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The Role of Joint Attention in Pragmatic Language Development in Children with Autism Spectrum Disorders

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Table of Contents

List of Figures

List of Tables

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Abstract

All children with autism spectrum disorders (ASD) present with some form of impairment in social communication. Social cognitive learning theory suggests children's early joint attention skills provide a foundation for future language development. Preliminary research suggests social cognitive behaviors such as joint attention in the context of parent scaffolding may serve as a mechanism for language development in children with ASD. The current study utilized a parent-child free play task to explore the relations among parent and child attention and responsivity and child pragmatic language in 26 children ages 3:1 to 6:11 and their parents. Parent supported joint attention was assessed during a parent child free-play task. Pragmatic language ability was assessed by the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999). Developmental status significantly predicted child's pragmatic language score while controlling for overall verbal ability, $F(2, 23) = 6.37$, $p = 0.01$, $\Delta R^2 = .15$. Developmental status was not a significant predictor of parent supported joint attention, $F(1, 24) = 1.09$, $p = 0.31$, indicating that regardless of developmental status there was no significant difference in the percentage of time parents and children spent in parent supported joint attention. Children with autism spectrum disorders initiated joint attention with their parents ($M = 0.28$) about half as much as their typically developing peers ($M = 0.55$). Post hoc analyses indicated for children with ASD in this current study, initiation of joint attention was significantly correlated to child RJA, $r = 0.60$, $p = 0.04$, suggesting that child with ASD who initiate joint attention with their parents also spend a larger amount of time responding to their parent's bids for joint attention. The interaction between developmental status and child RJA was also significant, $F = 6.16$, $p = .02$, $\Delta R^2 = .13$, indicating that for children with ASD, responsiveness to their parent's bids for joint attention of their parents plays a significant role for their pragmatic language ability in comparison to children with typically development. Collectively, the nature of these findings provides evidence for supporting social cognition in children with autism.

Keywords: autism spectrum disorder; neurodevelopmental disorders; Parent supported joint attention; joint attention; pragmatic language; language

Chapter I

Introduction

Language development in children with autism spectrum disorder (ASD) has generated a wealth of interest from researchers and educators because the acquisition of language is one of the best predictors of later social and adaptive functioning for these children (Bennett et al., 2008; Gillespie-Lynch et al., 2012). ASD is a neurodevelopmental disorder represented by core impairments in social communication and restricted/repetitive behaviors (DSM-5; American Psychiatric Association [APA], 2013). Although language impairment alone is not sufficient for the diagnosis of autism spectrum disorder, all children with autism present with some form of impairment in social communication (APA, 2013). One aspect of social communication often found to be impaired in children with ASD is pragmatic language, the use of socially appropriate language (Bishop, 1997).

Preliminary research suggests that early behaviors such as pointing and showing during moments of joint attention may be one of the best predictors of language development for children with autism (Gillespie-Lynch et al., 2013; Mundy, Sigman, & Kasari, 1990, 1994; Thurm, Lord, Lee, & Newschaffer, 2007). Further, nonverbal social behaviors such as joint attention may facilitate social communication in children with autism. Deficits in joint attention may be an early, nonverbal behavioral representation of autism which then limits children's opportunities for attending to the words and intentions of their social partner (Baron-Cohen, 1989; Baron-Cohen, Wheelwright, & Jolliffe, 1997). Children with autism may have difficulty with aspects of social communication due to difficulty understanding others as resources who can provide

social information (Bates et al., 1975; Bates et al., 1979; Bottema-Beutel et al., 2014). Therefore, compared to children with TD, children with autism may need additional support to help them engage with their social environment (Bakeman & Adamson, 1984; Tager-Flusberg, 2001). Because parents vary in the ways they help their children attend to and learn from their social environment, it is important to investigate how parent support may provide a foundation for children's social communication skills such as pragmatic language.

The current study will examine joint attention as an early nonverbal behavior related to pragmatic language in young children ages 3:0 to 6:11 with and without ASD. This study will examine aspects of parent supported joint attention in the context of a parent-child free play task. Joint attention will be discussed as a pivotal social behavior that supports children as they interact with and learn from their social environment. In the following sections I provide a brief overview of ASD and the theoretical framework for the development of social communication in young children.

Autism Spectrum Disorders

Overview. Autism spectrum disorder (ASD) is a neurodevelopmental disorder represented on a spectrum of severity with core impairments in social communication and restricted/repetitive behaviors (APA, 2013). The DSM-5 diagnosis of ASD replaces the previous diagnostic categories of autistic disorder, Asperger's disorder, pervasive developmental disorder not otherwise specified (PDD-NOS), childhood disintegrative disorder, and Rett's disorder with one diagnosis, autism spectrum disorder (DSM-IV-TR; American Psychiatric Association [APA], 2000). Although the diagnosis of autism is usually made in early childhood a diagnosis may occur during a later period of

development because symptom severity may not be fully manifested for some children until later development (APA, 2013).

Impairments in social communication have been identified as the core diagnostic criteria in autism spectrum disorder (APA, 2013; Bernier & Gerdts, 2010; Tager-Flusberg, 2000). This paper will focus on social communication as the core impairment in autism spectrum disorder. DSM-5 diagnostic criteria for ASD represent social communication impairments in terms of social-emotional reciprocity, nonverbal communication, and stereotyped or repetitive speech. Language delay or impairment alone is no longer a diagnostic criteria. These social communication impairments are defined as difficulties coordinating attention and impairments in language and gestures. Before providing information about the epidemiology and etiology of ASD, the following sections describe the full diagnostic criteria for autism spectrum disorder.

According to DSM-5 (APA, 2013) autism spectrum disorder (ASD) is characterized by persistent and pervasive challenges in social communication and restricted and repetitive behaviors, interests, or activities. These characteristics include deficits in social-emotional reciprocity (e.g., failure to initiate and respond to social interaction), nonverbal communication (e.g., lack of sustained and integrated eye contact, deficits using gestures), and developing social relationships. Characteristics of ASD also include symptoms and challenges in restricted and repetitive behavior. These areas 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.

In addition to the specific diagnostic criteria of autism spectrum disorders, the DSM-5 outlines accompanying information such as behavioral patterns and symptom severity. Symptoms related to autism tend to emerge in the early developmental period between two and three years of age. For instance, delayed language accompanied by lack of social interest or unusual social interaction have been identified as early "red flags" for ASD (Johnson, 2007). However, these symptoms may not be fully manifested until social demands exceed the child's developing skills. The DSM-5 outlines ASD as a continuum of symptom severity and functionality. In addition, the DSM-5 allows clinicians to specify diagnostic symptoms of ASD in terms of functional severity level. Clinicians can note any accompanying features to an ASD diagnosis by specifying accompanying impairments in language and intellectual abilities (APA, 2013).

Epidemiology. The U.S. Centers for Disease Control (CDC, 2014) reports the current estimate of prevalence rates of ASD as 1 in every 68 births. ASD is diagnosed in 1 and 42 males and 1 and 189 females. These rates are about 120% higher than prior 2002 estimates of 1 in 150 children according to survey estimates conducted by the CDC as part of the Autism and Developmental Disabilities Monitoring Network (Baio, 2012). ASD reportedly occurs in every culture, ethnicity, and socioeconomic group, but the diagnosis of ASD is nearly 5 times more common in males (CDC, 2014; Elsabbagh et al., 2012). Age of diagnosis has been linked with socioeconomic status such that lower SES often is related to later diagnosis (Hill, Zuckerman, & Fombonne, 2014). The reliability of a diagnosis of autism has been established for children as young as 24 months, however most diagnoses typically occur after the age of four (CDC, 2014; Johnson,

2007). These increased prevalence rates have raised concerns among parents, researchers, and clinicians.

Researchers and clinicians are somewhat divided when evaluating the increase in prevalence and whether or not it truly represents an increased risk in the population. Specific environmental factors have been noted by some as reasons for the increased ASD prevalence while others highlight recent changes in the early identification and diagnosis (CDC, 2011; Volkmar, Paul, & Rogers, 2014). For example, Hill et al. (2014) proposed diagnostic changes and improved diagnostic tools as key reasons for increased prevalence. Weintraub (2011), however, argued that increased awareness and diagnostic criteria only explain part of the rise in prevalence rates. Casanova (2014) theorized the neuropathology of autism as a combination of three factors: genetic predisposition, exogenous stress, and a critical period of brain development. Different contributions of these factors may help explain the heterogeneity of symptom presentations in autism. Research on the etiology of ASD provides further examination of these factors.

Etiology. The precise etiology for autism has not yet been identified; however, genetic, environmental, and biological factors all likely play a role in ASD. Most researchers agree that specific genetic factors increase the likelihood of an ASD diagnosis (Huquet & Bourgeron, 2013). Twin, sibling, and family studies provide evidence for the genetic etiology of ASD. Twin studies have provided estimates for genetic heritability of autism at close to 90% (Bailey et al., 1995; Freitag, 2007). Hallmayer et al. (2011) found concordance rates of ASD at about 60% for monozygotic twins and 25% for dizygotic twins. The increased incidence rates for infant siblings of children already diagnosed with ASD provide further evidence for the strong genetic heritability of autism. For

example, Ozonoff et al. (2011) found that 18.7% of infant siblings also developed ASD which represented a higher recurrence rate than previous estimated rates of 3-10%. Further, first-degree relatives of individuals diagnosed with autism may demonstrate specific neurocognitive features at subclinical levels such as speech delays and repetitive behaviors noted as the broader autism phenotype (Bolton et al., 1994; Losh, Adolphs, & Piven, 2011). Overall, continuing research highlights strong genetic heritability of ASD.

In addition to the strong genetic factors related to autism, environmental factors also have been studied. In their study of rates of ASD in twins, Hallmayer et al. (2011) suggested that the shared environment of twins may represent a stronger contribution than genetic factors. In fact, they found that the environment accounted for about 55% of the variance in risk of autism. Researchers have studied environmental contributions in relation to exposure to toxins in utero and maternal infection. For example, toxins in the environment such as prenatal exposure to thalidomide and valproic acid may contribute to increased risk for autism (Moore et al., 2000; Stromland, Nordin, Miller, Akerstrom, & Gillberg, 1994). Maternal infections such as fever and influenza have also been associated with increased risk of autism in some cases (Gardener, Spiegelman, & Buka, 2009; Zerbo et al., 2013). Other specific environmental factors have been identified as greater paternal age, premature birth, or low birth weight (Durkin et al., 2008; Levy et al., 2010).

Lastly, specific biological factors in brain development have been studied in relation to the etiology of autism. Williams and Minshew (2010) suggest that language delays in children with ASD may be the result of structural alterations in brain development interacting with the social environment. For example, Hodge et al. (2010)

found an increase in the cerebellar white matter in children with autism and language impairment in comparison to children with only specific language impairment. The authors theorized that this increase was most likely due to overgrowth and lack of synaptic pruning. Hill and Frith (2003) note that this lack of pruning may affect the functioning of specific neural circuits localized to brain regions theorized to be related to higher social cognition.

In summary, researchers highlight the combination of genetic, environmental, and biological factors in relation to the risk for autism. In regards to the neurodevelopment, various social cognitive explanations should be examined as potential mechanisms between biological brain alterations and behavioral symptoms of ASD. Hill and Firth (2003) cite deficits in the understanding of minds, or theory of mind (Baron-Cohen et al., 2000), as an example of social cognition likely related to differences in the brain and impairments in social communication. Given the increased incidence rates and varied etiology of autism, it is important to investigate the theories underlying the social communication impairments as one of the core diagnostic criteria in ASD (Bernier & Gerdts, 2010; Tager-Flusberg, 2000). The following section reviews the theoretical framework of social communication and language development in children with typical development and children with ASD.

Theoretical Framework of Social Communication

Language development is an important aspect of children's development. In fact, a deficit or delay in language acquisition is often the first indicator to parents that their child is not developing typically (Short & Shopler, 1988). Children's social environment typically provides numerous opportunities for them to learn and practice language.

However, children must be attentive and responsive to these opportunities in order to benefit from them. Therefore, the theoretical framework of language development is often viewed as an interaction of both internal and external influences (Chomsky, 1975). Chomsky proposes that humans are designed with the cognitive capacity to learn language. Similarly, Piaget (1950) focuses on how cognitive structures develop and change as children organize their experiences of the world (1950). According to Piagetian theory, language serves as a shared symbol of a child's mental representations of the world. In terms of language development, these internal cognitive structures continue to develop with external input from the environment (Chomsky, 1975).

