

Joint Attention and its Relation to Social Outcomes:  
Typically Developing Children and Children with Autism

by

Shantel Elizabeth Meek

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Graduate Supervisory Committee:

Laudan Jahromi, Chair  
Carlos Valiente  
Amy Guimond

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## ABSTRACT

Previous research has suggested that the social interactions parents engage in with their typically developing children are critical to the relationships children form with peers later in development. Fewer studies, however, have investigated the relation between parent and child interactions and peer relations in children with autism. The current study aimed to investigate the relation between parent-child joint attention skills, social competence and friendship quality in children with autism and in typically developing children. A matched sample of 20 preschool-aged children with autism and 20 preschool-aged typically developing children were observed interacting with their parents in a laboratory setting. Approximately one year later, parents filled out a questionnaire assessing their child's social competency and quality of friendships with peers. Results indicated significant group differences between children with autism and typically developing children in all study variables, with children with autism displaying less initiation of joint attention, lower social competence and low quality friendships. Additionally, child initiated joint attention was positively related to social competence for both groups; effects were not moderated by diagnosis status. It is concluded that parent and child interactions during the preschool years are important to the development of social competence with peers. Intervention and policy implications are discussed.

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## Chapter 1

### Introduction

Recent studies indicate that 1 in 110 children in the United States have autism or a related disorder (Center for Disease Control and Prevention, 2010). Autism affects children of all racial, social and ethnic groups (Autism Society of America, 2008). Autism in children is now more prevalent than diabetes, AIDS, and pediatric cancer combined and it is the fastest growing developmental disability in the United States (Autism Speaks, 2009). According to figures from the U.S. Department of Education and other governmental agencies, the prevalence of autism is rising at a rate of 10 to 17 percent per year (as cited in Autism Society of America, 2008). Further, services, research and education in autism costs the government over 35 billion dollars a year (Autism Speaks, 2009). The costs of lifelong care can be reduced by 67 percent with early diagnosis and early intervention (Autism Society of America, 2009). Despite these facts, research in autism receives approximately five percent of the funding used to study childhood diseases and much less than this in child development research overall. Clearly, more needs to be investigated and uncovered about this disorder in every aspect so as to eventually reduce the rate and bring an improved quality of life to those who are affected.

Social interaction, communication and restrictive and repetitive behaviors are the three main deficits characteristic of autism and related disorders. The steep deficit in the domain of social interaction is reflected through a lack of joint attention, play techniques, eye contact, pointing, sharing, social initiations (verbal

or nonverbal) and social or emotional reciprocity (DSM-IV, 1994). Specifically, joint attention, a state where the child is mutually engaged with another person and with an object, has been linked to numerous important developmental outcomes including language acquisition and ability, parent-child relationships and social competence (Travis, Sigman & Ruskin, 2001; Sillar & Sigman, 2008). The deficit in social interaction and associated symptoms of problem behaviors can make it very difficult for children with autism to establish important long lasting relationships, including the critical parent-child relationship and later in development, peer relationships (Jerome, Fujiki & Brinton & James, 2002). It is therefore not surprising that children with autism tend to have poor peer relationships and few meaningful friendships (Guralnick, Connor, Neville, & Hammond, 2008; Guralnick, 1999; Stanton-Chapman, Denning & Roorbach Jamison, 2008). It is important to understand the extent to which fundamental social skills, such as joint attention, explain these poor outcomes in order to inform social skills interventions. This investigation studied the relation between the developmental milestone of joint attention and social competence in children with autism and in typically developing children.

Healthy social relationships are critical to positive development. The first social bond humans experience is with their primary care-giver, usually the mother. Previous investigations have shown that positive parent-child relationships predict a number of favorable outcomes for children including academic adjustment, popularity amongst peers and positive long-term social outcomes (Morrison, Rimm-Kauffman & Pianta, 2003; Pianta & Harbers, 1996;



Black & Logan, 1995). These crucial relationships have also been positively associated with a variety of social skills such as peer competence, peer interaction and friendship (Ladd & Pettit, 2002; Strouf & Fleenon, 1986; Bowlby, 1973; Park & Ladd, 1992). Given the significance of identifying targets for early intervention that may have long-term consequences on the social interactions of children with autism, it is important to understand the specific skills that may develop in the context of parent-child interactions that impact later peer social competence. Joint attention is one such “pivotal” skill, as it is one of the first dimensions of social interactions between parents and their infants and can therefore be recognized as an early foundation of social interaction (Bruner, 1978; Kasari, Freeman, Paparella, Wong & Kwong, 2005). The first social relationships infants encounter have significant effects far beyond the first few years of life.

As children grow older, peers become an increasingly important aspect of development. Positive parent-child interactions can facilitate the transition from child-caregiver relationships to child-peer relationships (Guralnick et al., 2008). Peer relations and their effects on child outcomes have been shown to be extremely important and indicative of the future well being of children (Parker & Asher, 1987; Coie, Dodge & Coppetelli, 1982). Furthermore, previous literature has repeatedly shown that peer relationships are an important part of healthy development and influence factors such as cognition, social behavior and personality (Ladd, 1992). Good peer relations can provide help in skill acquisition and educational goal attainment, access to meaningful supports and an improved quality of life (Kraemer, McIntyre & Blacker, 2003; Ryndak & Fisher, 2001). In

addition to being important to a child's social experiences, peer relations and the social skills necessary to maintain them, have been shown to have a significant relation to academic success. Behaviors related to social skills such as cooperative play and self control in addition to social-emotional factors have been found to be significant in predicting academic success in the early school years for children with autism and their typical peers (Agostin & Bain, 1997; Smith, Edmond & Naylor, 1992).

The Reauthorized Individuals with Disabilities Education Act (IDEA) of 1997 stipulates that children with disabilities are entitled to education in a maximally normalized environment so as to amplify social interaction and contact with their typically developing peers (U.S. Department of Education, 2004). Given that the incidence of autism diagnoses is rising at unprecedented rates, one implication of IDEA is that there are a greater number of children with autism in general education classrooms. However, inclusion in a general education classroom in itself is not enough to ensure successful inclusion and positive peer interactions (Hallenbeck & Kauffman, 1995; Hunt & Goetz, 1997; Harrower & Dunlap, 2001). In fact, on average, children with autism have a lower level of social network centrality, are less accepted by the peer group and have fewer reciprocal friendships in the school setting than their typically developing peers (Chamberlain & Kasari, 2007). More needs to be investigated about social processes in children with autism and other developmental disabilities to meet the demands of higher diagnoses rates and higher frequency of general education inclusion practices.

Social processes and social development are important in determining the outcomes of children's lives and are therefore important to study in all populations. For decades there have been numerous studies investigating the quality, roles and importance of social relationships in the lives of typically developing children. There has been much less focus however, examining the challenges, predictors, outcomes and factors that affect the quality of social relationships in children with disabilities. The investigation of social processes between parents and children is especially important to children with autism because social interaction is a main deficit of the disorder. Specifically, it is important to learn how parent-child interactions facilitate such skills as joint attention, as parents are the first individuals to interact with young infants and joint attention is among the first phenomena noticed within these interactions. As the crucial first years of life set the stage for a child's social developmental trajectory later in life, it is also important to understand the consequences of parent-child interactions on children's outcomes with peers.

Past research has indicated that joint attention is a critical social developmental milestone that is related to peer competence and pro-social behavior in children with autism (Sigman & Ruskin, 1999; Travis et al., 2001). The current study aimed to investigate the relation between parent-child joint attention states and social competence in typically developing children and children with autism.

## Chapter 2

### Review Of Literature

The process of engaging in joint attention is among the first interactions infants experience early in life. It significantly relates to important developmental processes such as language and social development, and is therefore an important fundamental social process to investigate. The following chapter reviews the literature on joint attention in typical and atypical development and the relations among joint attention and important aspects of social development. It concludes with a theoretical explanation derived from a developmental neuroscience perspective on why children with autism display less joint attention skills with their caregivers and engage in fewer social interactions later in life with peers.

#### **Joint Attention**

Joint attention is a social-communicative developmental milestone that is characterized as two individuals sharing interests in each other and in an object. It is a coordinated triadic interaction, usually between young children and their caretakers embedded in a social context. Past literature has identified a wide array of joint attention behaviors such as, gaze-following, social referencing, imitation and early productive language (Moore & Dunham, 1995). Children learn to engage in joint attention well before they engage in symbolic language with caregivers (Bruner, 1977).

Typically developing infants have been documented to engage in organized interactions with caregivers as young as a few weeks old (Brazelton, Koslowski & Main, 1974). This interaction appears prior to joint attention. Very

young infants are only capable of dyadic interactions, that is, they are either engaged with another person, or they are engaged with an object (Bakeman & Adamson, 1984). At three months of age, most infant interactions are focused on the caregiver. Typically, by six months of age, the infant becomes more interested in attending to objects for interaction than attending to caregivers. Initially, joint attention begins to emerge when caregivers follow the young child's object of interest (Bruner, 1977). Parents usually hold the majority of the responsibility in establishing and maintaining joint attention. Gradually, between 9 and 15 months, infants begin to play more active roles in this engagement and begin to develop the ability to have triadic interactions, sharing a state of attention and enjoyment between themselves, a caregiver and an object of mutual interest (Sillar & Sigman, 2008; Jones, Carr & Feeley, 2006; Bakeman & Adamson, 1984). This new behavior is seen as the beginning of intentional communication (Bates, 1979). By 15-18 months, young children seek interactions with adult caregivers and have relatively well developed joint attention skills, including coordinated looks, pointing or showing objects (Jones et al., 2006; Bates, 1979). This initial development of joint engagement typically occurs first between child and caregiver before generalizing to peer interactions (Bakeman & Adamson, 1984; Jones & Carr, 2004).

In order to be characterized as joint attention, the goal of the interaction must be strictly social; the child's intent is to share something enjoyable with the individual and the reward of gaining that adult attention is a social interaction (Jones et al., 2004). The implications of joint attention are embedded in its social

function and in the critical role it plays in language and social development. Past research has consistently found a positive association between language, play skill development and joint attention in particular, highlighting the importance of studying the interaction and engagement states between primary caregivers and children, especially those with developmental delays and those at risk for developing language deficiencies (Smith, Adamson, Bakeman, 1988; Sillar & Sigman, 2008; Adamson et al, 2004; Jones et al., 2006; Rutherford, Young, Hepburn & Rogers, 2006).

### **Initiating Joint Attention**

Two distinct behavior types in joint attention have been identified in the literature, response to joint attention (RJA) and initiating joint attention (IJA) (Sheinkopf, Mundy, Claussen & Willoughby, 2004). Gaze following along with following points and head turns are all responses to joint attention (Vaughan, Mundy, Block, Burnette & Delgado et al., 2003). These behaviors, seen early in joint attention development, are significantly related to cognitive and language outcomes in young children (Sillar & Sigman, 2008). As children develop, they begin to initiate joint attention (IJA) with social partners; this includes the use of eye contact and using gestures such as pointing or showing (Sheinkopf et al., 2004).

Interestingly, Classic as well as recent studies on typical children and children with disabilities have shown that IJA but not RJA is highly sensitive to environmental factors such as parental sensitivity and parents' ability to scaffold joint attention by following the child's lead (Vaughan, Mundy, Block, Burnette,

Delgado, Gomez, Meyer, Neal & Pomares, 2003; Adamson & Bakeman, 1985). Because IJA has been shown to be sensitive to environmental factors, studying IJA within the dynamics of parent-child interactions can yield important information about a child's language, social and cognitive development such that parenting behaviors may be highly influential in developing the skill of initiating joint attention. Previous investigations have shown that in addition to decreased levels of responding to bids of joint attention from parents and experimenters, children with autism also initiate less bids of joint attention with experimenters and parents (Mundy et al., 1986; Sigman et al., 1986), further inhibiting development of joint attention skills. Other investigations have found that play initiations for children with autism are less frequent and qualitatively different than those of their typically developing and mentally retarded peers (Hauck & Fein, 1995). Taken together, this research suggests that there are important differences to consider, specific to this population, in terms of social initiations.

### **Joint Attention in Autism**

Children who lack joint attention skills may be at an increased risk for delay in language and social development, communication impairments, and may be more heavily dependent on language input that is contingent on immediate experiences and not generalizable to other environments (Sillar & Sigman, 2008; Nadig, Ozonoff, Young, Rozga & Sigman et al., 2007). Children with autism have a deficit in most social-communicative skills including joint attention (Jones et al., 2004; Sigman & Ungerer, 1984; Bruner & Sherwood, 1983). Previous studies indicate that children with autism display and respond to less joint attention than

their typically developing peers (Mundy, Sigman, Ungerer & Sherman, 1986; Mundy, Sigman & Kasari, 1994). In a study comparing children with autism to typically developing children, researchers found that children with autism were specifically impaired in turn taking sequences, response to invitation of adult, pointing, showing, and making eye contact while holding an object or while watching a moving object (Mundy, Sigman, Ungerer & Sherman, 1986). These children typically have decreased social interests and are therefore less motivated to seek out social interactions or share experiences with other people. The implications of early social deficits, including joint attention, are evident later in childhood and into adulthood when individuals with autism often have trouble forming and maintaining peer relations and friendships (Eaves & Ho, 2008; Billstedt, Gillberg & Gillberg, 2005).

The early deficit in joint attention has been found to persist throughout toddlerhood in children with autism. One investigation looked at joint attention in 30 month old children with autism over the course of a year and found that early deficiencies in joint attention were stable over time (Adamson, Bakeman, Deckner, Ronski, 2009). Although typically developing children develop joint attention skills in infancy, children with autism display deficits in these skills through pre-school and middle childhood. Findings have suggested that for children with disabilities, variability in joint attention skills in pre-school predict variability in language acquisition and social development later in childhood (Sillar & Sigman, 2008; Stanton-Champan et al., 2008). Joint attention appears to be the most pronounced and persistent non-verbal social deficit experienced by



individuals with autism and related disorders, thus joint attention remains an important construct to study among children with autism well beyond infancy.

