, and adaptive functioning in children with ASD. This is the first study that examined the relation between pragmatic language, ToM, and adaptive communication in children with ASD when compared to children with TD. Previous longitudinal research examining only children with ASD (beginning at age 6) has found that ToM skills mediate the relation between pragmatic language and adaptive communication skills (Bennett et al., 2013). However, the current study did not find statistically meaningful results when investigating the serially mediating roles of pragmatic language and ToM on the relation between status and adaptive communication (*Hypothesis 2*). As mentioned above, these nonsignificant results are likely due to unequal group sizes, low variability in the ToM Total score range, and very low effect sizes. Additionally, these nonsignificant results may also be due to the current study's younger sample than the previous study examining these variables. It is possible that these results are not able to be detected in younger children.

Pragmatic language skills and ToM abilities in children with ASD and TD. Finally, I found that children who demonstrated greater pragmatic language skills displayed significantly greater ToM abilities (*Hypothesis 5*). Specifically, results indicated that children with higher pragmatic language Standard Scores exhibited on average a ToM Total score that was 0.028 points higher when compared to children with lower pragmatic language scores. At first glance, this appears to be a small increase. However, it is important to take the small variability in the ToM Total score (0 to 3) into account when interpreting these results. Interpreting this finding through this lens bolsters the importance of this relatively small result. Additionally, results indicated that pragmatic language explained a large percentage (30%) of the variance in ToM skills. As previously mentioned, the relation between pragmatic language and ToM has been under-examined in the current literature. However, this finding is similar to the small body of research that has examined this effect in children between the ages of 5 and 17 years old, which found a unidirectional relation between pragmatic language and ToM, where children who demonstrated greater pragmatic language also exhibited greater ToM abilities (Eisenmajer & Prior, 1991; Jacques & Zelazo, 2007; Whyte & Nelson, 2015). The current study adds to a greater understanding of the relation between pragmatic language and theory of mind in young children. Specifically, the current study's results extended the age range of this relation to also include younger children (ages 3 and 4). To my knowledge, this is the first study that has examined this relation in this age group.

Post Hoc Analyses

Through exploratory analyses, I investigated the general trends of the ToM measure, as this measure did not show significant group differences. Specifically, I compared the patterns of the mean and individual ToM scores for the ASD and TD groups. Results of this comparison suggest that the data were trending in the same directions as previous research indicated. Specifically, children with ASD exhibited slightly lower mean ToM scores than children with TD. These findings support the current body of research that has found negative relations between status and ToM (Baron-Cohen et al., 1985; Perner, Frith, Leslie, & Leekam, 1989; Slaughter et al., 2007; Yirmiya, Erel, Shaked, & Solomonica-Levi, 1998). Additionally, the current study found that individual participant scores trended in the predicted direction, indicating further support for this study's results. Additionally, post hoc analyses also explored the relation between the two variables that showed statistically significant mean differences between the TD and ASD groups (i.e., pragmatic language and adaptive communication). Exploratory analyses were conducted to examine the levels of clinical importance for these variables. Scores that fell at or below one standard deviation from the mean of the pragmatic language measure (i.e., at or below 85) and the adaptive communication measure (i.e., at or below 40) were considered clinically important. Results showed that only children with ASD exhibited pragmatic language or adaptive communication scores that fell into the range of clinical importance. Specifically, eight out of the 13 children with ASD exhibited clinically important adaptive communication scores, pragmatic language scores, or both.

These results are notable, as almost two thirds of the children with ASD demonstrated challenges in one of these areas that reached at-risk or clinically significant levels. Importantly, three of the 13 children with ASD exhibited both adaptive communication and pragmatic language skills that fell in the clinically important level, comprising almost 25 percent of the ASD sample. These results indicate that children with ASD who demonstrate average or higher structural language scores (as evidenced by the DAS-II verbal ability study inclusion criteria) still exhibit significant challenges with adaptive communication skills and/or pragmatic language skills.

These findings support previous research. Specifically, previous research has shown that children with ASD with average structural language skills demonstrated pragmatic language skills that were 1.5 standard deviations lower than their TD comparison group (Young et al., 2005). Additionally, research has shown that children with ASD demonstrate Functional Communication scores on the BASC-2 that are over 2 standard deviations lower than the mean of their TD comparison group (Goldin, Matson, Konst, & Adams, 2014). Orinstein and colleagues (2015) have explored the adaptive communication skills in children with ASD and TD who had verbal ability scores that were greater than 77 (i.e., at least 1.5 standard deviations above the mean). These researchers found that children with ASD demonstrated adaptive communication skills that fell one standard deviation below the mean. The current study has shown similar findings, indicating that young children with ASD who have average to above-average structural language skills (as evidenced by this study's inclusion criteria of DAS-II verbal ability scores of 85 or greater) still experience challenges with pragmatic language and adaptive communication skills that reach levels of clinical importance.