Social cognitive learning theory conceptualizes learning as it occurs in social interactions with others (Tomasello, 1995). Bandura (1977) emphasizes the importance of observation and modeling in learning. Similarly, Bruner (1983) notes that language acquisition must occur within a support structure. Vygotsky (1978) noted that children are most likely to develop new skills within their zone of proximal development (ZPD), skills the child is able to learn with adult assistance. In this way, the ZPD also represents optimal teaching opportunities for acquiring new skills. According to Vygotsky, parents are key contributors in the language development of their children.

In the following sections social cognitive learning theory will be used as a theoretical framework for understanding language development in children with typical development and children with autism. These sections present background information on two foundational processes: intentional communication and social motivation.

Intentional communication. Bates (1979) defines intentional communication as, "Signaling behavior in which the sender is aware a priori of the effect that a signal will

have on his listener, and he persists in that behavior until the effect is obtained or failure is clearly indicated" (p. 36). Thus, intentional communication involves the ability to understand that another person is a communication partner who provides social information (Bates, Camaioni, & Volterra, 1975). The development of intentional communication with a social partner provides a foundation for future social behaviors such as joint attention or sharing attention with another. Intentional communication begins at about nine months in typically developing infants. During this time, infants learn that they can influence their social environment and others by sending signals to communicate. Overall, intentional communication involves the comprehension of language in terms of how it serves a social and informational purpose.

Bates (1979) outlines the process of intentional communication as involving three steps: (a) social interaction, (b) persistence, and (c) feedback from the social environment. First, social interaction involves the coordination and alternation of eye gaze between the desired object and the adult while producing some sort of signal such as making a sound or reaching. The alternation of eye contact is not necessarily the only component of this social interaction, but it is a behavioral indication that the child is linking his signaling behavior with the desired effects in his environment. Second, the persistence step involves the sequencing and changing of signals. Bates notes that any signal in this phase is beginning to be contingent upon changes of the listener in relation to obtaining the desired goal.

The third step of intentional communication involves feedback from the environment regarding obtaining the desired object. The opportunity to alter behavior may occur in response to feedback from the environment such as redirecting gaze, using

gestures, or making a verbal response (Bates, 1979). Communicative gestures such as shifting gaze and using gestures serve as reliable behaviors that lead another to attend to the child's intended goal. Unfortunately, these fundamental prelinguistic skills for language development, such as using communicative gestures and the ability to share attention with others, are early impairments seen in children with ASD (Mundy et al., 1994). In addition, intentional communication requires the desire to share those intentions or what has been termed as social motivation.

Social motivation. In general, human beings appear to be socially motivated to interact with one another. They desire to engage with others and find these interactions rewarding. Numerous researchers have examined young children's seemingly involuntary sensitivity and orientation to social stimuli such as faces who later receive an autism diagnosis (Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998; Rochat & Striano, 1999). Children as early as five months of age exhibit sensitivity to eye gaze in adults during social interactions (Symons, Hains, & Muir, 1998). Chevallier, Kohls, Troiani, Brodkin, and Schultz (2012) outline social motivation theory in terms of: (a) social orienting; (b) social reward such as seeking and taking pleasure in social interactions; and (c) maintenance of social relationships. Social motivation theory provides an explanation for the importance of social attention and intentional communication in terms of language development.

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 behaviors such as joint attention may arise from a lack of social understanding and interest (Charman, 1998; Mundy, Sigman, Ungerer, &

Sherman, 1986; Sigman & Kasari, 1995). Impairments in social orientation are theorized to be a failure to find social stimuli rewarding (Dawson et al., 1998). Mundy and Neal (2001) theorize that these early impairments may create a negative feedback loop leading to fewer opportunities for these children to gain and learn from social situations and possibly interfering with language development. Before discussing research on the social communication skills of children with autism, an overview of language development in typically developing children will be provided.

Social Communication

Overview of language development in typically developing children. Typical language development can be organized by children's achievement of milestones in receptive and expressive language across the first 48 months of life. Receptive and expressive language are also referenced together as aspects of structural language (Boucher, 2012; Tager-Flusberg, 2000). Receptive language, or the ability to comprehend the meaning of speech, is acquired before expressive, spoken language. Hoff (2009) notes that children can demonstrate some receptive language at 6 months of age by responding to their name. Bergelson and Swingley (2012) add that children's receptive vocabulary is also evident about this time by their ability to orient to a person such as "daddy" when hearing his name.

Children begin to acquire expressive spoken language in their second year of life. Babbling, a syllabic sequence (e.g., bababa, dadada) begins at about six months, representing an early form of expressive language (Oller, Oller, & Oller, 2012). Children's expressive speech begins at about twelve months of age as they begin to use single words (Hoff, 2009). At fifteen months, children's average expressive vocabulary

increases to about ten words while their average receptive vocabulary increases to 50 words (Tager-Flusberg, Paul, & Lord, 2005). At about eighteen months of age a dramatic increase in both expressive and receptive language occurs which has been termed the vocabulary explosion (Tomasello, 2001). Children's average expressive vocabulary increases to up to 200 words. Many children are beginning to combine words at this time as well (Tager-Flusberg et al., 2005). At the end of the second year of life children's vocabulary is at about 300 words and most are beginning to use two-word phrases (Fenson et al., 1994; Tager-Flusberg et al., 2005). Children between the ages of three and four continue to develop acquired language and begin to build skills related to grammar, articulation, and conversation (Hoff, 2009). Between the ages of four and seven years children begin to reach an area of language development noted as the limit of diminishing returns in terms of expressive and receptive language. In this way, many children begin to add pragmatic language, the socially appropriate use of language, to their repertoire as they begin to use language in their social environment (Oller et al., 2012). The research literature related to pragmatic language development will be discussed in more detail in the following section.

Pragmatic language in typically developing children. Pragmatic language is the socially appropriate use of language including adapting to different audiences and maintaining conversation changes across different social contexts. Pragmatic language involves knowing when to say what to whom and how much is appropriate to say in a given social context (Bishop, 1997). Pragmatic language is considered to be a relatively distinct construct from expressive and receptive language (Fujiki & Brinton, 2009).

Nonetheless, pragmatic language similarly develops along a typical developmental trajectory.

Children demonstrate early pragmatic skills by orienting to their caregiver's speech and the movement of her face (Hyde, Jones, Flom, & Porter, 2011). This type of temporary synchrony is regarded as the first pragmatic milestone in typically developing children. In this way, children are demonstrating an understanding of how language is used (Oller et al., 2012). Hoff (2009) explains that children as young as two years of age demonstrate an understanding of turn taking in conversation. Children continue to acquire pragmatic language skills such as politeness, asking questions, and narrating stories in conversation (Tager-Flusberg et al., 2001).

Impairments in pragmatic language often are evident in back and forth conversations. For example, individuals may have difficulty understanding humor, use overly literal language, provide insufficient information, or have difficulty with emotional tone or facial expressions (Martin & McDonald, 2003). More specifically, understanding the attention and emotion cues of others in conversation allows the speaker to highlight specific information and draw the listener's attention (Tager-Flusberg et al., 2001). The following section will review research on the language development of children with ASD and the specific pragmatic language difficulties in these children.

Overview of Language Development in Children with ASD

Numerous researchers have documented variations in language development in children with autism (Charman, 2003; Tager-Flusberg et al., 2009). For example, language impairments in children with ASD are heterogeneous. In terms of receptive and expressive language, children with autism can have exceptional language abilities,

standard language scores within average range, or minimal language ability. However, many children with autism who have expressive and receptive verbal abilities within the average range have more specific aspects of language such as articulation, comprehension, and grammar. These challenges are found in many children with ASD in early development and some continue to have these impairments in structural language throughout the lifespan (Boucher, 2012).

Language acquisition in children with ASD often occurs along an atypical trajectory. Children with autism frequently first develop expressive language skills and then receptive language skills, representing a reversal of the typical pattern of language development (Charman, Drew, Baird, & Baird, 2003). In other words, they often demonstrate stronger expressive language skills than receptive skill related to understanding the language of others.

Researchers have also studied language impairments in children with autism in comparison to children with other developmental delays in order to identify any distinct patterns associated with ASD. Weismer, Lord, and Esler (2010) found that toddlers with ASD exhibited deficits in nonverbal cognition, receptive language, and expressive language in comparison to children with other developmental delays. Children with developmental delays had average receptive language and nonverbal cognition, but lower expressive language in comparison to their chronological age; however, children with autism had delays in both receptive and expressive language. In addition, researchers have documented the particular challenges of pragmatic language for children with autism regardless of the development of expressive and receptive language (Tager-Flusberg et al., 2001). These impairments include back and forth conversation and

nonverbal behaviors such as gestures, eye contact, body language, and facial expressions (Prutting & Kirchner, 1987). A more detailed examination of pragmatic language in children with autism is presented in the following section.

Pragmatic language in children with ASD. Pragmatic language has been noted as universally impaired in children with autism. Pragmatic language includes both verbal and nonverbal behaviors. Verbal aspects of pragmatic language difficulties in individuals with ASD include providing insufficient or excessive information, abrupt topic changes, limited back and forth conversation, and having difficulty interpreting non-literal language (Philofsky, Fidler, & Hepburn, 2007). Nonverbal behaviors related to pragmatic language include the use gestures, eye contact, body language, facial expressions and attention (Prutting & Kirchner, 1987). Pragmatic language difficulties often serve as a discriminatory variable between children with autism and children with other developmental delays (Weismer et al., 2010). Therefore, a further examination of pragmatic language is necessary when investigating social communication deficits in children with ASD.

Difficulties in pragmatic language appear to be a consistent issue for children with autism. For example, some children with ASD present with pragmatic language impairment but intact expressive and receptive language abilities (Grzadzinski et al., 2013; Landa, 2000; Young et al., 2005). For many other individuals, their social communication deficits have been referenced as a "double-hit" of impairment because they have difficulty with the structural domains of language (e.g., expressive and receptive language abilities) and the pragmatic use of language in social settings (Tager-Flusberg, 2000). In prior research using diagnostic criteria from DSM-IV-TR, children

who displayed symptoms related to autism but did not have clinically significant structural language impairments were diagnosed with Asperger's disorder (APA, 2000). Yet, individuals with Asperger's or with "high functioning" autism often have large spoken vocabularies but deficits in pragmatic language (Tager-Flusberg et al., 2005). Overall, pragmatic language deficits remain a persistent challenge for individuals diagnosed on the autism spectrum.

Pragmatic language has been linked with deficits in social development. For example, Volden et al. (2009) found that high pragmatic language skills as measured by the Test of Pragmatic Language (TOPL; Phelps-Terasaki & Phelps-Gunn, 1992) predicted less severe social impairment whereas increased expressive language ability was associated with more severe social impairment as measured by adaptive scores on the Vineland Adaptive Behavior Scale (VABS; Sparrow Balla, & Cincchetti, 1984). In addition, these authors reported that pragmatic language accounted for 27% of the variance in communication and socialization as reported on the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, & LeCouteur, 1994). This variance was above and beyond the variance explained by cognition as well as expressive and receptive language. Based on this finding, Volden et al. (2009) proposed that pragmatic language skills significantly contribute to how well an individual functions in his social environment. In addition, the unique variance accounted for by pragmatic language may distinguish this construct as an additional aspect of social communication that influences social functioning.

Overall, pragmatic language is a persistent area of challenge for children with autism that has numerous implications for their language and social development. It is

important to understand factors that facilitate pragmatic language development for children with ASD. In early childhood, caregivers often are children's primary social partners (Bakeman & Adamson, 1984). This is especially true for children with ASD who are especially dependent on external support for engaging with and benefiting from their social environment. Therefore, it is important to investigate how parent support may provide a foundation for children's social communication skills such as pragmatic language.

Role of parents in language acquisition. Social cognitive learning theory maintains that the social environment provides opportunities for learning language (Tomasello, 1995). Parents facilitate children's language development through providing differing levels of support depending on their children's needs (Vygotsky, 1978). Children with autism continue to rely on their social partner for communicative support much longer than children who are typically developing (Keen, 2014). Therefore, the level of support provided by parents during parent-child interactions is important when examining language development in children with typical development versus those with ASD.