Previous studies have shown that early social experiences may be effective in improving social and language developmental trajectories in children at risk for language delays or children with developmental delays (Tannock, Girolametto, & Siegel, 1992). More specifically, Jones et al. (2006) found that interventions targeting joint attention can be used to improve social and communicative functioning in children with autism; joint attention skills can serve as a mechanism that facilitates nonverbal interaction, language development and word learning. Other researchers have identified joint attention as a pivotal skill for children with autism (Thurm, Lord, Lee & Newschaffer, 2007; Jones et al., 2004; Charman, 2003). A pivotal skill is characterized as a skill that influences the development of many other skills, therefore targeting and focusing on specific pivotal skills will have collateral effects on many other deficit areas (for review see Koegel, Koegel, Harrower & Carter, 1999). These collateral effects change children's overall trajectories in a number of domains and allow for less intervention and greater improvements across a wider range of deficits (Koegel, Koegel, Harrower & Carter, 1999). Joint attention therefore, is of increased relevance for interventionists and children with autism and related developmental delays. The more we know about joint attention, the more effective interventions targeting joint attention can be, allowing its pivotal nature to take place and ameliorate numerous associated symptoms.

## **Joint Attention and Social Competence**

Joint attention is an important developmental milestone that sets the trajectory for later developed social competence. Studies have found that parents of children with autism reported joint attention skills such as pointing, showing, and turn-taking, are positively associated with parent reported social behaviors (Mundy, Sigman & Kasari, 1994). Although parent report is a useful measure for studying certain aspects of social development, individual differences in joint attention are more difficult for parents to accurately measure and report due to the precise definitions of joint attention and the often discreetness of joint attention behaviors, such as coordinated looks. For example it can be difficult to remember exactly how often a child engages in coordinated looks with a parent or peer during play. The current study aimed to observe and code joint attention behaviors in a controlled environment to more accurately identify true joint attention engagement states versus non-engagement states.

In addition to cross-sectional studies, a longitudinal investigation identifying the association between early joint attention skills and social competence in older children with disabilities (i.e. autism, Down syndrome and developmental delays) was conducted using parent report and laboratory assessment (Sigman & Ruskin, 1999). Results suggested that initiating joint attention with a social partner and responding to joint attention bids from a social partner at age three were related to frequency of initiation of peer play and the extent of peer engagement at age 12. Overall these studies indicate that the

initiation of and response to early non-verbal communication predicts social competence in early to middle childhood.

Aside from parent report and laboratory assessments, observational measures have also been employed in studying the relation between joint attention and social development. In a study of 12 year-old children with autism, investigators assessed joint attention in a research laboratory and observed pro-social behaviors with peers on the playground during recess. Results indicated that initiating joint attention was positively correlated with social competence and pro-social behaviors (Travis et al., 2001). Together, these studies show a clear link between joint attention skills and later acquired social skills such as pro-social behaviors. The current investigation seeks to replicate these findings and extend the connection further, to friendship quality.

**Child-initiated joint attention and social competence.** Within joint attention, initiating joint attention (e.g. coordinated looks and pointing) in particular, has repeatedly been linked to social functioning in children with autism (Sheinkopf et al., 2004; Vaughan et al., 2003; Travis et al., 2001). Results have indicated that initiating joint attention is not only positively related to social behaviors in a laboratory setting and on the playground (Travis et al., 2001), but it is also negatively related to disruptive behaviors in pre-school children with disabilities (Sheinkopf et al., 2004). These results speak to the importance of the development of initiating joint attention states.

**Parent-initiated joint attention and social competence.** Parent-initiated joint attention has been shown to be negatively related to infant and child initiated

joint attention. Gaffan and colleagues (2010) found that for parents of typical children, 'active involvement' at time one, negatively predicted infant bids at time two. Overly active parental involvement within a dyad's engagement can be contributed to a variety of factors; among those is that the over activity is a compensatory behavior for children who initiate less. Therefore, a parent who has a child who initiates less, initiates more to compensate for their child's lack of initiation. A different possibility is that parents are simply over-controlling of the engagement and their over activity impedes the child's development of joint attention, particularly in initiating joint attention. Whether the process is through over-compensation or over-controlling behavior, evidence has suggested that parent-initiated joint attention is negatively related to socially competent children.

### **Social Competence and Friendship Quality**

The proposed study seeks to extend the current literature by going beyond the study of joint attention and its relation to social competence and looking at the connections among initiating joint attention engagement states, social competence and friendship quality in children with autism. Given the association between joint attention and social competence, it is expected that joint attention impacts friendship quality through children's socially competent behaviors. Thus, this investigation analyzed social competence, of which pro-social behaviors are one dimension, as a mediating variable between joint attention and friendship quality. Previous literature has consistently found a close link between social competence and friendships in typical children (Hartup & Stevens, 1997; Howes, 1990). Further, the bi-directional effects of social competence and friendships on healthy

social development have also been noted. Typical children that are more socially competent have more friends; experiencing more close interactions with friends, in turn, makes children more socially competent (Rubin, Bukowski & Parker, 2006; Newcomb & Bagwell, 1996). It is evident then, that the quality of friendships is a critical aspect of social development as it not only serves as a source of support for children, but it fosters the ongoing development of more advanced and complex social competences.

Past investigations that have studied the relation between joint attention and social development have focused on how joint attention skills correlate with social and peer competence. No studies have specifically looked at if and how joint attention predicts friendship quality in children with autism. Literature on typical child development has shown that friends serve as social support and facilitate a child's ability to cope with life stressors (Kramer & Gottman, 1992), protect at risk children from victimization by other peers and provide support and encouragement during important school transitions (Ladd, Kochenderfer & Coleman, 1997). Friendship can serve as a buffer against negative effects of victimization or other social difficulties, experiences children with autism often face. Children who are rejected from the peer group have been found to have less mutual friendships, affecting their levels of interaction and support. Observational investigations have suggested that children with autism rarely form reciprocal friendships (Guralnick, Guttman, & Hammond, 1996). Teacher and parent reports alike have indicated that children with delays have less friends as well as less in depth social contact with peers when compared to their typically

developing classmates (Buysse, Goldman & Skinner, 2002). Children with autism, in particular, have a lower level of social network centrality, are less accepted by the peer group and have fewer reciprocal friendships in the school setting than their typically developing peers (Chamberlain & Kasari, 2007). If joint attention significantly predicts friendship quality, important early intervention strategies could be implemented to help improve joint attention and consequently friendship quality in children with autism and those that face other social difficulties.

### **A Developmental Neuroscience Perspective**

There are a number of perspectives on joint attention deficits in autism. As the present study is a cross-sectional, observational account of group differences in joint attention during the preschool years, a test of theories on the development of joint attention across early childhood is beyond its scope. Nevertheless, I believe that a developmental neuroscience perspective best explains why some children fail to acquire adequate joint attention skills across early childhood. This perspective illustrates how biological factors, sensory stimulation and other environmental factors can affect brain development and consequential behavior. Although the cause of autism and related disorders is currently unknown, most experts agree that it is a combination of neural development, genetic and environmental factors. Despite early beliefs that neural development is completely genetically and biologically determined, increasingly, research supports the idea that the environment can be highly influential on a child's neural development (Segalowitz & Schmidt, 2003). In particular, the

process of synaptic pruning, the eliminating or strengthening of neural synapses depending on environmental stimulation, seems to be heavily dependent on early life experiences (Segalowitz & Schmidt, 2003; Nelson, Thomas & DeHann, 2008). This process applies to joint attention and other social processes such that the more a child is engaged in a certain task, the more efficient the child's brain becomes at performing such functions (Segalowitz & Schmidt, 2003). If a child spends little time engaged in joint attention, those regions of the brain will be activated less often, and consequently, future social interactions and attempts at joint attention will be performed less efficiently.

The social deficit seen in children with autism may inhibit them from being motivated to seek social interactions. Trevarthen and Aitken (2001) suggest that there is an intrinsic motivation system that makes humans naturally inclined to socialize. The effect of this motivation system on social behavior is mediated through brain structures and neural activity. It has been proposed that the strength of the motivation system varies from individual to individual and is most likely determined by both biological and environmental influences. Biologically, each individual has a different level of sensitivity to social rewards as well as a learned reward value of social interactions obtained through reinforcement histories (Mundy & Neal, 2000). The resulting variability in social motivation seen between humans may therefore contribute to individual differences in social competence, including joint attention abilities. If children with autism are not innately socially motivated, they likely spend less time socially engaged in human contact than typically developing children. Previous research has indicated that

successful engagement in multiple social opportunities supports development of social communicative skills (Ladd, 2005). If the social regions of the brain are not receiving sufficient activation, the pruning process can be detrimental to social development and further widen the gap between children with autism and typically developing children in their joint attention and subsequent social development.

Together, the existing theoretical and empirical work points to delayed joint attention in children with autism, possibly because these children are born less socially motivated and have significantly less human interaction and social brain stimulation over time. Thus, by the preschool years, children with autism may be significantly less engaged in joint attention with their parents and with other children than their typical peers. This lack of social opportunities and neural stimulation impedes their ability to learn socially competent behaviors and subsequently develop friendships with peers. In turn, while typically developing children are becoming more competent as they engage in mutual friendships, children with autism may be remaining stable in their social development. The present study is the first of its kind to analyze the connection between the first social developmental milestone, joint attention, and friendship quality, an important part of social development occurring later in childhood. While previous studies have examined the role of joint attention in social competence and language development, no studies have previously assessed how this phenomenon relates to the quality of interaction between friends.

### **The Current Study**



The current study aimed to investigate the relation between parent-child joint attention skills, social competence and friendship quality in children with autism and in typically developing children. Four hypotheses were proposed.

Hypothesis 1: I expect that children with autism, as a group, will be less engaged in joint attention engagement states during a parent-child interaction, will initiate less states of joint attention, will have lower social competence scores and will have lower quality friendships than the typically developing group. It is proposed that children with autism are less socially motivated in infancy; this lack of social motivation limits the social experiences they have and consequently the social stimulation their brain receives, further inhibiting their social competence and close relationships later in childhood. Additionally, parents of children with autism will initiate more states of joint attention engagement than parents of typical children. This finding is expected potentially because parents may compensate for their child's lack of social involvement.

Hypothesis 2: I expect that joint attention engagement states and child initiation of joint attention, will be positively related to social competence and friendship quality for both typically developing children and children with autism. Joint attention skills are among the first forms of social communication noted in children and therefore should be related to positive social development, one dimension of which is friendship quality. Conversely, parent initiated joint attention will be negatively related to social competence and friendship quality. Parents who initiate more states of joint attention may be doing so to compensate for their child's lack of engagement; the parents who initiate more therefore, may have children who engage less and are

potentially less socially competent. Hypothesis 3: I expect that the relation between initiating joint attention, social competence and friendship quality will be stronger for children with autism; this relation will be moderated by group status. This is expected because joint attention ability represents a core deficit in autism that may differentiate the social functioning of high versus low functioning children. Thus, joint attention may explain more of the variance in friendship quality for children with autism than for typically developing children. Specifically, children with autism who have higher joint attention should also have higher friendship qualities, while children with lower joint attention should be lower functioning socially and consequently have lower quality friendships. On the other hand, for typically developing children, other variables in addition to joint attention account for individual differences in the relation of joint attention skills to friendship quality. There is likely less variance in the joint attention skills of typically developing children (as most typically developing children master joint attention skills during infancy), thus these skills may not predict social functioning as strongly. Hypothesis 4: Finally, I expect that the relation between initiating joint attention and friendship quality will be mediated by social competence for children with autism and for typically developing children. This is expected because previous findings have shown that joint attention is positively related to social competence in children with autism and in typically developing children; further, social competence has been found to predict friendship quality in typically developing samples.

## Chapter 3

### Methodology

#### **Participants**

Study participants included 20 typically developing children ( $M= 50$  months,  $SD= 11.12$ ) and 20 children with autism ( $M = 59$  months,  $SD=11.46$ ). All children in the autism group had a clinical diagnosis of autism that was confirmed with an ADI-R one to two weeks prior to the first visit or at the first visit.

Children were matched based on gender and expressive language scores, as determined by standardized assessments. There were no significant differences between groups in mental age, receptive language and expressive language level. As expected, there was a significant difference in chronological age; because of their cognitive delays, children in the autism group were on average, eight months older than typically developing children (See table 1). Children were recruited by graduate students in person or via email from university pre-schools and from the Southwest Autism Research and Resource Center (SARRC), a local agency serving families with autism.

With respect to ethnicity, 77.5% of the participants were White, 10% were Hispanic or Latino, 7.5% were of Asian origin and 2.5% were of biracial or other. The mean age of mothers in the study was 36.3 years ( $SD = 4.92$ ), while the mean age of fathers was 37.6 ( $SD = 6.08$ ). Regarding household income, 25% of the families in the sample made under \$60,000 a year, 35% reported making \$60,000 to \$100,000 a year, 30% made over \$100,000 a year and 10% of families chose not to respond. In terms of family structure, 97.5% of the parents in the study

were married while 2.5% of the families had never been married. Highest level of maternal and paternal completed education was collected. In terms of fathers' highest level of education attained, 5.6% completed a high school degree, 47.2% completed a bachelor's degree and 47.2% completed a graduate degree. For mothers, 2.8% reported high school as their highest education completion, 50% reported college, and 47.2% completed a graduate degree.