Clinical Implications

This study found that young children with ASD exhibited greater adaptive communication and pragmatic language deficits than children with TD. While it has been previously shown that older children with ASD (ages six through adolescence) demonstrate pragmatic language deficits compared to children with TD, this relation has not been examined in younger children. These results may help inform therapy goals for young children with ASD. Specifically, it may be beneficial for children with ASD as young as three years old to begin working on improving their pragmatic language skills. Past research has revealed that greater pragmatic language skills during childhood scaffold later social development (Bennett et al., 2013). As improving social skills is a common goal for children with ASD, it is important to find new ways to target this critical skill.

Strengths and Limitations

There are a number of strengths in the current study. First, this study did not have any missing data due to the data collection method. Additionally, this research studied a specific group of children with ASD. Specifically, I examined children whose verbal ability was greater than a standard score of 85. As a result, the findings of this study add to the relatively small amount of literature on young children with ASD with average-toabove-average language abilities. Third, despite having unequal group sizes, thus inflating the risk for Type II error, this study found statistically significant results. Fourth, this study utilized both child performance on task batteries (i.e., CASL Pragmatic Judgment subtest and ToM battery) as well as parent-reported measures (i.e., BASC-2 Functional Communication) as measures of the study constructs. This is a particular strength of the study, as it not only examined children's ability, but also how some skills were perceived by parents in multiple settings. Finally, and perhaps most notably, this study utilized a comparison group (i.e., TD group). This adds to the relatively small body of literature that investigates the adaptive communication skills in children with ASD when compared to children with TD.

In addition to these strengths, this study also had a number of limitations. This study is limited in its small sample size. More importantly, this study's unequal status groups and particularly small ASD group limited the interpretability of the data. It is also important to note that this study utilized a cross-sectional design, and therefore could not determine if there was a causal relation between these constructs. Additionally, the ToM battery had low variability in its scores (i.e., scores fell between 0 and 3). This limited the robustness of the study's measure of ToM abilities.

Conclusions and Future Directions

Consistent with prior research, this study found that children with ASD exhibit significant deficits in their adaptive communication and pragmatic language skills when compared to children with TD, and these deficits reach levels of clinical importance. However, likely due to the current study's unequal group sizes, I was unable to draw conclusions about the role of pragmatic language and ToM skills in the relation between children's status and their adaptive language skills. As such, future research should replicate this study with a larger sample size, as well as with equal groups. This research should focus on confirming this study's hypotheses. Due to the cross-sectional design of this study, it was impossible to draw causal conclusions regarding relations between these constructs. As a result, future researchers should study the longitudinal effects of the roles of pragmatic language and ToM ability on the association between children with and without ASD and their adaptive communication skills. Specifically, they should examine if pragmatic language measured at one time point influences ToM skills at a second time point, and if this relation affects adaptive communication skills at a third time point in children with and without ASD. In this longitudinal research, I would expect to see children with ASD demonstrating lower skills across all time points, which in turn would lead to lower adaptive communication skills. This longitudinal research could help pinpoint an optimal time in the development of children with ASD for interventions to target adaptive communication goals by improving their ToM and pragmatic language skills. In summary, additional research is needed in order to determine the relations between adaptive communication, pragmatic language, and ToM. This body of research should continue to be explored as it may help improve the overall

adaptive communication skills for children with ASD, a common goal in interventions for young children with ASD.

References

American Association of Intellectual and Developmental Disabilities. (2013). *Diagnostic Adaptive Behavior Scale*. Retrieved from

http://www.aaidd.org/content_106.cfm?navID=23.

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC.
- Ashwood, K. L., Tye, C., Azadi, B., Cartwright, S., Asherson, P., & Bolton, P. (2015).
 Brief report: Adaptive functioning in children with ASD, ADHD and ASD +
 ADHD. *Journal of Autism and Developmental Disorders*, 45(7), 2235-2242.
 doi:10.1007/s10803-014-2352-y
- Attwood, T. (2005). Theory of Mind and Asperger's Syndrome. In L. J. Baker, L. A.
 Welkowitz, L. J. Baker, L. A. Welkowitz (Eds.), *Asperger's Syndrome: Intervening in schools, clinics, and communities* (pp. 11-41). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
- Bailey A., Le Couteur A., Gottesman I., Bolton P., & Simonoff E. (1995). Autism as a strongly genetic disorder: Evidence from a British twin study. *Psychological Medicine*, 23, 63-77.
- Baron-Cohen, S. (1995). Theory of mind and face-processing: How do they interact in development and psychopathology?. In D. Cicchetti, D. J. Cohen, D. (Eds.), *Developmental psychopathology, Vol. 1: Theory and methods* (pp. 343-356). Oxford, England: John Wiley & Sons.
- Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a 'theory of mind'?. *Cognition*, *21*(1), 37-46. doi:10.1016/0010-0277(85)90022-8

