

The Relationship between Adult Participation and Child Engagement of Preschool
Children with ASD

Ann M. Sam

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the
School of Education.

Chapel Hill
2012

Approved by:

Samuel Odom

Harriet Able

Brian Boyd

Linda Watson

Becky New

©2012
Ann M. Sam
ALL RIGHTS RESERVED

ABSTRACT

ANN M. SAM: The Relationship between Adult Participation and Child Engagement of
Preschool children with ASD
(Under the direction of Samuel L. Odom)

The ability to engage in classroom activities is associated with better academic outcomes (Downer et al., 2007; Ponitz et al., 2009), and characteristics of children can affect how a child is able to engage in classroom activities (McWilliam & Bailey, 1995; Kishida & Kemp, 2006). Yet, support from adults can enhance the engagement of children (Sutherland & Oswald, 2005; de Kruif & McWilliam, 1999). To date, researchers have focused on the interactions between adults and typically developing children in classrooms. Limited information is known concerning how adults support the engagement of children with autism spectrum disorder (ASD) in preschool classrooms. The present study will examine 1) the patterns of adult participation and child engagement in classrooms that serve children with ASD; 2) the associations between child engagement and adult participation; 3) if autism severity moderates the relationship between adult participation and child engagement; 4) if language ability moderates the relationship between adult participation and child engagement; and 5) if problematic behavior moderates the relationship between adult participation and child engagement. Participants included 190 preschool aged children diagnosed with ASD enrolled in the Autism Spectrum Disorders Treatment Comparison Study. Each participant was videotaped 30 minutes during center time activities by research staff. Through using an

ecobehavioral assessment new variables were created: Adult Participation and Child Engagement. Children were actively engaged for more than 70% of the time during center time. Adult participation levels were associated with child engagement; specifically, no adult participation was associated with higher levels of child engagement. Children with less severe autism, more language ability, and less problematic behaviors had higher levels of engagement in activities, and were more likely to be engaged when there was no active adult participation. Adult participation was associated with higher levels of engagement for children with more severe forms of autism. For children with less language ability, active adult participation was associated with low levels of engagement. Finally, problematic behavior was correlated with lower levels of engagement, yet these children had higher levels of engagement when adults were not participating. Implications for practice and future research needs are addressed.

ACKNOWLEDGEMENTS

A special thank you for all the children, families, and teachers who participated in Autism Treatment Comparison Study. I would like to thank the research staff for collecting the data. I am very thankful for Brian Boyd and Kara Hume, each of whom have provided support, guidance, and encouragement throughout my graduate school career. I am grateful for my committee, especially my dissertation chair, Sam Odom, who gave me input and feedback during this long process. I could not have returned to graduate school or completed my dissertation without the love and support of my family, especially my parents, sister, and my husband. Finally, a huge thanks to my son, Atticus, who contentedly sat on my lap or played with toys while I wrote my dissertation.

TABLE OF CONTENTS

LIST OF TABLES.....	viii
LIST OF FIGURES.....	ix
Chapter	
I. INTRODUCTION.....	1
Statement of problem.....	1
Background on ASD.....	3
Theoretical and conceptual framework.....	4
Characteristics related to relationships and interactions.....	9
Child engagement and adult participation.....	15
Ecobehavioral assessment.....	22
Contribution of study.....	23
II. METHOD.....	26
Inclusion criteria.....	26
Program settings.....	27
Participants.....	30
Measures.....	34
Operational definitions.....	39
Inter-Observer Agreement.....	43
Data analysis.....	44
III. RESULTS.....	50

Question one: Pattern of child engagement and adult participation.....	50
Question two: Association between child engagement and adult participation.....	53
Question three: Autism severity as Moderator.....	54
Question four: Language ability as Moderator.....	57
Question five: Behavioral issues as Moderator.....	60
IV. DISCUSSION.....	64
Results.....	64
Implications.....	72
Limitations.....	75
Future research.....	78
Conclusion.....	80
REFERENCES.....	82

LIST OF TABLES

Table 2.1. Model descriptions.....	29
Table 2.2. Child demographics.....	32
Table 2.3. Teacher demographics.....	33
Table 2.4. Classroom demographics.....	34
Table 2.5. Child measures.....	37
Table 2.6. Adult participation operational definitions.....	41
Table 2.7. Child engagement operational definitions.....	42
Table 2.8. Inter-observer agreement.....	44
Table 3.1. Comparison of adult participation levels.....	54
Table 3.2. Comparison of the association between severity and child engagement among adult participation levels.....	55
Table 3.3. Interaction of adult participation and child severity on child engagement.....	57
Table 3.4. Comparison of the association between language ability and child engagement among adult participation levels.....	58
Table 3.5. Interaction of adult participation and child language ability on child engagement.....	60
Table 3.6. Comparison of the association between problematic behavior and child engagement among adult participation levels.....	61
Table 3.7. Interaction of adult participation and child problematic behaviors on child engagement.....	63

LIST OF FIGURES

Figure 3.1. Adult participation with focal children.....	50
Figure 3.2. Child engagement.....	51
Figure 3.3. Child engagement by adult participation.....	52
Figure 3.4. Adult participation by child engagement.....	52
Figure 3.5. Impact of adult participation on child engagement.....	53
Figure 3.6. Interaction of adult participation and child severity on child engagement....	56
Figure 3.7. Interaction of adult participation and child language ability on child engagement.....	59
Figure 3.8. Interaction of adult participation and child problematic behaviors on child engagement.....	62

CHAPTER 1: INTRODUCTION

Statement of the Problem

Children's development is shaped through their experiences and interactions with family members, teachers, and individuals in the community. These significant interactions are often characterized by their dynamic and bidirectional nature (Sameroff & Mackenzie, 2003; Sameroff, 2000). Teachers play a vital role in the developmental process as they assist in regulating children's self-image, activity levels, and interactions with peers and adults (Pianta, 1999). Early on, children develop a working model of teacher-child relationships and establish a pattern of how to engage with other adults in the school environment (Howes, Phillipsent, & Peisner-Feinberg, 2000). Furthermore, the experiences children have with teachers during the early school years influence the relationships children will have with other adults and peers in the future (Pianta, 1999). In fact, the early relationships children have with teachers are important factors that can shape and alter their developmental trajectory.

Researchers have found that more positive relationships with teachers are associated with better academic (Burchinal, et al., 2008; Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Curby, Rimm-Kaufman, & Ponitz, 2009; O'Connor & McCartney, 2007) and social (Brophy-Herb, Lee, Nievar, & Stollak, 2007; Mashburn et al., 2008; Hamre & Pianta, 2001) outcomes for young children. A reciprocal process influences these outcomes, as characteristics of both the teacher and the child are associated with the quality of teacher-child relationships and interactions (Colwell &

Lindsey, 2003; Birch & Ladd, 1998; Hamre & Pianta, 2001; Howes et al., 2000; Qi et al., 2006; Coplan & Prakash, 2003; Wehby, Tally, & Falk, 2004; Van Acker et al., 1996). For example, children with more problematic behaviors have less than optimal relationships and interactions with teachers (Coplan & Prakash, 2003; Colwell & Lindsey, 2003).

The interactions between children and teachers also play an important role in promoting child engagement (Sutherland & Oswald, 2005). A child's ability to maintain engagement in the classroom is linked to better academic outcomes (Downer, Rimm-Kaufman, & Pianta, 2007; Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009).

Characteristics of children potentially affect a child's ability to engage in classroom activities (McWilliam & Bailey, 1995; Kishida & Kemp, 2006). However, support and guidance from adults can facilitate children's classroom engagement (de Kruif & McWilliam, 1999; Kishida & Kemp, 2006; Chien et al., 2010).

Currently, most research about the quality of teacher-child interactions and relationships has focused on typically developing children. There is a dearth of information concerning children with disabilities, in particular children with autism spectrum disorder (ASD). With recommendations from the National Research Council (NRC, 2001) for young children with ASD to receive intensive services for 25-hours per week, the interactions and the relationships these children form with adults in classrooms become imperative. Additionally, information is needed concerning how engaged preschool children with ASD are in classroom activities and how adults in these classrooms support their engagement.

Background on ASD

Autism spectrum disorder is characterized by difficulty with social functioning, impairments in communication, and displays of repetitive or inflexible behaviors and interests (American Psychiatric Association, 2000). The prevalence of ASD has increased over the past few decades leading to increased concerns from families, school personnel, and community groups. In the mid 1980s, Zahner and Pauls (1987) reported the prevalence rates of ASD to be about 2 per 10,000 individuals. Yet, recent U.S. prevalence reports suggest 1 out of every 91 individuals between 3 to 17 years of age may have an ASD (Kuehn, 2007). In 2007, it was found that 31,136 children between the ages of three and five received services in the U.S. under the educational eligibility category of autism (Data Accountability Center, retrieved May 2010). However, this may reflect an underestimate as some children may be served under other education eligibility categories (e.g. developmental delay) (Yeargin-Allsopp, Rice, Karapurkar, Doernberg, Boyle, & Murphy, 2003).

As previously stated, the NRC (2001) recommended that children with ASD receive intensive services for 25-hours per week. Thus, children with ASD are spending many hours in various treatment programs and classrooms, with limited information about the efficacy of these models and how they are actually being implemented in practice (Odom, Boyd, Hall, & Hume, 2010). Further, there is a limited amount of information concerning how adults are participating with children in these classrooms and how adults' participation affects child engagement.

Several theoretical and conceptual models have been proposed to assist in examining the relationship and interactions between adults and typically developing

children. These frameworks provide an understanding of how both teacher and child characteristics can influence the dynamic relationships and interactions with one another. While these models may not perfectly explain the relationships and interactions between teachers and children with ASD, they do present a possible background and grounded framework for examining these relationships and interactions.

Theoretical and Conceptual Framework

Theoretical and conceptual frameworks provide support for understanding teachers' interactions and relationships with children. Specifically, the transactional model, influenced by Bronfenbrenner's systems theory, provides information concerning the importance of relationships and interactions between individuals (Sameroff, 2000; Sameroff & Mackenzie, 2003). Similarly, Pianta was influenced by Bronfenbrenner's systems theory and developed a model for specifically examining teacher-child relationships and interactions (Myers & Pianta, 2008; Pianta, 1999). Traditionally, both the transactional model and Pianta's model have been applied to typical development. Recently, researchers have used the transactional model to explain interactions between teachers and students with disabilities, specifically students with emotional and behavioral disorders (EBD) (Sutherland & Oswald, 2005; Gunter et al., 1994). These conceptual models provide a foundation for understanding the elements of the child, environment, and interactions with others that can influence and shape the quality of teacher-child relationships.

Overview of conceptual models for typically developing children. The transactional model describes how children's development occurs as a product of the dynamic, bidirectional interactions with social contexts (Sameroff & Mackenzie, 2003).

As Sameroff (2000) pointed out, experience plays a vital role in shaping development; thus, as children grow, so do the number of environments and contexts within which they participate as well as their ability to organize these varied experiences into meaningful information. Children's environmental contexts expand from parents, siblings and family members to broader contexts of peers, schools, and communities, with parents and teachers playing a central role in how children adapt to these various environments (Sameroff, 2000). Children's expressed behaviors within these environments are the result of transactions between the child (i.e. the phenotype), the external experiences (i.e. environment), and the child's biological characteristics (i.e. genotype). The child and the environment are influenced by one another, and over time, both the child and the environment can change as a result of these bidirectional influences (Sameroff & MacKenzie, 2003).

While Sameroff's theory has traditionally been applied to children who are typically developing, he noted its application to children with disabilities. Specifically, Sameroff (2009) described how cognitive disabilities, such as autism, could hinder children's functioning due to the difficulty in drawing meaning from their experiences in the environment. He went on to surmise that the development of children with cognitive disabilities could be compensated through the appropriate environmental interventions and adaptations.

Like Sameroff, Myers and Pianta (2008) used systems theory to develop a model to understand the nature of teacher-child relationships. While Sameroff's transactional model focused on the broader transactions children experience with various individuals, Myers and Pianta (2008) focused specifically on the interactions between teachers and

children. The researchers emphasized how environments influenced children's development through three main components: (a) external influences, (b) characteristics of the individuals, and (c) interactive exchanges.