One type of support provided by parents involves helping children direct their attention toward relevant aspects of their social environment. Attending to the social environment is a prerequisite for benefiting from opportunities presented in the social context (Tomasello, 1992). The process of parental support for attention usually involves the following basic elements. While the child is engaged with their parent, the parent uses this social engagement as an opportunity to draw the child's attention to other aspects of their social environment. Through repeated experiences with this type of

parent scaffolding children become more adept at jointly attending to objects and events with the parent and eventually are able to initiate instances of joint attention more independently. The child's ability to establish joint attention and respond to or direct a social partner's attention represent a major milestone in their understanding of intentional communication (Bates et al., 1979; Bottema-Beutel et al., 2014; Charman, 2003; Tomasello, 1995; Koegel et al., 1999).

In the following sections I provide definitions and descriptions of joint attention as well as review research on joint attention in children with TD and ASD. Information is also presented on important aspects of joint attention such as dyadic and triadic joint attention, the role of responsiveness to joint attention and the initiation of joint attention, and the relation between joint attention and language development. A more detailed review is necessary because moments of joint attention provide opportunities for caregivers to support the development of their children's joint attention skills and language.

Joint Attention

Background of joint attention. Joint attention is a prelinguistic skill that provides the foundation for children to attend and learn language within their social environment. More specifically, joint attention facilitates children's ability to direct their attention to relevant social information as well as process and use this information in social situations (Mundy, Sullivan, & Mastergeorge, 2009). Children's ability to engage in joint attention provides a behavioral representation of their responsiveness to and engagement with events in their social world (Baron-Cohen, 1989; Baron-Cohen, Wheelwright, & Jolliffe, 1997). Numerous aspects of joint attention must be in place for

a child to attend to and engage with their social world. More specifically, joint attention requires social orientation and the management of attention between a social partner and objects in the social environment. Dyadic joint attention and triadic joint attention represent the distribution of various levels of attention (Mundy et al., 1986; Mundy et al., 2009) and will be discussed in more detail in the following sections.

Dyadic joint attention. Dyadic joint attention refers to processes used in social orientation such as coordinated eye contact or coordinated gaze, as well as shared affect with a social partner (Dawson et al., 2004). Dyadic joint attention is an early social cognitive skill used to initiate a social exchange with someone else. Mundy et al. (1994) describe dyadic joint attention as, "Gestures and eye contact to coordinate attention with another person in order to share experiences of an interesting object or event" (p. 389). Other common behaviors associated with joint dyadic attention include gaze shifting, pointing, and showing (Bono, Daley, & Sigman, 2004; Charman, 2003).

The quality of joint attention has been hypothesized to be essential in its relation to language development. For example, Dawson et al. (2004) proposed that dyadic joint attention may mediate the relation between social orienting and language development. More specifically, a child's dyadic attention with a social partner must be established first before orienting the person to an outside object (Leekam & Ramsden, 2006). Thus, social orienting alone does not lead to language development, rather it serves as a prerequisite skill for directing another's attention to objects in the social environment in order to learn about these objects. The distribution of attention between a social partner and other objects in the environment, referred to as triadic attention, also plays a large role as children learn from their social environment.

Triadic joint attention. Triadic joint attention involves the child's coordination of joint attention between his social partner and an outside object. Coordination of this type of attention involves pointing, showing, or alternating gaze as is seen in dyadic joint attention but also involves at least three shifts in attention, for example, to a social partner, to an object, and back to the partner. Triadic attention also involves initiating, maintaining, and responding to the attention of someone else in relation to an object in the social environment. Thus, triadic joint attention requires children to monitor various levels of their attention in relation to a social partner and the social environment (Mundy et al., 1994; Mundy et al., 2009).

In summary, repeated experiences with dyadic and triadic joint attention facilitates children's language development in children by directing their attention to opportunities to learn about objects and people in their social environment. The following section briefly will review the development of these skills in children with typical development and children with autism.

Joint attention in children with typical development. The visual coordination of gaze with another individual, also defined as dyadic joint attention, has been noted in children with TD as early as four months of age (Bruner, 1977). The development of coordinated joint attention, or triadic joint attention, occurs at about 18 months in typically developing children (Bakeman & Adamson, 1984). For example, a child who point to a preferred object while shifting his gaze between the object and his social partner is exhibiting this coordinated, triadic joint attention. Joint attention has been shown to predict future language development for children with typical development (Charman, 2003; Kasari, Freeman, & Paparella, 2001; Mundy et al., 1990; 1994).

However, as typically developing children continue to develop language, their verbal skills tend to replace nonverbal joint attention as a means for gaining their social partner's attention and obtaining their goals (Adamson & Bakeman, 1985). Therefore, the role of joint attention in language acquisition is a concern for children with autism who have impairments in language.

Joint attention in children with ASD. Children with ASD do not have well-established joint attention skills in comparison to their TD peers and a lack of these skills is one of the most reliable diagnostic variables for ASD (Charman, 2000; Leekham & Ramsden, 2006). Because a lack of joint attention skills is one of the early signs of autism, joint attention is often targeted in early interventions (Charman, 2003). Impairments in dyadic joint attention is hypothesized to relate to the failure to find social stimuli rewarding (Dawson et al., 2004). Researchers have found that children with autism are less likely to look at others, show toys, and respond to their name. In fact, decreased dyadic joint attention has been observed as early as one year of age in these children (Osterling & Dawson, 1994). In the remaining sections of this paper, the term joint attention will refer to triadic joint attention.

Mundy et al. (2009) notes that many individuals with autism may display high levels of social motivation or social cognitive skills but remain impaired in their execution of their social skills. Further, Mundy et al. (2009) conceptualized triadic joint attention as the parallel processing of attention. The ability to process and organize social information is an area of observed difficulty in autism spectrum disorders (Mundy et al., 2009). Responsiveness to joint attention and the initiation of joint attention are

both aspects of triadic joint attention and will be further reviewed in how they relate to language outcomes.

Responsiveness to and initiation of joint attention. The responsiveness to joint attention (RJA) and initiation of joint attention are regarded as two distinct skills (Bono et al., 2004). First, responsiveness to the joint attention bid of another person serves as an opportunity for the responder to learn and engage with the social world. More specifically, responsiveness to joint attention is the child's or parent's response to their social partner's point or shift in eye gaze to an object or event in their social environment. However the link between responsiveness and learning from the social environment often is dependent on another, such as a caregiver, to initiate opportunities for joint attention. Overall, increased responsiveness to the joint attention bids of a social partner is likely to affect the development of more complex social behaviors such as the initiation of joint attention (Koegel et al., 1999; Mundy et al., 1994).

The initiation of joint attention is a central skill of intentional communication. It serves both an informative and social function by shifting attention to relevant stimuli in the social environment (Jones & Carr, 2004; Kirsten, Sodian, Thoermer, & Perst, 2011). For example, children may initiate joint attention with a social partner in order to gain information or to share a social experience. Mundy et al. (1994) defines the initiation of joint attention as a more complex skill in comparison to responsiveness to joint attention which only requires the monitoring of another's attention. Whereas responsiveness to joint attention involves responding another's bit for attention, the initiation of joint attention is defined as one individual directing the attention of another individual.

Both responsiveness to joint attention and initiation of joint attention have been found to positively predict language development for children with autism (Bono et al., 2004). The initiation of joint attention is considered to be a more complex social cognitive behavior because it requires the motivation to engage with the social environment (Mundy et al., 1994, Mundy, 2003). Mundy et al. (1994) notes that the initiation of joint attention remains relatively impaired in individuals with autism whereas responsiveness to the joint attention may improve throughout development. Siller and Sigman (2008) found that responsiveness to joint attention (RJA) was the strongest predictor of rate of language acquisition in children three to five years of age measured at four time periods across eight weeks. Mundy and Jarrold (2010) found that IJA was more significantly related to measures of language in children with autism. In addition, Gillespie-Lynch et al. (2013) found that only IJA was a significant predictor of language for children with ASD.

Joint attention and language in children with ASD. The establishment of joint attention skills appears to be important for a number of different developmental outcomes including language. As noted earlier, joint attention is positively associated with language development in children with typical development and with ASD (Charman, 2003; Jones & Carr, 2004; Mundy et al., 1990). Researchers have examined both responsiveness to and initiation of joint attention in relation to expressive and receptive language and pragmatic language in children with ASD.

Joint attention longitudinally predicts expressive and receptive language. A number of longitudinal studies have investigated the relation between joint attention skills and language development in individuals with autism. Charman (2003) examined

both dyadic and triadic measures of joint attention in relation to expressive and receptive language ability at 20 months and 42 months of age. He found that dyadic joint attention (e.g., gaze shifting and imitation) was associated with fewer social and communication impairments and increased language in children with autism. Charman found that only imitation, a measure of dyadic joint attention, as compared to IQ or eye contact at 20 months of age longitudinally related to increased expressive and receptive language ability at 42 months. Charman (2003) discusses that these variations in social communication impairments may lead to different language outcomes in children with autism.

In addition to this study, Gillespie-Lynch et al. (2012) examined responsiveness to joint attention, intelligence, and language with 20 adults (M = 26.6 years) with autism measured across three previous time points with mean age of: 3.9 years, 11.7 years, and 18.3 years. They measured the responsiveness aspect of joint attention in a social environment using the Early Social-Communication Scale (ESCS; Seibert, Hogan, & Mundy, 1982). Responsiveness to joint attention assessed in childhood predicted improved social skills as assessed by the Vineland Adaptive Behavior Scales (VABS; Sparrow et al., 1984) and improved nonverbal communication as assessed by the Autism Diagnostic Interview (ADI-R; Rutter, Le Courteur, & Lord, 2003) in adulthood.

Joint attention in relation to pragmatic language. Only two known studies have assessed joint attention and pragmatic language development. Loveland and Landry (1986) examined pragmatic language and joint attention in children with ASD in comparison to children with developmental delays. They studied how children initiated attention by pointing and showing objects to the examiner in relation to their proper use

of personal pronouns (e.g., "I/you"). Eleven children with autistic disorder and 11 children with developmental delays in language participated in this cross-sectional study. The authors found that children's correct production of personal pronouns was positively related to their spontaneous initiation of joint attention. This relation was only significant for the children with autism and not for the children with developmental language delay. Loveland and Landry proposed that for children with autism a unique relation exists between initiation of joint attention and pragmatic language in comparison to children with other developmental language deficits.

More recently, Gillespie-Lynch et al. (2013) assessed the relation between initiation and responsiveness to joint attention at 12 months of age in relation to language and pragmatic language approximately six months later in children with and without autism spectrum disorders. Structural components of expressive and receptive language such as semantics, syntax, and phonology were assessed using the Clinical Evaluation of Language Fundamentals - 4 (CELF-4, Semel, Wiig, & Secord, 2003). Pragmatic language was assessed using the Children's Communication Checklist-2 (Bishop, 2003), a parent-reported measure. Gillespie-Lynch et al. (2013) found an association between joint attention and structural language but not for pragmatic language for children with ASD. Although a significant relation between joint attention and pragmatic language was not found in this study, a marginal association between responsiveness to joint attention and school age pragmatic language (p = .061) was found for the typically developing group (Gillespie-Lynch et al., 2013).

In order to gain a better understand how joint attention may help children with ASD attend and learn from their social environment, it may be necessary to incorporate

other elements of support such as parents. Children with autism often need additional support to benefit from joint attention and learn from their social environment (Bates et al., 1979; Bottema-Beutel et al., 2014). Therefore, the current study will examine the role of parent supported joint attention in relation to children's pragmatic language.

Parent Supported Joint Attention

The establishment of joint attention is crucial in language development because it creates opportunities for social interactions. The effectiveness of joint attention relies on feedback from the social partner and the social environment. Caregivers often are children's primary social partners in early childhood. Therefore, before children are able to coordinate joint attention independently, children's caregivers often support their attention (Bakeman & Adamson, 1984). Supported joint attention refers to moments when the parent and child are engaged with the same toy, but they do not necessarily reference one their social partner (Bottema-Beautel et al., 2014). In other words, this interaction is similar to dyadic joint attention but does not require that the participants acknowledge one another with eye contact or gaze shifts. In addition, this type of supported joint attention is dependent on the parent to initiate and sustain the child's attention in the form of physical or verbal direction (Bakeman & Adamson, 1984; Bruner, 1983; Trevarthen & Hubley, 1978; Vygotsky, 1978).

Parental responsivity and synchrony in play interactions. Parent's use of language in moments of parent-child interactions may have significant implications for their child's language across time. Haebig, McDuffie, and Weismer (2013) studied parental responsivity to children's attention in relation to language development. For example, when a parent observed the child attending to a ball, the parent made a

statement about the ball. Their study found that only parent directives for language that followed the child's attention predicted both expressive and receptive language one year later.