- Bauminger, N., & Kasari, C. (2000). Loneliness and friendship in high-functioning children with autism. *Child Development*, 71(2), 447-456. doi:10.1111/1467-8624.00156
- Bennett, T. A., Szatmari, P., Bryson, S., Duku, E., Vaccarella, L., & Tuff, L. (2013).
 Theory of mind, language and adaptive functioning in ASD: A neuroconstructivist perspective. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 22(1), 13-19.
- Bergelson, E., & Swingley, D. (2012). At 6-9 months, human infants know the meanings of common nouns. *Proceedings of the National Academy of Sciences of the United States of America*, 109(9), 3253-3258. doi: 10.1073/pnas.1113380109
- Bernier, R. & Gerdts, J. (2007). Autism spectrum disorders: A reference handbook. ABC: CLIO Publishers, Santa Barbara, CA.
- Billstedt, E., Gillberg, I. C., & Gillberg, C. (2007). Autism in adults: Symptom patterns and early childhood predictors. Use of the DISCO in a community sample followed from childhood. *Journal of Child Psychology and Psychiatry*, 48(11), 1102-1110. doi:10.1111/j.1469-7610.2007.01774.x
- Bishop, D. (1997). Uncommon understanding: Development and disorders of language comprehension in children. Hove, UK: Psychology Press.

Bölte, S., & Poustka, F. (2002). The relation between general cognitive level and adaptive behavior domains in individuals with autism with and without co-morbid mental retardation. *Child Psychiatry and Human Development*, *33*(2), 165-172. doi:10.1023/A:1020734325815

- Bowles, S. (2008). Policies designed for self-interested citizens may undermine "the moral sentiments": Evidence from economic experiments. *Science*, 320(5883), 1605-1609.
- Burd, L., Severud, R., Kerbeshian, J., & Klug, M. G. (1999). Prenatal and perinatal risk factors for autism. *Journal of Perinatal Medicine*, 27(6), 441-450.
- Cardon, T. A. (2012). Teaching caregivers to implement video modeling imitation training via iPad for their children with autism. *Research in Autism Spectrum Disorders*, 6(4), 1389-1400. doi:10.1016/j.rasd.2012.06.002
- Baio J., Wiggins L., Christensen D.L., Maenner, M., Daniels, J., Warren, Z., ... Dowling, N. (2014). Prevalence of autism spectrum disorder among children aged 8 years
 autism and developmental disabilities monitoring network, 11 sites, United States. *Surveillance Summaries* 67(SS-6), 1–23.

doi:http://dx.doi.org/10.15585/mmwr.ss6706a1

- Charman, T., Pickles, A., Simonoff, E., Chandler, S., Loucas, T., & Baird, G. (2011). IQ in children with autism spectrum disorders: Data from the Special Needs and Autism Project (SNAP). *Psychological Medicine*, *41*(3), 619-627. doi:10.1017/S0033291710000991
- Chevallier, C., Kohls, G., Troiani, V., Brodkin, E. S., & Schultz, R. T. (2012). The social motivation theory of autism. *Trends in Cognitive Sciences*, *16*(4), 231-239.
 doi:10.1016/j.tics.2012.02.007
- Constantino, J. N., Todorov, A., Hilton, C., Law, P., Zhang, Y., Molloy, E., . . . Geschwind, D. (2013). Autism recurrence in half siblings: Strong support for genetic mechanisms of transmission in ASD. *Molecular Psychiatry*, 18(2), 137-

138. doi: doi.org/10.1038/mp.2012.9

Crişan, C., & Stan, C. (2013). The efficiency of LCSMA in reducing challenging behaviors in children with autism. *Journal of Cognitive and Behavioral Psychotherapies*, 13(2), 421-435.

Croen, L.A., Grether, J.K., & Selvin S. (2002). Descriptive epidemiology of autism in aCalifornia population: Who is at risk? *Journal of Autism and DevelopmentalDisorder*, 32, 217-24. doi:

http://dx.doi.org.ezproxy.spu.edu/10.1023/A:1015405914950

- Dawson, G., Meltzoff, A. N., Osterling, J., Rinaldi, J., & Brown, E. (1998). Children with autism fail to orient to naturally occurring social stimuli. *Journal of Autism and Developmental Disorders*, 28(6), 479-485. doi:10.1023/A:1026043926488
- de Bildt, A., Sytema, S., Kraijer, D., Sparrow, S., & Minderaa, R. (2005). Adaptive functioning and behaviour problems in relation to level of education in children and adolescents with intellectual disability. *Journal of Intellectual Disability Research*, 49(9), 572-681. doi: 10.1111/j.1365-2788.2005.00711.x
- de Villiers, J.G. & de Villiers, P.A. (2000). Linguistic determinism and the understanding of false beliefs. In P. Mitchell, K. Riggs (Eds.), *Children's reasoning and the mind* (pp. 191-228). Hove England: Psychology Press/Taylor & Francis.
- Eisenmajer, R., & Prior, M. (1991). Cognitive linguistic correlates of 'theory of mind' ability in autistic children. *British Journal of Developmental Psychology*, 9(2), 351-364. doi:10.1111/j.2044-835X.1991.tb00882.x
- Elsabbagh, M., Divan, G., Koh, Y., Kim, Y. S., Kauchali, S., Marcín, C., & ... Fombonne, E. (2012). Global prevalence of autism and other pervasive developmental

disorders. Autism Research, 5(3), 160-179. doi:10.1002/aur.239

Flavell, J. H., & Miller, P. H. (1998). Social cognition. In W. Damon (Eds.), *Handbook of child psychology: Volume 2: Cognition, perception, and language* (pp. 851-898).
Hoboken, NJ: John Wiley & Sons Inc.