The three elements of the Myers and Pianta (2008) model work together to shape the relationship and interactions of teachers and students. First, external influences refer to influences outside of the teacher-child relationship that affect the relationship. Parental behavior is an example of an external influence; for example, negative parental behavior such as aggression can provide a model for how the child will interact with teachers at schools. Second, characteristics or features of the individuals (teacher and child) can shape the interactions and relationships between teachers and children. Characteristics of individuals can include biological factors (e.g. gender and temperament), developmental factors (e.g. social skills, self-esteem), and perceptions and beliefs. Finally, interactive exchanges refer to how the relationship is dynamic and reciprocal with both the teacher and the child influencing these interactions and relationships. For example, a child who negatively responds to a teacher's request repeatedly may influence how or if a teacher makes requests of that child in the future. Unfortunately, the model proposed by Myers and Pianta (2008) has not been applied to children with disabilities; thus, additional conceptual models must be reviewed to understand the unique aspects of these teacher-child relationships and interactions.

Overview of conceptual models for children with disabilities. Sutherland and Oswald (2005) described a transactional model for examining the relationships and interactions between teachers and children with emotional and behavioral disorders (EBD). As with the other models, they proposed that teachers and children influence one

another's behavior in a reciprocal and bidirectional manner. In a more direct application of Sameroff's work, Sutherland and Oswald (2005) also stated that the behaviors of children with EBD are a product of the transactions between the genotype, environment, and phenotype. The researchers suggested that a child's engagement could have an effect on the quality of instruction a child receives based upon the reciprocal nature of interactions. That is, past experiences between teachers and children can influence future interactions. Dynamic exchanges influence the ongoing interactions between teachers and students. Sutherland and Oswald (2005) specifically proposed that negative interactions between teachers and children could lead to less optimal outcomes for students.

Gunter's work expanded upon this notion of recursive negative interactions between teachers and children with severe behavioral issues. Gunter and colleagues (Gunter et al., 1994) described how teaching is an interactive and reciprocal process that can either be positive or negative. Positive reciprocal interactions are positive for all participants (teachers and children) and serve as positive reinforcements for future interactions. When children exhibit problematic behaviors, teachers may avoid or escape from the child. In addition, teachers may engage in counter-control when interactions are coercive. In coercive interactions, the individuals exhibit behaviors that are aversive to the other individual and this can lead to further negative reinforcement or future punishment. For instance, some teachers may attempt to assert control over the child when coercive interactions occur through such means as giving a time-out or presenting a negative consequence. Gunter and colleagues termed this reassertion of power as counter-control. The consistency and quality of instruction can be affected by the teacher's

negative interactions with the child. Obviously, this negative cycle would not be conducive to optimal teacher-child relationships and interactions.

Application of conceptual models to current study and children with ASD.

The aforementioned models and conceptual frameworks have not been applied specifically to children with ASD. However, there is a need to examine teacher-child interactions and relationships for this specific group of children, and these models could provide a general conceptual framework. For instance, Sutherland and colleagues' (2005) work focused on children with EBD, because these children may be at a greater risk for developing less than optimal teacher-child relationships due to their problematic behavior. Given that children with ASD also struggle with challenging behavior (Pandolfi, Magyar, & Dill, 2009; Love, Carr, & LeBlanc, 2009) as well as other behavioral deficits, the research of Sutherland (2005, 2008), Gunter (1994) and their colleagues appears very applicable to this population. The current study will draw upon these proposed models as a basis for examining the relationships between children with ASD and the adults who work with them. Specifically, characteristics of these children (e.g. autism severity, language ability, or problematic behaviors) may influence how adults participate with them in classroom settings, resulting in differing levels of child engagement in classroom activities.

Furthermore, Sameroff (2000, 2009) as well as Myers and Pianta (2008) described how characteristics of individuals shape relationships in a bidirectional, reciprocal manner. Given the unique characteristics of children with ASD including more challenging behavior as well as communication and social issues that could potentially negatively influence relationships with teachers, research specific to children with ASD is

needed to determine how adults interact with these children in classroom settings. Presently, research has focused upon factors of typically developing children that influence teacher-child relationships. This body of research can be examined and then applied to children with ASD.

Characteristics Related to Relationships and Interactions

As the conceptual models described indicate, intrinsic factors within individuals play a vital role in shaping and forming relationships and interactions between individuals (Sameroff, 2009; Sameroff, 2000; Sameroff & Mackenzie, 2003; Myers & Pianta, 2008; Pianta, 1999; Sutherland & Oswald, 2005). The characteristics of the individuals can push the relationship in either a positive or negative direction. For the purposes of this paper, relationships and interactions are considered to impact one another in a bidirectional manner with interactions influencing the relationship amongst individuals and the nature of relationships shaping interactions. These concepts are distinguished in the following manner: the relationships are the broad characterization of the connection between two people, whereas interactions are specific instances of encounters between two individuals. Both interactions and relationships can either be positive or negative. The following section will discuss characteristics of children that either promote or hinder optimal relationships and interactions between teachers and children.

Chronological age. Children's chronological age has been found to influence the teacher-child relationship. Colwell and Lindsey (2003) found an inverse relationship between the age of preschool children and the proportion of teacher-child interactions, such that younger children interacted more with teachers than did older children.

Similarly, O'Connor and McCartney (2007) found, from pre-kindergarten to third grade, the quality of the teacher-child relationship slightly decreased. These findings indicate that age is a dynamic developmental factor that must be considered when examining the quality of the teacher-child relationship.

Language ability. Qi and colleagues (2006) studied children's behavior in Head Start classrooms and found that children with high language ability received more positive teacher responses in comparison to children with low language ability. Children with lower language ability from this same study also had less favorable interactions with teachers characterized by more problem behaviors and fewer initiations. Further, teachers directed less praise to preschool girls with low levels of language during child-directed activities. The results of this study indicate children's language is a key factor in determining how teachers interact with students.

Children's prosocial behaviors. Several studies have focused on the specific behaviors of children that can promote positive relationships with teachers. For example, both typically developing preschool children (Coplan & Prakash, 2003) and preschool children with disabilities (Harper & McCluskey, 2003) who participated in more solitary and passive play elicited teacher interactions more often. Although this finding may appear paradoxical, teachers being more likely to seek out children who engage in solitary or passive play could account for this finding. In addition to play type, the sociability of the child also impacted teacher interactions. Preschool children who were perceived to be more sociable by teachers had closer, less dependent, and less conflictual kindergarten teacher-child relationships (Howes et al., 2000). Thus, children who played

passively or alone elicited more teacher responses and interactions, whereas children identified as more sociable had closer relationships with teachers.

Children's problem behaviors. Two types of problem behavior are associated with less than optimal teacher-child interactions (a) externalizing behavior including aggression and (b) atypical social behaviors. The negative externalizing behaviors of children have been linked to coercive relationships or interactions with teachers. Teachers gave more commands versus praise to preschool children with more problem and externalizing behaviors (Dobbs & Arnold, 2009). Similarly, Van Acker, Grant, and Henrey (1996) found students who were at-risk for aggression in second, third, and fifth grades received differential attention in the form of more teacher reprimands. Henricsson and Rydell (2004) found further evidence of externalizing behavior contributing to negative teacher-child interactions. The authors determined that children in first through third grades who displayed externalizing behaviors had interactions with teachers characterized by anger and conflict, and that teachers rated the relationship with these students as more negative overall. Similarly, Colwell and Lindsey (2003) found pre-kindergarten children who were identified as aggressive displayed more negative emotions when interacting with their teachers.

Surprisingly, Coplan and Prakash (2003) found preschool children who were rated and observed to be more aggressive and rough in their play initiated more interactions with teachers. The researchers explained this unusual finding by suggesting that perhaps teachers make themselves more available to children with aggression issues in case they are needed to respond to an issue or that these students seek out teachers for more attention.

The externalizing behaviors exhibited by children can also have a cascading effect on later interactions and relationships with teachers. Problem behaviors in preschool are predictive of more conflict in the children's relationships with their kindergarten teacher (Howes et al., 2000). Doumen and colleagues (2008) examined the bidirectionality between kindergarten teachers and students with externalizing behavior. The researchers found a reciprocal relationship between teacher-child conflict and children's aggressive behavior overtime, with a child's aggression at the beginning of the kindergarten year initiating the process of negative interactions throughout the school year. It appears that behavioral issues put children at an increased risk for developing and maintaining negative interactions and relationships with teachers.

Like externalizing behaviors, atypical behaviors also play a role in the relationship between teachers and students. Birch and Ladd (1998) found that kindergarteners described as anti-social were more likely to be dependent on their first grade teacher, and these students' relationships with teachers were characterized as having more conflict and lower levels of closeness. While pre-kindergarteners described by teachers to be more anxious, fearful, and anti-social did not seek out interactions with teachers, they were more likely to elicit teacher responses including initiating interactions, asking the child questions, and intervening in the child's play (Coplan & Prakash, 2003). Finally, Rimm-Kaufman and colleagues (2002) identified children in terms of socially wary or bold at 15-months of age by using *Ainsworth's Strange Situation* (Ainsworth, Blehar, Waters & Wall, 1978) and followed these children through kindergarten. The children identified as socially wary had fewer interactions with their kindergarten teacher when compared to the identified socially bold children. Children

who were less socially inclined were less likely to initiate or interact with their teachers. Overall, children with atypical behaviors were not as close to teachers, less likely to initiate interactions with teachers, and had fewer interactions as a whole with teachers.

Children with disabilities. The research described above focused on children who were typically developing; however, a limited number of studies have focused on the influence of disability status on teacher-child relationships and interactions. Chow and Kasari (1999) examined the interactions between kindergarten through second grade children and their teachers throughout the school year. In their study, some of the children were typically developing, some considered at-risk, and others were diagnosed with mild disabilities. They found that children with disabilities received more negative interactions from teachers (including general educators, special educators, and teacher assistants) for off-task behavior when compared to their typically developing counterparts, and that children labeled as at-risk received more negative interactions from teachers than either of the other two groups of students. The authors suggested teachers' perceptions of these children as possibly having more problematic behavior may have influenced these negative interactions.

Additionally, Wehby, Tally, and Falk (2004) examined teacher interactions for students with EBD in third and fourth grades enrolled in self-contained classrooms. Students identified as more attention seeking received more instruction from their teachers whereas students identified as escape motivated received less teacher attention. Given Gunter's (Gunter et al., 1994) model of recursive negative interactions, these findings make sense. Teachers may not receive positive reinforcement from students who escape from task, thereby minimizing the teacher's attention. Further, teachers may

receive some form of positive reinforcement to interact with students who seek out their attention, resulting in more teacher attention. However, students who sought out teacher attention in negative ways may also receive more time with teachers due to these students problematic behavior. The findings from these two studies seem to indicate that children at-risk for disability or children with a disability may experience teacher interactions that are different in quality when compared to teacher interactions of typically developing children.

Impact of child characteristics research on ASD. Even though the majority of the research on teacher-child interactions and relationships described thus far has focused on typically developing children, it provides information that is potentially relevant to children with ASD. For example, studies found that children with low language ability have less positive experiences with teachers (Qi et al., 2006). A primary characteristic of ASD is impaired language and communication (APA, 2000). Research is needed to determine if findings from research on typically developing children apply to children with ASD, given that most of these preschool-aged children have language or communication difficulties. Furthermore, the transactional model describes the bidirectional, reciprocal nature of relationships. Studies are needed to discern if teachers alter their own communication pattern with these children or spend less or more time interacting with these children given the characteristics of ASD.

Finally, negative child behaviors are associated with coercive teacher-student interactions (Colwell & Lindsey, 2003; Van Acker, Grant, & Henrey, 1996; Dobbs & Arnold, 2009; Henricsson & Rydell, 2004; Birch & Ladd, 1998; Doumen et al., 2008; Mercer & DeRosier, 2009), and young children with ASD have a variety of behavioral

issues (Pandolfi et al., 2009). Gunter and colleagues (1994) described the development of a negative teacher-child interaction cycle as the student continues to display problem behaviors and the teacher continues to respond to those behaviors in an ineffective manner. More relevant to ASD is severity level of these children. Currently, no studies to date have examined how autism severity may impact how teachers interact with these children. Teacher participation with a child may vary based upon the severity level of particular children. Overall, the characteristics of children with ASD appear to put them at a greater risk for developing and having less than optimal relationships and interactions with adults in preschool classrooms.

Child Engagement and Adult Participation

The theoretical models described above detail how child characteristics impact the interactions between teachers and children. Additionally, these interactions influence the quality of instruction the child receives by influencing the level of engagement of children in classrooms. The manner in which adults participate with children can either facilitate or hinder this engagement.