### **Procedures**

Children came to a research laboratory at the university or SARRC for two visits. Visits were held in a large experimental room with a one-way mirror. For visit one, parents brought their child into the lab and an experimenter completed a variety of assessments on the child's developmental level (expressive and receptive language; mental age). Parents of children with autism completed the ADI-R, a diagnostic interview.

For visit two, one parent brought their child to the university for a videotaped assessment. The visit consisted of administering a variety of tasks that measured social and emotional development. The parent was in the room with the child and the experimenter for all but two tasks. Near the end of the visit, parents and children were provided with a box full of toys and asked to engage in free-play for five minutes during which time the experimenter left the room. The toys in the box included a puzzle, a doll, pretend feeding utensils, cars and a doctor kit. At the end of the five minutes, the experimenter handed the parent a sheet that instructed parents to ask their children to clean up. At the end of clean-up time, children were allowed to choose a prize to take home.

Upon completion of the initial study (visits one and two), a follow-up measure of the sample was conducted to assess children's social outcomes when children were six years-old on average ( $SD= 1.21$  years). Parents were contacted by phone or email to determine if they were interested in participating in an online follow-up measure. Those who agreed were sent a link to the online questionnaire packet. Parents who preferred to complete a hard copy of the questionnaire were sent it by mail. Of the 40 matched participants, 37 returned the questionnaire. The packet included questionnaires assessing family demographics, child friendship quality, school liking, and social competence. Parents of children with autism also completed questions about their child's services.

## **Measures**

**Visit one measures.** During visit one, children's expressive and receptive language was assessed using the Preschool Language Scale 4, an assessment of language abilities in children under 12 months through children six years and 11 months of age (Zimmerman, Steiner & Pond, 2002). Children's mental age was assessed using the Differential Abilities Scale II, a comprehensive assessment used for evaluating the cognitive abilities of children ages 2 years and 6 months through 17 years and 11 months (Elliot, 2007). The subtests administered for this test included block building, verbal comprehension, picture similarities, naming vocabulary, early number concepts, copying and pattern construction. From these assessments, each child received an expressive language score, a receptive language score, a global language ability score and a global mental age score. These scores were used to confirm that the groups are matched based on

developmental level. Finally, to confirm the diagnosis of children in the autism group, their parents completed the Autism Diagnostic Interview-Revised (ADI-R; Lord, Rutter, & Le Couteur, 1994), a structured, standardized parent interview which assesses the presence and severity of symptoms of autism in early childhood.

**Visit two measures.** During visit two, children and their parent participated in a free-play session from which joint attention engagement states and joint attention initiations were coded based on the coding scheme designed by Adamson and colleagues (1998).

***Coding and data reduction.*** Two undergraduate students were trained in coding videos by the primary investigator and by two graduate students. The five minute free-play session was split into five second intervals and coded for joint attention engagement states and parent/child initiations of joint attention using a coding paradigm designed by Adamson et al. (1998). Coders observed whether children were engaged in joint attention or unengaged in the interaction.

Engagement was determined by the child's coordinated eye contact between the parent and an object, verbal engagement by talking to the mother about the object or the experience, or by any directed gestures displayed by the child. Children were coded as unengaged if they did not acknowledge the parent's presence by showing little or no verbal or nonverbal communication. In addition, after each interval, coders identified the initiator of the interaction. Credit for the initiation was given to the person who introduced a new engagement state after a state of un-engagement. Key indicators of an initiation were verbal (e.g. "let's feed the

baby” or “look at how fast my car goes!”) or non verbal (e.g. showing, giving or coordinated looks) invitations to play immediately following periods of un-engagement. If a certain interval was a continuation of the previous intervals’ initiation, the previous intervals’ initiator would continue to be coded as initiator. Continuations were differentiated from new initiations by states of un-engagement; that is, if the dyad became unengaged for a period of time, but became re-engaged shortly after, it was considered a new initiation. If the dyad never un-engaged, the original initiator continued to be coded as the initiator. Proportion scores were calculated by dividing total number of jointly engaged intervals by total number of intervals coded or by dividing the total number of child or parent initiations by total number of intervals. <sup>1</sup>

Joint attention states within a mother-child dyad are difficult to code for the target population due to unique communication tendencies (e.g. frequent non-directed speech, low levels of eye contact). Due to these challenges, every video was coded by two independent undergraduate coders. A reliability assessment of each video was calculated and those videos that had a kappa of less than .7 were then team coded with a graduate student or the primary investigator. Twenty five percent of videos were randomly selected to calculate a reliability score; a kappa statistic of .88 was obtained. Initiation coding is more concrete and therefore the double coding of each video was not necessary. Approximately 25% of initiation coded videos were randomly chosen and coded by two independent coders to assess reliability. The mean kappa statistic for these codes equaled .86.

**Follow-up questionnaire.** A measure of children's friendship quality was obtained using a friendship questionnaire adapted from previous research that was originally used to identify friendship patterns in typical children and children with disabilities (Buysee, 1991; Early Childhood Friendship Survey). The modified questionnaire emphasized qualities of the child's friendships at school and during play dates, regardless of the number of friends. Parents were allotted space to include children's closest friends. Questions assessed details about play dates, play initiation frequencies, friendship arguments, friendship reciprocity, feelings of closeness and affection shown during interactions (see Appendix A).

Children's social competence was assessed using the Child Behavior Scale (Ladd & Profilet, 1996). Each individual sub-scale of the measure (i.e. pro-social, asocial, excluded, aggressive, hyperactive-distractible and anxious-fearful) was analyzed separately in addition to the social competence composite scores. The pro-social subscale measures such behaviors as helping, cooperation, and kindness toward peers. The asocial subscale measures solitary play behaviors, such as the extent to which the child avoids peers or plays alone. The exclusion subscale measures the extent to which the child is included or excluded from peer activities. The aggressive subscale measures the child's verbally and physically aggressive behaviors. The hyperactive subscale was used to measure child's attentiveness and restlessness. Finally, the anxious-fearful subscale identifies fearful or sad emotional expression and worried or distressed appearances (see Appendix B).



**Scoring and data reduction.** The *friendship quality* variable consisted of a score based on the sum of items reflecting positive friendship qualities, such as stability of friendships, reciprocal affection, and closeness. All except two questions were to scale (always, usually, sometimes, hardly ever, never). Scaled answers were assigned numerical values such that always received a score of four, usually received a score of three, sometimes received a score of two, hardly ever received a score of one, and never received a score of zero. One of the remaining two questions that did not fit this scale was “how long have your child and their friend been friends?” Numerical values were assigned to these answers in hierarchical order in terms of longevity of friendship: children that had been friends for over a year received a score of five, children who had been friends for about a year received a score of four, children who had been friends for seven to nine months received a score of three, children who had been friends for four to six months received a score of two, and children who had been friends for less than three months received a score of one. The other non-scaled question used was “who arranges play dates”; if the child or friend initiated, a score of one was given, if the parent or any other third party initiated, it was scored as zero. The *social competence* variable was composed of the sum of scores from all individual sub-scales of the Child Behavior Scale (Ladd & Profilet, 1996). A score for each individual subscale was calculated by summing all items pertaining to the respective scales.

## Chapter 4

### Results

#### **Diagnostic Analyses**

Prior to running the primary study analyses, diagnostic analyses were run to determine the normality of each variable's distribution; measures of skewness and kurtosis were analyzed. First, the standard error of skewness was calculated by using the formula  $\sqrt{6/N}$ . A standard error of .39 was found. Any variable with a skewness statistic over two standard errors of the calculated skew (.78) was considered skewed. Joint attention states and friendship quality were identified as substantially negatively skewed variables, while exclusion from peers was moderately positively skewed. According to the recommended procedures set forth by Tabachnick and Fidell (2001), a square root transformation was first employed as an attempt to normalize the distribution. This transformation was effective in eliminating the positive skew for the exclusion by peers variable. For the negatively skewed variables, reflection was used prior to performing any transformations. Scores were subtracted from the constant so that each variable with a negative skew was positively skewed. After this, a log transformation was used on these variables (joint attention states and friendship quality). The log transformation was effective in normalizing the joint attention state variable, but friendship quality remained slightly skewed. After this, transformed scores were multiplied by (-1) to facilitate and avoid the reversal of interpretation from reflection.

A similar procedure was followed to determine kurtosis values. The standard error of kurtosis was calculated using the formula  $\sqrt{24/N}$ . The standard error of the kurtosis was .78. Any kurtosis statistic greater than two standard errors over its calculated kurtosis was transformed. Joint attention states was the only variable with a non-normal kurtosis and was adjusted using a square root transformation. After normalizing the distribution, standardized ( $z$ ) scores for each study variable were calculated and used in subsequent analyses.

### **Preliminary Analyses**

Prior to testing the proposed hypotheses, preliminary analyses were run to identify the need for any potential covariates. Bivariate correlations were used to determine any significant associations between children's developmental level (i.e., mental age) and all study variables (i.e., joint attention engagement states, child initiation of joint attention, social competence, and friendship quality). Results indicated that children's developmental level was not significantly related to any of the study variables. Next, chi squared tests were conducted in order to test the relation between group and parents' highest level of education completed. For mothers, analyses indicated that there was no significant relationship between education and group,  $X^2(1, N = 37) = 2.23, p = .14$ . Results for father education also revealed no significant relation between education and group,  $X^2(1, N = 37) = 2.32, p = .14$ . In addition, chi square analyses were conducted to test the relation between family income and group; results suggested no significant relation between these two variables,  $X^2(1, N = 37) = 1.98, p = .76$ . Due to preliminary results, no covariates were used in primary analyses.

The study sample consisted of mothers ( $n=36$ ) and fathers ( $n=4$ ). Independent samples  $t$  tests were conducted on each study variable to identify potential group differences. Mother-child versus father-child dyads significantly differed in parent initiated joint attention, with fathers initiating less joint attention states ( $M= -1.07$ ) than mothers ( $M=.12$ ),  $t(37)= 2.38$ ,  $p=.022$ . However, no differences were found in child initiated joint attention states between father-child and mother-child dyads,  $t(37)=.66$ ,  $p=.51$ . After examining the subsample of father-child dyads more closely, it was discovered that three of the four dyads in this sub-sample were in the autism group. Because dyads that consisted of a child with autism differed from dyads with typically developing children on nearly every measure studied, it is more meaningful to look for parental sex differences within groups. It was found that parents of typically developing children initiate significantly less than parents of children with autism. It may have been that the one father of a typically developing child may have been pulling the parent initiation scores down for the father group, and therefore confounding the interpretation. An independent samples  $t$ -test was re-run, excluding the one typical father-child dyad, revealing no significant differences in parent initiation between mother-child and father-child dyads,  $t(36)=2.0$ ,  $p=.10$ . Although comparing the differences between mother and father behaviors would be meaningful, it is not the aim of this paper; further, because of the small subset of fathers in the sample, it is not appropriate to run subsequent analyses separately based on parent sex. In addition, the small subsample of fathers would have to be further divided between fathers of children with autism and fathers of typically

developing children, leaving a sample size far too small for appropriate analysis. Nevertheless, possible parent-level differences will be considered in the discussion.

### **Primary Analyses**

Analyses were conducted to determine the relations between joint attention engagement states in parent-child dyads and social competence, including friendship quality. The following hypotheses were explored:

Hypothesis 1: Children with autism, as a group, will spend less time engaged in joint attention states during a parent-child interaction, will initiate less states of joint attention, will have lower social competence scores and will have lower quality friendships than the typically developing group. Parents of children with autism will initiate more than parents of typically developing children as a compensatory behavior. Hypothesis 2: Joint attention states and child initiation of joint attention, will be positively related to social competence and friendship quality for both typically developing children and children with autism.

Conversely, parent initiated joint attention will be negatively related to social competence and friendship quality. Hypothesis 3: The relation between initiating joint attention, social competence and friendship quality will be moderated by group status (i.e. autism or typically developing). Hypothesis 4: The relation between initiating joint attention and friendship quality will be mediated by social competence for children with autism and for typically developing children.

**Group differences in joint attention states, parent and child initiated joint attention, social competence and friendship quality.** Independent samples

*t*-tests were conducted to examine group differences between children with autism and typically developing children in all study variables. Children with autism engaged in significantly fewer states of joint attention with their parents than their typically developing counterparts,  $t(37)=2.34$ ,  $p=.03$ , *Cohen's d* = .81. Children with autism also initiated significantly fewer states of joint attention,  $t(37)=-4.55$ ,  $p<.001$ , *Cohen's d* = 1.58, than typically developing children. Social competence analyses revealed that children with autism were significantly less socially competent than their typical peers  $t(35)=-2.55$ ,  $p=.02$ , *Cohen's d* = .83. Within the social competence measure, all subscales were analyzed individually. Children with autism were found to be significantly more hyperactive-distractible,  $t(35)=3.37$ ,  $p=.002$ , *Cohen's d* = 1.12, but not more aggressive or anxious-fearful. There were no significant differences between groups in pro-social behavior or in asocial behavior. However, children with autism were found to be more excluded by their peers than their typical matches at significant levels,  $t(35)=2.47$ ,  $p=.02$  *Cohen's d* =.80. In terms of friendship quality, results indicated that children with autism have significantly lower quality friendships than typically developing children,  $t(35)=2.14$ ,  $p=.04$  *Cohen's d* =.81. See tables 2 and 3 for descriptive statistics and group differences.