Freeman, B. J., Ritvo, E. R., Yokota, A., & Childs, J. (1988). WISC—R and Vineland adaptive behavior scale scores in autistic children. *Journal of the American Academy of Child & Adolescent Psychiatry*, 27(4), 428-429. doi: 10.1097/00004583-198807000-00008

- Freeman, B. J., Rahbar, B., Ritvo, E. R., Bice, T. L., Yokota, A., & Ritvo, R. (1991). The stability of cognitive and behavioral parameters in autism: A twelve-year prospective study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 30(3), 479-482.
- Frith, U., Happé, F., & Siddons, F. (1994). Autism and theory of mind in everyday life. Social Development, 3(2), 108-124. doi:10.1111/j.1467-9507.1994.tb00031.x
- Fu, G., & Lee, K. (2007). Social grooming in the kindergarten: The emergence of flattery behavior. *Developmental Science*, 10(2), 255-265.
- Fujiki, M., & Brinton, B. (2009). Pragmatics and social communication in child language disorders. In R. G. Schwartz (Ed.), *Handbook of Child Language Disorders* (pp. 406-423). New York: Psychology Press.
- Gillberg, C., & Steffenburg, S. (1987). Outcome and prognostic factors in infantile autism and similar conditions: A population-based study of 46 cases followed through puberty. *Journal of Autism and Developmental Disorders*, *17*, 273–287. doi: http://dx.doi.org.ezproxy.spu.edu/10.1007/BF01495061

- Gliga, T., Elsabbagh, M., Andravizou, A., & Johnson, M. (2009). Faces attract infants' attention in complex displays. *Infancy*, 14(5), 550-562. doi:10.1080/15250000903144199
- Goldin, R. L., Matson, J. L., Konst, M. J., & Adams, H. L. (2014). A comparison of children and adolescents with ASD, atypical development, and typical development on the Behavioral Assessment System for Children, Second Edition (BASC-2). *Research in Autism Spectrum Disorders*, 8(8), 951–957. https://doi-org.libproxy.unm.edu/10.1016/j.rasd.2014.04.005
- Gopnik, A., & Astington, J. W. (1988). Children's understanding of representational change and its relation to the understanding of false belief and the appearance-reality distinction. *Child Development*, *59*(1), 26-37. doi:10.2307/1130386
- Green, J. Gilchrist, A., Burton, D., & Cox, A. (2000). Social and psychiatric functioning in adolescents with Asperger syndrome compared with conduct disorder. *Journal* of Autism and Developmental Disorders, 30(4), 279-293. doi: 2048/10.1023/A:1005523232106
- Grzadzinski, R., Huerta, M., & Lord C. (2013). DSM-5 and autism spectrum disorders
 (ASDs): An opportunity for identifying ASD subtypes. *Molecular Autism*, 4(12), 1-6. doi:10.1186/2040-2392-4-12

Hale, C. M., & Tager-Flusberg, H. (2005). Social communication in children with autism: The relationship between theory of mind and discourse development. *Autism*, 9(2), 157-178. doi:10.1177/1362361305051395

- Happé, F., & Frith, U. (1995). Theory of mind in autism. In E. Schopler, G. B. Mesibov,
 E. Schopler, G. B. Mesibov (Eds.), *Learning and cognition in autism* (pp. 177-197). New York, NY, US: Plenum Press. doi:10.1007/978-1-4899-1286-2_10
- Hill, A. P., Zuckerman, K. E., & Fombonne, E. (2014). Epidemiology of autism spectrum disorders. In F. R. Volkmar, S. J. Rogers, R. Paul, K. A. Pelphrey, F. R. Volkmar, S. J. Rogers, ... K. A. Pelphrey (Eds.), *Handbook of Autism and Pervasive Developmental Disorders: Diagnosis, Development, and Brain Mechanisms* (pp. 57-96). Hoboken, NJ, US: John Wiley & Sons Inc.
- Hoff, E. (2009). Language development (4th ed.). Belmont, CA: Wadsworth Publishing.
- Hogrefe, G., Wimmer, H., & Perner, J. (1986). Ignorance versus false belief: A developmental lag in attribution of epistemic states. *Child Development*, 57(3), 567-582. doi:10.2307/1130337
- Holmes, E., & Willoughby, T. (2005). Play behaviour of children with autism spectrum disorders. *Journal of Intellectual and Developmental Disability*, *30*(3), 156-164. doi:10.1080/13668250500204034
- Howard, J. S., Stanislaw, H., Green, G., Sparkman, C. R., & Cohen, H. G. (2014).
 Comparison of behavior analytic and eclectic early interventions for young children with autism after three years. *Research in Developmental Disabilities*, 35(12), 3326–3344. doi:10.1016/j.ridd.2014.08.021
- Hudepohl, M. B., Robins, D. L., King, T. Z., & Henrich, C. C. (2015). The role of emotion perception in adaptive functioning of people with autism spectrum disorders. *Autism*, 19(1), 107-112. doi:10.1177/1362361313512725