Child engagement. Sutherland and Oswald (2005) proposed a student's engagement could shape the reciprocal interactions between teachers and students thereby affecting student learning. Child engagement is defined as “the amount of time children spend interacting with the environment (with adults, children, or materials) in a manner that is developmentally appropriate” (McWilliam, Trivette, & Dunst, 1985, p. 60). Child engagement is optimal. In fact, classroom quality has been linked to children's engagement levels in preschool, kindergarten, and third grade (McWilliam et al., 1985; Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009; Downer, Rimm-Kaufman, & Pianta,

2007). In kindergarten classrooms, children who were identified as more engaged in classroom activities had higher literacy achievement scores at the end of the year when compared to children who were not as engaged in these classroom activities (Ponitz et al., 2009). The following will describe child engagement in preschool classrooms and characteristics of children that potentially influence child engagement.

In a study by Odom and colleagues (Odom, Brown, Schwartz, Zercher, & Sandall, 2002), both typically developing children and children with disabilities spent most of their time engaged in manipulating objects (19% for typically developing children; 15% for children with disabilities), self-care activities (10% for each group) and large motor activities (8% for typically developing children and 7% for children with disabilities). Less common activities for engagement were books, preacademic behavior, art, and pretend play. Similarly, Kishida and Kemp (2006) found during routine and one-to-one activities with an adult, preschool aged children with disabilities were actively or passively engaged for more than 80% of the time. In a study by Brown and colleagues (Brown, Odom, Li, & Zercher, 1999), overall engagement across various time points in inclusive preschool programs was 54% for children with disabilities and 58% for children without disabilities. The authors explained that this amount of engagement was not a concern as children may be passively engaged by listening to peers or teachers or transitioning from activities that may not have been captured by the coding system.

As with the teacher and child relationship, characteristics of children impact engagement levels. Odom and colleagues (2002) found the engagement of children with autism (51%) and other disabilities (52%) to be statistically comparable to, although slightly lower than, children without disabilities (59%). Yet, Kishida and Kemp (2006)

found disability level may be a contributing factor to how engaged these children are in preschools. A study by McWilliam and Bailey (1995) concluded that developmental age of children influenced their attentional engagement (i.e. playing with or attending to an adult or peer) and passive nonengagement (i.e. not interacting with environment). Children with disabilities with younger developmental ages were more likely to be nonengaged for longer periods of time than typically developing children. Similarly, in a study by de Kruif and McWilliam (1999), both teacher report and researchers' observations in classrooms found that children who were more developmentally mature spent more time in higher level engagement activities. Additionally, children's negative behavior, such as disruptive behavior, restricted their level of engagement (Odom et al., 2002). Finally, when children are not engaged, repetitive behaviors are more likely (de Kruif & McWilliam, 1999).

Adult participation. Similar to child engagement, researchers have focused on adult participation in preschool classrooms. Adult participation has been defined by various ways in the literature (McWilliam et al., 2003; Powell, Burchinal, File, & Kontos, 2008; Tsao et al., 2008). For the purposes of this review and the study, adult participation will be categorized by 1) how adults are actively participating with focal child (i.e. interacting directly with a child), 2) adults passive participating (i.e. present or close to focal child but not interacting directly), and 3) no participation towards a focal child or focal group of children.

Adults' active participation with children has been defined differently by researchers. For example, McWilliam and colleagues (2003) examined the behaviors of adults when interacting with preschoolers. Behaviors of interest included adults' requests,

questions, elaborations, information, and responses. Tsao and others (2008) defined adult participation as the following: approval, comment, support, or group discussion/directions. Finally, Powell and colleagues (Powell et al., 2008) also observed adult behaviors. Adult behaviors were categorized as praise, social, verbal direction, gesture/demonstration, or question. In the play setting, researchers observed adults as actively engaged (e.g., interacting directly with children) for 19% of the time (Powell et al., 2008).

Along with active adult participation, passive adult engagement has been measured by McWilliam (2003) and Powell (2008) and colleagues. These researchers observed the amount of time adults were in close proximity to focal child or focal group of children, but were not directly involved with the children (as defined above in adult participation). In play activities, adults monitored children for 6% of the time (Powell et al., 2008).

Finally, researchers have also examined when adults are not actively engaged and not present near focal children. Powell and colleagues (2008) found that adults were out of range and disengaged with focal children for 76% of the time during play activities. Similarly, Kontos and colleagues (Kontos, Burchinal, Howes, Wisseh, & Galinsky, 2002) observed that for 85% of typically developing children's time in preschool classrooms, they were not interacting or involved with adults.

Relationship between adult participation and child engagement. Currently, there is a limited amount of information concerning how child engagement is impacted by adult behavior with the majority of studies concerning initiator of activities and child engagement (de Kruif & McWilliam, 1999). Preschool children demonstrated higher

levels of engagement in activities when activities are selected by children versus by adults (Kishida & Kemp, 2006; Odom et al., 2002). Odom and colleagues found (2002) when children with and without disabilities initiated an activity they were engaged for almost 70% of the time versus 45 to 49% when adults initiated the activities.

Furthermore, when adults initiated the activity, children with disabilities were more likely to interact with the adults versus other children (Tsao, Odom, Buysse, Skinner, West, & Vitztum-Komaneki, 2008). In a study of 2-year-old boys with ASD, these children had higher levels of engagement when selecting a toy to play with versus having a teacher make the selection (Reinhartsen, Garinkle, & Wolery, 2002). Clearly, when children initiate activities, they are more likely to be engaged.

Besides initiations of activities, the environment and responsiveness of teachers also shapes children's engagement (Ridley, McWilliam & Oates, 2000). In preschool classrooms, typically developing children who spent more time in instructional activities with teachers (both individual and whole group) or received high amounts of teacher scaffolding made larger gains in language/literacy and mathematics when compared to children who spent more time in free choice activities (Chien et al., 2010). These findings suggest that while children may be engaged less of the time in teacher directed activities, children benefit academically when adults initiated and structured learning activities. Group arrangement may also play a role in children's engagement. In a study with both typically developing children and children with disabilities, McWilliam, Scarborough, and Kim (2003) found when children were addressed individually by teachers, children were engaged for 53% of the time. The level of engagement dropped slightly to 48% of the time, when teacher addressed children in groups.

The interactions teachers have with children may also influence the type and degree of engagement. McWilliam and colleagues (2003) found when a teacher elaborated on a child's activity, provided information, and was close to a child, the preschoolers' engagement was enhanced more so than when teachers responded to a child, made a request of the child, or asked a child a question. Similarly, Powell and colleagues (2008) found that when teachers exhibited behaviors that affirmed children's actions, children were actively engaged for about 50% of the time. Yet, when teachers directed or questioned children, children were only actively engaged for 26% and 7% of the time respectively. However, when adults were monitoring (i.e. present but not interacting with the child) or out of range/disengaged, children were engaged 51% and 60% of the time respectively. Both McWilliam and Powell and colleagues (2008) noted the surprising positive relationship between passive adult engagement and children's active engagement. Researchers concluded these findings could be due to an adult's presence as affirming and supportive to children, and that this type of engagement may be a way to increase child engagement through nonverbal means. Additionally, these studies are correlational and provide descriptive information, but do not establish direction of effects.

Teachers may interact with a child differently based upon disability status. For example, Kishida and Kemp (2006) found children with disabilities received more physical prompts from adults during one-to-one instruction time than peers. The authors suggested this finding could be a result of adults needing to provide more physical assistance in order for children to be actively or passively engaged. Similarly, Odom and others (2002) and Brown and colleagues (1999) found adults provided three times as

much support to children with disabilities (15%) compared to typically developing children (5%). Adult support was similar for children with autism and PDD as compared to children with other disabilities. Finally, in a study of 30 children (10 with severe disabilities and 20 typically developing children), Hamilton (2005) found teachers focused more upon children with disabilities engaging with materials versus engaging with peers. In fact, teachers only prompted children to move closer to peers when physically isolated. These correlational studies suggest that both child and adult behaviors influence one another to effect engagement. Overall, teachers support children's engagement and provide more support for children with disabilities to ensure engagement.

While information is known about how children with and without disabilities engage in preschool classrooms across the day (Odom et al., 2002; Kishida & Kemp, 2006; Brown et al., 1999), limited information is known about how children with ASD engage in free play or center time activities specifically. Furthermore, children's characteristics, such as disability and developmental maturity influenced how children engaged in these classroom activities (de Kruif & McWilliam, 1999; McWilliam & Bailey, 1995; Kishida & Kemp, 2006). Perhaps due to these characteristics, children with disabilities received more teacher support in preschool classrooms than typically developing children (Odom et al., 2002; Brown et al., 1999). Currently, no studies have addressed how levels of adult participation (i.e. active participation, passive participation, or no participation) impact the engagement of children with ASD specifically. Furthermore, there is a dearth of information concerning how characteristics of autism

(e.g. severity, language ability, and problematic behavior) may moderate this relationship between child engagement and teacher participation.

Ecobehavioral Assessment

One observational method employed to examine both adult participation and child engagement is ecobehavioral assessments. These assessments are used to measure the relationships between three variables: adult variables, classroom/environment variables, and student behaviors (Logan, Bakeman, & Keefe, 1997). This assessment can be used for program evaluation as “a means of assessing program variables through systematic observation and measuring the moment-to moment effects of an array of variables upon student behavior” (Carta & Greenwood, 1985, p. 92). Carta and Greenwood (1985) explained the fields of behavioral ecology, applied behavioral analysis and product-product research helped to shape the ecobehavioral approach to assessing programs. Ecobehavioral assessments can be used to design, implement, and evaluate treatments for early intervention (Carter & Greenwood, 1985). Additionally, these assessments can assist in identifying instructional strategies that enhance learning and developments for students with disabilities (Kamps, Leonard, Dugan, Boland, & Breenwood, 1991).

The *Code for Instructional Structure and Student Academic Response (CISSAR)* has been used in elementary settings for children with disabilities to examine such variables as child engagement and teacher instruction or support (Kamps et al., 1991; Logan et al., 1991). For preschool classrooms, two assessments have more commonly been employed to examine ecological features of classrooms: *Eco-behavioral System for Complex Assessment of Preschool Environments (ESCAPE)* and *Code for Active Student Participation and Engagement (CASPER)*. Researchers employed *ESCAPE* to examine

how ecological features influence peer social interactions of young children with disabilities (Odom & Peterson, 1990) and how teachers support engagement of children with and without disabilities in inclusive classroom (Hamilton, 2005).

CASPER II is a revision of two previous observational systems: *ESCAPE* and *CASPER I* (Brown, Odom, Li, & Zercher, 1999). Previous studies have used this measure to describe the ecology of inclusive classrooms, compare behavior and experiences of children with and without disabilities (Brown et al., 1999), and examine how social participation varies across different inclusive models for children with disabilities (Tsao et al., 2008). The current study will use *CASPER III* (Tsao, Odom, & Brown, 2001) to examine how teacher engagement influences child engagement.

Contribution of Study

Previous authors noted positive relationships between teachers and children lead to better academic and social outcomes for children. Theoretical and conceptual models provide a framework for understanding that relationships and interactions between teachers and children are based upon several factors (e.g., characteristics of the individuals, characteristics of the environment, and the bidirectional, reciprocal exchanges between children and teachers) (Sameroff & Mackenzi, 2003; Sameroff, 2000; 2009; Myers & Pianta, 2008; Sutherland & Oswald, 2005; Sutherland et al., 2008; Gunter et al., 1994). These factors can either facilitate or hinder the development and sustainability of positive, optimal interactions and relationships between teachers and children. Furthermore, the child's engagement can potentially shape the relationships between teachers and children and influence the instruction children receive (Sutherland & Oswald, 2005).

In fact, child engagement is linked to more positive academic outcomes for children (Ponitz et al., 2009). Child characteristics such as developmental maturity and disability appear to influence the engagement of preschool children (de Kruif & McWilliam, 1999; McWilliam & Bailey, 1995; Kishida & Kemp, 2006). The relationships and interactions with adults affect children's level of engagement in classrooms, and adults alter their interactions with children based upon child characteristics (Odom et al., 2002; Brown et al., 1999). Yet there is a limited information concerning children with ASD specifically.