Similarly, Siller and Sigman (2002) found a longitudinal association between parents' level of synchronization with children during play interactions and later development of joint attention skills and language skills measured at one, ten, and sixteen years later. Parents' higher levels of synchronization with their children as measured in a play interaction led to significantly higher verbal and nonverbal language in comparison to children whose caregivers demonstrated lower levels of synchrony. In addition, Siller and Sigman (2002) report that parents' utterances synchronized with the children's focus of attention remained the strongest predictor of children's language over time.

Parent supported joint attention in play interactions. Researchers have begun to explore the association between joint attention and language development within parent-child interactions. Kasari, Panarella, Freeman, & Jahromi (2008) conducted a study on joint attention and play interventions in 58 children ages three to four years of age with ASD and their parents across a six week period. The study examined language outcomes in three groups: free play control group, symbolic play group, and joint attention treatment group. The joint attention treatment group included training on how to create moments of joint engagement and specific bids for joint attention with their child. Kasari et al. (2008) found that the joint attention treatment group had greater improvements in expressive language skills than the symbolic play or control playgroups.

In addition, Bottema-Beutel et al. (2014) examined the relation between parent's use of supported joint engagement, parent's language, and children's social

communication across eight months in 63 children with autism ages 24 to 47 months and their parents. These researchers assessed the frequency of supported joint engagement and parent utterances in a free play task. The researchers also examined higher order supported joint engagement, such as turn taking, imitation, following verbal instructions, and lower order supported engagement, such as no reciprocal exchanges beyond joint engagement in the materials. Bottema-Beutel et al. reported that higher order supported joint engagement behaviors predicted later expressive language and social communication. Higher order supported joint engagement did not significantly relate to receptive language. In addition, lower order supported engagement alone did not significantly predict any language outcomes.

In summary, researchers have examined how parent's scaffold and support joint attention in free play interactions in relation to language. Parents' use of verbal responsivity and synchrony play a key role in their children's acquisition of language across time (Haebig et al., 2013; Siller & Sigman, 2002). Siller and Sigman's (2002) longitudinal analysis of these variables provides support for the role of parents to create opportunities for children to attend to social experiences and acquire language skills. These authors add that these opportunities are especially beneficial for those children who have deficits in joint attention. In addition, recent research highlights the role of parent supported joint attention in the language development of children with autism (Bottema-Beutel et al., 2014; Kasari et al., 2008). Bottema-Beutel et al. (2014) found that higher order parent supported joint attention may play a pivotal role in children's acquisition of social communication. Overall, research suggests that parents play an

integral role in establishing moments of joint engagement with their children so that they can learn from their social environment.

Current Study

Children with ASD have persistent deficits in their understanding of others as intentional agents of communication (Bates et al., 1979; Bottema-Beutel et al., 2014). In comparison to children with typical development, children with autism may be more likely to benefit from parent support to engage in moments of social interaction and joint attention (Bakeman & Adamson, 1984; Tager-Flusberg, 2001). Therefore, the current study will examine pragmatic language and parent supported joint attention in children with autism and children who are typically developing. More specifically, this study will examine moments of parent supported joint attention in the context of a parent-child free play task. Pragmatic language will be examined in terms of its relation to developmental status and pragmatic language as a distinct measure of language apart from expressive and receptive language. Parent supported joint attention will be examined as a mediator variable between developmental status and pragmatic language. Lastly, the conditional indirect effects of parent supported joint attention and child responsiveness to and initiation of joint attention will be assessed in relation to pragmatic language. Based on previous research, the following hypotheses were made.

Hypotheses

Hypothesis 1A. I hypothesized that children's developmental status (ASD versus TD) would predict children language skills, with children with ASD exhibiting lower language scores on assessments of expressive, receptive, and pragmatic language. Impairments in structural language and social communication have been well

documented by researchers (APA, 2013; Tager-Flusberg, 2001; Tager-Flusberg et al., 2001).

Hypothesis 1B. I hypothesized that children with ASD would have significant impairments in pragmatic language while 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 (see Tager-Flusberg, 2001, Volden et al., 2009, Young et al., 2005).

Hypothesis 2. I hypothesized that children with autism spending would have fewer moments of both (a) dyadic and (b) triadic joint attention with their caregivers in comparison to their typically developing peers. Less time spent in dyadic (Osterling & Dawson, 1994) and triadic (Mundy et al., 1994) moments of joint attention has been observed in children with ASD. Previously highlighted research hypothesized these deficits in joint attention to be a nonverbal behavioral representation of the social impairments in children with autism (Baron-Cohen, 1989; Baron-Cohen et al., 1997). Consistent with previous research, I expected that in general children with autism would exhibit fewer joint attention behaviors in their social interactions with their caregivers.

Hypothesis 3. I hypothesized that children's developmental status would predict parents' use of supported joint attention. In other words, compared to parents of children with TD, I hypothesized that parents of children with autism would engage in a higher frequency of instances of parent supported joint attention in order to structure their children's attention with them in a free play task. Children with autism typically rely on

their social partner for communicative support longer than children with TD (Keen, 2014). Therefore, it seems likely that parents of children with ASD would use additional methods of support such as supported joint attention in comparison to parents of children with typical development who may not rely on their parents to support their attention (Adamson & Bakeman, 1985).

Hypothesis 4. I hypothesized that parent supported joint attention would mediate the relation between developmental status and pragmatic language. Parent supported joint attention scaffolds learning moments in the social environment so that the child can attend to and learn language (Bottema-Beautel et al., 2014). The positive relation between joint attention and language has been established by numerous researchers (Charman, 2003; Gillespie-Lynch, 2012). Children's expressive and receptive language scores were controlled for this analysis in order to examine pragmatic language as a distinct construct. Preliminary research has examined the relation between joint attention and pragmatic language (Gillespie-Lynch et al., 2013; Loveland & Landry, 1986); however, no known study has examined parent supported joint attention and pragmatic language. The current study examined parent supported joint attention as a mechanism explaining the association between children's status and pragmatic language (see Figure 1).

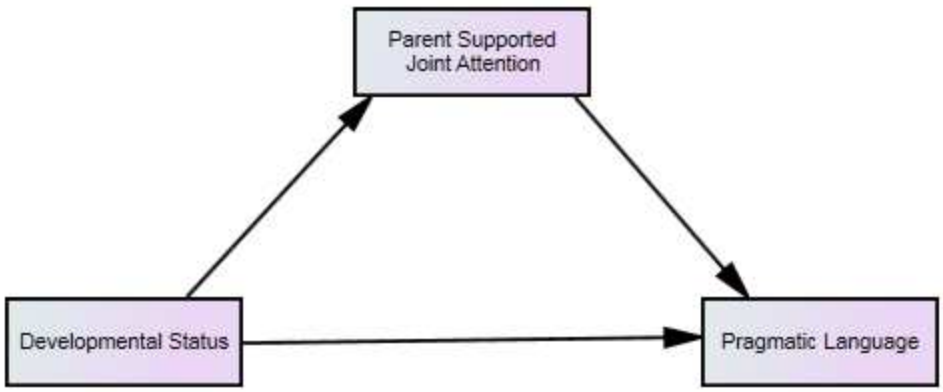

Figure 1. The proposed indirect effect of developmental status on pragmatic language through parent supported joint attention.

Hypothesis 5. I hypothesized that children who are responsive to their parent supported bids for joint attention would have higher scores on an assessment of their pragmatic language. The conditional indirect effects of developmental status on pragmatic language through parent support joint attention, as moderated by children's responsiveness to their parents' joint attention bids were assessed. Children's expressive and receptive language scores again were controlled for this analysis in order to examine pragmatic language as a distinct construct. Children's responsiveness to joint attention (RJA) was found to be a significant predictor of receptive and expressive language ability both concurrently and longitudinally (Bono et al., 2004; Gillespie-Lynch et al., 2012). In relation to pragmatic language, a marginally significant relation was found between responsiveness to joint attention and pragmatic language for the typically developing group (Gillespie-Lynch et al., 2013). Examining these variables within the context of parent supported joint attention may assess how the parent child interactions may scaffold

the acquisition of pragmatic language in children with autism.

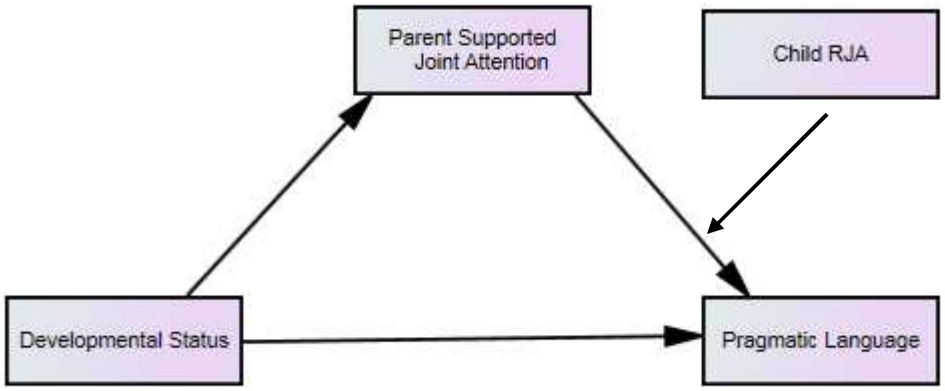

Figure 2. The proposed indirect effects of developmental status on pragmatic language through parent supported joint attention as moderated by children's responsiveness to joint attention.

Hypothesis 6. I hypothesized that children who are responsive to their parent supported bids for joint attention and then make initiations of joint attention would have higher scores on an assessment of their pragmatic language. The conditional indirect effects of developmental status on pragmatic language through parent supported joint attention as moderated by children's initiation of joint attention were assessed. The initiation of joint attention has been theorized as a more complex skill in terms of joint attention and often remains relatively impaired in children with ASD (Mundy et al., 1994). Parents' scaffolding of joint attention may create learning opportunities and increased support for children to then initiate later episodes of joint attention with their parents. The conditional indirect effects of developmental status on pragmatic language

through parent support joint attention, as moderated by children's initiation of joint attention were assessed. Children's expressive and receptive language scores were controlled for this analysis in order to examine pragmatic language as a distinct construct. Therefore, in other words, the combination of parent supported joint attention and children's initiation of joint attention is proposed to be significantly related to their pragmatic language scores such that children with higher rates of initiation of joint attention may have pragmatic language scores more similar to their typically developing peers than children with ASD with lower incidences of initiation of joint attention.

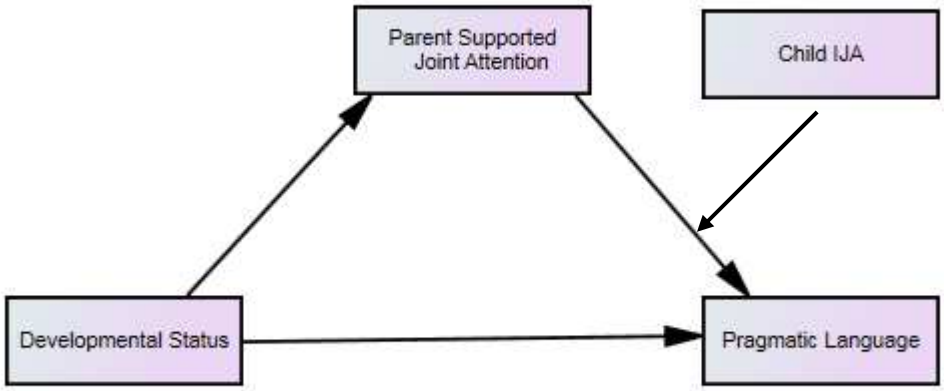

Figure 3. The proposed indirect effects of developmental status on pragmatic language through parent supported joint attention as moderated by children's initiation of joint attention.

Chapter II

Method

Participants

This study was part of a larger project investigating self-regulation skills in young children with ASD and with typical development (TD). Participants in this larger study included children between the ages of 3:0 and 6:11 and their parents. The current study included approximately 12 children in the ASD group diagnosed with (a) autistic disorder, (b) Asperger's disorder, or (c) pervasive developmental disorder-not otherwise specified (PDD-NOS). This current study also included approximately 14 in the TD, control group who did not have any diagnosis, have a sibling with ASD, or show elevated ASD symptom characteristics.