- Hughes, C. (2011). Social understanding and social lives: From toddlerhood through to the transition to school. New York, NY, US: Psychology Press.
- Humphrey, N., & Symes, W. (2011). Peer interaction patterns among adolescents with autistic spectrum disorders (ASDs) in mainstream school settings. *Autism*, 15(4), 397-419. doi:10.1177/1362361310387804
- Individuals with Disabilities Education Act of 2004, Pub. L. No. 108-446, 118 Stat. 2647 (2004).
- Kamphaus, R. W. (1987). Conceptual and psychometric issues in the assessment of adaptive behavior. *The Journal of Special Education*, 21(1), 27-35. doi:10.1177/002246698702100107
- Kishida, Y., & Kemp, C. (2006). A measure of engagement for children with intellectual disabilities in early childhood settings: A preliminary study. *Journal of Intellectual and Developmental Disability*, *31*(2), 101-114. doi:10.1080/13668250600710823
- Kjellmer, L., Hedvall, Å., Fernell, E., Gillberg, C., & Norrelgen, F. (2012). Language and communication skills in preschool children with autism spectrum disorders:
 Contribution of cognition, severity of autism symptoms, and adaptive functioning to the variability. *Research in Developmental Disabilities*, *33*(1), 172-180. doi: 10.1016/j.ridd.2011.09.003
- Klin, A., Jones, W., Schultz, R., & Volkmar, F. (2003). The enactive mind, or from actions to cognition: Lessons from autism. In U. Frith, E. Hill, U. Frith, E. Hill (Eds.), *Autism: Mind and brain* (pp. 127-159). New York, NY, US: Oxford University Press.

- Klin, A., Saulnier, C. A., Sparrow, S. S., Cicchetti, D. V., Volkmar, F. R., & Lord, C. (2007). Social and communication abilities and disabilities in higher functioning individuals with autism spectrum disorders: The Vineland and the ADOS. *Journal of Autism and Developmental Disorders*, *37*(4), 748-759. doi: 10.1007/s10803-006-0229Klin, A., & Volkmar, F. R. (2003). Asperger syndrome: Diagnosis and external validity. *Child and Adolescent Psychiatric Clinics of North America*, *12*(1), 1-13. doi:10.1016/S1056-4993(02)00052-4
- Kohls, G., Chevallier, C., Troiani, V., & Schultz, R. T. (2012). Social 'wanting' dysfunction in autism: Neurobiological underpinnings and treatment implications. *Journal of Neurodevelopmental Disorders*, 4(1), 1-20. doi:10.1186/1866-1955-4-10
- Lakens D. (2013). Calculating and reporting effect sizes to facilitate cumulative science:
 A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, 4(863). 112. doi:10.3389/fpsyg.2013.00863
- Lam, Y. G., & Yeung, S. S. (2012). Towards a convergent account of pragmatic language deficits in children with high-functioning autism: Depicting the phenotype using the Pragmatic Rating Scale. *Research in Autism Spectrum Disorders*, 6(2), 792-797. doi:10.1016/j.rasd.2011.08.004
- Landa, R. (2000). Social language use in Asperger syndrome and high-functioning autism. In A. Klin, F. R. Volkmar, S. S. Sparrow, A. Klin, F. R. Volkmar, S. S. Sparrow (Eds.), *Asperger Syndrome* (pp. 125-155). New York, NY, US: Guilford Press.

- Leary, M. R., & Allen, A. B. (2011). Belonging motivation: Establishing, maintaining, and repairing relational value. In D. Dunning, D. Dunning (Eds.) *Social motivation* (pp. 37-55). New York, NY, US: Psychology Press.
- Leigh, P., Nievar, M. A., & Nathans, L. (2011). Maternal sensitivity and language in early childhood: A test of the transactional model. *Perceptual and Motor Skills*, *113*(1), 281-299. doi:10.2466/10.17.21.28.PMS.113.4.281-299
- Lillard, A. (1998). Ethnopsychologies: Cultural variations in theories of mind. *Psychological Bulletin*, *123*(1), 3-32. doi:10.1037/0033-2909.123.1.3
- Liss, M., Harle, B., Fein, D., Allen, D., Dunn, M., Feinstein, C.... Rapin, I. (2001).
 Predictors and correlates of adaptive functioning in children with developmental disorders. *Journal of Autism and Developmental Disorders*, *31*(2), 219-230. doi: 0162-3257/01/0400-0219
- Lotter, V. (1974). Factors related to outcome in autistic children. *Journal of Autism and Childhood Schizophrenia*, 4(3), 263-277. doi:10.1007/BF02115232
- Luckasson, R., Borthwick-Duffy, S., Buntinx, W. H. E., Coulter, D. L., Craig, E. M., Reeve, A., . . . Tassé, M. J. (2002). *Mental retardation: Definition, classification, and systems of supports (10th ed.)*. Washington, DC, US: American Association on Mental Retardation, Washington, DC.
- Mahan, S., & Matson, J. L. (2011). Children and adolescents with autism spectrum disorders compared to typically developing controls on the behavioral assessment system for children, second edition (BASC-2). *Research in Autism Spectrum Disorders*, 5(1), 119-125. doi: 10.1016/j.rasd.2010.02.007

Matthews, N. L., Smith, C. J., Pollard, E., Ober-Reynolds, S., Kirwan, J., & Malligo, A.