**Associations between joint attention measures and social outcome measures.** Proportion of time dyads spent in states of joint attention overall was significantly negatively related to aggressive behavior ( $r=-.52$ ,  $p=.001$ ). Initiating joint attention also yielded significant correlations to social outcome variables. Child-initiated joint attention was positively related to social competence at

significant levels, ( $r = .36, p = .03$ ). Conversely, child initiation was negatively related to exclusion by peers ( $r = -.33, p = .05$ ) and hyperactive behavior ( $r = -.40, p = .02$ ) at significant levels. Parent initiated joint attention was significantly negatively related to aggressive behavior ( $r = -.36, p = .03$ ), that is, the more the parent initiated, the less aggressive the child was reported to be. Parent-initiated joint attention was not significantly related to any other social outcome variable. Interestingly, although not an original hypothesis, correlation analyses revealed that child initiated joint attention was negatively correlated with parent initiated joint attention ( $r = -.54, p < .001$ ). That is, those dyads in which children initiated more frequently, parents initiated less frequently, whereas the dyads in which parents initiated more frequently, children initiated less frequently (see Table 4).

In order to examine this finding more closely, a new variable was formed. The total number of parent or child initiations was divided by total number of intervals engaged. This is different than the original initiation variable in that the number of initiations is now divided by the number of engaged intervals rather than by the number of total intervals. This new variable essentially analyzed children's initiations while controlling for total amount of engaged states. Independent samples *t*-tests revealed significant group differences in child-initiated joint attention within engagement states  $t(37) = -.39, p < .001$ . Bivariate correlation analyses for the entire sample indicated that the proportion of child initiations during engagement was positively related to the social competence composite ( $r = .33, p = .05$ ). In addition, child initiations during engagement was negatively related to exclusion by peers ( $r = -.36, p = .03$ ) and hyperactive behavior

( $r=-.41, p=.01$ ) at significant levels. That is, children who initiated more states of joint attention with their parents were also more socially competent, less hyperactive-distractible and less excluded by peers than children who initiated less. Group differences were also found in parent- initiated joint attention within states of engagement  $t(37)=3.88, p<.001$ , with parents of children with autism initiating more states of joint attention engagement than parents of typically developing children. In addition, parent-initiated joint attention within states of joint attention was found to be negatively related to their child's social competence ( $r=-.33, p=.05$ ), and was positively related to their child's exclusion by peers ( $r=.35, p=.03$ ) and hyperactive behavior ( $r=.41, p=.01$ ), indicating that parents of children who were less socially competent, more excluded and more hyperactive-distractible, tended to initiate significantly more than parents of higher socially functioning children (see Table 4).

**Associations between social outcome variables.** While friendship quality was not significantly correlated with any of the parent-child variables, it was negatively related to exclusion at marginally significant levels ( $r=-.31, p=.06$ ). Some subscales from the Child Behavior Scale (used to measure social competence) were significantly related to joint attention variables. Exclusion was significantly related to parent and child initiations (negatively and positively respectively), therefore it was of interest to identify other social outcome variables that were highly correlated with exclusion. Bivariate correlations were as expected, exclusion was positively correlated with anxious-fearful behavior, aggressive behavior and asocial behavior. However, the variable that was most



highly correlated with exclusion was hyperactive behavior ( $r=.80, p<.001$ ) (see Table 4).

**Moderation analysis.** After bivariate correlations were conducted on the sample in its entirety, correlations for each individual group, autism and typically developing, were analyzed. For the autism group, results indicated that parent-initiated joint attention was negatively related to aggressive behavior ( $r=-.58, p=.02$ ). This indicates that the more a parent initiated joint attention with their child with autism, the less aggressive the child was reported to be. Further, aggressive behavior ( $r=-.46, p=.05$ ) and exclusion by peers ( $r=-.47, p=.05$ ) were negatively related to friendship quality at significant levels. This means that the more aggressive and excluded children were from peers, the lower their friendship quality. As expected, social competence scores were positively correlated with friendship quality ( $r=.50, p=.03$ ), that is, the more socially competent the child was, the higher their friendship quality. With respect to correlates of being excluded from peers for this group, anxious-fearful behavior ( $r=.49, p=.04$ ) and hyperactivity ( $r=.82, p<.001$ ) were significantly correlated with exclusion, with hyperactive-distractible behavior showing a particularly high correlation (See Table 5).

For typically developing children, parent-child variables were not significantly correlated with social outcome variables. However, for this group, being excluded from peers was positively correlated with hyperactive behavior ( $r=.68, p=.001$ ), anxious-fearful behavior ( $r=.68, p=.001$ ), and aggressive behavior ( $r=.72, p<.001$ ), with aggressive behavior showing the strongest

correlation. That is, for typically developing children, being excluded from peers was most strongly related to their aggressive behavior. As expected, exclusion from peers was negatively related to pro-social behavior ( $r=-.47, p=.04$ ) and social competence ( $r=-.80, p<.001$ ). See Table 5.

After these initial bivariate correlations, the proposed moderation analyses were employed to identify the potential influences of group status on the relation between child-initiated joint attention and social competence or friendship quality. All standardized ( $z$ ) scores had a mean of zero, therefore, previously calculated standardized scores for continuous variables (child initiated joint attention, social competence and friendship quality) were used for this analysis. Because of uneven group sizes, the moderator, group status (autism or typical) was centered using the formula  $n2/(n1+n2)$  for the autism group and  $-n1/(n1+n2)$  for the typical group, where  $n1$  equals the sample size for the autism group and  $n2$  equals the sample size for the typical group. The standardized variables or centered variables were used to calculate interaction terms by multiplying the newly centered group variable by each predictor variable (i.e. child-initiated joint attention). Results revealed no significant moderation effect between child-initiated joint attention and social competence (*Standardized  $\beta$  = -.02,  $se = .18, t = -.13, p = .10$* ) or friendship quality (*Standardized  $\beta$  = -.08,  $se = .18, t = -.43, p = .29$* ) based on group status.

**Mediation analysis.** For hypothesis 4, a mediation model was tested following the procedures set forth by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002). It was hypothesized that social competence would mediate the

relation between child-initiated joint attention states and friendship quality (see Figure 1). According to the pre-requisites suggested by this approach, there must be a significant relation between variables in order to test for mediation. First, path A was tested, where the mediator variable (social competence) was regressed upon the independent variable (initiating joint attention). This analysis revealed a significant relation between child initiated joint attention and social competence (*Standardized  $\beta$  = .36,  $se$  = .16,  $t$  = 2.19,  $p$  = .044*). Next, path B was tested, where the dependent variable (friendship quality) was regressed upon the mediator variable, while the independent variable (initiating joint attention) was in the model. Results indicated that social competence did not predict friendship quality (*Standardized  $\beta$  = -.14,  $se$  = .18,  $t$  = -.76,  $p$  = .45*). The final mediation path was not tested due to the lack of significant relations between the remaining variables.

**Power analyses.** Power analyses were conducted in each regression analysis (i.e. moderation and mediation models); analyses showed that for the first moderation analyses, testing the moderation of group on the relation between child initiated joint attention and social competence revealed a power of .58, considering a medium effect size; the second moderation analysis, testing the moderation of group on the relation between child initiated joint attention and friendship quality yielded a power of .35, considering a small effect size. For the mediation analyses, path A regression had a power of .44, while the path B regression had a power of .11. These are relatively low power values, which were likely influenced by small sample sizes. If possible, future investigations should conduct power analyses prior to designing a research study in order to attain the

appropriate amount of participants necessary to arrive at an acceptable level of power. This was impossible in the current investigation, as the proposed research questions were asked after research design and data collection had begun.

## Chapter 5

### Discussion

The current study aimed to investigate group differences in social interaction between high functioning, verbal children with autism and their typically developing peers. In addition, the study examined relations between social interaction (i.e. joint attention states, parent and child initiations) within a parent-child dyad, and social outcome variables (i.e. social competence and friendship quality), including the potential role of moderators and mediators. Specifically, group status was tested as a moderator of the relation between initiating joint attention states and social competence and friendship quality; additionally, social competence was tested as a mediator between the association between initiating joint attention states and friendship quality. The study draws from a developmental neuroscience perspective which proposes that children with autism are born less socially motivated and consequently receive less neural social stimulation, through lack of initiation and reciprocity, making them less efficient at performing social skills. It was hypothesized that group differences would be found in all study variables, such that children with autism would spend less time in states of joint attention, would initiate fewer states of joint attention with their parents, would be less socially competent and would have lower quality friendships. Furthermore, it was hypothesized that parents of children with autism would initiate more states of joint attention than parents of typical children. Based on previous investigations in typical child development which have shown that early social skills practiced within the parent-child dyad predict social

relationships with peers (Gurnalick et al., 2008), it was hypothesized that increased states of joint engagement with parents and child initiation of these joint engagement states would be positively related to social outcomes (i.e. social competence and friendship quality). On a conceptual basis, it was also hypothesized that the relation between joint engagement states and social outcomes would be moderated by group status; specifically, the relation would be stronger for children with autism. Finally, based on previous research in typically developing children which has shown that social competence predicts friendship (Hartup & Stevens, 1997; Howes, 1990), it was hypothesized that the relation between joint engagement states and friendship quality would be mediated by social competence

### **Joint Attention Engagement States**

The study found significant group differences in joint attention states, with children with autism engaging and initiating significantly less states of joint attention than their typical counterparts; this supports the first hypothesis, and is consistent with previous literature that has found children with autism engage in fewer states of joint attention than typically developing children (Jones et al., 2004; Sigman & Ungerger, 1984). It is interesting that even verbal, high functioning children with autism, who were matched by developmental levels (i.e. mental age) could be distinguished from typical children in joint attention abilities within a five minute sample of parent-child play. Children in the autism group were found to be engaged in less states of joint attention with their parents than children in the typical group, and the effect sizes for these findings were large.

Effect sizes are important indicators of the magnitude of the differences found between groups and are especially important to consider in statistical tests employed on small samples sizes, as they are less influenced by sample size. In typical development, joint attention skills are usually acquired and mastered by 15 to 18 months, ages much younger than our sample. While empirical evidence has suggested that children with autism show some delays in acquiring these skills (Jones & Carr, 2004; Sigman & Ungerer, 1984), the current investigation suggests that by the ages of three to six years, children with autism continue to struggle in joint attention skills and in remaining engaged in an interaction with their parents for periods as short as five minutes.

A variety of factors are potential contributors to these findings. First, children with autism generally have substantially less practice in social interaction than typically developing children (Travis et al., 2001). This may be due to a host of factors, including less motivation to interact, less practice interacting and less knowledge as to how to interact. In addition, when parents try to interact with their children, often times, they are provide little or no reciprocity, which over time, can build a history of negative association in interacting with their child, further inhibiting the child's future practice at the skill. Alternatively, research has indicated that parents of children with autism attempt to interact with their child as frequently or more than parents of typical children (Doussard-Rosevelt, Joe, Bazhenova & Porges, 2003), however, the challenges involved in initiating and maintaining a state of engagement with a child with autism may make it more difficult to attain a successful interaction, that is, one where the child reciprocates

and is able to continue the interaction. Over time, a parent's frequent but potentially unsuccessful attempts may also inhibit the child's practice at the skill. Children's lack of interest in social engagement, characteristic of the disorder, combined with parents' poor reinforcement history in attempting to effectively interact with their children, may be jointly working against their neurological development of social skills. As time progresses, their lack of experience and practice with social interaction, specifically joint attention, can be reflected, as it was in this study, in parent-child dyadic interactions and, later in development, in peer relations.

The results of this investigation suggest that while the children in the autism group were comparable to the typical children in our sample in language abilities, mental age and gender, there is still a significant discrepancy in their interaction styles. As joint attention is rarely studied in samples older than 24 months, the current results provide an important contribution to the literature on this topic, and provide justification for future studies to focus on joint attention in older children with autism. Future work should also explore this construct in typically developing children with social difficulties, children with different developmental disabilities or mental health issues.

There is a large array of joint attention interventions offered in the field of autism by a variety of professionals, including applied behavior analysts, speech therapists, special-education teachers and others. The vast majority of these programs, however, are for very young children, and are rarely offered to children through and after pre-school. This is partly due to the fact that joint attention is a



skill thought to be acquired early in infancy for typical children and early in the toddler years for children with autism (depending on functioning levels). Additionally, because joint attention has been found to be strongly predictive of spoken language, most joint attention interventions are implemented prior to spoken language; the skill is rarely revisited after children acquire verbal language. Early intervention is critical in the positive development of children with autism and other social difficulties, and should always be implemented as soon as possible after receiving a diagnosis. Although early intervention should be the primary goal early in the intervention process, the group differences between typical children and high functioning, verbal children with autism uncovered in this investigation merit an extension in the field of joint attention intervention to provide services to verbal children through pre-school and into elementary school as necessary.

### **Parent and Child Initiation**

In addition to the group differences found in time engaged in states of joint attention, children with autism also *initiated* joint attention significantly less than their typical peers. This finding is consistent with previous findings that have revealed that children with autism have difficulties initiating joint attention behaviors and do so significantly less than their typical peers or peers with other developmental delays (Travis et al., 2001; Mundy et. al, 1994; Mundy et al., 1986); the skill of sustaining states of engagement has also been found to be deficient in this population (Kasari, Gulsrud, Wong, Kwon & Locke, 2010). The effect size for this statistical test was large. To interpret this finding, it is

important to take into account the amount of practice children with autism experience in initiating social interactions in comparison to typically developing children. The developmental neurological pruning process functions on a “use it or lose it” basis; therefore, skills that are practiced more often, are performed more efficiently in the future, while skills that are practiced less often, are performed less efficiently in the future. Social interaction is a main deficit of autism; children with this disorder struggle not only to sustain an interaction, but according to these results, to initiate one. Consistent with the theoretical perspective proposed in this study, therefore, children with autism may initiate less joint attention with their parents during the five minute play session, potentially because they have had less practice with the skill, and as a result may be less efficient at performing the skill in the future when compared to typically developing children who are much more likely to initiate interaction with family members or peers.