Due to the characteristics of ASD, these children may be at a greater risk for developing less than optimal relationships with teachers. Given the intensive education recommendations for this population (NRC, 2001), research needs to specifically focus on the relationships and interactions between teachers and preschool children with ASD. Information is needed concerning how adults participate with children with ASD in preschool classrooms, and how this participation impacts child engagement. Furthermore, research is needed to determine how specific characteristics of ASD (i.e. severity, language ability, and problematic behavior) moderate the relationship between adult participation and child engagement. The purpose of this study is to address this research gap through the following research questions:

1. What is/are the pattern(s) of adult participation and child engagement in classrooms that serve children with ASD?
2. What are the associations between child engagement and adult participation?
3. Does autism severity moderate the relationship between adult participation and child engagement?

4. Does language ability moderate the relationship between adult participation and child engagement?
5. Does problematic behavior moderate the relationship between adult participation and child engagement?

CHAPTER 2: METHOD

This study uses data collected as part of the multi-site Autism Spectrum Disorders Treatment Comparison Study led by Principal Investigators Drs. Samuel Odom and Bryan Boyd. The purpose of the larger study was to compare two comprehensive treatment models designed for preschoolers with autism (i.e. Learning Experiences Alternative Programs for Preschoolers and Parents (LEAP) and Treatment and Education of Autistic and related communication-handicapped Children (TEACCH)) with a control model (Business as Usual (BAU) . The current study will not compare treatment models as this was the purpose for the larger study. Sites included four states: North Carolina, Florida, Colorado, and Minnesota. For the larger study, data were collected at three time points: pre-test (i.e. at the beginning of the year), post-test (i.e. at the end of the year), and follow-up (6 months after post-test was collected). Data from the first time point for all three years of data collection will be used for this smaller study. Data were collected by research staff at the various sites. I was a research assistant for the larger study in North Carolina. My role included administering assessments (including the *PLS* and *Mullen*) and coding videotapes.

Inclusion Criteria

To be included in the study, classrooms had to meet the following inclusion/exclusion criteria: 1) classrooms operated within the public school system, 2) teacher licensed to teach in their respective state, 3) teachers attended a formal TEACCH or LEAP training, at least at the district level, 4) teachers worked in a TEACCH or LEAP

classroom for at least 2 years prior to the study, and 5) for BAU classrooms, teachers taught children with autism for at least 2 years prior to the study. Finally, all classrooms had to meet high fidelity of implementation standards to be included in the study. Any student in the selected classrooms were eligible to enroll in the study as long as they met other inclusion criteria such as student only exposed to the current comprehensive treatment model (i.e. a student enrolled in a TEACCH classroom would be ineligible if previously enrolled in a LEAP classroom).

Program Settings

The children were enrolled in three different preschool models: a) TEACCH, b) LEAP, and c) BAU. As noted, the current study will not address how engagement of children or participation of adults varies as a function of the model; however, model type will be used as a covariate in order to remove possible model confounds. Below is a description of each model and Table 2.1 provides additional model information.

TEACCH. Eric Schopler established TEACCH in 1972. This approach draws upon behavioral principles and cognitive-social learning theory. TEACCH emphasizes the importance of using the environment to maximize the learning of individuals with ASD. The TEACCH model emphasizes Structured Teaching. Structured Teaching involves the following six elements: (1) organization of the physical environments; (2) predictable sequence of activities; (3) visual schedules; (4) routines with flexibility; (5) work/activity systems; and (6) visually structured activities (Mesibov, Shea, & Schopler, 2005). Additionally, TEACCH stresses the importance of individualization in contrast to a standardized curriculum.

LEAP. Phillip Strain established LEAP in 1981. This model draws upon applied behavioral analysis and developmental theory. Children with ASD are included in a program that employs an adapted early childhood curriculum. In LEAP classrooms, the majority of the children are typically developing. Children with ASD receive individual instruction through incorporating learning opportunities within activities and routines. Parents receive educational training that they can apply in the home environment. Furthermore, staff in LEAP classrooms receive training to ensure a high degree of implementation (Strain & Cordisco, 1994; Strain & Hoyson, 2000; Strain & Bovey, 2011).

BAU. Finally, BAU classrooms use an eclectic approach to educating children with autism (Howard, Sparkman, Cohen, Green, & Stanislaw, 2005). Although these classrooms included children with autism, the curricula used in the classrooms were not necessarily designed to address the symptoms of autism or the learning characteristics of children with autism. Unlike TEACCH or LEAP classrooms, this model does not use a primary or guiding theoretical orientation. Additionally, these classrooms can either include typically developing children or children with various developmental disabilities. Finally, classrooms had to reach a high level of quality to be included in the study. Therefore, these classrooms may not be representative of typical preschool classrooms for children with ASD, but rather serve as a comparison for the LEAP and TEACCH classrooms included in the study with high fidelity of implementation.

Table 2.1

Model Descriptions

BAU	<ul style="list-style-type: none">- No guiding theoretical orientation- Employs an eclectic approach to educating children with ASD- Can include typically developing children or children with developmental disabilities
LEAP	<ul style="list-style-type: none">- Developed in 1981 by Dr. Phil Strain- Theoretical foundation is applied behavior analysis- Five features:<ul style="list-style-type: none">• Typically developing children are full-time class members• Co-teaching model of instruction• Naturalistic teaching strategies used• Classroom environment mirrors typical early childhood setting• Strong parent training component
TEACCH	<ul style="list-style-type: none">- Formally developed in 1972 by Dr. Eric Schopler- Theoretical foundation is cognitive social learning theory- Five features<ul style="list-style-type: none">• Classroom environments arranged based on characteristics of autism• Adult-structured learning opportunities• Special education teacher as the primary instructor• Self-contained classrooms for preschool children often used• Strong parent involvement component

Participants

Participants included 190 preschool aged children (age 3-5) diagnosed with ASD enrolled in the Autism Spectrum Disorders Treatment Comparison Study. Table 2.2 shows child demographic information. The participants lived in one of four states: 1) North Carolina (65 children), Colorado (33 children), Florida (62 children), and Minnesota (30 children), and were enrolled in BAU (56 children), LEAP (52 children) and TEACCH (82 children) classrooms. The participants included 159 males and 31 females. Most participants were white (79%) followed by black (12%), Asian (5%), and multi-racial (3%). Research staff confirmed diagnosis of ASD through administration of the ADOS. All participants met diagnostic criteria. At pre-test, children ranged in age from 36 to 63 months with a mean age of 48 months. An age equivalent score was determined by the *Mullen* Visual Reception subscale. Participants mean age equivalence was 34.9 months. Most caregivers had a college education or above (51%). Thirty-seven percent of caregivers' household income fell between \$40,000 and \$100,000 followed by more than \$100,000 (32%) and less than \$40,000 (31%).

Seventy-three teachers participated in the study (72 females and 1 male) (see Table 2.3 for teacher demographics). The majority of teachers were white (96%) followed by black (3%) and multi-racial (1%). Most teachers held a masters degree (52%) followed by a bachelors degree (41%), above a masters degree (6%), and an associates degree (1%). The mean number of years teaching was 10.3 with a range of 2 to 29.5 years. The mean number of years teaching students with ASD was 6.5 years with a range of 2 to 22 years. Thirty-six percent of classrooms were classified as BAU, 30% as LEAP, and 34% as TEACCH (see Table 2.4 for classroom demographics). The length of

the instructional day varied by classroom. Most classrooms' instructional day was between 2 to 3 hours (64%) followed by more than 7 hours (25%), 4 to 5 hours (8%), and 3 to 4 hours (3%). At pre-test, class size ranged from 3 to 20 students with a mean of 9 students per class. Adults working in classrooms ranged from 2 to 6 adults with a mean of 3 adults per class. The child to adult ratio ranged from 0.9 to 9.5 with a mean of 3.4 children for every adult.

Table 2.2

Child Demographics

Participants	31 Female
	159 Male
Age	48 months (mean) (range 36-63 months)
Race	5% Asian 12% Black 3% Multi-racial 79% White
Mullen Age Equivalent	34.9 months (mean) (range 15.4-69.0 months)
Household Income	31.4% < \$40,000 36.8% \$40,000-100,000 31.9% >\$100,000
Caregiver Education	23% =< High School 26% Partial College 30% College 21% =>Masters

Table 2.3

Teacher Demographics

Participants	72 Female
	1 Male
Race	3% Black
	1% Multi-racial
	96% White
Degree	1% A.A.
	41% B.A./B.S
	52% M.Ed./M.A./M.S.
	6% Above Masters
Years Teaching	10.3 years (mean)
	(2 – 29.5 years)
Years Teaching ASD	6.5 years
	(2 – 22)

Table 2.4

Classroom Demographics

Model	36% BAU
	30% LEAP
	34% TEACCH
Length of Instructional Day	64% 2-3 hours
	3% 3-4 hours
	8% 4-5 hours
Child to Adult Ratio	3.9 children per adult (0.9 to 9.5)

Measures

Once a child was enrolled in the study, assessments could begin. Students had to be enrolled in the study by November 1st and all pre-test data had to be collected by December 31st. Assessments from other sources were not accepted, unless they were gathered from a research project and were administered within three months from the child being enrolled in the study. Child assessments were conducted by research staff and were completed within two weeks of starting the assessment process. All assessments for each child had to be completed within a six week window (i.e. parent, teacher, child, and video).

Preschool Language Scale-IV (PLS) (Zimmerman, Steiner, & Pond, 2003). The PLS is appropriate for children aged birth through 6.11 years of age. The assessment measures auditory comprehension and expressive communication to obtain a total language score. Research assistants were trained by project personnel to administer the

PLS. Training included: 1) reading the manual and exploring materials, 2) reviewing two videos of trained researchers administering the assessment and discussing the videos with the team, 3) watching one live administration with trained research staff and scoring the protocol, 4) conducting and scoring and assessment with a child at the Frank Porter Graham childcare center, and 5) watching an assessment with a child at the Frank Porter Graham childcare center and scoring for reliability. The trained research staff administered the *PLS* to participants. The raw total score was used in the analysis. The mean score was 63.0 (see Table 2.5 for more details).

Childhood Autism Rating Scale (CARS) (Schopler, Reichler, & Renner, 1988). *CARS* is a diagnostic assessment aimed at differentiating children with autism from other developmental delays. Behaviors are observed and rated such as relationships, object use, listening response, verbal communication, activity level, body use and emotional response, etcetera. A composite score ranging from 15 to 60 is obtained with a score of 30 as a cutoff for diagnosing autism. Severity of autism is assessed as normal, mildly autistic, moderately autistic, or severely autistic. Research staff were trained to administer the *CARS*. The *CARS* was scored from the interactions observed during the administration of the *Mullen*. In addition, toys were given at the end of the *Mullen* to the child for 10 minutes to assist in scoring the *CARS*. Toys included two cars, doll and furniture, red balls, a book, and orange blocks. The mean *CARS* score was 33.36 (see Table 2.5 for more details).

Child Behavior Checklist (CBCL): The *CBCL* assessment provides information on descriptions of problems, concerns of the parents. Scores obtained from the *CBCL* include Internalizing, Externalizing, and Total Problems scales. The *CBCL* was given to

parents to complete. Research staff collected forms from parents and reviewed any questions parents had concerning the assessment. The *CBCL* total raw total score was used for analysis. The mean score was 50.8 (see Table 2.5 for more details).

Mullen Scales of Early Learning (Mullen, 1995): This measure is a developmental assessment that addresses children's gross motor, fine motor, visual reception, expressive language, and receptive language. Research staff administered the fine motor, visual reception, expressive language, and receptive subscales to participants. Training included: 1) reading the manual and exploring materials, 2) reviewing two videos of trained researchers administering the assessment and discussing the videos with the team, 3) watching one live administration with trained research staff and scoring the protocol, 4) conducting and scoring and assessment with a child at the Frank Porter Graham childcare center, and 5) watching an assessment with a child at the Frank Porter Graham childcare center and scoring for reliability. The mean score of the visual reception age equivalent score as 34.87 months (see Table 2.5 for more details).

Table 2.5

Child Measures

Measure	N	Mean *	SD	Range
<i>PLS</i>	190	63.0	28.67	3.0 – 129.0
<i>CARS</i>	190	33.36	7.27	18.5 – 55.5
<i>CBCL</i>	190	50.81	22.47	3.0 – 106.0
<i>Mullen (Visual Receptive Age Equivalent)</i>	183	34.87 (months)	15.32	5.0 – 69.0

*Standard scores unless noted

CASPER III. Each participant was videotaped for a total of 30 minutes during center time by research staff. Center time was a common feature across classroom models. During center time, children rotated to different activity areas. Adults, other children, or the focal child could select activities. Activities included such areas as manipulatives, dramatic play, sensory, pre-academics, computers, large blocks, or art. Instructions were provided to research staff to video the focal child and the environmental context (i.e. film focal child, the center or area the focal child participated in, and other children/adults in the center or immediate area). Filming could begin during centers or another activity (e.g. transition or circle time), but no more than 5 minutes of an activity other than centers should have been filmed. At the beginning of videos, research staff identified focal child and when appropriate who initiated the current center activity.