Procedures

Eligibility criteria. Children were required to meet several eligibility criteria to participate in the study. Children were between 3 and 6 years and 11 months of age at the time of the study. The typically developing group did not have children with elevated scores on a two screeners that assess symptoms characteristics of autism. Parents completed the Social Communication Questionnaire – Current Form (SCQ; Rutter, Baily, & Lord, 2003). Children in the typically developing group had parent rated scores lower than 15. In addition, all parents completed the ABC (Krug, Arick & Almond, 1980) to further ensure that TD children did not display symptoms characteristic of ASD, a score lower than 68 on this measure. In addition, children in both the ASD and TD group demonstrated verbal abilities within the average range as demonstrated on a verbal screener to participate in tasks. Children's expressive and receptive language were

assessed using the Differential Abilities Scale –II (Elliot, 2007). Children's overall language scores were at least within average range to participate. A more detailed description of these assessments is included in the measure section.

Recruitment. The current study included children and their parents who participated in a larger research project examining self-regulation. Participants were recruited for participation through autism organizations, local schools, therapy clinics, and by placing advertisements in parenting magazines and listservs. Participants were evaluated over two visits: (a) the enrollment visit, which typically takes place at the family's home or a local library and (b) the university visit at Seattle Pacific University. Data for the current study was collected during both the enrollment visit and the university visit.

Enrollment visit. The enrollment visit served to introduce the study, complete parent consent, and administer screening procedures to evaluate the child's eligibility for the study. Both parent consent and child assent to participate in the study was obtained during this enrollment visit. The enrollment visit lasted approximately 60-90 minutes and will take place in either the participant's house, local library, school, or the university. Parents completed a series of questionnaires, including the Social Communication Questionnaire (SCQ; Rutter et al., 2003) to screen for symptoms related to autism. The Differential Abilities Scale – Version II (DAS-II; Elliot, 2007) was administered to assess language ability. Once the child's eligibly for the study was established, the researcher then will proceed to schedule the university visit.

University visit. The university visit lasted approximately 90 to 120 minutes and included a variety of tasks related to self-regulation which are video-taped or audiotaped

for later coding. For the purposes of this study, the free play tasks occurred at this visit. This task is 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 and stickers.

Free-play task. Parents and children in this current study participated in an 8-minute, parent-child free play task. Numerous studies have assessed communicative behavior such as joint attention in the context of a semi-unstructured free play task (Loveland & Landry, 1986; Kasari et al., 2008). In the current study, parents were instructed to play with their children as they would at home. Each parent-child dyad was provided a set of age-appropriate toys. The toys included for this task also included ones with noise and removable parts (e.g., puzzle) to foster moments of joint attention between the parent and the child (Charman, 2003; Loveland & Landry, 1986). The current study examined how parents support moments of joint attention with their children in the context of the free-play task and how these opportunities related to the child's social pragmatic language. The measure section includes specific assessments and coding system that will be used in this study.

Measures

Developmental status. Parents confirmed their child's ASD diagnosis, parents provided original diagnostic reports or provided consent for diagnosing clinics to release reports.

Verbal skills. The Differential Ability Scale – Second Edition (DAS-II; Elliott, 2007) is a comprehensive assessment of cognitive abilities for children ages 2 years and 6 months through 17 years and 11 months. This current study used the early years

cognitive battery, which is for children between the ages of 2 years and 6 months and 6 years and 11 months. Children were assessed on their verbal comprehension and naming vocabulary skills. Each child's ability score, T score, percentile ranking, and age equivalent was used to assess the child's verbal ability, also referred to as their verbal IQ. The DAS-II was originally standardized with 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.

Autism screener. The Social Communication Questionnaire – Current Form (SCQ; Rutter et al., 2003) is an autism screening tool assessing the frequency autism symptoms across three domains: social interaction, communication, and restricted, repetitive patterns of behavior. This parent-report questionnaire contains 40 questions regarding their children's behavior using scores of 0 or 1 to indicate "yes" or "no." Total scores range from 0 to 40 with a cutoff score of 15 or greater indicative of ASD symptomatology. Reliability and validity for the SCQ have been well established. Internal consistency estimates for the SCQ range from .84 to .93 (Rutter et al., 2003). The SCQ also has a documented discriminate validity of .088 indicating it serves as a strong measure to screen autism spectrum disorders (Berument, Rutter, Lord, Pickles, & Bailey, 1999).

Pragmatic language. The Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999) is a normed-referenced oral language assessment in four areas: (a) lexical/semantic, (b) syntactic, (c) supralinguistic, and (d) pragmatic

language. The CASL was standardized using a nationally representative sample of 1,700 individuals between the ages of 3 and 21 with and without disabilities. The pragmatic judgment subtest was used in this study. This subtest measures the awareness of the appropriateness of language in relation to the situation in which it is used and the ability to modify language to that situation, (i.e., "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 items answered correct or incorrect based on the test manual. Support for the construct validity of this subtest for children starting at age 3 has found based on research indicating that children are able to reflect on their own speech acts and modify their speech for the listener (Bates, 1976; Prinz, 1982). Split-half reliabilities range from .79 to .90 for the ages of the participants in this current study.

Pragmatic language is a context dependent behavior that cannot be easily captured in a formal testing environment (Bishop, 1997). Only a few studies have been published using the CASL as an outcome measure for children with autism. Reichow, Salamack, Paul, Volkmar, and Klin (2008) evaluated the nonliteral language and pragmatic judgment subtests as measures of everyday language use in individuals with autism. The inferences and pragmatic judgment subtests accounted for a significant portion of the variance in the Socialization domain on the Vineland Scales of Adaptive Functioning (VABS; Sparrow, Balla, & Cincchetti, 1984), $R^2 = .45$, $p = .005$, indicating the construct validity of these subtests as a measure a of social communication in children with ASD. The CASL has also demonstrated clinical relevance for assessing pragmatic language and social communication outcomes in children with autism when compared to other parent report of socialization such as the VABS (Reichow et al., 2008). Overall, the CASL

appears to be an effective measure of pragmatic language for my dissertation due to its well-established psychometric properties, instrument of direct assessment of language, and short administration time.

Parent supported joint attention. Video recordings of the parent-child free play task were examined to assess for parent supported joint attention. The coding system was developed from the Caregiver-Child Joint Attention (CCJA) Coding Manual (Vo, 2011) and Supported Joint Engagement coding system (Bottema-Beutel et al., 2014). Each video was event coded for dyadic attention, failed dyadic attention, parent supported joint attention, triadic joint attention, and child responsiveness to parent's initiation of joint attention, and child initiation of joint attention. Other behavioral codes also include object attention and no attention. Parent supported joint attention refers to moments when the parent and child are engaged with the same toy, but they do not visually reference one another (Bottema-Beautel et al., 2014). Specific instances of joint attention were assessed within these moments to assess how the parent initiates and sustain the child's attention in the form of physical or verbal direction (Bakeman & Adamson, 1984). Triadic joint attention was coded as the coordination of attention between the child, parent, and an object. For example, behaviors such as pointing, showing, and alternating gaze between the social partner and object are all codes for triadic joint attention (Mundy et al., 1994). Lastly, child responsiveness was measured in terms of their responsiveness to their parent's joint attention bids and their subsequent bids for the initiation of joint attention with their caregivers. Child responsiveness was measured by the respondent's ability to engage at the specified point within five seconds of their parent's initiation of joint attention. Coders were trained and inter-rater reliability was

0.87. Inter-coder reliability was achieved using 25% of total videos and was greater than Cohen's kappa required score of .80.

Chapter III

Results

Power Analysis

An a priori analysis, using a statistical calculator software entitled G*Power (Buchner, Erdfelder, Paul, & Lang, 2009), was conducted to determine the appropriate number of participants needed to have sufficient power for the analysis. I chose to control for overall verbal ability to further examine pragmatic language apart from expressive and receptive language. Language and gender were also controlled for in this analysis. Five predictor variables were included in the power analysis: language, gender, child's developmental status, overall language ability, and parent supported joint attention as predictors in the power analysis. The selected Cohen's effect size was .15, the alpha level was 0.05, and the power level was .80. A medium effect size was selected because the present project does not include experimental analysis and previous research using regression analyses to examine parent supported joint attention and pragmatic language in children with autism in children with ASD has not been published. The effect size also was estimated to be medium based on findings from previous research examining at least two of the identified variables (Bottema-Beutel et al., 2014; Gillespie-Lynch et al., 2013). Based on these criteria, a minimum of 68 participants was needed to achieve significant power. Due to the sample size of the current study ($N = 26$), and a particularly small ASD subsample size ($n = 12$), analyses were underpowered to find statistical significant effects.

Data Entry and Preparation

All data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) Version 25 software. Developmental status was entered as a categorical variable (0 = *typically developing*; 1 = *ASD*). Regarding demographic variables, parent education level was entered as a categorical variable (1 = less than high school degree, 2 = high school degree, 3 = some college coursework, 4 = bachelor's, 5 = some masters, 6 = masters, 7 = some professional schooling beyond masters, 8 = completed professional degree) . Parent income level was entered as a continuous variable in terms of number of dollars. Children's age in months was entered as a continuous variable. Standard scores and percentiles were entered for the pragmatic judgment subtest of the CASL. The following variables were second by second coded: dyadic attention (DA), failed dyadic attention (F-DA), parent supported joint attention (PSJA), parent initiation of joint attention (P: IJA), child responsiveness to parent's initiation of joint attention (C: RJA), child initiation of joint attention (C: IJA), object attention (OA), and no attention (NA). In order to prepare the data for analyses, frequency counts of different codes were converted to percentages by dividing the seconds spent in a particular behavior by the total time of the parent child free-play task.

Data Screening

Prior to analysis, data were screened for missing data, outliers, and to examine the assumptions of parametric data. Results indicated 2 variables in the TD group and 1 variable within the ASD group failed the tests of normality, which are further discussed below. All children completed the DAS-II and CASL measures. No missing data were found for the parent reported demographic variables. With regards to the parent child

free-play task, one participant only completed the play task for 468 seconds. In order to include this case despite the shorter time, the percentage was calculated by dividing the seconds spent in a particular behavioral code by 468 seconds.

Continuous variables then were examined to test the assumptions for analyses utilizing multiple linear regression. Due to the presence of a categorical predictor variable (i.e., developmental status), normality was assessed for all continuous study variables within each group (i.e., ASD and TD groups) separately based on recommendations from Field (2013). The Kolmogorov-Smirnov test (K-S test) was conducted to examine normal distribution of study variables in conjunction with histograms, box plots, Q-Q plots, and the values of skew and kurtosis. Skewness and kurtosis values and z-scores were then examined to provide further information regarding distribution with estimates ≥ 1.96 considered significant (Field, 2013). Results indicated 2 variables in the TD group and 1 variable within the ASD group failed the tests of normality (see results in Table 1 for the TD group and Table 2 for the ASD group). Based on the significant skew and kurtosis for child initiation of joint attention (C: IJA) and child responsiveness to parent's joint attention (C: RJA), a square root transformation was made for these variables in order to improve the normality and reduce the influence of outliers in this data. Significant outliers were found for the TD group in the PSJA and DAS-II Expressive Language scores. Significant outliers were also found for the ASD group in the CASL and DAS-II Receptive Language scores. One ASD case contained a CASL score representing a significant outlier and was transformed to the next lowest score, 81, according to the Winsor method (Field, 2013). Overall, these cases likely represent children with autism with significantly lower pragmatic language and receptive

language scores, which is understood within the diagnostic criteria of autism spectrum disorder; therefore, these cases were not removed. Normality then was assessed for these transformed variables. These results are presented below in Tables 1 and 2.

Table 1

Normality Among Continuous Variables in TD Group

Variable	K-S Test of Normality			Kurtosis		Skewness	
	D	*Df*	*p*	Kurtosis	*z* Kurtosis	Skewness	*z* skewness
Age	0.24	14	0.03*	-1.85	-1.60	-0.05	-0.08
DAS-II	0.18	14	0.20	-1.42	-1.23	0.47	0.78
Expressive	0.14	14	0.20	-0.02	-0.02	0.72	1.20
Receptive	0.13	14	0.20	-0.42	-0.37	0.31	0.52
CASL	0.13	14	0.20	-1.15	-1.00	0.16	0.26
PSJA	0.13	14	0.20	-1.02	-0.87	-0.37	-0.62
C: RJA	0.13	14	0.20	-0.16	-0.14	0.22	0.36
C: IJA	0.37	14	<0.01*	-1.97	-1.71	0.45	0.75

Note: *indicates significant skewness or kurtosis. Age = chronological age in months, DAS-II = Differential Abilities Scale, Version 2 Verbal Ability Standard Score, CASL = Comprehensive Assessment of Spoken Language, Version 2, Pragmatic Judgment Standard Score, PSJA = Parent Supported Joint Attention, frequency code percentage, C: RJA = child responsiveness to parent's initiation of joint attention, frequency code percentage, square root transformation, C: IJA = child initiation of joint attention, frequency code percentage, square root transformation. *D* is the K-S (Kolmogorov-Sminov Test of Normality) test statistic. *Z* scores are calculated by dividing the respective standard error.