Moreover, the child’s social motivation may play a significant role in the frequency of initiation; if children with autism are not motivated to interact with their parents, one would expect their initiations to reflect this. The effect sizes indicate stronger differences between groups in initiation versus overall engagement in joint attention states. This provides evidence for the idea that for the children in our autism group, the lack of developmental or verbal delays potentially contributes to a smaller gap between groups in terms of responsiveness to others’ bids for joint attention; nonetheless, these skills are not reducing the gap between groups in initiation, as larger magnitude group differences are more

evident in initiation. It is possible that parent behavior contributed to these differences, such that parents of children with autism in our sample contributed to the overall time the dyad was coded as engaged in a joint attention state, and were therefore responsible for the smaller dyad group difference in overall joint attention states. Initiation on the other hand, was directly attributed to each individual partner's behavior, making initiation a more accurate assessment of child skills and joint attention states a more accurate assessment of dyadic interaction.

Parents may have played a substantial role in the results found in this study. Results revealed that parents of children with autism, on average, initiate more states of joint attention within engagement with their children than parents of typically developing children. This supports previous investigations that have revealed that parent initiations differ based on child skills, that is, the less skills the child possesses, the more involved the parent becomes (Bruner & Sherwood, 1983). This finding is also consistent with previous findings that have found that parents of children with autism initiated more joint attention behaviors during play (Kasari, Sigman, Mundy & Yirmiya, 1988). A variety of mechanisms could be responsible for this finding. One possible explanation is that parents are compensating for their child's lack of initiation; that is, in order to become and remain engaged, parents of children with autism must continuously initiate because their children lack in initiation skills. It is highly probable that there is a difference however, between parents who compensate and parents who over-compensate. That is, parents who compensate may still follow their child's lead

and scaffold opportunities for the child to initiate, while still providing needed support and acting as the driving force of the interaction. On the other hand, over-compensating parents, in their attempt to make up for their child's lack of initiation during engagement, may be further reducing opportunities for their children to practice initiation by, for example, not following the child's choice of activity, which has been shown to affect a child's motivation to participate in interactions (Koegel et al., 1999).

Previous investigations have shown that children with autism have qualitatively different play skills than typical children (Rutherford, Young, Hepburn & Rodgers, 2007). Typically developing children initiate more and seem to take a more active role in play, thereby leaving less time for their parents to initiate and drive the interaction. In addition, if a child clearly initiates and is motivated to interact with the parent, it is likely easier to follow the child's lead and in essence, interact with the child. If there is limited initiation on the part of the child, it may be that the parent is left with the task of determining the child's interest and making him or herself a motivating agent for the child.

Another potential interpretation of the finding can be that parents of children with autism may have less practice sustaining an interaction with their children than parents of typically developing children. Because children with autism show little social reciprocity from young ages, it is possible that although parents may not reduce the frequency of attempts to interact they may experience less success in their attempts or reduce the duration of their attempts. Consequent to a lack of child reciprocity and experience maintaining interactions, parents of

children with autism may not have sufficient experience in skills such as following the child's lead, maintaining their interest or providing opportunities to their children, skills that have been found to be critical to fostering social development. These parenting skills are much easier to master in interacting with a typical child; children with autism require different methods of play and interaction, skills that are very difficult to learn naturally and that are usually acquired through programs such as parent training (Aldred, Green & Adams, 2004; Drew, Baird, Baron-Cohen, Cox & Slonims et al., 2002). Therefore, while these parenting skills may come natural and are relatively easier to facilitate with a typical child, rigorous and specific training is generally involved for these skills to be successful for a child with autism. Most parents interact with their children most frequently in the home environment, surrounded by their own toys and objects. Because of this, the home environment is an ideal setting to focus on crucial parent-child interactions.

### **Social Outcomes**

Positive social peer relations have been shown to predict a number of favorable outcomes, among those, increased social support, school liking and academic success (Kramer & Gottman, 1992; Ladd, 1997). The study of social interactions in typical children and in children with autism provides critical information that can be used for social competence interventions in educational institutions. The present study found that, as hypothesized, children with autism were less socially competent with peers, as measured by the Child Behavior Scale (Ladd & Profilet, 1996). A large effect size was found for this difference,

indicating a large and meaningful difference between groups. This finding was expected due to the nature of social deficits in the disorder and findings from previous research. Specifically, Chamberlain and Kasari (2007) have found that children with autism have lower levels of network centrality with peers, are less accepted by peers and have fewer reciprocal friendships, indicating less social competence (Chamberlain & Kasari, 2007). Other studies have found that children with autism engage in less social interactions and have fewer meaningful interactions and relationships with peers (Travis et al., 2001; Eaves & Ho, 2008).

It is important to note that the Child Behavior Scale was designed for typically-developing children; this is the first study to our knowledge that has utilized the Child Behavior Scale (Ladd & Profilet, 1996) to study social competence in children with autism. Children with autism scored lower than typical children on this measure and all study subscales were in the expected direction. Furthermore, there was evidence of internal reliability as positive social competence sub-scales were highly positively related to each other whereas negative social competence subscales were positively correlated with each other. Additionally, as will be discussed later, this measure shows appropriate relations with other social variables (i.e. child initiated joint attention and friendship quality) suggesting evidence of validity. Together, this provides preliminary evidence that this is a valid and useful tool for autism research.

The Child Behavior Scale (Ladd & Profilet, 1996) is made up of six subsections: pro-social behavior, exclusion from peers, asocial behavior, hyperactive-distractible behavior, anxious-fearful behavior and aggressive behavior. Children

with autism had significantly lower scores on the total composite score of this measure, overall social competence. The children in our study were pre-school aged, and some were very temporally close to starting kindergarten. This finding suggests that the children with autism, although comparable to the typical children in mental age and language abilities, were still struggling to socially interact with peers. It is very possible that these children are going to start kindergarten at a disadvantage, as social development has been found to be essential to school engagement and academic achievement (Ladd, Herald & Kochel, 2006; Dodge Coie & Lynam, 2006). Although this finding was expected, it adds to literature in highlighting the importance of social skills interventions within the school system. This is especially true in recent times due to the passing of IDEA (U.S. Department of Education, 2004), a law based on the argument that children with disabilities deserve an education equivalent to that of typical children and that is currently resulting in many more children with disabilities, including autism, being included general education classrooms. Additionally, it is assumed that modeling can be a useful tool in helping children with disabilities learn from their typical peers. Whilst this may be justified, children with autism need supplementary support to aid them in closing the social abilities gap between themselves and typical children. This additional support can be provided through comprehensive social skills programs that include typical children and children with special needs and focus on initiating, maintaining and being flexible with play.

While it is important to analyze differences between groups, it is also meaningful to look at variability within groups; in the current study, children with autism had more variability in negative social outcome variables (i.e. asocial behavior, hyperactive-distractible behavior, aggressive behavior and being excluded from peers) than positive social outcome variables, suggesting that within the autism group, scores are more varied across the continuum of each negative variable. On the other hand, typically developing children showed more variability than children with autism in pro-social behavior, a positive indicator of social competence, showing that typical children vary more from one another in pro-social behavior than children with autism vary from one another. The distribution showing that children with autism vary more in variables that are negative indicators of social competence than typical children may be explained through the social deficit characteristic of the disorder; specifically this may suggest that in addition to overall functioning levels (as determined by language and developmental assessments), different social functioning levels may be present. Even within our somewhat homogeneous group of high functioning children with autism, more differences are noted within negative social indicators than within typical children, indicating potential differential social functioning levels and social deficits within this group. Typical children may show less variability in these variables because unlike children with autism, they do not have an array of symptoms that affect different aspects of social development, making their distribution of scores less varied.



Because significant differences were found between groups in the social competence composite score, the measure was further explored; all sub-scales were analyzed individually. Children with autism were found to be significantly more hyperactive-distractible and more excluded by peers according to their parents. An associated symptom of autism is hyperactivity and attention difficulties, thus, this finding was expected. The calculated effect size for both group differences was large. The finding on group differences in being excluded by peers may be explained through a lack of motivation on the part of children with autism to make an effort to get involved with other children's activities at school. Moreover, these children's typical peers may have acquired a lack of positive experiences in trying to engage classmates with autism, similar to the pattern of behaviors observed in parents and their children with autism. Children with autism are generally very object-focused and therefore may prefer to play alone. Further, when they are approached by typical children, they may not reciprocate socially and simply ignore the bids. A history of lack of reciprocation may lead to an overall decrease in attempts, and thereby may be reflected as exclusion.

There were no significant differences between groups in the pro-social, aggressive, anxious-fearful or asocial subscales, however small and medium effect sizes were found for some of these variables. Small effect sizes were found for group differences in pro-social behavior, anxious-fearful behavior and asocial behavior, indicating small, but nonetheless meaningful difference between groups in terms of the amount of pro-social, anxious-fearful and asocial behavior they

exhibit. A medium effect size was found for the difference between groups in aggressive behavior, suggesting that although no statistically significant differences were found, possibly as a function of the small sample size, meaningful differences may exist and should be explored in future research. There may be a variety of explanations for these findings. First, it may be that children in our sample were less socially competent overall, but did not display less pro-social or more asocial, aggressive or anxious behavior than the typically developing group. In spite of this, however, they were still more excluded. It is possible that while they are not more asocial, aggressive and anxious or less pro-social, they exhibit other behaviors that contribute to their exclusion. Previous research has shown that children who do not cooperate and are disruptive, often have less friends (Coie, Lochman, Terry & Hyman, 1992; Dishion, French & Patterson, 1995). The literature has also revealed that children with autism display increased amounts of disruptive behavior and less cooperative behavior than typically developing children, some of which may be reflected through their hyperactivity-distractibility. It is possible then, that other children exclude children with autism more than typical children, because of these characteristics, rather than because of a decreased levels of pro-social behavior or increased levels of asocial, aggressive or anxious behavior.

It may also be possible that it is difficult for parents to assess or report on their child's asocial, aggressive, anxious-fearful, and pro-social behaviors. Anxiety and fearfulness may be especially difficult for parents to accurately report due to their internal nature (Achenbach, McConaughy, & Howell, 1987). In

terms of externalizing negative behaviors, hyperactivity or distractibility may be easier to report because unlike aggressive or asocial behavior, this domain of social competence has much less of a negative stigma, thereby reducing any potential parental bias. It is more socially acceptable to be hyperactive-distractible than aggressive, for example. Because of these factors, this behavior may have been more easily reported and accurately perceived by parents. Previous research has been inconsistent in identifying the reliability of parent report; some studies have found parent report to be the most useful and accurate tool in identifying certain child behaviors (Youngstrom, Findling, Calabrese, Gracious & Demeter et al., 2004), while others have found parent report may be biased (Rajmil, Fernandez, Gispert, Rue & Plasencia et al., 1999). Overall, it may be that some behaviors may be more difficult for parents to report than others.

Finally, significant friendship quality differences were found between children with autism and typically developing children, with children with autism having lower quality friendships. This finding is consistent with previous research that has found that children with autism rarely form reciprocal friendships (Guralnick et al., 1996). Thus, this finding was expected, specifically because children with autism tend to struggle with social interactions and social interactions are critical to forming friendships (Hartup & Stevens, 1997). Forming quality friendships usually requires some level of communicative and social skills. Even among verbal children with autism, such as those in our study, often their verbalizations are not appropriate in the sense that they perseverate on certain topics of interests, have lower perspective taking abilities and have more

trouble remaining attentive and interested in conversation than typical children. These differences in communication and social abilities may account for some of the qualitative differences in friendships of children with autism versus friendships of typically developing children.

### **Children's Joint Attention States, Initiations and Social Outcomes**

The present study found that the amount of time children spent in a state of joint attention engagement with their parent was related to children's social outcomes. A negative significant relation was found between states of joint attention and aggressive behavior. Children who were rated as more aggressive spent less time jointly engaged with their parents. Direction of effects cannot be interpreted from correlation analyses; nonetheless, it is likely that bidirectional effects can explain this association such that parents may interact with aggressive children less, this lack of initiation may consequently act as a missed opportunity for self regulation. These missed opportunities to learn how to regulate behavior during interactions with parents, may generalize to peer interaction. Additional factors not tested in this study probably contribute to this relation. As noted, a child's behavior regulation skills can heavily contribute to social interactions with parents and with peers. Behavior regulation is defined as the control of one's behavior, and includes the ability to regulate the pace of one's movement, to inhibit impulses, to delay gratification and to comply with others' requests (Kochanska, Murray & Harlan, 2000; Rothbart & Posner, 2006). Children who have difficulty regulating themselves, including their aggression, are harder to engage than those who do not; over time the difficult task of engaging these

children may lead to fewer attempts to interact. While aggression is an important variable to consider in behavior control, other important variables to consider may include emotion regulation or cognitive regulation. In addition, the extent to which a parent helps their child regulate, or parent regulation strategies, may also be an important factor to consider. The more skillful a parent is at successfully engaging their child, however aggressive that child is, the more engagement time they experience, which may contribute to fostering important social developmental skills.

Numerous associations between initiating joint attention and social outcome variables were found in the present study; these links further support previous findings indicating that the interactions that occur between parent and child may be related to interactions that occur between peers in social settings (Morrison et al., 2003; Guralnick et al., 2008). Specifically, results revealed that while there was not a significant relation between joint attention states overall and the social competence composite, there was a significant positive correlation between child-initiated joint attention states and social competence, yielding important information as to which aspects of joint attention engagement in particular seem most important to social development. This finding implies that the act of initiating a state of joint attention serves a specific developmental function in social interactions. It is important to remember that the statistical tests employed do not provide causal results; the direction of effects cannot be determined by the current study. That in mind, it can be speculated that the relation between initiation and social competence could be due to a number of

factors. In order for a child to initiate, he or she must be motivated, socially, by an object, or otherwise, to do so. Low motivation is likely related to less initiation, which this investigation found, is associated with lower social competence. If a child rarely initiates play with parents and fellow peers, they are at a disadvantage in terms of practicing the skill. On the other hand, if a child is very socially motivated, they will probably be more likely to initiate social interactions with parents and peers and theoretically should receive intrinsic pleasure from doing so; consequently they may learn how to be socially competent with peers through multiple interactions and practice at the skill.