PROCODER software (Tapp & Walden, 2000) was used to assist in coding the videos using *CASPER-III* (Tsao, et al., 2001). Videos were coded using momentary time sampling at 10-second intervals (total of 180 intervals per video). The *PROCODER* program paused video every 10 seconds allowing trained research staff to code each interval using the six *CASPER-III* variables: Activity Area, Group Arrangement, Child Behavior, Initiator of Activity, Adult Support, and Social Behavior (see descriptions below).

Activity Area concerns where the child is within the physical early childhood setting, and does not focus upon what the child is doing or the behavior of the child. Activity areas included: Transition, Manipulative, Large Motor, Story-time (Books), Art, Pretend Play/Sociodramatic Play, Large Blocks, Sensory, Dance/Music/Recitation, Snack/Meals (Food), Self Care (Self Help), Pre-Academics/3 Rs, Computer Activities, Circle Time (Group), and Can't Tell.

Group Arrangement refers to what other adults and children are in a particular center or activity area with the child. Group Arrangement codes were Solitary, 1:1 with Adult, Small Group with 1-2 Peers, Small Group with Adult and 1-2 Peers, Large Group with 3 or More Peers, Large Group with Adult and 3 or More peers, and Can't Tell.

Initiator of Activity involved who initiated the activity where the child is currently participating. Codes include Adult, Focal Child, Typical Peer, Peer with Developmental Delays, and Can't Tell.

Child Behavior is what the child is doing within an activity area. The Child Behavior codes in hierarchical order are: Books, Pre-Academics/3 Rs, Pretending/Sociodramatic Play, Art, Game with Rules, Singing/Reciting, Dancing, Self

Help or Self Care, Computer, Manipulating, Large Motor, Clean-up, Stereotypic/Repetitive Behaviors, Not Engaged, and Can't Tell.

Child Social behaviors refer to both focal child social behaviors to adults and peers and peer social behaviors to focal child. The following codes are also based upon a hierarchy: Social Behavior Directed to Adult, Negative Social Behavior to Adult, Social Behavior Directed to a Typical Peer, Negative Social Behavior to a Typical Peer, Social Behavior Directed to a Peer with Disabilities, Negative Social Behavior to a Peer with Disabilities, Social Behavior Directed from a Typical Peer, Negative Social Behavior from a Peer with Disabilities, No Social Behavior, and Can't Tell.

Adult Support concerns the adult behaviors directed towards the focal child. The following codes are also based upon hierarchical order: Adult Support, Adult Approval, Adult Comment, Group Discussion/Directions, None, and Can't Tell.

Operational Definitions

The purpose of this study is concerned with both adult participation in reference to a focal child and a child's engagement level. Through using *CASPER* variables, new variables were created: Adult Participation and Child Engagement.

Adult Participation included No Adult Participation, Passive Adult Participation, and Active Adult Participation (see Table 2.6). Active Adult Participation was created by recoding any instances of Adult Support, Adult Approval, or Adult Comment. Passive Adult Participation was created by recoding when No Adult Support was coded AND the adult was present in the Group Arrangement as evidenced by the following Group Arrangement codes: 1:1 with Adult, Small Group with Adult, and Large Group with Adult. Also, Passive Adult Participation was coded when Adult Support variable was

coded as Group Discussion/Directions, because while the adult was providing directions to a group of children no individual support was given specifically to the focal child. Finally, No Adult Participation was created by recoding when No Adult Support was coded AND no adult was present in Group Arrangement as evidenced by the following Group Arrangement codes: Solitary, Small Group with 1-2 Peers, and Large Group with 3 or More Peers. Intervals coded as Can't Tell will be removed and not included in analyses.

Child Engagement was coded as either Active Child Engagement, or No Active Child Engagement (see Table 2.7). Active Child Engagement was created by recoding the following Child Behavior codes: Preacademics, Books, Pretend/Sociodramatic Play, Manipulating, Art, Large Motor, Dance/Music/Recitation, Games, Clean-Up, and Self-Care/Self-Help). No Active Child Engagement was created by aggregating the following Child Behavior codes: Not Engaged and Stereotypic/Repetitive Behavior. Intervals coded as Can't Tell will be removed and not included in analyses.

Table 2.6
Adult Participation Operational Definitions

Adult Participation Variables	CASPER Variables	CASPER Definitions
Active Participation	Direct Adult Support	Adult provides instruction to the focal child or direct assistance in accomplishing a task or performing an activity.
	Adult Approval	Adult expresses praise, appreciation, or satisfaction with the focal child or his or her behavior (verbally or physically).
	Adult Comment	Adult talks or gestures to the focal child without providing direct support for accomplishing or performing a task or providing approval.
Passive Participation	Group Discussion/Directions	Adult reads aloud to a group of children, sings to the group of children, or gives directions to a group of children, which includes the focal child.
	No Adult Behavior to Focal Child and one of the following group arrangements:	Adult is directing no codeable behavior to the focal child or a group of children in which the focal child is located or involved in the activity.
	1:1 with Adult	Focal child and adult in center
	Small Group with Adult	Focal child, an adult, and 1 to 2 peers in center
	Large Group with Adult	Focal child, an adult, and 3 or more peers in center
No Participation	No Adult Behavior to Focal Child and one of the following group arrangements:	Adult is directing no codeable behavior to the focal child or a group of children in which the focal child is located or involved in the activity.
	Solitary	Alone in center area
	Small group	Focal child and 1 to 2 peers in center
	Large group	Focal child and 3 or more peers in center

Table 2.7
Child Engagement Operational Definitions

Engagement Variables	CASPER Variables	CASPER Definitions
Active Child Engagement	Books	Focal child is actively involved with books (e.g. pointing, looking at pictures, vocalizing about the book, turning the pages of a book)
	Pre-academics	Focal child engages in behavior related specifically to pre-academics.
	Pretend/Sociodramatic Play	Focal child uses objects or materials in a symbolic manner or performs a role in a play theme with other children.
	Art	Focal child is involved in creating an object of art.
	Games with Rules	Focal child engages in games that have established and defined rules
	Dance/Music/Recitation	Focal child performs songs, poems, nursery rhymes, and dances.
	Self-Care/Self-Help	Focal child is actively involved with or partially participating in caring for his or her personal needs.
	Manipulating	Focal child employs coordinated eye-hand movements to interact in a meaningful manner with materials and objects
	Large Motor	Focal child employs large muscles movements.
	Clean-Up	Focal child is putting away toys, instructional materials, play equipment, furniture, food, and dishes.
No Active Child Engagement	Not Engaged	Focal child is not actively engaged in any of the child behavior categories delineated above.
	Stereotypic/Repetitive Behavior	Focal child is involved in stereotypic or repetitive behavior of some type.

Inter-observer Agreement

Videos were coded by one of four trained research assistants trained with the *CASPER-III* Training Manual for Observers (Tsao et al., 2001). Raters practiced coding videos followed by analysis and discussion until all raters reached consensus with at least an 80% agreement (i.e., the number of agreements divided by the number of agreements plus disagreements), or a Kappa of at least 0.80 for each variable.

In addition, 20% of observations were coded by an additional rater for inter-observer agreement for each variable (Group Arrangement, Adult Support, Child Behavior). Both *kappa* and an agreement measure ($\text{Agreement}/(\text{Agreement} + \text{Disagreement})$) were used as measures of the inter-observer agreement for all variables. Note agreement is based upon observed behaviors. Note the agreement measure is based upon observed agreement. See Table 2.8 for the inter-observer agreement.

Table 2.8

Inter-observer Agreement

	A/(A+D)		<i>kappa</i>	
	Mean	Range	Mean	Range
Adult Support	0.93	0.73-0.99	0.84	0.48-0.94
Support	0.79	0.18-0.94	0.83	0.41-0.94
Approval	0.75	0.17-1	0.81	0.27-1
Comment	0.92	0.67-1	0.95	0.79-1
Discussion	0.82	0.32-1	0.87	0.44-1
No Adult	0.87	0.47-0.99	0.84	0.36-0.99
Arrangement	0.93	0.83-0.99	0.88	0.70-0.99
Solitary	0.79	0.2-1	0.85	0.32-1
1:1	0.82	.2-1	0.87	0.32-1
Sm. Group	0.77	0.33-1	0.83	0.49-1
Sm. Group Adult	0.86	0.42-1	0.88	0.53-1
Lg. Group	0.77	0.5-1	0.84	0.66-1
Lg. Group Adult	0.9	0.67-1	0.92	0.78-1
Child	0.90	0.73-0.97	0.83	0.57-0.91
Books	0.84	0.89-1	0.97	0.92-1
Pre-academics	0.84	0.42-1	0.89	0.55-1
Pretend	0.78	0.2-1	0.84	0.32-1
Art	0.84	0.67-0.96	0.89	0.8-0.97
Games	0.90	0.8-1	0.94	0.88-1
Singing	0.89	0.67-1	0.94	0.8-1
Self-Care	0.75	0.33-1	0.82	0.48-1
Manipulatives	0.79	0.4-0.97	0.77	0.2-0.94
Lg. Motor	0.89	0.77-1	0.92	0.83-1
Clean UP	0.52	0.17-1	0.63	0.24-1
Stereotypic	0.81	0.56-1	0.87	0.72-1
Not Engaged	0.71	0.14-0.94	0.75	0.03-0.91

Data Analysis

The adult participation and child engagement codes, as described above, were analyzed to address each of the research questions. For analyses, the statistical software package SAS version 9.2 was used. Procoder files for each participant were transferred into SAS. Based upon original CASPER codes, the new adult participation and child engagement codes were created in SAS. The dataset consisted of individual time intervals for each participant. That is, specific adult and child behavior codes occurring in the time

interval were recorded. For example, a time interval could consist of “active adult participation” and “active child participation” co –occurring in the same interval. The use of intervals allowed for the concurrent examination of child engagement and adult participation. The dataset was set up by using a repeated measure (“long”) format. Specifically, each participant could have up to 180 (10 second intervals for 30 minutes) observations (repeated measures).

The first research question was addressed using descriptive statistics. Proportional data are reported for the amount of time adults were actively participating, passively participating, or not participating with the focal child. Additionally, a contingency table provides information concerning the percentage of child engagement based upon active, passive, and no adult participation.

The second research question (What are the associations between child engagement and adult participation?) was addressed using a multilevel model. A multilevel logistic regression was needed because of the repeated measures within children, children are nested within classrooms, and both adult level and child level variables will be analyzed. If a multilevel model was not used, and clustering ignored, the standard errors would be too small and any statistical test would be too liberal. A three-level model was applied. The Level 1 model consisted of the predictors across all intervals within the video sample. The Level 2 model examined the change at the child level. Finally, the Level 3 model examined the change by classroom level. The model used the logit link function due to the nature of the data (Long, 1997). Specifically, the child engagement variable was based upon proportion scores. Therefore, the distribution of the data is bounded (0 – 1). Since multilevel models assume outcomes are continuous

following a normal distribution, a logit transformation created a larger distribution. The following model was used for analysis:

$$\text{logit } P_{tij} = \gamma_{000} + \gamma_{001}\text{adultactive}_{tij} + \gamma_{002}\text{adultpassive}_{tij} + \gamma_{100}\text{ratio}_j + \gamma_{101}\text{TEACCH}_j + \gamma_{102}\text{LEAP}_j + \gamma_{010}\text{severity}_{ij} + \gamma_{011}\text{language}_{ij} + \gamma_{012}\text{behavior}_{ij} \mu_{oij} + R_{1j}$$

where P_{tij} = child active participation, γ_{000} = grand mean intercept, $\gamma_{001}\text{adultactive}_{tij}$ = adult active participation (predictor variable), $\gamma_{002}\text{adultpassive}_{tij}$ = adult passive participation (predictor variable), $\gamma_{100}\text{ratio}_j$ = covariate of adult to child ratio, $\gamma_{101}\text{TEACCH}_j$ = covariate for TEACCH model, $\gamma_{102}\text{LEAP}_j$ = covariate for LEAP model, $\gamma_{010}\text{severity}_{ij}$ = covariate for child severity, $\gamma_{011}\text{language}_{ij}$ = covariate for child language ability, $\gamma_{012}\text{behavior}_{ij}$ = covariate for child behavioral issues, μ_{oij} = level 2 residual error (child level), and R_{1j} = level 3 residual error (classroom level). Covariates for child/adult ratio, model type, child severity level, child language level, and child behavioral issues were used, because these variables could impact the amount of time adults are able to spend with children. In order to facilitate interpretation, once the analysis was run, the model parameter was exponentiated. Exponentiating the model parameter allowed for the inverse of the logit function, thereby making the results interpretable.