Table 2

Normality Among Continuous Variables in ASD Group

Variable	K-S Test of Normality			Kurtosis		Skewness	
	D	*Df*	*p*	Kurtosis	*z* Kurtosis	Skewness	*z* skewness
Age	0.14	12	0.20	-0.70	-0.57	-0.35	-0.55
Verbal Ability	0.12	12	0.20	-1.31	-1.07	0.01	0.02
Expressive Language	0.14	12	0.20	-0.87	-0.71	-0.47	-0.73
Receptive Language	0.17	12	0.20	0.78	0.63	0.29	0.45
Pragmatic Language	0.19	12	0.20	-0.18	-0.15	0.57	0.89
PSJA	0.12	12	0.20	-0.78	-0.63	0.59	0.92
C: RJA	0.13	12	0.20	-0.27	-0.22	0.48	0.75
C: IJA	0.46	12	<0.01*	0.56	0.46	1.49	2.33*

Note: *indicates significant skewness or kurtosis. Age = chronological age in months, DAS-II = Differential Abilities Scale, Version 2 Verbal Ability Standard Score, CASL = Comprehensive Assessment of Spoken Language, Version 2, Pragmatic Judgment Standard Score, PSJA = Parent Supported Joint Attention, frequency code percentage, C: RJA = child responsiveness to parent's initiation of joint attention, frequency code percentage, square root transformation, C: IJA = child initiation of joint attention, frequency code percentage, square root transformation. *D* is the K-S (Kolmogorov-Sminov Test of Normality) test statistic. Z scores are calculated by dividing the respective standard error.

Homogeneity of variance was examined using Levene's Test for equality of variances. As seen in Table 3, variances were significantly unequal between groups (ASD vs. TD) for child initiation of joint attention. All other variables yielded non-significant values for Levene's test for Equality of Variances.

Table 3
Homogeneity of Variance in Continuous Variables

Variable	Levene Statistic
Age	0.01
Gender	0.16
Child Ethnicity	0.10
Marital Status	0.18
Education	2.13
Annual Salary	0.88
Verbal Ability	0.51
Expressive Language	0.02
Receptive Language	0.57
Pragmatic Language	2.40
PSJA	0.28
C: RJA	0.23
C: IJA	5.14*

Note. $N = 26$. *indicates significantly unequal variances. Age = chronological age in months, Verbal Ability = Differential Abilities Scale, Version 2 Verbal Ability Standard Score, Pragmatic Language = Comprehensive Assessment of Spoken Language, Version 2, Pragmatic Judgment Standard Score, PSJA = Parent Supported Joint Attention, frequency code percentage, C: RJA = child responsiveness to parent's initiation of joint attention, frequency code percentage, square root transformation, C: IJA = child initiation of joint attention, frequency code percentage, square root transformation. *$p < .05$. ** $p < .01$., ***$p < .001$.

Data were also screened for multicollinearity by examining correlations between study variables as presented in Table 4. Following recommendations by Field (2013) correlations exceeding $r = .90$ where considered highly correlated. A value exceeding $p = .90$ was only found among the DAS-II Verbal Ability and Expressive Language scores indicating multicollinearity was not present among variables other than that Expressive Language was highly correlated with the overall Verbal Ability score on the DAS-II, which is to be expected since that cluster score makes up the overall verbal ability standard score on this measure.

Table 4
Correlations for Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	-	0.02	0.40*	0.02	-0.20	0.04	0.20	0.04	-0.04	0.14	-0.31	0.08	-0.04	-0.08
2. Gender		-	0.46*	-0.43*	0.03	-0.05	0.05	-0.11	-0.18	0.03	-0.28	0.34	-0.30	0.09
3. Developmental Status			-	0.03	-0.05	-0.36	0.03	-0.45*	-0.39*	-0.41*	-0.55*	0.21	-0.08	-0.22
4. Child Ethnicity				-	-0.18	-0.23	-0.12	0.01	0.10	-0.09	-0.08	-0.27	-0.10	0.13
5. Marital Status					-	-0.10	-0.20	-0.23	-0.15	-0.29	-0.21	-0.17	-0.08	0.01
6. Education						-	0.49*	0.07	-0.40	0.26	0.14	-0.21	-0.08	0.02
7. Annual Salary							-	0.16	0.05	0.28	-0.30	-0.33	-0.09	-0.19
8. Verbal Ability								-	0.92***	0.82***	0.46*	-0.03	0.06	0.28
9. Expressive Language									-	0.54**	0.40*	0.00	-0.01	0.27
10. Receptive Language										-	0.40*	-0.02	0.06	0.18
11. Pragmatic Language											-	0.10	0.28	0.24
12. PSJA												-	-0.17	-0.06
13. C: RJA													-	0.28
14. C: IJA														-

Note. $N = 26$. Age = chronological age in months, Verbal Ability = Differential Abilities Scale, Version 2 Verbal Ability Standard Score, Pragmatic Language omprehensive Assessment of Spoken Language, Version 2, Pragmatic Judgment Standard Score, PSJA = Parent Supported Joint Attention, frequency code ercentage, C: RJA = child responsiveness to parent's initiation of joint attention, frequency code percentage, square root transformation, C: IJA = child itiation of joint attention, frequency code percentage, square root transformation. *$p < .05$. ** $p < .01$., ***$p < .001$.

Descriptive Analyses

Descriptive statistics including: mean, standard deviations, *t*-tests, and effect sizes for all study variables based on group are presented in Table 5. Significant group differences were found the following study variables. The ASD group had significantly lower verbal ability scores including both the DAS-II Expressive and Receptive language measures and the CASL, the measure of pragmatic language as compared to the typically developing group with a very large effect size for this difference between groups.

Table 5
Descriptive Statistics for Study Variables by Group

Variable	Means (*SD*) [Range]				
	Total	TD (*n* = 14)	ASD (*n* = 12)	*t*	*d*
Verbal Ability	111.54 (*14.45*) [86.00, 139.00]	117.50 (*13.94*) [101.00, 139.00]	104.58 (*12.13*) [86.00, 123.00]	-2.50*	0.99
Expressive Language	57.85 (*11.07*) [35.00, 85.00]	61.79 (*10.66*) [48.00, 85.00]	53.25 (*10.08*) [35.00, 66.00]	-2.09*	0.82
Receptive Language	54.96 (*7.48*) [41.00, 72.00]	57.71 (*7.41*) [45.00, 72.00]	51.75 (*6.42*) [41.00, 65.00]	-2.17*	0.86
Pragmatic Language	110.04 (*14.56*) [81.00, 131.00]	117.29 (*8.28*) [106.00, 130.00]	101.58 (*16.01*) [81.00, 131.00]	-3.21**	1.23
PSJA	0.61 (*0.14*) [0.32, 0.88]	0.59 (*0.15*) [0.32, 0.78]	0.65 (*0.13*) [0.48, 0.88]	1.04	0.43
C: RJA	4.43 (*2.34*) [0.00, 9.17]	4.60 (*2.60*) [0.00, 9.17]	4.23 (*2.09*) [1.73, 4.23]	-0.39	0.16
C: IJA	0.43 (*0.61*) [0.00, 1.41]	0.55 (*0.67*) [0.00, 1.41]	0.28 (*0.52*) [0.00, 1.41]	-1.12	0.45

Note. *N* = 26. Verbal Ability = DAS, Verbal Ability Standard Score, Expressive Language = DAS-II Naming Vocabulary *t* score, Receptive Language = DAS-II Verbal Comprehension *t* score, Pragmatic Language = CASL, Version 2, Pragmatic Judgment Standard Score, PSJA = Parent Supported Joint Attention, frequency code percentage, C: RJA = child responsiveness to parent's initiation of joint attention, frequency code percentage, C: IJA = child initiation of joint attention, frequency code percentage, square root transformation. *$p < .05$. ** $p < .01$., ***$p < .001$.

Test of Hypotheses

Hypothesis 1A. Child developmental status is negatively related to child verbal ability score. Hierarchical linear regression was used to examine the relation between developmental status and verbal ability. Gender and age were correlated with developmental status and thus were entered as control variables in the first step. Developmental status was entered in the second step and verbal ability was entered as the dependent variable. The control variables, gender and age, were not significant predictors of verbal ability, accounting for 1% of the variance in the model, $F(3, 23) = 0.17$, $p = 0.84$. Developmental status significantly predicted child's verbal ability score and accounted for an additional 27% of the variance in the model, indicating that children with ASD had significantly lower verbal ability scores than children with typical development. See Table 6 for regression coefficients.

Table 6

Hierarchical Regression: Verbal Ability Regressed on Developmental Status

Variable	*B*	SE *B*	β	R^2	*F*	ΔR^2
Step 1				0.02	0.17	
Gender	0.05	0.24	0.04			
Age	-3.26	5.87	-0.12			
Step 2				0.29	2.99*	
Developmental Status	-18.65	6.40	-0.66**			0.27

N = 26. Verbal Ability = Verbal Ability = Differential Abilities Scale (DAS-II), Verbal Ability Standard Score, Developmental Status (TD = 0, ASD = 1).
*$p < .05$. ** $p < .01$., ***$p < .001$.

Hypothesis 1B. Child developmental status is negatively related to child pragmatic language score when controlling for verbal ability. In order to assess the pervasive impairments in pragmatic language in children with autism regardless of verbal

abilities, hierarchical linear regression was used to examine the relation between developmental status and pragmatic language when controlling for verbal ability. Verbal ability was entered as control variables in the first step. Developmental status was entered in the second step and pragmatic language ability was entered as the dependent variable. Developmental status significantly predicted child's pragmatic language score while controlling for overall verbal ability, accounting for an additional 15% of the variance in the model, $F(2, 23) = 6.37$, $p = 0.01$. As can be seen in Table 7, children with ASD had significantly lower pragmatic language scores when controlling for overall verbal ability in comparison to children with typical development. See Table 7 for regression coefficients.

Table 7

Hierarchical Regression: Pragmatic Language Regressed on Developmental Status

Variable	*B*	SE *B*	β	R^2	*F*	ΔR^2
Step 1				0.21	6.42*	
Verbal Ability	0.46	0.18	0.46			
Step 2				0.36	6.37**	
Developmental Status	-12.25	5.38	-0.43*			0.15

N = 26. Verbal Ability = Differential Abilities Scale (DAS-II), Verbal Ability Standard Score, Developmental Status (TD = 0, ASD = 1).
*$p < .05$. ** $p < .01$., ***$p < .001$.

Hypothesis 2. Child's developmental status is negatively related to dyadic and triadic joint attention with their caregivers. The relation between developmental status and dyadic and triadic joint attention was assessed using linear regression. Dyadic and triadic joint attention codes were first combined into one variable, child responsiveness to parent's initiation of joint attention, and then entered as the dependent variable. Child

developmental status then was entered as the independent variable. Developmental status was not a significant predictor of child's responsiveness to joint attention, $F(1, 24) = 0.15$, $p = 0.70$, indicating children with ASD were not significantly different in the number of times their responsiveness to parent joint attention in comparison to children with typical development. Developmental status was not a significant predictor of child's initiation of joint attention, $F(1, 24) = 1.21$, $p = 0.28$, indicating children with ASD were not significantly different in the number of times they initiate joint attention with their parents.

Hypothesis 3. Child's developmental status is positively related to frequency of parent supported joint attention. The relation between developmental status and the percentage of time spent in parent supported joint attention was assessed using linear regression. Percentage of time spent in parent supported joint attention was entered as the dependent variable. Child developmental status then was entered as the independent variable. Developmental status was not a significant predictor of parent supported joint attention, $F(1, 24) = 1.09$, $p = 0.31$, indicating that regardless of developmental status there was no significant difference in the percentage of time parents and children spent in parent supported joint attention.