It may also be possible that in addition to motivation factors, children who do not initiate, do not know how to do so or at least cannot do so efficiently, and as a result, have much less interaction with their parents and peers, making them less socially competent over time. Skills in successful peer relations can include knowing how to join a group of peers who are already engaged, how to ask a fellow classmate to play or how to maintain an interaction once another peer has initiated. Returning to a developmental neuroscience perspective then, the lack of practice or “use” of social interaction may be related to synapse connections that were weakened during the pruning process, thereby making the act of engaging more difficult.

Finally, it is possible that the child’s genetic disposition, specifically that of being diagnosed with autism, is present and generalizes to interactions with parents and with peers, so, the relation that we’re seeing between initiation with the parent and social competence with peers, may be social traits that are present

and affecting multiple domains of interaction. In addition to how these children treat people in their social world, it is important to consider how their biological traits affect the way others treat them. An evocative gene correlation arises when genetically influenced traits elicit a specific reaction or differential treatment from others (D'Onofrio & Lahey, 2010). These reactions from the environment ergo become influential in brain development. In terms of the link between initiation and social competence, the lack of initiation on the part of the child elicits certain reaction from others, perhaps negative reactions toward the child or ignoring the child altogether. The consequent responses they receive from individuals thereafter may be influenced by their diagnosis and likely influence future interactions.

Direct environmental factors, such as those that have been discussed (i.e. parenting skills) can certainly contribute to the severity of social deficits and the general social outcome of the child within parent-child relationships and peer relationships (Venter, Lord & Schopler, 1992). In addition to parenting factors, variables like peer sensitivity, teacher awareness and classroom support may all be influential in determining a child's social and possibly educational outcomes (Birch & Ladd, 1996; Howes, Hamilton & Matheson, 1994). Peers who are aware of the disorder may be more likely to excuse certain behaviors, such as lack of reciprocity or hyperactivity, and continue to try to interact with the child, potentially, increasing the child's opportunities to initiate and certainly increasing the amount of interactive opportunities. Teachers who are educated in autism awareness may be more likely to provide extra opportunities to allow children to

initiate interaction with their peers or adults in the classroom. Finally, classrooms that are set up with objects that classmates with autism are interested in may provide better opportunities for those children to engage appropriately in joint attention with peers. All of these factors may contribute to the link between initiation and social competence.

While initiating joint attention was positively related to social competence, it was negatively related to being excluded by peers and hyperactive-distractible behavior. This finding makes conceptual sense as children who are more excluded likely initiate less with peers as they do with parents. Again, the effects are most likely bidirectional in that children who initiate with their parents less, also initiate with their peers less and the effects of less initiation in each environment, affects social functioning in other environments. This finding is similar to previous findings that have indicated that joint attention skills are related to peer relations (Kasari et al., 2007; Travis et al., 2001; Sheinkopf et al., 2004). The deficiency seen in initiation skills, potentially limits the interaction children with autism have with their peers and may make them excluded over time, which following a cyclic pattern, reduces their opportunities to practice initiation. Perhaps children who are excluded by peers don't have sufficient experience in initiating interactions overall, including interacting with parents. In addition, hyperactive-distractible behavior was also found to be negatively related to initiation. Children who are hyperactive and distractible are potentially less likely to remain in engagement for relatively prolonged periods of time; this lack of duration in engagement inevitably affects initiation frequency. Most scientists



agree that behavior, including initiating an interaction, is a product of biological and environmental influences, like the ones previously discussed (Nelson et al., 2008; Segalowitz et al., 2003; Plomin, 1994). Therefore the link between initiation and hyper-activity may be influenced by the child's underlying genetic disposition, but may be perpetuated or alleviated through environmental factors.

In terms of social outcome variables, exclusion seemed to be consistently related to both parent and child initiation, thus it was of interest to further explore which social outcome variables were associated with exclusion, in an attempt to explain what specific social behaviors may be most closely correlated with exclusion by peers. Results for the entire sample indicated that consistent with previous reports of the CBS (Ladd, Andrews & Brown, 2009), exclusion by peers was positively related to anxious-fearful behavior, aggressive behavior, asocial behavior and hyperactive-distractible behavior, with the strongest correlation being with hyperactive-distractible behavior. Again, while direction of effects cannot be determined with this data, there is likely a bidirectional effect at work; that is, being excluded by peers may be due to an increased likelihood to exhibit more of these negative behaviors (e.g. hyperactivity, aggression), this exclusion in turn, reduces the amount of practice a child has at initiating and interacting and may therefore inhibit social growth and perpetuate negative behaviors.

### **Parent Joint Attention Behaviors and Children's Social Outcomes**

Results of the present study indicated that parent initiated joint attention within the free-play session was negatively related to children's aggressive behavior. The data suggest that the more aggression the children were rated as

having, the less their parents initiated joint attention states. This is a significant contribution to the literature as no previous studies, to our knowledge, have specifically investigated parent joint attention skills as they relate to child aggression. Although not tested in the present study, it may be that there are qualitatively different reasons parents may have low initiation scores. Parents who have low initiation scores and also have aggressive children may not initiate because it is difficult to engage their child or because their child reacts negatively, potentially with aggression, when they try to initiate with them; this suggests a parent-child history of negative interactions. The data may also indicate a different trend, that is, parents with high initiation who have children low on aggression may be initiating at high levels because their child is more absent from the interaction, due potentially to distractibility, low interest or low motivation. The child may not be aggressive per se, but may still be difficult to engage; this lack of aggression may relatively facilitate attempts to initiate (when compared to attempts to initiate with an aggressive child) and therefore increase the frequency of initiations made by parents. This explanation is further supported by the finding that parent and child initiations were negatively correlated, so, the more the parent initiated, the less the child initiated and vice versa. Parents who have low initiation scores, but have children with high initiation scores may be letting their child lead the interaction and be working to maintain rather than initiate new states of joint attention; while parents with high initiation scores who have children with low initiation scores may be compensating for their child's lack of skill or may be lacking in parental skills of engagement (as previously discussed).

As previously reported, child initiations are positively related to social competence; this may suggest that parents with the lower socially functioning children tend to initiate more. This is supported by previous literature that has found that the less skills the child has, the more active the parent is during interactions (Bruner & Sherwood, 1983)

After finding the negative relation between parent initiation and child initiation, it was of interest to analyze how the initiation of each was correlated with social outcomes, controlling for amount of time engaged in states of joint attention. A new variable was formed where total number of each partners' initiations was divided by total number of intervals engaged rather than total number of intervals; a proportion score was calculated for each dyad. While child-initiation within engagement was related to the same social outcome variables as the original child-initiation variable, more was revealed about parent initiation. Parent initiation within engagement was negatively related to social competence and positively related to exclusion by peers and hyperactive-distractible behavior. While direction of effects cannot be implied, this finding may further supports the idea that parents with lower socially functioning children, initiate more than parents with higher socially functioning children. Therefore, it is likely that the relation between exclusion and hyperactive-distractible behavior and parent initiation is more accurately reflected through lack of child initiation rather than active and frequent parent initiation. An alternate idea may be that a child's hyperactive behavior requires a parent to frequently initiate in order to keep a child on task and interested. This hyperactive-distractible behavior may also

generalize to peer settings where these children continue to have social difficulties.

### **Group Status, Joint Attention and Social Outcomes**

The next hypothesis proposed was that group status would moderate the relation between child-initiated joint attention and social competence. Correlation analyses were conducted on each individual group to test if the relation between joint attention variables and social outcome variables differed based on group. Results for the autism group revealed results unique to their group; first, parent-initiated joint attention was negatively related to aggressive behavior. This suggests that the more a parent initiated with their child with autism, the less aggressive this child tended to be. This could have been due to variety of factors, including exterior factors that were not tested in this study. For example, effective parent regulation strategies, through multiple specific initiations, could have reduced or kept under control levels of aggression. In other words, parent regulation strategies could have moderated the relation between parent initiation and aggression. Another possibility is that through a history of negative reactions, potentially aggressive behavior, parents of aggressive children have reduced the frequency of initiations. Conversely, the parent could show a continuing effort to initiate an interaction, but if the child does not respond with engagement, or maintain the engagement, according to the coding scheme, the parent would not have gotten credit for that initiation. The coding scheme therefore, is better described as a measure of successful parent initiation rather than parent attempts at initiation.

This finding warrants future investigations analyzing different parental techniques that may moderate the relation between parent initiations and aggression. In addition to being a needed contribution to the literature, it would more importantly, be useful information for clinicians. If empirical evidence identified that specific parental behaviors were shown to impede aggressive behavior, parents could be trained on implementation and as a result, their children may reach lower levels of aggression, thereby improving the longevity, frequency and quality of interactions.

A second finding unique to this group was that exclusion by peers was positively related to anxious-fearful behavior and hyperactive-distractible behavior, with hyperactive-distractible behavior having the highest correlation. Further, aggressive behavior was not significantly related to being excluded by peers for this group. The data suggest that for children with autism, being hyperactive and distractible is the social variable most strongly related to being excluded from peers. By distinction, for typically developing children, although anxious-fearful behavior and hyperactive-distractible behavior were significantly related to exclusion by peers, aggressive behavior was the variable most strongly correlated. Interestingly, it seems that for typical children, being aggressive is more closely related to being excluded, while the high functioning children with autism in our sample, being hyper-active seems to be most closely related to being excluded. Previous findings on the CBS have found that exclusion by peers was most strongly correlated with asocial and aggressive behavior in typically developing children (Ladd et al., 2009). No studies to our knowledge have used

this measure on children with autism, however, other measures have found that children with autism are more hyperactive and have more social difficulties than their typical peers (Iizuka, Yamashita, Nagamitsu, Yamashita & Araki et al., 2010).

This finding has important implications for social interventions differentially targeted for children with autism or typically developing children. It is important to remember that the children in our sample were all high functioning and verbal, thus for this particular sample of children with autism, these findings may suggest to specifically address hyperactive-distractible behavior by working on things like behavior and emotion regulation, decreasing disruptive behaviors, prolonging the duration a child can stay engaged in an activity, and increasing cooperative behavior in structured group activities. For typically developing children with social difficulties, it may be particularly important to address physical and relational aggression and teach replacement behaviors, that is, appropriate and functional behavior that can be used to replace inappropriate behavior. For example, instead of hitting when a child wants a toy, a child could be taught to ask, and wait for a toy, incorporating aspects of self regulation and self control.

It was hypothesized that the relation between child initiation and social competence or friendship quality would be moderated by group status (i.e., autism or typical). Results indicated that moderation results were not significant, suggesting that similar processes occur between parent-child dyads and peer groups in typical children and in children with autism. So, despite group

differences in levels of joint attention states and social competence, the relation between variables between groups is not significantly different. Small sample size and low power could have impeded statistically significant results. It may also be that there is no true effect due to group, based on the developmental characteristics of our sample. Specifically, perhaps high functioning children with autism do not differ in their relation between joint attention and social competence from their typical peers. Different results may be found in lower functioning children with autism, for example, children with lower language abilities or lower developmental ages (i.e. mental age). It is possible that for less verbal children, interaction within the parent-child dyad is especially crucial to development, precisely because they have limited communication abilities and play with their parents may be their sole mode of interaction. Finally, these findings may suggest that there is no significant difference in the process that links parent-child interactions to peer interactions between children with autism and typical children; perhaps, the important part of the equation is that these two groups have different social starting points; that is, children with autism are at a social disadvantage due to the nature of their symptoms, while typical children have an advantage. These group differences may explain the social differences seen between these groups, while the actual processes that social development unfolds in, may be similar.

Finally, it was hypothesized that the relation between child-initiated joint attention and friendship quality would be mediated by social competence; results revealed no significant mediation between these variables. Specifically, child-

initiated joint attention was predictive of social competence, but social competence was not significantly predictive of friendship quality, when initiating-joint attention was in the equation. This specific result was not anticipated, as theoretically and empirically, social competence should and has predicted friendship quality. Like in the moderation analysis, small sample size could have contributed to a lack of significant results; significant mediation can be challenging to find with a sample size of 40.

Another possibility may have been an unforeseen psychometric problem with the friendship questionnaire. The questionnaire was adapted from Buysse, Goldman and Skinner (2002), a study that looked at friendship formation in children with and without disabilities. To our knowledge, no friendship quality questionnaire has been developed exclusively for children with autism. Children with autism are qualitatively different from children with other disabilities; likewise, parents of children with autism may have undergone different experiences than parents of children with other disabilities. It is possible that children with autism share some of the relationship attributes described in the questionnaire (e.g. expressed affection, frequency of play initiation) with peers, but have trouble in other specific domains, such as, quality of play with friends. For example, if during play dates, the dyad engages in parallel play, that is, playing near each other rather than with each other, for the majority of the time rather than social and interactive play, the quality of the interaction would be reduced. In addition, parents of children with autism may be more likely to arrange play dates with other children in an attempt to increase their child's



interactive experiences with same aged peers. If this is the case, it may be that children with autism have more play dates with other children, but again, the quality of play may be lacking. Therefore, if parents scored their child as lacking in social competence, but misinterpreted frequency of play dates as quality of friendship, it is possible that social competence would not be predictive of friendship quality.

Another possible explanation is that high functioning children with autism, regardless of their social difficulties, have at least one quality friendship. The children in our study were high functioning, had verbal skills and were at developmental levels near that of their same aged peers. Perhaps, despite their low scores in social competence, this group in particular, still manages to have meaningful friendships. Previous investigations have highlighted the importance of having at least one close friendship, and that this may be of higher importance than being included in the entire peer group. If the children in our sample truly had at least one quality friendship, despite their social difficulties and tendencies of being excluded by most peers, it is probable that the social competence variable would not be predictive of friendship quality, at least for this unique group.