(2015). Adaptive functioning in autism spectrum disorder during the transition to adulthood. *Journal of Autism and Developmental Disorders*, *45*(8), 2349-2360. doi:10.1007/s10803-015-2400-2

- McDonald, C. A., Thomeer, M. L., Lopata, C., Fox, J. D., Donnelly, J. P., Tang, V., & Rodgers, J. D. (2015). VABS-II ratings and predictors of adaptive behavior in children with HFASD. *Journal of Developmental and Physical Disabilities*, 27(2), 235-247. doi:10.1007/s10882-014-9411-3
- Meinzen-Derr, J., Wiley, S., Grether, S., Phillips, J., Choo, D., Hibner, J., & Barnard, H. (2014). Functional communication of children who are deaf or hard-of-hearing. *Journal of Developmental and Behavioral Pediatrics*, 35(3), 197-206. doi:10.1097/DBP.000000000000048
- Milligan, K., Astington, J. W., & Dack, L. A. (2007). Language and theory of mind: Meta-analysis of the relation between language ability and false-belief understanding. *Child Development*, 78(2), 622-646. doi:10.1111/j.1467-8624.2007.01018.x
- Milne, S., & McDonald, J. (2015). Assessing adaptive functioning in preschoolers referred for diagnosis of developmental disabilities. *Infants & Young Children*, 28(3), 248-261. doi:10.1097/IYC.000000000000037
- Müller, U., Miller, M. R., Michalczyk, K., & Karapinka, A. (2007). False belief understanding: The influence of person, grammatical mood, counterfactual reasoning and working memory. *British Journal of Developmental Psychology*, 25(4), 615-632. doi:10.1348/026151007X182962

- Newschaffer, C. J., Croen, L. A., Daniels, J., Giarelli, E., Grether, J. K., Levy, S. E., . . . Windham, G. C. (2007). The epidemiology of autism spectrum disorder. *Annual Review of Public Health*, 28, 235-258.
- Oller, J. W., Oller, S. D., & Oller, S. N. (2012). *Milestones: Normal speech and language development across the lifespan* (2nd ed.). San Diego, CA: Plural Publishing, Inc.

Orinstein, A. J., Suh, J., Porter, K., De Yoe, K. A., Tyson, K. E., Troyb, E., ... Fein, D. A. (2015). Social function and communication in optimal outcome children and adolescents with an autism history on structured test measures. *Journal of Autism and Developmental Disorders*, 45(8), 2443–2463. https://doi-org.libproxy.unm.edu/10.1007/s10803-015-2409-6

- Pankert, A., Pankert, K., Herpertz-Dahlmann, B., Konrad, K., & Kohls, G. (2014).
 Responsivity to familiar versus unfamiliar social reward in children with autism. *Journal of Neural Transmission*, *121*(9), 1199-1210. doi:10.1007/s00702-014-1210-6
- Paul, R. (2008). Communication development. In K. Chawarska, A. Klin, & F. R.
 Volkmar (Eds.), *Autism spectrum disorders in infants and toddlers* (pp. 76–103).
 New York, NY: The Guilford Press.
- Perner, J. (1991). Understanding the representational mind. Cambridge, MA: The MIT Press.
- Perner, J., Frith, U., Leslie, A. M., & Leekam, S. R. (1989). Exploration of the autistic child's theory of mind: Knowledge, belief, and communication. *Child Development*, 60(3), 689-700. doi:10.2307/1130734

Perry, A., Flanagan, H. E., Dunn Geier, J., & Freeman, N. L. (2009). Brief report: The

Vineland Adaptive Behavior Scales in young children with autism spectrum disorders at different cognitive levels. *Journal of Autism and Developmental Disorders*, *39*(7), 1066-1078. doi: 10.1007/s10803-009-0704-9

- Peterson, C. C., Slaughter, V. P., & Paynter, J. (2007). Social maturity and theory of mind in typically developing children and those on the autism spectrum. *Journal* of Child Psychology and Psychiatry, 48(12), 1243-1250. doi:10.1111/j.1469-7610.2007.01810.x
- Peterson, C. C., Wellman, H. M., & Liu, D. (2005). Steps in theory-of-mind development for children with deafness or autism. *Child Development*, 76(2), 502-517. doi:10.1111/j.1467-8624.2005.00859.x
- Peterson, C. C., Wellman, H. M., & Slaughter, V. (2012). The mind behind the message:
 Advancing theory-of-mind scales for typically developing children, and those with deafness, autism, or Asperger syndrome. *Child Development*, *83*(2), 469-485.
- Philofsky, A., Fidler, D. J., & Hepburn, S. (2007). Pragmatic language profiles of schoolage children with autism spectrum disorders and Williams syndrome. *American Journal of Speech-Language Pathology*, *16*(4), 368-380. doi:10.1044/1058-0360(2007/040)
- Platt, L. O., Kamphaus, R. W., Cole, R. W., & Smith, C. L. (1991). Relationship between adaptive behavior and intelligence: Additional evidence. *Psychological Reports*, 68(1), 139-145. doi:10.2466/PR0.68.1.139-145
- Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind?.*Behavioral and Brain Sciences*, 1(4), 515-526. doi:10.1017/S0140525X00076512