Hypothesis 4. Parent supported joint attention will mediate the relation between child's developmental status and child's pragmatic language score. Parent supported joint attention was assessed as a mediator between developmental status and pragmatic language. The impact of developmental status on pragmatic language through parent supported joint attention was assessed using the PROCESS macro, model 4 in SPSS (Hayes, 2013). This PROCESS macro command tests mediation models including

covariates and estimates direct and direct effects. Pragmatic language was entered as the dependent variable and developmental status was entered as independent variable. Parent supported joint attention was entered as the mediator, M variable. Child verbal ability score was entered as a covariate variable in order to examine these relations while controlling for verbal ability. Bootstrapping using 5,000 resamples was used to estimate confidence intervals around this indirect effect.

Results did not support a significant indirect effect of parent supported joint attention on pragmatic language. Results indicted the direct path of developmental status on pragmatic language, ignoring the mediator, was significant, t (22) = -2.51, p = 0.02. The effect of developmental status on the mediator, PSJA, was not significant, t (22) = -1.07, p = 0.29. The mediation analysis indicated that the mediator (parent supported joint attention), controlling for developmental status, was not significant predictor of pragmatic language. The Sobel test (z_{ab} =0.69, p = .49) did not support parent supported joint attention as a mediator between developmental status and pragmatic language ability. Bootstrapping in PROCESS provides a more confident measure of mediation. The bootstrap confidence interval (95%) using 5,000 bootstrap samples (-0.94, 8.45) included zero. Therefore, these results do not support that the mediation model.

Table 8
Regression Results for the Relation of Developmental Status to Pragmatic Language as Mediated by Parent Supported Joint Attention

	Mediator Variable Model			
Predictor	*B*	*SE*	*t*	*p*
Constant	0.49	0.27	1.84	0.08
Developmental Status	0.07	0.06	1.07	0.29
Verbal Ability (covariate)	0.00	0.00	0.35	0.73
	Dependent Variable Model			
Predictor	*B*	*SE*	*t*	*p*
Constant	75.47	23.81	3.17	<0.01
PSJA	21.12	17.27	1.22	0.23
Developmental Status	-13.71	5.45	-2.51	0.02*
Verbal Ability (covariate)	0.25	0.19	1.33	0.20
	Indirect Effect of Developmental Status on Pragmatic Language			
	Effect	*SE*	LL 95& CI	UL 95% CI
Sobel	1.46	2.12	-0.94	8.45

N = 26. Verbal Ability = Differential Abilities Scale (DAS), Verbal Ability Standard Score, Developmental Status (TD = 0, ASD = 1). Pragmatic Language = Comprehensive Assessment of Spoken Language, Version 2, Pragmatic Judgment Standard Score, PSJA = Parent Supported Joint Attention, frequency code percentage. *p < .05. ** p < .01., ***p < .001.

Hypothesis 5. Child's responsiveness to joint attention (RJA) will positively moderate the indirect effects of developmental status on pragmatic language through parent-support joint attention. Child's responsiveness to joint attention includes both responsiveness to parent's initiation of joint attention and responsiveness dyadic joint attention. A moderated-mediation analysis was conducted using PROCESS (Hayes, 2013) to assess how developmental status predicts pragmatic language ability through parent supported joint attention as moderated by child's responsiveness to joint attention (RJA). The interaction between parent supported joint attention and child RJA was not significant, t (21) = 0.43, p = 0.67. The direct effect of status on pragmatic language ability remained significant as parent supported joint attention and child responsiveness to joint attention did not account for a significant proportion of the variance in pragmatic

language ability above and beyond developmental status. Therefore, developmental status remained a significant predictor of pragmatic language ability, t (21) = -2.48, p = .02, meaning support was not found for the proposed moderated-mediation model. Furthermore, a bootstrap confidence interval (95%) using 5,000 bootstrap samples also found the moderation-mediation model to be nonsignificant because the confidence interval for the mediator, parent supported joint attention, included zero.

Hypothesis 6. Child initiation of joint attention (IJA) will positively moderate the indirect effects of developmental status on pragmatic language through parent-support joint attention. A moderated-mediation analysis was conducted using PROCESS (Hayes, 2013) to assess how developmental status predicts pragmatic language ability through parent supported joint attention as moderated by child initiation of joint attention (IJA). The interaction between supported joint attention and child IJA was not significant, t (21) = -0.83, p = 0.41. The direct effect of status on pragmatic language ability remained significant as parent supported joint attention and child IJA did not account for a significant proportion of the variance in pragmatic language ability above and beyond developmental status. Therefore, developmental status remained a significant predictor of pragmatic language, t (21) = -2.31, p = .03, meaning support was not found for the proposed moderated-mediation model. Furthermore, a bootstrap confidence interval (95%) using 5,000 bootstrap samples also found the moderation-mediation model to be nonsignificant because the confidence interval for the mediator, parent supported joint attention, included zero.

Post-hoc Analyses

Child initiation of joint attention. Although the hypothesized moderated mediation model was not significant, the role of child initiation of joint attention in language development documented in previous research suggest that an alternative model might exist between these variables. In this current study, developmental status was not a significant predictor of children's initiation of joint attention, r = -0.22, p = 0.28. No significant group difference was found between the two groups on child initiation of joint attention, t (24) = -1.12, p = 0.27, although this difference did indicate a medium effect size, d = 0.45. Nonetheless, children with autism spectrum disorders initiated joint attention with their parents (M = 0.28) about half as much as their typically developing peers (M = 0.55). Given these differences, I sought to explore the potential impact of child initiation of joint attention on developmental status, responsiveness to joint attention, and pragmatic language.

To further examine child initiation of joint attention (IJA), I first created a categorical coded variable for the presence of child IJA (i.e., *IJA* = 1, *no IJA* = 0) to create two groups to describe children who did and did not initiate joint attention with their parents during the course of a parent-child free play task. With regards to developmental status, 8 typically developing children did not initiate joint attention and 6 did initiate joint attention with their parents. Among children with ASD, 9 did not initiate joint attention and 3 did initiate joint attention with their parents. I then examined the relations between initiation of joint attention, responsiveness to joint attention (RJA), and pragmatic language within the ASD and TD groups. For children with typical development, there was a trend toward significance for IJA and overall verbal ability, r =

0.51, $p = 0.06$, indicating that children with typical development who initiated joint attention had higher overall verbal ability as measured on the DAS-II. Initiation of joint attention was not significantly related to child RJA or pragmatic language.

Table 9
Correlations for Study Variables Within TD Group

Variable	1	2	3	4	5
1. Verbal Ability	-	0.41	0.04	0.26	0.52^{+}
2. Pragmatic Language		-	0.26	0.07	0.11
3. PSJA			-	-0.18	-0.17
4. C: RJA				-	0.19
5. Child IJA					-

Note. $N = 14$. Verbal Ability = Differential Abilities Scale, Version 2 Verbal Ability Standard Score, Pragmatic Language = Comprehensive Assessment of Spoken Language, Version 2, Pragmatic Judgment Standard Score, PSJA = Parent Supported Joint Attention, frequency code percentage, C: RJA = child responsiveness to parent's initiation of joint attention, frequency code percentage, square root transformation, C: IJA = child initiation of joint attention, categorical variable (0 = No IJA, 1 = IJA).
$^{+}p < .10$. * $p < .05$.

For children with ASD, initiation of joint attention was significantly correlated to child RJA, $r = 0.60$, $p = 0.04$, suggesting that children with ASD who initiated joint attention with their parents also spent a larger amount of time responding to their parent's bids for joint attention. In addition, there was a possible trend toward significance for RJA and pragmatic language ability, $r = 0.50$, $p = 0.10$. In this way, while there was no significant finding, there was a medium effect size indicating that children with ASD who have a higher percentage of responsiveness to their parents' bids for joint attention have slightly higher pragmatic language scores.

Table 10
Correlations for Study Variables Within ASD Group

Variable	1	2	3	4	5
1. Verbal Ability	-	0.23	0.12	-0.38	-0.11
2. Pragmatic Language		-	0.30	0.50^{+}	0.32
3. PSJA			-	-0.11	0.16
4. C: RJA				-	0.60*
5. Child IJA					-

Note. $N = 12$. Verbal Ability = Differential Abilities Scale, Version 2 Verbal Ability Standard Score, Pragmatic Language = Comprehensive Assessment of Spoken Language, Version 2, Pragmatic Judgment Standard Score, PSJA = Parent Supported Joint Attention, frequency code percentage, C: RJA = child responsiveness to parent's initiation of joint attention, frequency code percentage, square root transformation, C: IJA = child initiation of joint attention, categorical variable (0 = No IJA, 1 = IJA).
$^{+}p < .10$. * $p < .05$.

Child responsiveness to joint attention. The hypothesized moderated mediation model was not significant in this current study. In fact, results indicated that children's responsiveness to joint attention (RJA) did not vary based on developmental status as children with ASD ($M = 4.23$) spent the relatively same amount of time responding to their parent's bids for joint attention as children with typical development ($M = 4.60$). However, results indicated a potential trend toward significance between dyadic joint attention and pragmatic language, $r = 0.34$, $p = 0.09$. Dyadic joint attention is one component of the coded variable of child's responsiveness to joint attention. In addition, within the ASD group, when IJA was coded as a categorical variable, initiation of joint attention was significantly correlated to child RJA, $r = 0.60$, $p = 0.04$. There was a possible trend toward significance for RJA and pragmatic language ability, $r = 0.50$, $p = 0.10$ within the ASD group. These relations suggest that an alternative model might exist

to explain the relations between these variables. Therefore, I sought to further explore the role of child's responsiveness of joint attention on the relationship between developmental status and pragmatic language. I hypothesized that the interaction between responsiveness to the joint attention and developmental status would create a synergistic effect in which time spent in RJA would strengthen the pragmatic language scores for children with ASD. In other words, I expect that child RJA will differentially affect pragmatic language ability between groups.

A moderation analysis was conducted using PROCESS (Hayes, 2013) to assess the interaction between developmental status and child responsiveness to joint attention (RJA) to predict pragmatic language. This PROCESS macro command tests moderation models including covariates and conditional effects of the independent variable on the dependent variable at different values of the moderator. Pragmatic language was entered as the dependent variable and developmental status was entered as independent variable. Child RJA was entered as the moderator, M variable. Child verbal ability score was entered as a covariate variable in order to examine these relations while controlling for verbal ability. Bootstrapping using 5,000 resamples was used to estimate confidence intervals around this indirect effect.

Developmental status was a significant predictor of pragmatic language ability, t (21) = -3.02, p = .01. Similarly, child's verbal ability remained a significant predictor of pragmatic language, t (21) = 2.26, p = 0.03. The interaction between developmental status and child RJA was also significant, F = 6.16, p =.02, indicating that for children with ASD, responsiveness to their parent's bids for joint attention of their parents may play a significant role for their pragmatic language ability in comparison to children with

typically development, accounting for 13% of the variance in the model. I graphed the interaction using procedures described by Aiken and West (1991) and Dawson (2014) to visually represent the moderation effects. Children with ASD and spent a larger amount of time in responsiveness to joint attention had significantly higher scores on pragmatic language. The pragmatic language ability with TD did not vary based on their responsiveness to joint attention.

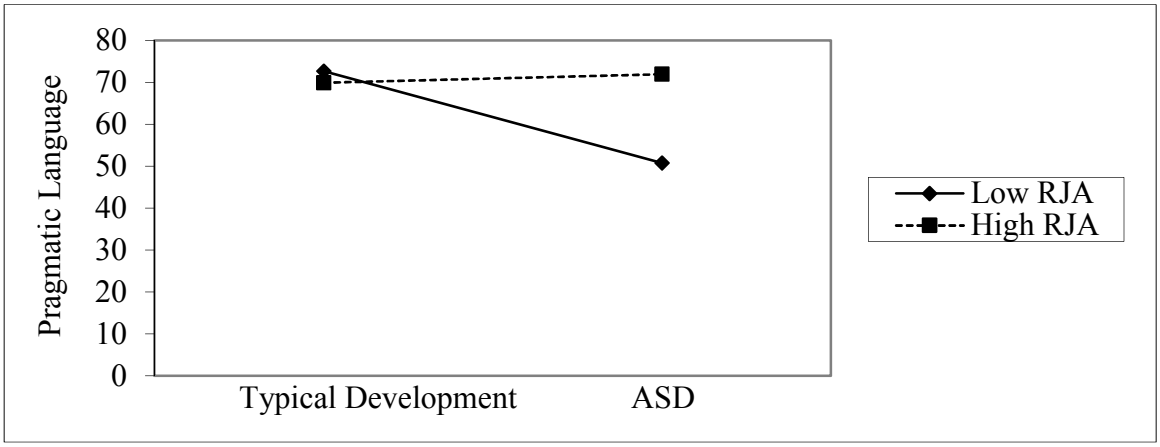

Figure 4. Interaction between developmental status and child responsiveness to joint attention (RJA) on pragmatic language.