### **Limitations and Future Directions**

This investigation made an important contribution to the literature on social outcomes in children with autism by demonstrating significant differences and large effect sizes between pre-school aged typical children and verbal, high functioning pre-school aged children with autism within the parent-child dyad and

within a peer context. While this investigation had limitations, a main contribution was providing ideas and directions for future investigations.

The study of children with developmental disabilities is challenging on a variety of fronts. First, large sample sizes, complete with high statistical power are difficult to attain due to the numerous criteria participants must meet in order to conduct a sound investigation (e.g. developmentally matched samples). In addition, the participant pool for children with a specific disability is obviously much smaller than that of typically developing children or the general population. Furthermore, a unique issue for children with developmental disabilities, autism in particular, is that they have extremely busy schedules. Autism symptoms affect a wide array of functioning domains, therefore, children usually need help from a variety of specialists. It is not uncommon for children with autism to receive a variety of services (e.g. speech therapy, occupational therapy, and applied behavior analysis therapy) and to use multiple services at a time (Jahromi, Guimond, Robinson & Meek, 2009). Together, these issues affect sample size in autism research. The current study consisted of a matched sample of 20 children with autism and 20 typically developing children. It is acknowledged that in general, larger sample sizes are more apt to generalization of findings across children; the same holds true for the results of this investigation. Although most of the children were uniformly high functioning, verbal children with autism, only 20 were studied, thereby inhibiting inferences that can be made across the entire population of children with autism or even the population of children with high functioning autism. Because sample size is a challenge in this field, it is especially

important to study effect sizes. The medium to large effect sizes found in some of the results of this investigation provide optimism about the relations studied and provide justification for replication studies to be conducted.

Although it is challenging, future investigations should address the issue of small sample sizes so as to facilitate generalization across studies and across children. This investigation studied only high functioning children with autism as indicated by developmental and language tests; while it is important to study children of all functioning levels, the heterogeneity of children with autism makes it very problematic to study all functioning levels together. Researchers should have strict criterion (e.g. developmental level, expressive or receptive language skills) for the functioning levels they will group together. Failure to do so may result in misinterpretation of results, as children of different functioning levels exhibit varying intensities and frequencies of certain behaviors.

Another limitation was the lack of fathers that participated in the study. It would have been ideal to have a sufficient amount of mothers and fathers to analyze separately and compare, unfortunately, the reasons stated above make it very difficult to gather the data. Even a sample size large enough to allow for removing the few fathers from analyses (so as to look at a homogenous parent gender) would have been an improvement, but doing so with the amount of dyads in the study, would have eliminated 10% of participants, a number too large for sample sizes of this size.

An important future direction is to study the dynamics between father-child relations in typical children and in children with autism. Empirical

investigations on fathers and their interactions with their young typically developing children greatly lack in the field; empirical investigations on fathers and their children with autism are even more absent but equally needed. Many fathers play a significant role in raising their children and therefore interact with them in significant and important ways. Some work has been done suggesting that fathers of children with developmental disabilities, when compared to fathers of typical children, are less involved in caring for their children (Bristol, Schopler & Gallagher, 1988). While some studies have found less involvement, little is known on specific interaction styles that fathers of children with autism share with their children. For example, it would be interesting to investigate if fathers of children with autism use similar parenting strategies, play techniques, verbal communication and disciplinary actions with their children as fathers of typically developing children. Additionally, it would be of interest to observe the dynamics that occur in a familial triad, that is, between a mother, father and a child with autism and analyze if certain behaviors, interaction approaches or types of play are strongly related to the social outcomes in the peer setting.

A third limitation of this investigation was that social outcome variables were measured by parent report rather than by teacher report or observation. Study budget concerns restricted the reimbursement teachers could be granted, therefore other forms of report were explored. While many of the questions were geared toward play groups and other social situations where parents are vigilant of their child's behavior, some of the questions were included to understand overall social functioning of the child in peer situations. It is possible that some forms of

parent report are relatively biased; teacher report would have potentially been less biased. In addition, teachers have the advantage of seeing children interact with same aged peers on a daily basis, thereby improving their knowledge of their student's social functioning levels. For the study at hand, parent report was decided upon based on two factors. First, the children that made up this sample were of pre-school age. There was no uniform teacher report available as some children attended pre-school, others attended daycare, while others attended different types of play or therapy groups. Parent report was a uniform data collection source. Secondly, friendship quality was a main variable in question; questions included assessing how much the child talked about the friend, how often they saw each other and how much they would miss each other if one moved away (among others). Most of these, it was decided, were questions parents of very young children would be well informed about. Nevertheless, future investigations should aim to investigate peer relations and social competence through the most objective means possible; depending on the child's age and activities he or she is involved in, teacher report would be a preferable method of attaining data on social relations among peers.

Finally, while half of the study variables (those collected during visit two) were observational in nature, those collected with the follow-up questionnaire were reported. Observational data collection is arguably the most objective data that can be collected and analyzed. Examining participants' social interactions with same aged peers in the lab may have been an improved form of identifying social competence and friendship qualities. In addition, while laboratory

observations are very useful and controlled environments, observing both parent-child dyads and child-peer dyads in the natural environment would have been most effective in identifying parent-child dynamics and peer dynamics. Observing interactions in the natural environment allows the researcher to see what the relationship is like on a regular basis, in a less altered and artificial situation than a laboratory context. Parent or child behavior can potentially be altered in a laboratory situation based on a variety of factors such as anxiety from being in a new environment or having an unknown authority figure observing. Future investigations should take the value of observational studies into account and design studies around capturing important social interactions in the natural environment, especially peer interactions in the classroom, on the playground and during after-school activities. Concepts such as play initiation, maintaining engagement and effectively transitioning between activities can be captured in the natural environment. Nevertheless, some phenomena, such as emotion regulation or conflict resolution, may be difficult to capture in this setting, therefore studies investigating specific phenomena that do not readily occur in the natural environment should employ structured and controlled laboratory experiments so as to be more equipped to discuss potential causal relations.

An additional limitation in the current study is the overall number of *t*-tests conducted. A widely accepted *p* level of .05 is traditionally used in the social sciences; this number results in a five percent chance of Type I error, that is, the indication of a significant finding when there is no significant finding. The more *t*-tests that are employed, the higher the likelihood of a Type I error; the current

study ran 13 tests. While this is acknowledged as a limitation, in such a small sample size, statistical significance is difficult to attain and while a statistical adjustment, such as a bonferonni adjustment, could have been conducted, most of the results would have been non-significant. Nevertheless, it is important, especially in small sample sizes to seriously consider effect sizes; while this investigation may have a higher likelihood of attaining a Type I error due to the numerous tests conducted, large effect sizes inevitably support the findings, suggesting group differences large in magnitude. Future investigations should limit the number of *t*-tests conducted so as to decrease the probability of attaining a Type I error.

This investigation studied joint attention and its relation to social competence in typical children and children with autism using a developmental neuroscience perspective. While the resources or tools available to actually test the neurodevelopment of the children in our sample over time were not available, biological influences and implications were considered. Most if not all scientists agree that it is impossible to tease apart and neglect the processes in which the interaction between biology and the environment influence social behavior. This is especially true in studying children with autism or other genetic or developmental disorders, as the cause of autism (including all of its associated symptoms) has a large genetic component, and is also inevitably affected by the environment. While most social scientists do not have the tools necessary for genetic testing or neurological imaging, researchers should still consider the implications biology undeniably has on behavior and have an informed genetic

and neurological perspective when studying environmental effects on behavior. That in mind, future investigations on social interaction between children with autism, their parents and their peers should strive to incorporate biological markers as well as operationally defined environmental influences so as to arrive at a more comprehensive explanation of their behavior.

In addition to keeping biology in mind while designing studies and interpreting results, investigators should work to translate the work conducted in laboratory settings to clinical settings. The fact that the environment has been shown to have such large effects on behavior serves as a source of optimism in that professionals may not have the knowledge or tools to modify biology, but the environment on the other hand, is very modifiable. Large environmental effects have important implications for intervention research and for the translation of intervention research to clinical practice. Therefore, future studies should not only test new interventions aimed at alleviating symptoms of autism, but replicate interventions that have been found to be successful in order to provide clinicians, school districts and parents with the highest quality empirical work to follow.

Moreover, the link found between parent and child relations and peer relations in children with autism and in typical children speak to the importance of enriching parent and child relationships through, for example, parent training programs. Improving interactions within parent and child dyads may generalize to improved interactions between peers. Although the model tested in this investigation was not causal, it provides valuable information as to which aspects of joint attention may be especially important to the future social development of



children. Child initiation of joint attention in particular seemed important to predicting social competence, therefore, future studies should examine child-initiated joint attention in different settings, across different age groups and across children of different functioning levels. Perhaps responding to joint attention, rather than initiating it is more important for lower functioning children with autism.

The multiple aspects of social competence studied in the current investigation should also be addressed in future research. Specifically, the finding that for children with autism being excluded by peers was most highly correlated with hyperactive-distractible behavior while for typical children aggression was most strongly correlated with being excluded by peers, should be a key concept studied in the future. The sample size in this investigation warrants replication of these findings in order to arrive at a conclusion that can potentially be used to inform interventions on social development and peer relations in children with autism as well as typical children with social difficulties.

Finally, while it is important to translate research to clinical practice, it is equally important to inform public policy in order to make large scale improvements to the education system for example. Currently, the education system is not set up to foster the social or academic growth of children with disabilities, especially autism. These children have complex emotion and behavior regulation problems, in addition to social and communication deficits, making a typical education environment ineffective for cultivating their school success. Teachers and paraprofessional aids should be trained in empirically supported

interventions so as to maximize the quality of education these children receive and ultimately improve their educational and life outcomes. So, while research has the responsibility to create knowledge, future investigations should also aim to inform clinical intervention and public policy.

This investigation specifically found that the act of initiating joint attention with a parent is important for the development of social competence in peer settings. This information can be used to inform clinical interventions aimed at increasing joint attention between parents and their children with autism; further, these results can also be used to train other individuals working with children with autism, most importantly, school teachers. If initiation is targeted as an important ability to develop, children will receive an increased amount of opportunities to practice the skill and thereby improve their ability and efficiency in doing so. This increase in initiation with teachers and peers will assuredly increase the frequency of interaction between children with autism and their peers, a powerful tool in integrating children in the peer group. With the prevalence of autism increasing every year, it is critical to continue investigating social phenomena that occur within this population in order to more appropriately provide the community with informed techniques on how to improve the quality of life of affected individuals.

In conclusion, the present study has made an important contribution to the literature on joint attention engagement states and social competence in autism by uncovering group differences among typical children and verbal, pre-school aged children with autism. It suggests important implications for an extension of joint

attention interventions beyond infancy, toddlerhood and the acquisition of verbal language. Further, the important relations found between parent-child interactions and social outcome variables encourage further research and intervention focus within the parent-child dyad at this critical stage of development.

## Chapter 6

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#### Footnote

<sup>1</sup>. An alternate observational coding scheme was designed in order to analyze parent and child initiated joint attention states in a different way. While the initiation coding scheme described thus far was calculated by counting the frequency of intervals in which one partner's initiation was responsible for the state of joint attention, the novel coding scheme only gave "credit" for each initiation after an unengaged state. Both variables were divided by total number of intervals. Results indicated that the novel frequency initiation variable yielded significant group differences in child initiation,  $t(37)=-2.19$ ,  $p=.006$ , with children with autism initiating less. There were no significant differences between groups in parent-initiations  $t(37)=1.11$ ,  $p=.27$ . The new child-initiation frequency variable was not significantly related to any social outcome variables, therefore, the original initiation variable was used in consequent analyses.