- Prutting, C. A., & Kirchner, D. M. (1987). A clinical appraisal of the pragmatic aspects of language. *Journal of Speech & Hearing Disorders*, 52(2), 105-119. doi:10.1044/jshd.5202.105
- Rapin, I. (2006). Language and communication: Clinical assessment and differential diagnosis. In R. Tuchman, I. Rapin, R. Tuchman, I. Rapin (Eds.), *Autism: A neurological disorder of early brain development* (pp. 51-67). London NW3 5RN, England: Mac Keith Press.
- Rapin, I. (2007). Language and its development in the autistic spectrum disorders. In J.
 M. Perez, P. M. Gonzalez, M. L. Comi, & C. Nieto (Eds.), *New developments in autism: The future is today* (pp. 214-236). London, UK: Jessica Kingsley
 Publishers.
- Reichow, B., Salamack, S., Paul, R., Volkmar, F. R., & Klin, A. (2008). Pragmatic assessment in autism spectrum disorders: A comparison of a standard measure with parent report. *Communication Disorders Quarterly*, 29(3), 169-176. doi:10.1177/1525740108318697
- Repacholi, B. M., & Gopnik, A. (1997). Early reasoning about desires: Evidence from 14- and 18-month-olds. *Developmental Psychology*, 33(1), 12-21. doi:10.1037/0012-1649.33.1.12
- Reynolds, C. R., & Kamphaus, R. W. (2004). BASC-2: Behavior assessment system for children, second edition manual. Circle Pines, MN: American Guidance Service.
- Rojahn, J., Wilkins, J., Matson, J. L., & Boisjoli, J. (2010). A comparison of adults with intellectual disabilities with and without ASD on parallel measures of challenging behaviour: The behavior problems inventory-01 (BPI-01) and autism spectrum

disorders-behavior problems for intellectually disabled adults (ASD-BPA). Journal of Applied Research in Intellectual Disabilities, 23(2), 179-185.

- Ross, H., Smith, J., Spielmacher, C., & Recchia, H. (2004). Shading the truth: Selfserving biases in children's reports of sibling conflicts. *Merrill-Palmer Quarterly: Journal of Developmental Psychology*, 50(1), 61-85.
- Russell, G., Kelly, S. & Golding, J. (2010). A qualitative analysis of lay beliefs about the etiology and prevalence of autistic spectrum disorders. *Child: Care, Health and Development, 36*, 431-436. doi: 10.1111/j.1365-2214.2009.00994.x
- Salva, O. R., Farroni, T., Regolin, L., Vallortigara, G., & Johnson, M. H. (2011). The evolution of social orienting: Evidence from chicks (Gallus gallus) and human newborns. *Plos ONE*, 6(4), 1-10. doi:10.1371/journal.pone.0018802
- Schalock, R. L. (1999). The merging of adaptive behavior and intelligence: Implications for the field of mental retardation. In R. L. Schalock (Ed.), *Adaptive behavior and its measurement: Implications for the field of mental retardation* (pp. 43–59).
 Washington, DC: American Association on Mental Retardation.
- Schopler, E., & Mesibov, G. B. (Eds.). (1995). Learning and cognition in autism. Boston, MA: Springer.
- Schultz, R. T. (2005). Developmental deficits in social perception in autism: The role of the amygdala and fusiform face area. *International Journal of Developmental Neuroscience*, 23(2-3), 125-141. doi:10.1016/j.ijdevneu.2004.12.012
- Slaughter, V., Peterson, C. C., & Mackintosh, E. (2007). Mind what mother says: Narrative input and theory of mind in typical children and those on the autism

spectrum. *Child Development*, 78(3), 839-858. doi:10.1111/j.1467-8624.2007.01036.x

- Steele, S., Joseph, R.M., & Tager-Flusberg, H. (2003). Brief report: Developmental change in theory of mind abilities in children with autism. *Journal of Autism and Developmental Disorders*, 33(4), 461-467. doi:10.1023/A:1025075115100
- Stefanatos, G. A., & Baron, I. S. (2011). The ontogenesis of language impairment in autism: A neuropsychological perspective. *Neuropsychology Review*, 21(3), 252-270. doi:10.1007/s11065-011-9178-6
- Szatmari, P., Bryson, S. E., Boyle, M. H., Streiner, D. L., & Duku, E. (2003). Predictors of outcome among high functioning children with autism and Asperger syndrome. *Journal of Child Psychology and Psychiatry*, 44(4), 520-528. doi:10.1111/1469-7610.00141
- Tager-Flusberg, H. (2000). Language and understanding minds: Connections in autism.
 In S. Baron-Cohen, H. Tager-Flusberg, D. J. Cohen, S. Baron-Cohen, H. Tager-Flusberg, D. J. Cohen (Eds.), Understanding other minds: Perspectives from developmental cognitive neuroscience, 2nd ed (pp. 124-149). New York, NY, US: Oxford University Press.
- Tager-Flusberg, H. (2007). Evaluating the theory-of-mind hypothesis of autism. *Current Directions in Psychological Science*, *16*(6), 311-315. doi:10.1111/j.1467-8721.2007.00527.x
- Tager-Flusberg, H., & Joseph, R. M. (2005). How language facilitates the acquisition of false belief understanding in children with autism. In J. W. Astington, J. A. Baird, J. W. Astington, J. A. Baird (Eds.), *Why language matters for theory of mind* (pp.