A similar multilevel logistic regression model was used to address the latter three research questions. For the third research question (Does autism severity moderate the relationship between adult participation and child engagement?), autism severity was measured using *CARS* scores. The following model will be used to address how autism severity moderated the relationship between adult and child engagement:

$$\text{logit } P_{tij} = \gamma_{000} + \gamma_{001}\text{adultactive}_{tij} + \gamma_{002}\text{adultpassive}_{tij} + \gamma_{003}\text{adultactive}_{tij}*\text{severity}_{ij} + \gamma_{004}\text{adultpassive}_{tij}*\text{severity}_{ij} + \gamma_{100}\text{ratio}_j + \gamma_{101}\text{TEACCH}_j + \gamma_{102}\text{LEAP}_j + \gamma_{010}\text{severity}_{ij} + \gamma_{011}\text{language}_{ij} + \gamma_{012}\text{behavior}_{ij} + \mu_{oij} + R_{1j}$$

where P_{tij} = child active participation, γ_{000} = grand mean intercept, $\gamma_{001}\text{adultactive}_{tij}$ = adult active participation (predictor variable), $\gamma_{002}\text{adultpassive}_{tij}$ = adult passive participation (predictor variable), $\gamma_{003}\text{adultactive}_{tij}*\text{severity}_{ij}$ = interaction between active adult participation and autism severity, $\gamma_{004}\text{adultpassive}_{tij}*\text{severity}_{ij}$ = interaction between passive adult participation and autism severity, $\gamma_{100}\text{ratio}_j$ = covariate of adult to child ratio, $\gamma_{101}\text{TEACCH}_j$ = covariate for TEACCH model, $\gamma_{102}\text{LEAP}_j$ = covariate for LEAP model, $\gamma_{010}\text{severity}_{ij}$ = moderator for child severity, $\gamma_{011}\text{language}_{ij}$ = covariate for child language ability, $\gamma_{012}\text{behavior}_{ij}$ = covariate for child behavioral issues, μ_{oij} = level 2 residual error (child level), and R_{1j} = level 3 residual error (classroom level) Due to high correlation between $\gamma_{001}\text{adultactive}_{tij}$, $\gamma_{002}\text{adultpassive}_{tij}$, $\gamma_{010}\text{severity}_{ij}$, $\gamma_{003}\text{adultactive}_{tij}*\text{severity}_{ij}$, $\gamma_{004}\text{adultpassive}_{tij}*\text{severity}_{ij}$, grand mean centering was performed (Raudenbush & Bryk, 2002). To reduce this colinearity, the main effects were grand mean centered before the products were computed. Centered scores were created by subtracting individual scores by the mean score. Centered scores were created for the following variables : $\gamma_{001}\text{adultactive}_{tij}$, $\gamma_{002}\text{adultpassive}_{tij}$, $\gamma_{010}\text{severity}_{ij}$. Once the analysis was run, the model parameter was exponentiated to assist in interpretation.

The fourth question (Does language ability moderate the relationship between adult participation and child engagement?) followed the steps outlined above. Child language ability was measured using the *PLS*. The model for this question was

$$\text{logit } P_{tij} = \gamma_{000} + \gamma_{001}\text{adultactive}_{tij} + \gamma_{002}\text{adultpassive}_{tij} + \gamma_{003}\text{adultactive}_{tij}*\text{language}_{ij} + \\ \gamma_{004}\text{adultpassive}_{tij}*\text{language}_{ij} + \gamma_{100}\text{ratio}_j + \gamma_{101}\text{TEACCH}_j + \gamma_{102}\text{LEAP}_j + \gamma_{010}\text{severity}_{ij} + \\ \gamma_{011}\text{language}_{ij} + \gamma_{012}\text{behavior}_{ij} \mu_{oij} + R_{1j}$$

where P_{tij} = child active participation, γ_{000} = grand mean intercept, $\gamma_{001}\text{adultactive}_{tij}$ = adult active participation, $\gamma_{002}\text{adultpassive}_{tij}$ = adult passive participation, $\gamma_{003}\text{adultactive}_{tij}*\text{language}_{ij}$ = interaction between active adult participation and language ability, $\gamma_{004}\text{adultpassive}_{tij}*\text{language}_{ij}$ = interaction between passive adult participation and language ability, $\gamma_{100}\text{ratio}_j$ = covariate of adult to child ratio, $\gamma_{101}\text{TEACCH}_j$ = covariate for TEACCH model, $\gamma_{102}\text{LEAP}_j$ = covariate for LEAP model, $\gamma_{010}\text{severity}_{ij}$ = covariate for child severity, $\gamma_{011}\text{language}_{ij}$ = moderator for child language ability, $\gamma_{012}\text{behavior}_{ij}$ = covariate for child behavioral issues, μ_{oij} = level 2 residual error (child level), and R_{1j} = level 3 residual error (classroom level). Once again grand mean centering was performed on the following variables to reduce the colinearity among variables: $\gamma_{001}\text{adultactive}_{tij}$, $\gamma_{002}\text{adultpassive}_{tij}$, $\gamma_{011}\text{language}_{ij}$, $\gamma_{003}\text{adultactive}_{tij}*\text{language}_{ij}$, $\gamma_{004}\text{adultpassive}_{tij}*\text{language}_{ij}$, . Finally, the model parameter was exponentiated in order to more easily interpret the results.

The final question (Does problematic behavior moderate the relationship between adult participation and child engagement?) was addressed similarly. Behavioral issues were measured using the caregiver teacher rating form of challenging behaviors. The model for this question was

$$\text{logit } P_{tij} = \gamma_{000} + \gamma_{001}\text{adultactive}_{tij} + \gamma_{002}\text{adultpassive}_{tij} + \gamma_{003}\text{adultactive}_{tij}*\text{behavior}_{ij} + \\ \gamma_{004}\text{adultpassive}_{tij}*\text{behavior}_{ij} + \gamma_{100}\text{ratio}_j + \gamma_{101}\text{TEACCH}_j + \gamma_{102}\text{LEAP}_j + \gamma_{010}\text{severity}_{ij} + \\ \gamma_{011}\text{language}_{ij} + \gamma_{012}\text{behavior}_{ij} \mu_{oij} + R_{1j}$$

where P_{tij} = child active participation, γ_{000} = grand mean intercept, $\gamma_{001}adultactive_{tij}$ = adult active participation (predictor), $\gamma_{002}adultpassive_{tij}$ = adult passive participation (predictor), $\gamma_{003}adultactive_{tij}*behavior_{ij}$ = interaction between active adult participation and behavioral issues, $\gamma_{004}adultpassive_{tij}*behavior_{ij}$ = interaction between passive adult participation and behavioral, $\gamma_{100}ratio_j$ = covariate of adult to child ratio, $\gamma_{101}TEACCH_j$ = covariate for TEACCH model, $\gamma_{102}LEAP_j$ = covariate for LEAP model, $\gamma_{010}severity_{ij}$ = covariate for child severity, $\gamma_{011}language_{ij}$ = covariate for child language ability, $\gamma_{012}behavior_{ij}$ = moderator for child behavioral issues, μ_{ojj} = level 2 residual error (child level), and R_{1j} = level 3 residual error (classroom level). Once again grand mean centering was performed on the following variables to reduce the collinearity among variables: $\gamma_{001}adultactive_{tij}$, $\gamma_{002}adultpassive_{tij}$, $\gamma_{012}behavior_{ij}$, $\gamma_{003}adultactive_{tij}*behavior_{ij}$, $\gamma_{004}adultpassive_{tij}*behavior_{ij}$. Finally, the model parameter were exponentiated in order to more easily interpret the results.

CHAPTER 3: RESULTS

This study examined the patterns and associations between child engagement and adult participation. Child characteristics (i.e. severity, language ability, and problematic behavior) were examined to determine how the relationship between child engagement and adult participation were moderated by these characteristics.

Questions One: Pattern of Child Engagement and Adult Participation

What is/are the pattern(s) of adult participation in classrooms that serve children with ASD? Adult spent most of their time passively participating with focal children (36.4%) followed by actively participating (34.1%) and no adult participation (29.5%). Figure 3.1 depicts adult participation. Children spent the majority of their time actively engaged in activities (72.3%) with only 27.7% of time spent not engaged (see Figure 3.2).

Figure 3.1. Adult Participation with Focal Children

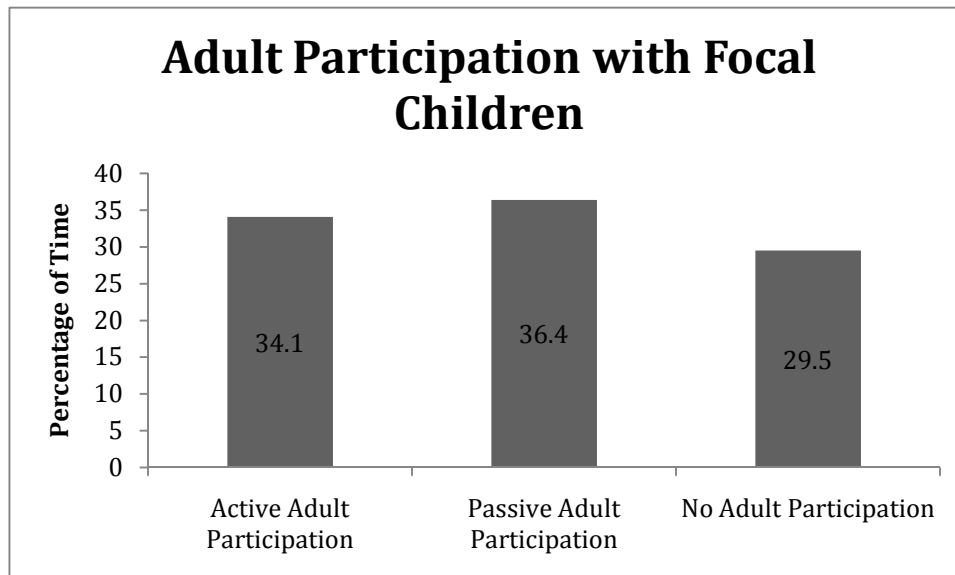
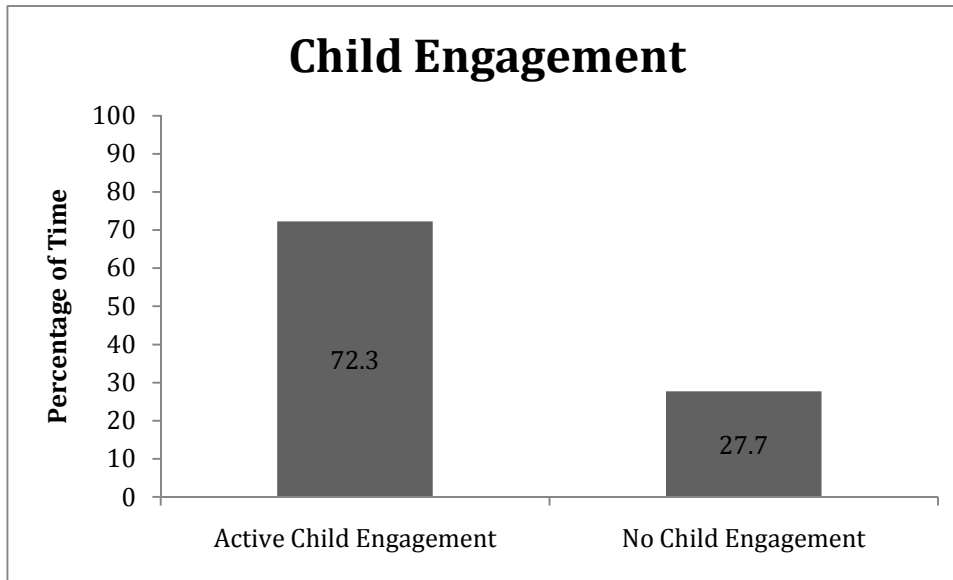
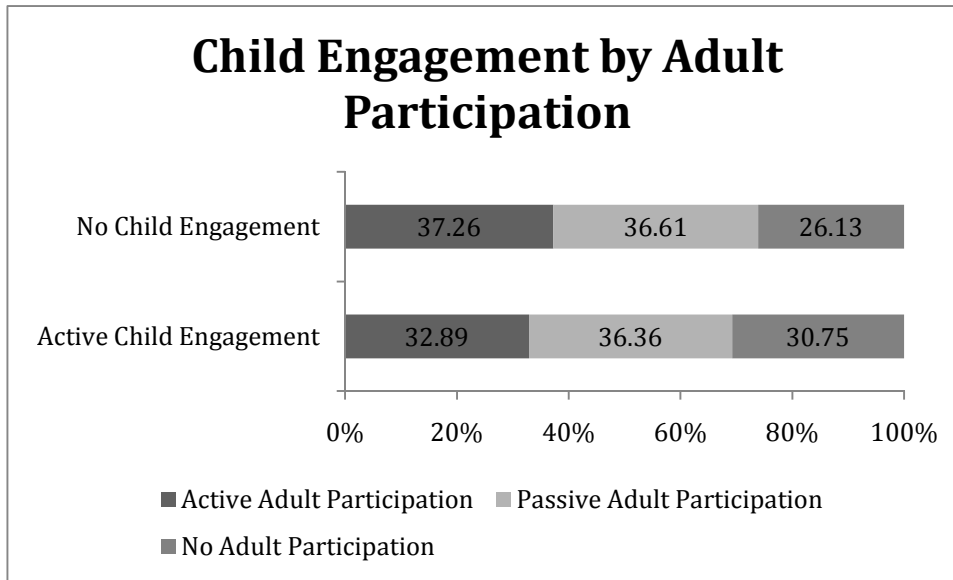