Table 1

*Developmental Characteristics of Study Participants by Group*

| Characteristic     | Autism |       |       | Typically developing |       |       |
|--------------------|--------|-------|-------|----------------------|-------|-------|
|                    | Mean   | SD    | Range | Mean                 | SD    | Range |
| CA <sup>a</sup>    | 59.58  | 11.50 | 40-77 | 50.20                | 11.12 | 33-78 |
| MA <sup>b</sup>    | 57.79  | 16.80 | 32-94 | 52.95                | 13.66 | 29-86 |
| ACAGE <sup>c</sup> | 60.20  | 13.53 | 39-81 | 58.05                | 11.63 | 45-81 |
| ECAGE <sup>d</sup> | 56.70  | 12.36 | 32-83 | 58.05                | 12.01 | 37-81 |

*Note.* <sup>a</sup> Chronological Age <sup>b</sup> Mental Age <sup>c</sup> Receptive Language Age <sup>d</sup> Expressive Language Age



Table 2

*Mean, Standard Deviation, Range, Group Difference and Effect Size Comparisons Between Typical Children and Children with Autism in Joint*

*Attention Study Measures*

| Variable   | Total Sample  |            |            | Autism Sample |            |            | Typical Sample |            |            | <i>t</i> | <i>p</i> | <i>d</i> |
|--|---------------|------------|------------|---------------|------------|------------|----------------|------------|------------|----------|----------|----------|
|  | <i>M (SD)</i> | <i>Min</i> | <i>Max</i> | <i>M (SD)</i> | <i>Min</i> | <i>Max</i> | <i>M (SD)</i>  | <i>Min</i> | <i>Max</i> |          |          |          |
| Joint Attention States   | .67 (.21)     | 1          | .96        | .61 (.24)     | .1         | .96        | .74 (.11)      | .49        | .90        | 2.34     | .028     | .81      |
| Child-Initiated Joint Attention                                | .31 (.21)     | 0          | .81        | .18 (.13)     | 0          | .43        | .43 (.19)      | 0          | .81        | -4.55    | <.001    | .83      |
| Parent-Initiated Joint Attention                               | .36 (.19)     | .05        | .92        | .21 (.34)     | .05        | .92        | .31 (.17)      | .06        | .52        | 1.93     | .062     | .61      |
| Child-Initiated Joint Attention within Joint Attention State   | .44 (.26)     | 0          | .92        | .30(.19)      | 0          | .67        | .57 (.25)      | 0          | .92        | -.39     | <.001    | 1.25     |
| Parent -Initiated Joint Attention within Joint Attention State | .56 (.26)     | .08        | 1.0        | .70 (.19)     | .33        | 1.0        | .43 (.25)      | .08        | 1.0        | 3.88     | <.001    | 1.25     |

*Note. n = 39 (19 autism, 20 typical)*

Table 3

*Social Outcome Measures: Mean, Standard Deviation, Range, Group Difference and Effect Size Comparisons Between Typical Children and Children*

*With Autism*

| Variable                    | Total Sample |       |       | Autism Sample |       |       | Typical Sample |     |      | t     | p    | d    |
|-----------------------------|--------------|-------|-------|---------------|-------|-------|----------------|-----|------|-------|------|------|
|                             | M (SD)       | Min   | Max   | M (SD)        | Min   | Max   | M (SD)         | Min | Max  |       |      |      |
| Social Competence Composite | -3.86 (1.96) | -7.33 | -1.17 | -4.61(1.75)   | -7.33 | -1.17 | -3.16 (1.71)   | 6.5 | -1.3 | -2.55 | .015 | .83  |
| Pro-Social Behavior         | 15.43 (3.61) | 9     | 21    | 14.56(3.01)   | 10    | 21    | 16.26 (4.01)   | 9   | 21   | -1.46 | .153 | .09  |
| Anxious-Fearful             | 1.07 (.35)   | .32   | 1.84  | 6.61(1.94)    | 4     | 10    | 5.95 (2.04)    | 4   | 9    | 1.01  | .32  | .33  |
| Excluded by Peers           | 9.27 (2.70)  | 6     | 15    | 10.33 (2.91)  | 7     | 15    | 8.26 (2.10)    | 6   | 14   | 2.47  | .019 | .80  |
| Hyperactive-Distractible    | 6.68 (2.21)  | 4     | 12    | 7.78(2.18)    | 4     | 12    | 5.63 (1.67)    | 4   | 9    | 3.37  | .002 | 1.12 |
| Aggressive with Peers       | 8.57 (1.76)  | 7     | 14    | 9.16(2.01)    | 7     | 14    | 8.12 (1.37)    | 7   | 12   | 1.69  | .101 | .55  |
| Friendship                  | 16.54 (4.19) | 3     | 23    | 15(4.72)      | 3     | 21    | 18 (3.09)      | 10  | 23   | 2.14  | .039 | .81  |
| Asocial with Peers          | 7.84 (2.52)  | 5     | 13    | 8.44 (2.77)   | 5     | 13    | 7.26 (2.18)    | 5   | 11   | 1.45  | .157 | .47  |

Table 4

Correlations Between Joint Attention Variables and Social Outcome Variables for Total Sample

| Variable  | 1 | 2       | 3       | 4        | 5     | 6     | 7      | 8     | 9      | 10     | 11     | 12      | 13     |
|---|---|---------|---------|----------|-------|-------|--------|-------|--------|--------|--------|---------|--------|
| Child-Initiated<br>Joint Attention<br>Overall               | 1 | -.836** | .956**  | -.958**  | .149  | -.144 | -.145  | .062  | -.329  | -.100  | .196   | .211    | -.458* |
| Parent-Initiated<br>Joint Attention<br>Overall              |   | 1       | -.921** | .920**   | -.010 | .021  | -.099  | -.285 | .216   | -.087  | -.076  | -.007   | -.092  |
| Child-Initiated<br>Joint Attention<br>within<br>Engagement  |   |         | 1       | -1.000** | .160  | -.075 | -.052  | .195  | -.298  | -.029  | .168   | .132    | -.246  |
| Parent-Initiated<br>Joint Attention<br>within<br>Engagement |   |         |         | 1        | -.160 | .079  | .045   | -.196 | .308   | .025   | -.165  | -.132   | .251   |
| Friendship Quality  |   |         |         |          | 1     | -.141 | -.325  | -.044 | -.538* | -.063  | .211   | .296    | -.286  |
| Anxious-Fearful   |   |         |         |          |       | 1     | .628** | .499* | .340   | .676** | -.502* | -.776** | .216   |
| Hyperactive-  |   |         |         |          |       |       | 1      | .527* | .439   | .676** | -.508* | -.789** | .438   |

|                            |   |      |        |        |         |       |   |
|----------------------------|---|------|--------|--------|---------|-------|---|
| Distractible               |   |      |        |        |         |       |   |
| Aggressive Behavior        | 1 | .306 | .722** | -.563* | -.752** | .374  |   |
| Asocial Behavior           |   | 1    | .311   | -.384  | -.607** | .289  |   |
| Excluded by Peers          |   |      | 1      | -.471* | -.797** | .333  |   |
| Prosocial Behavior         |   |      |        | 1      | .827**  | -.264 |   |
| Social Competence          |   |      |        |        | 1       | -.397 |   |
| Joint Attention Engagement |   |      |        |        |         |       | 1 |

Note. \*\* Correlation is significant at the 0.01 level (2-tailed), \*Correlation is significant at the 0.05 level (2-tailed).

Table 5

*Correlations Between Joint Attention Variables and Social Outcome Variables by Group*

| Variables   | 1       | 2       | 3        | 4        | 5     | 6      | 7     | 8      | 9     | 10     | 11     | 12      | 13      |
|---|---------|---------|----------|----------|-------|--------|-------|--------|-------|--------|--------|---------|---------|
| Child-Initiated<br>Joint Attention<br>Overall               | 1       | -.053   | .791**   | -.791**  | -.025 | -.114  | -.157 | -.138  | .069  | -.162  | -.025  | .094    | -.505*  |
| Parent-Initiated<br>Joint Attention<br>Overall              | -.836** | 1       | -.460*   | .460*    | -.106 | .460   | .004  | -.575* | -.048 | .172   | .404   | .083    | -.833** |
| Child-Initiated<br>Joint Attention<br>within<br>Engagement  | .956**  | -.921** | 1        | -1.000** | .086  | -.239  | -.378 | -.131  | .118  | -.369  | -.113  | .181    | -.034   |
| Parent-Initiated<br>Joint Attention<br>within<br>Engagement | -.958** | .920**  | -1.000** | 1        | -.086 | .239   | .378  | .131   | -.118 | .369   | .113   | -.181   | .034    |
| Friendship<br>Quality                                       | .149    | -.010   | .160     | -.160    | 1     | .425   | .254  | .459   | .276  | .477*  | -.269  | -.501*  | .065    |
| Anxious-Fearful   | -.144   | .021    | -.075    | .079     | -.141 | 1      | .519* | .126   | .427  | .492*  | -.152  | -.609** | -.363   |
| Hyperactive-<br>Distractible                                | -.145   | -.099   | -.052    | .045     | -.325 | .628** | 1     | .364   | .377  | .817** | -.543* | -.854** | .051    |

|                            |        |       |       |       |        |         |         |         |         |         |         |         |       |
|----------------------------|--------|-------|-------|-------|--------|---------|---------|---------|---------|---------|---------|---------|-------|
| Aggressive Behavior        | .062   | -.285 | .195  | -.196 | -.044  | .499*   | .527*   | 1       | .027    | .207    | -.432   | -.479*  | .551* |
| Asocial Behavior           | -.329  | .216  | -.298 | .308  | -.538* | .340    | .439    | .306    | 1       | .389    | -.651** | -.720** | -.017 |
| Excluded by Peers          | -.100  | -.087 | -.029 | .025  | -.063  | .676**  | .676**  | .722**  | .311    | 1       | -.284   | -.761** | -.097 |
| Prosocial Behavior         | .196   | -.076 | .168  | -.165 | .211   | -.502*  | -.508*  | -.563*  | -.384   | -.471*  | 1       | .760**  | -.321 |
| Social Competence          | .211   | -.007 | .132  | -.132 | .296   | -.776** | -.789** | -.752** | -.607** | -.797** | .827**  | 1       | -.089 |
| Joint Attention Engagement | -.458* | -.092 | -.246 | .251  | -.286  | .216    | .438    | .374    | .289    | .333    | -.264   | -.397   | 1     |

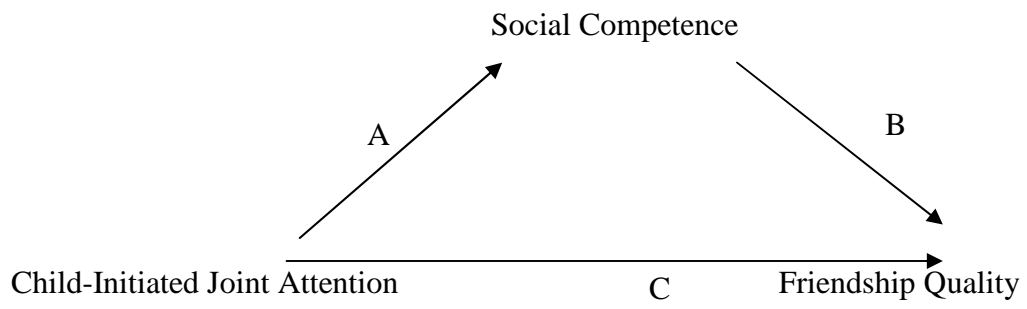
Note. \*\* Correlation is significant at the 0.01 level (2-tailed), \*Correlation is significant at the 0.05 level (2-tailed).

Note. Values above the diagonal reflect the autism group; values below the diagonal reflect the typical group.

### **Figure Caption**

*Figure 1.* Mediation model tested (based on the approach from MacKinnon, et al., 2002) for whether social competence mediates the relationship between child-initiated joint attention and friendship quality.

*Figure 1. Mediation Model*





APPENDIX A  
FRIENDSHIP QUALITY QUESTIONNAIRE

I. Please answer the following questions about your child's friendships.

1. Think of your child's close/special friends? List as many or few close/special friends as appropriate.

| Friend's Age | M/F*** (circle one) |   | Is this friend a classmate? (circle one) |    | How long (months) have they been friends? | Does this friend have a disability? (circle one) |    |
|--------------|---------------------|---|--|----|---|--|----|
|              | M                   | F | yes                                      | no |   | yes  | no |
| _____        | M                   | F | yes                                      | no | _____                                     | yes  | no |
| _____        | M                   | F | yes                                      | no | _____                                     | yes  | no |
| _____        | M                   | F | yes                                      | no | _____                                     | yes  | no |
| _____        | M                   | F | yes                                      | no | _____                                     | yes  | no |
| _____        | M                   | F | yes                                      | no | _____                                     | yes  | no |
| _____        | M                   | F | yes                                      | no | _____                                     | yes  | no |
| _____        | M                   | F | yes                                      | no | _____                                     | yes  | no |

2. Who initiates these play-dates most often?

Friend                  Child                  You                  Friend's Parent                  Other

3. Does your child currently have one friend who in turn thinks of your child as a friend?

Yes                  No

II. If you answered yes to the above question: now think of your child's closest/best friend:

1. What is your child's closest/best friend's

Gender \_\_\_\_\_ Age \_\_\_\_\_ Disability Status \_\_\_\_\_

2. Who arranges play-dates, activities, etc. between your child and his/her friend? (circle all that apply)

Friend                  Child                  You                  Friend's Parent                  Other

3. Circle the two activities that your child and his/her friend partake in most:

Sports Related                  Arts & Crafts                  Board Games                  Watch  
TV/Movie

Pretend Play                  Playground (swings/slide)                  Constructive (building  
blocks)

Computer Games

4. How often does your child initiate these activities with his/her friend?

Never            Sometimes            Usually            Always

5. How often does your child's friend initiate these activities with your child?

Never            Sometimes            Usually            Always

6. How often do they fight or argue?

Never            Sometimes            Usually            Always

7. If the friend moved away how much would your child miss the friend?

Never            Sometimes            Usually            Always

8. How often does your child express affection towards this friend (smiles, hugs, high-fives)?

All the time    Some of the time            Hardly Ever    Never

9. How often does your child's friend express affection towards your child (smiles, hugs, high-fives)?

All the time    Some of the time            Hardly Ever    Never

APPENDIX B  
CHILD BEHAVIOR SCALE

**Aggressive with Peers**

- 4. Fights
- 16. Bullies
- 23. Kicks, bites, hits
- 35. Aggressive
- 36. Taunts, teases
- 38. Threatens
- 48. Argues

**Pro-social with peers**

- 26. Helps
- 28. Recognizes feelings
- 34. Concerned about distress
- 40. Kind toward peers
- 46. Cooperative with peers
- 53. Concern for moral issues
- 56. Offers help

**Asocial with peers**

- 25. Prefer to play alone
- 31. Likes to play alone
- 32. Keeps peers at distance
- 51. Solitary child
- 55. Avoids peers
- 57. Withdrawn from peer activities

**Excluded by peers**

- 5. Not much liked
- 27. Peers refuse to let child play
- 30. Not chosen as playmate
- 33. Peers avoid this child
- 43. Excluded from peers' activities
- 45. Ignored by peers
- 54. Ridiculed by peers

**Anxious-fearful**

- 6. Is worried
- 8. Appears miserable, distressed
- 12. Fearful or afraid
- 19. Cries easily

**Hyperactive-distractible**

- 1. Restless, doesn't keep still
- 2. Squirmy, fidgety
- 11. Poor concentration
- 17. Inattentive

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