298-318). New York, NY, US: Oxford University Press.

doi:10.1093/acprof:oso/9780195159912.003.0014

- Tassé, M. J., Schalock, R. L., Balboni, G., Bersani, H. J., Borthwick-Duffy, S. A., Spreat, S., & ... Zhang, D. (2012). The construct of adaptive behavior: Its conceptualization, measurement, and use in the field of intellectual disability. *American Journal on Intellectual and Developmental Disabilities*, *117*(4), 291-303. doi:10.1352/1944-7558-117.4.291
- Thompson, J. R., McGrew, K. S., & Bruininks, R. H. (1999). Adaptive behavior and maladaptive behavior: Functional and structural characteristics. In R. L. Schalock (Ed.), *Adaptive behavior and its measurement: Implications for the field of mental retardation* (pp. 15–42). Washington, DC: American Association on Mental Retardation.
- Venter, A., Lord, C., & Schopler, E. (1992). A follow-up study of high-functioning autistic children. *Child Psychology and Psychiatry and Allied Disciplines*, 33(3), 489-507. doi:10.1111/j.1469-7610.1992.tb00887.x
- Volden, J., Coolican, J., Garon, N., White, J., & Bryson, S. (2009). Brief report:
 Pragmatic language in autism spectrum disorder: Relationships to measures of ability and disability. *Journal of Autism and Developmental Disorders*, 39(2), 388-393. doi:10.1007/s10803-008-0618-y

Volkmar, F. R., Sparrow, S. S., Goudreau, D., Cicchetti, D. V., Paul, R., & Cohen, D. J. (1987). Social deficits in autism: An operational approach using the Vineland Adaptive Behavior Scales. *Journal of the American Academy of Child and Adolescent Psychiatry*, 26(2), 156-161. doi:10.1097/00004583-198703000-00005

- Weismer, S. E., Lord, C., & Esler, A. (2010). Early language patterns of toddlers on the autism spectrum compared to toddlers with developmental delay. *Journal of Autism and Developmental Disorders*, 40(10), 1259-1273. doi:10.1007/s10803-010-0983-1
- Wellman, H., Fang, F., Peterson, C. (2011). Sequential progressions in a theory-of-mind scale: Longitudinal perspectives. *Child Development*, 82(3), 780-792. doi: 10.1111/j.1467-8624.2011.01583.x
- Wellman, H.M., & Liu, D. (2004). Scaling of theory-of-mind tasks. *Child Development*, 75(2), 523-541. doi:10.1111/j.1467-8624.2004.00691.x
- Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, 72(3), 655-684. doi:10.1111/1467-8624.00304
- Wellman, H. M., & Woolley, J. D. (1990). From simple desires to ordinary beliefs: The early development of everyday psychology. *Cognition*, *35*(3), 245-275. doi:10.1016/0010-0277(90)90024-E
- West, J. (2000). *Back to school on civil rights: Advancing the federal commitment to leave no child behind*. Washington, DC: National Council on Disability.
- Whyte, E. M., & Nelson, K. E. (2015). Trajectories of pragmatic and nonliteral language development in children with autism spectrum disorders. *Journal of Communication Disorders*, 542-14. doi:10.1016/j.jcomdis.2015.01.001
- Wilkins, J., & Matson, J. L. (2009). A comparison of social skills profiles in intellectually disabled adults with and without ASD. *Behavior Modification*, *33*(2), 143-155.
 doi: 10.1177/0145445508321880

- Williams, D. M., & Happé, F. (2009). What did I say? Versus what did I think?
 Attributing false beliefs to self amongst children with and without autism. *Journal* of Autism and Developmental Disorders, 39(6), 865-873. doi:10.1007/s10803-009-0695-6
- Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, 13(1), 103-128. doi:10.1016/0010-0277(83)90004-5
- Wing, L. (1980). Childhood autism and social class: A question of selection? *The British Journal of Psychiatry*, 137, 410-417.

Yirmiya, N., Erel, O., Shaked, M., & Solomonica-Levi, D. (1998). Meta-analyses comparing theory of mind abilities of individuals with autism, individuals with mental retardation, and normally developing individuals. *Psychological Bulletin*, 124(3), 283-307. doi:10.1037/0033-2909.124.3.283

Young, E. C., Diehl, J. J., Morris, D., Hyman, S. L., & Bennetto, L. (2005). The use of two language tests to identify pragmatic language problems in children with autism spectrum disorders. *Language, Speech, and Hearing Services in Schools*, 36(1), 62-72. doi:10.1044/0161-1461(2005/006)