Chapter IV

Discussion

This study investigated how parent support of their child's joint attention relates to pragmatic language development in children with and without autism spectrum disorders. This was accomplished by establishing the association between these variables and specifying if this relation differed based on the child's developmental status. The sample consisted of 12 children with ASD and 14 typically developing children between the ages of 3 and 6. The primary hypothesis involved investigating a model of the conditional indirect effects, whereby child responsiveness and initiation of joint attention would moderate the relation between developmental status and pragmatic language through parent-support joint attention. It was expected that the strength of the relation between joint attention and pragmatic language would be stronger for children with ASD who engaged in a greater amount of parent supported joint attention in a parent-child free play task. The following sections will provide a discussion of the results from analyses of study hypotheses and post-hoc analyses. Strengths and limitations of this current study, clinical implications, and suggestions for future research will also be discussed.

Interpretation of Results

Expressive, receptive, and pragmatic language deficits in children with ASD. The main hypothesis of the current study was founded on the well-established social communication impairments in children with autism spectrum disorders (APA, 2013). Previous research has documented the particular challenges of pragmatic language for children with autism regardless of their development of expressive and receptive language (Grzadzinski et al., 2013; Landa, 2000; Tager-Flusberg, Joseph, & Folstein,

2001; Young et al., 2005). When evaluated in the present study, this hypothesis was supported. Developmental status significantly predicted lower verbal ability scores such that children with ASD had significantly lower language scores than their typically developing peers. All children in this study had at least "average" language abilities with scores at least 85 or above. Nonetheless, children with ASD typically had scores on average 13 points lower than their peers. Thus, children with ASD had overall lower verbal abilities than their typically developing peers, and even while considering these verbal abilities, they had significantly lower pragmatic language scores. This confirms and extends prior research to younger children with ASD (Tager-Flusberg et al., 2001; Volden et al., 2009).

Direct effect model: Parent supported joint attention. It was hypothesized that the ASD parent-child dyads would spend a larger proportion of time in parent supported joint attention. Parent supported joint attention refers to moments when the parent and child are engaged with the same toy, but they do not necessarily reference, or look at, their social partner (Bottema-Beautel et al., 2014). Previous research highlights the foundation of parent support and the social environment for providing opportunities for language. Parents are often young children's primary social partners, and children with ASD are especially dependent on external support to build and maintain engagement within the social environment. Children with autism continue to rely on their social partner for communicative support much longer than children who are typically developing (Keen, 2014). In the present study, this hypothesis was not supported, and developmental status was not a significant predictor of parent supported joint attention. This result indicates that in the current study, dyads composed of parents and children

with autism spent a similar amount of time in parent supported joint attention as dyads composed of parents and children with typical development. Parent supported joint attention may look similar in both parent-child dyads due to the nature of this clinical sample; children with autism who have average levels of expressive and receptive language. In addition, due to the preliminary nature of this study, the parent child-dyads may look similar due to the lack of specific intervention support their children's joint attention which was not a part of this current study. Nonetheless, the use of parent supported joint attention served as a mechanism to further assess joint attention behaviors and observe how parents provide differing levels of support depending on their child's developmental needs.

Indirect effect model. Parent supported joint attention mediates the relation between developmental status and pragmatic language. The overarching model examined in this study assessed the meditational role of parent supported joint attention on the relation between developmental status and pragmatic language. While significant research has documented the relation between developmental status and pragmatic language, no known studies have documented parent supported joint attention and pragmatic language in young children with ASD. Parent supported joint attention was assessed as a mediator between developmental status and pragmatic language reflecting the social cognitive learning theory model. This model suggests that parents scaffold their children's social learning environment in a way that facilitates language development. Results from the current study did not support a significant indirect effect of parent supported joint attention on the relation between status and pragmatic language. This suggests that in the current study, time spent in parent supported joint attention

alone did not better explain the difference in language abilities for children with ASD and children with typical development.

Conditional indirect effect models. Developmental status was assessed as a predictor of pragmatic language ability through parent supported joint attention as moderated by child initiation of joint attention (IJA). Parents' scaffolding of joint attention may create learning opportunities and support for children to initiate joint attention with their parents, especially for children with ASD. The interaction between parent supported joint attention and child IJA was not significant. Nonetheless, children with autism spectrum disorders initiated joint attention with their parents ($M = 0.28$) about half as often as their typically developing peers ($M = 0.55$). Although not significant, this difference in initiation of joint attention did represent a medium effect size. Given these differences, post hoc analyses investigated how child initiation of joint attention was related to responsiveness to joint attention and pragmatic language, particularly for children with ASD. Only three children with ASD initiated joint attention with their parents during a parent-child free play task. Among children with ASD, initiation of joint attention was significantly and positively correlated with child responsiveness to joint attention. This finding indicates that in the current study, children with ASD who initiated joint attention with their parents also spent a larger amount of time responding to their parent's bids for joint attention. This lends support to previous research highlighting how responsiveness to the joint attention bids of a social partner is related to initiation of joint attention skills of children with ASD. Initiation of joint attention is regarded as a more complex social behavior than responsiveness to joint attention because it involves motivation to initiate a social overture to another person

(Koegel et al., 1999; Mundy et al., 1994). Previous research has highlighted the role of joint attention in predicting language development in children with ASD, and, more specifically the role of responsiveness to joint attention (RJA). Siller and Sigman (2008) found that RJA was the strongest predictor of rate of language acquisition in children. Similarly, Gillespie-Lynch et al. (2012) hypothesized and found that RJA assessed in childhood predicted improved social skills and nonverbal communication in adulthood.

Developmental status also was assessed as a predictor of pragmatic language through parent supported joint attention as moderated by children's RJA. This hypothesis was not supported. To further explore the relation between developmental status, RJA, and pragmatic language ability, a moderation analysis was conducted. More specifically, the analysis assessed whether the interaction between developmental status and child RJA predicted pragmatic language. It was hypothesized that children with autism who also have a higher percentage of responsiveness to joint attention bids would have higher pragmatic language. The interaction between developmental status and child RJA was significant accounting for 13% of the variance in the model. This suggests that, for children with ASD in the current study, responsiveness to their parent's bids for joint attention was significantly related to pragmatic language ability. This effect was not significant for children with typical development. This finding adds to the current research about the potential role of joint attention in supporting the social communication of children with ASD. Prior research by Gillespie-Lynch et al. (2013) found an association between joint attention and structural language for children with ASD but not for pragmatic language.

Strengths and Limitations

This study had several strengths as well as limitations. An important strength to note is the nature of the clinical sample. The sample for this study included children ages 3 to 6 with autism spectrum disorder and average language abilities. The inclusion of children who also have average language abilities helped to clarify the specific pragmatic language impairments in children with ASD. In addition, the use of a typically developing control group added to the methodological strength of this study by enabling comparisons of differences with same-aged peers without autism. The inclusion of children as young as 3 with autism spectrum disorder and with typical development also allowed for the evaluation of these challenges when children are just beginning to gain social pragmatic language skills. Lastly, the use of behavioral assessments of pragmatic language, Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999), and verbal abilities, Differential Abilities Scale – Version II (DAS-II; Elliot, 2007) improved on previous research using parent report of these abilities (Gillespie-Lynch et al., 2013; Volden et al., 2009).

The current study also had several limitations. For example, this study's analyses were underpowered with a sample size below expectations (n = 26). In addition, the two groups distributions were not equal, with the ASD group (n = 12) being slightly smaller than the typically developing group (n = 14). This might have affected the ability to detect significant effects and particularly differences between diagnostic groups and increased the potential of making a Type II error in some of the non-significant analyses. Additionally, this study examined pragmatic language and joint attention using a cross-sectional design therefore making it impossible to understand changes in these variables

over time for children with ASD or typical development. While the use of an assessment measure helped to clarify the differences between children with ASD versus typical development, it did not provide insight into how children use social language in everyday life. An additional limitation to note when assessing pragmatic language was that children with ASD included in this study had average language abilities and may demonstrate similar strengths on a standardized assessment of pragmatic language. A direct observation and language sample may provide the best picture of how children use language socially in real time.

Another limitation of this study was its relatively homogeneous sample composition with regard to ethnicity, marital status, and salary. Parents were predominately Caucasian (88%), married (81%), and upper-middle class (mean annual income = $127,346). Thus, the results may not accurately represent the general population. This study also did not specifically consider the cultural and linguistic differences in how children acquire language. In addition, all of the parents who participated in this study with their child were mothers. Greater variability in ethnicity, marital status, income, and parent gender may have resulted in different findings. Furthermore, children with ASD did not receive additional diagnostic confirmation in this study through the use of a standardized assessment in our laboratory setting beyond the report initially obtained from the family's outside provider.

Lastly, due to the cross-sectional nature of the study, causation cannot be inferred from the study findings. Findings such as the lack of difference between ASD parent-child dyads in parent supported joint attention and the role of responsiveness to joint attention in pragmatic language abilities may represent a misspecification of the study

variables and should be evaluated with future longitudinal designs. However, given the established empirical and theoretical support for the current hypotheses, it appears the discussion of the results may be an accurate representation of these constructs in children with ASD and typical development.

Clinical Implications

The results of this study have important clinical implications for the families and treatment providers of children with ASD. As supported by previous literature, this study further highlights the specific social communication deficits in children with ASD who have intact expressive and receptive language abilities. The findings of this current study also clarify the clinical needs for children with ASD and average verbal abilities to have treatment goals targeting verbal and nonverbal pragmatic language skills.

In addition, parents' use of parent supported joint attention did not differ between the two groups. While this finding did not support the initial hypothesis, it highlights the possibility that parents of children with ASD and parents of children with TD are more similar than different in the time they engage and support their child's attention in a free play task. These results may lend support for social cognitive learning theory as a model for how parents support their children's language development across diagnostic categories and typical development.

One other key finding relates children's responsiveness to their parent's bids, their joint attention and pragmatic language. Whereas children's responsiveness to joint attention (RJA) did not vary based on developmental status, the quality of children's responses served as indicators of pragmatic language ability. In analyses conducted with each group separately, a significant positive correlation was found between initiation of

joint attention and responsiveness to joint attention for children with ASD. Furthermore, post-hoc analyses found the interaction between developmental status and child responsiveness to joint attention was a significant predictor of pragmatic language for children with ASD. This finding suggest that for children with ASD, responsiveness to their parent's bids for joint attention may play an important role in their pragmatic language ability and thus can inform future intervention targeting parent support. The pragmatic language ability of children with TD did not vary based on their responsiveness to joint attention. This may be the case because children with typical language development have shifted focus to gaining pragmatic language by using it in their social environments (Oller et al., 2012). Both responsiveness to joint attention and initiation of joint attention have been found to positively predict language development for children with autism (Bono et al., 2004). Mundy et al. (1994) noted that the initiation of joint attention remains relatively impaired in individuals with autism whereas responsiveness to the joint attention may improve throughout development. With these findings in mind, responsiveness to joint attention appears to be a pivotal skill in language development for children with ASD.

Conclusions and Future Directions

Previous research and this study's current findings support the positive role of responsiveness to joint attention in language skills for children with ASD. Given these results, future research is needed to replicate and extend these findings. In particular, future studies should utilize larger samples with greater heterogeneity in age and socioeconomic backgrounds to allow for greater generalizability of the current study's findings. Future studies must also consider the cultural and linguistic differences in how

children acquire language and how parents support these endeavors. In addition, there is a need to increase variability in children's characteristics such as including children with a broader range of ASD characteristics as well as expanding the assessment of pragmatic language in children with limited language abilities. For example, other methods of assessing pragmatic language may include utilizing a verbal sample, parent questionnaire, or a measure of nonverbal pragmatic language to better capture both nonverbal and verbal pragmatic language in children with ASD.

An additional consideration for future research involves the use of a longitudinal design to examine how parent's support of joint attention over time for children with without ASD relates to their acquisition of pragmatic language. Due to the cross-sectional design of the current study, it was impossible to draw causal conclusions regarding relations between these constructs. Future longitudinal studies should continue to examine these relations, particularly among young children, to gain a better understanding of the early development of pragmatic language and discern the long-term outcomes for children on the autism spectrum. Ultimately, these efforts may contribute to the development of more effective parent supported interventions. To conclude, future research on pragmatic language in young children with autism should continue to include parents because they appear to play a key role in establishing moments of joint attention with their children.

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