Figure 3.2. Child Engagement



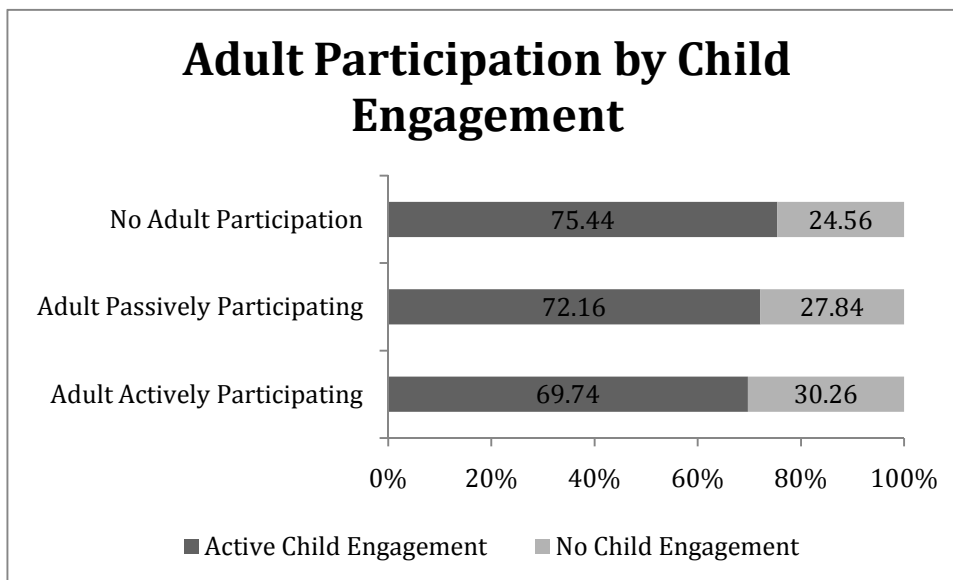
The relationship between child engagement and adult participation was examined. When children were actively engaged adults were passively participating 36.4% of the time, followed by actively participating (33.3% of the time) and no adult participation (30.8% of the time). For no child engagement, there was a different pattern of adult participation. When children were not engaged, adults were actively participating with focal children 37.3% of the time, followed by passively participating (36.6% of the time) and no adult participation (26.1% of the time). Figure 3.3 shows these patterns.

Figure 3.3. Child Engagement by Adult Participation



The relationship between adult participation by child engagement was also examined descriptively. When adults were actively participating, children were engaged for 69.7% of the time. Children were slightly more engaged (72.2%) when adults were passively participating, and children exhibited the most active engagement when adults provided no participation (75.4%). Figure 3.4 depicts these patterns.

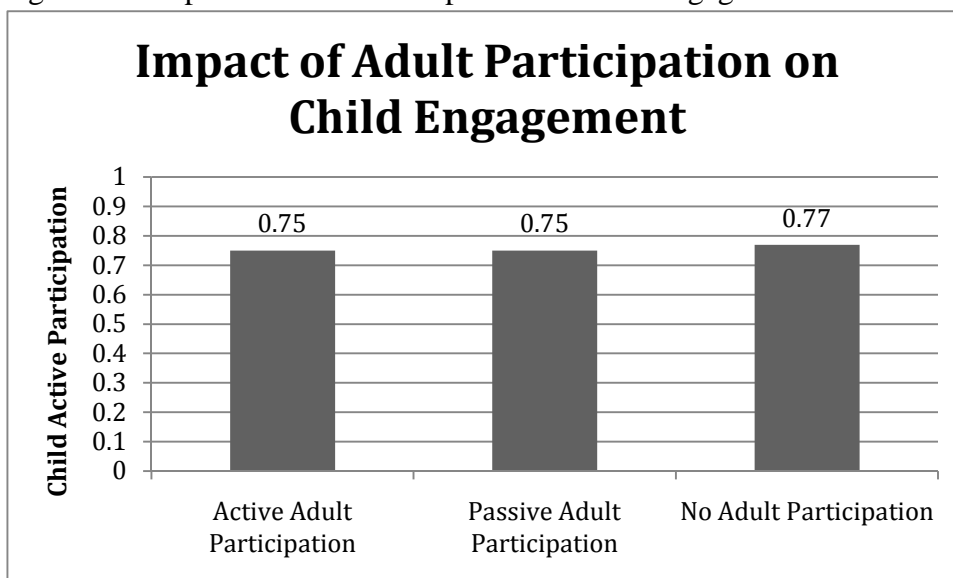
Figure 3.4. Adult Participation by Child Engagement



Question Two: Associations between Child Engagement and Adult Participation

What are the associations between child engagement and adult participation? To determine the relationship the following covariates were used: model (TEACCH and LEAP), child to adult ratio, child severity, child language ability, and child behavioral issues. Please note child characteristics will be analyzed as moderators for subsequent research questions. Adult participation levels was significantly correlated with active child engagement ($F(2, 31933) = 6.73$). Post hoc analysis determined the relationship between the various adult participation levels. An estimate of proportion was used to determine the likelihood of child engagement for each of adult participation levels. When adults provided active participation, children had a 75% chance of being actively engaged. Passive adult participation was similar to active adult participation with children having a 75% chance of being actively engaged. However, when adults were not actively participating with focal children, focal children were more likely to be engaged (77%). Figure 3.5 shows the likelihood of focal children participating in activities based upon adult participation.

Figure 3.5. Impact of Adult Participation on Child Engagement



While there was no significant difference between adult active participation and adult passive participation, no adult participation was statistically significant when compared to both active adult participation and passive adult participation. Specifically, children were more likely to be actively engaged when adults were not participating with them versus when adults were actively participating ($F(1, 31933)=11.96$). Similarly, children were more likely to be engaged with activities when adults were not participating with them versus when adults were passively participating ($F=9.78$, $p=0.0018$). Table 3.1 provides the comparisons of the levels of adult participation.

Table 3.1

Comparison of Adult Participation Levels

	Active Adult	Passive Adult	No Adult
Active	-----	$F(1, 31933)= 0.29$	$F(1, 31933)=11.96^*$
Passive	-----	-----	$F(1, 31933)=9.78 *$

* = $p < 0.01$

Question Three: Autism Severity as Moderator

Does autism severity moderate the relationship between adult participation and child engagement? The interaction between autism severity and adult participation was examined to determine the impact on child active engagement. Covariates included child to adult ratio, model (TEACCH and LEAP), child language ability, child behavioral issues. Adult participation and child engagement was moderated by child severity ($F(2, 31931) = 54.83$). Post hoc analysis determined the relationship between the various adult participation levels by comparing the slope of the three participation levels. The strongest

interaction was between severity and active adult versus no adult interaction ($F(1, 31931)=103.17$). The interaction between severity and active and passive adult participation was statistically significant ($F(1, 31931)=41.93$). The interaction between severity and passive adult and no adult participation was not as strong, but still statistically significant ($F(1, 31931)=25.18$). See Table 3.2 for a description of the comparisons of levels of adult participation with severity.

Table 3.2

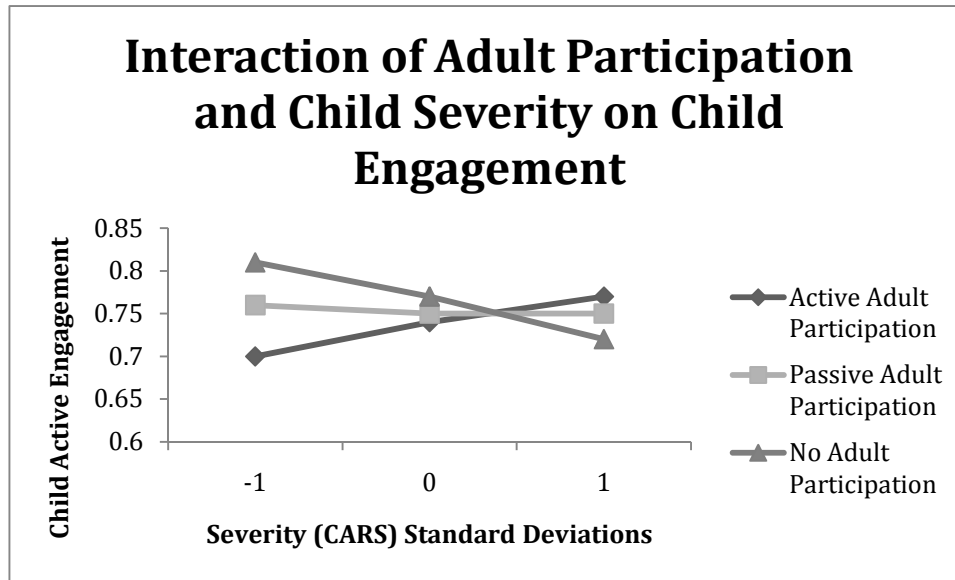
Comparison of the Association between Severity and Child Engagement among Adult Participation Levels

	Active Adult	Passive Adult	No Adult
Active	-----	$F(1, 31931)=41.93^*$	$F(1, 31931)=103.17^*$
Passive	-----	-----	$F(1, 31931)=25.18^*$

* = $p < 0.0001$

An estimate of proportion was used to determine the likelihood of child engagement for each of adult participation levels based upon severity. Specifically, this analysis determined the probability of a child being actively engaged based upon severity when severity of the child was 1 standard deviation below the mean (-1), at the mean (0), and 1 standard deviation above the mean (+1). The higher the severity score the more severe was the child's autism. Therefore, the standard deviation of a +1 represents children with a greater severity than a standard deviation of a -1. Figure 3.6 shows the impact of the interaction between adult participation and child severity on child engagement.

Figure 3.6. Interaction of Adult Participation and Child Severity on Child Engagement



For severity, moderator effects were least evident for passive adult participation ($F(1, 31931)=-0.38, p=0.70$) (see Table 3.3). Active adult participation had the strongest association with children with more severe characteristics of autism ($F(1, 31931) = 2.25, p=0.025$). When adults were actively participating with children with more severity (+1 standard deviation from the mean), children were actively engaged 77% of the time. In contrast, when adults were actively participating with children with less severity (-1 standard deviation from the mean), children were only actively engaged 70% of the time. An opposite pattern was seen for no adult participation ($F(1, 31931)=-2.80, p=0.005$). When adults were not participating with children with more severity (+1 Standard deviation from the mean), children were actively engaged 72% of the time. When adults were not participating with children with less severity (-1 standard deviation from the mean), children were actively engaged for 81% of the time.

Table 3.3

Interaction of Adult Participation and Child Severity on Child Engagement

	-1 SD	0 (Mean)	+1 SD
Active Adult	70%	74%	77%
Passive Adult	76%	75%	75%
No Adult	81%	77%	72%

Question Four: Language Ability as a Moderator:

Does language ability moderate the relationship between adult participation and child engagement? The interaction between language ability and adult participation was examined to determine the impact on child active engagement. Covariates included child to adult ratio, model (TEACCH and LEAP), child autism severity, and child behavioral issues. The association between adult participation and child engagement was moderated by child language ability ($F(2, 31933) = 60.13$). Post hoc analysis determined the relationship between the various adult participation levels. The strongest interaction was between language ability and active adult versus no adult interaction ($F(1, 31931) = 119.10$), followed by the interaction between language ability and no adult and passive adult participation ($F(1, 31931) = 55.22$). The interaction between language ability and passive adult and active adult participation was not as strong, but still statistically significant ($F(1, 31931) = 20.27$). See Table 3.4 for a description of the comparisons of levels of adult participation with language ability.

Table 3.4

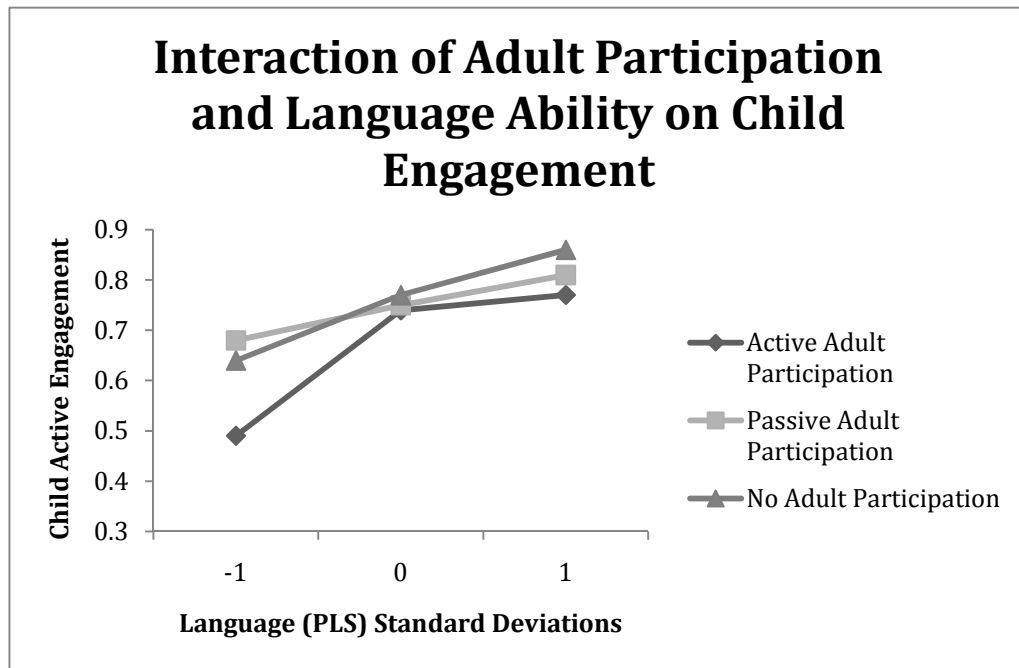
Comparison of the Association between Language Ability and Child Engagement among Adult Participation Levels

	Active Adult	Passive Adult	No Adult
Active	-----	F(1, 31931)=20.27*	F(1, 31931)=119.10*
Passive	-----	-----	F(1, 31931)=55.22*

* = $p < 0.0001$

An estimate of proportion was used to determine the likelihood of child engagement for each of adult participation levels based upon language ability. Specifically, this analysis determined the probability of a child being actively engaged based upon language ability when the language ability (PLS score) of the child was 1 standard deviation below the mean (-1), at the mean (0), and 1 standard deviation above the mean (+1). The higher the language ability score the more language the child had. Therefore, the standard deviation of a +1 represents children with greater language abilities than a standard deviation of a -1. Figure 3.7 shows the impact of the interaction between adult participation and language ability on child engagement.

Figure 3.7. Interaction of Adult Participation and Child Language Ability on Child Engagement



All three levels of adult participation statistically differed from zero (active adult participation ($F(1, 31931) = 2.42, p=0.015$), passive participation ($F(1, 31931) = 4.39, p<0.001$), and no adult participation ($F(1, 31931) = 7.74, p<0.001$)). Children with greater language abilities (+1 standard deviation from the mean) were more likely to be actively engaged when compared to children with less language ability (see Table 3.5). However, children with more language ability (+1 standard deviation from the mean) were more likely to be engaged when there was no adult participation (86%) than when adults were passively (81%) or actively (77%) participating. For children with average language ability, adult participation did not play a major role for child engagement. However, for children with less language ability the level of adult participation was strongly associated with children's level of engagement. Children with less language ability (-1 standard deviation from the mean) were more likely to be actively engaged

when adults were passively participating (68%) and slightly less engaged when adults were not participating (64%). However, when adults were actively participating with children with less language abilities (-1 standard deviation from the mean), these children were only engaged 49% of the time.

Table 3.5

Interaction of Adult Participation and Child Language Ability on Child Engagement

	-1 SD	0 (Mean)	+1 SD
Active Adult	49%	74%	77%
Passive Adult	68%	75%	81%
No Adult	64%	77%	86%

Question Five: Behavioral Issues as a Moderator:

Does problematic behavior moderate the relationship between adult participation and child engagement? The interaction between behavioral issues and adult participation was examined to determine the impact on child active engagement. Covariates included child to adult ratio, model (TEACCH and LEAP), child autism severity, and child language ability. The association between adult participation and child engagement was moderated by parent reported problematic behavior ($F(2, 31931) = 5.56$). Post hoc analysis determined the relationship between the various adult participation levels. The only significant interaction was between active and passive adult participation ($F(1, 31931) = 11.13$). See Table 3.6 for a description of the comparisons of levels of adult participation with problematic behavior.

Table 3.6

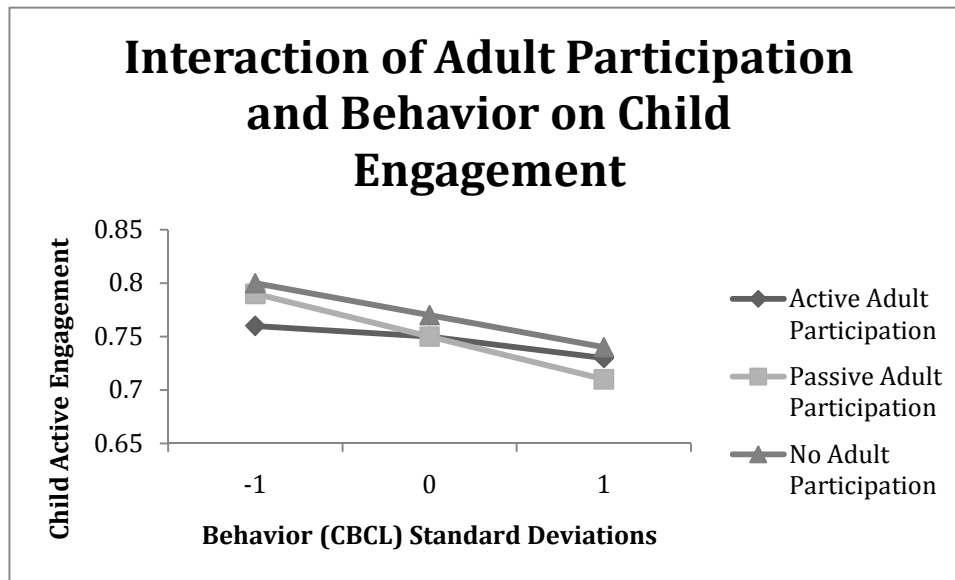
Comparison of the Association between Problematic Behavior and Child Engagement among Adult Participation Levels

	Active Adult	Passive Adult	No Adult
Active Adult	-----	F(1, 31931) = 11.13*	F(1, 31931) = 2.68
Passive Adult	-----	-----	F(1, 31931) = 1.78

* = $p < 0.001$

An estimate of proportion was used to determine the likelihood of child engagement for each of adult participation levels based upon problematic behavior. Specifically, the analysis determined the probability of a child being actively engaged based upon problematic behavior when the total behavioral issues (CBCL score) of the child was 1 standard deviation below the mean (-1), at the mean (0), and 1 standard deviation above the mean (+1). The higher the problematic behavior score the more behavioral issues the parent reported. Therefore, the standard deviation of a +1 represents children with greater behavioral issues than a standard deviation of a -1. Figure 3.8 shows the impact of the interaction between adult participation and problematic behavior on child engagement.

Figure 3.8. Interaction of Adult Participation and Child Problematic Behaviors on Child Engagement



Problematic behaviors had a smaller association on the relationship between adult participation and child engagement when compared to the other moderators: autism severity and language ability. While active adult participation was not statistically different from zero ($F(1, 31931) = -1.38, p=0.169$), passive adult ($F(1, 31931) = -2.94, p=0.003$) and no adult ($F(1, 31931) = -2.22, p=0.26$) participation were. Children with fewer problematic behaviors (-1 standard deviation from the mean) were engaged more when there was no adult (80%) or passive adult (79%) participation compared to active adult participation (76%) (see Table 3.7). For children with average problematic behaviors (children at the mean), level of adult participation had a minimal impact. These children were engaged 75% of the time when adults were actively or passively participating and engaged slightly more (77%) when there was no adult participation. For children with more problematic behaviors (+1 standard deviation from the mean), adult participation had a limited impact on child engagement. When an adult was not

participating, these children were engaged (74%) of the time. Engagement dropped slightly when adults were actively participating (73%) or passively participating (71%).

Table 3.7

Interaction of Adult Participation and Child Problematic Behaviors on Child

Engagement

	-1 SD	0 (Mean)	+1 SD
Active Adult	76%	75%	73%
Passive Adult	79%	75%	71%
No Adult	80%	77%	74%

CHAPTER 4: DISCUSSION

While the NRC (2001) recommended intensive services for 25 hours per week for young children with ASD, limited information is known concerning the efficacy of these models or how the models are implemented in practice (Odom et al., 2010). Furthermore, research has focused upon the interactions between adults and typically developing preschool children with a dearth of information focused upon children with ASD (Hamre & Pianta, 2001; Howes et al., 2000; Qi et al., 2006; Coplan & Prakash, 2003; Wehby, Tally, & Falk, 2004; Van Acker et al., 1996).

This study provided needed information examining the relationships between adult participation and child engagement in preschool classrooms that serve young children with ASD. Furthermore, characteristics specific to ASD (i.e. severity, language ability, problematic behavior) were addressed to understand how these characteristics moderate child engagement and adult participation.

Results

Pattern of adult participation and child engagement. Adults divided their time with focal children fairly evenly among the three levels of participation (i.e. 34% actively participating, 36% passively participating, 30% for no participation). In the current study, adults spent more time actively participating with focal children than previous research indicated. For example, Powell and colleagues (2008) found adults were only actively participating with children 19% or passively participating 6% of the time during play activities. Similarly, typically developing preschool children spent 85% of their time not

interacting or involved with adults (Kontos et al., 2002). While Odom and colleagues (2002) and Brown and others (1999) found adults did provide more support for children with disabilities (15% for children with disabilities versus 5% for typically developing children), this level of support is lower than what was found in the current study. These discrepancies may be due to several factors. For example, some of these studies observed children across various settings and activities (Odom et al., 2002; Brown et al., 1999) versus only observing children during center activities (Powell et al., 2008; Kontos et al., 2002). By observing across various settings, adults may be less likely to interact in such activities as self-help, meals, or transitions. Additionally, the classrooms participating in this study were high quality classrooms. Therefore, classrooms may have been preselected where adults were more likely to interact with children regularly.

The current study also found higher rates of active child engagement than previous studies. Children spent a majority of their time actively engaged in activities (72% of time actively engaged and 28% not engaged). Brown and colleagues (1999) examined child engagement across various time points in inclusive preschool classrooms and found children with disabilities were actively engaged for 54% of the time. Similarly, for children with autism, Odom and others (2002) found children were engaged for 51% of the time in preschool classrooms. Once again, classroom quality may play a role in the higher percentage of time children in the current study were actively engaged versus children in previous studies. In fact, classroom quality has been linked to children engagement levels in preschool, kindergarten, and third grade (McWilliam et al., 1985; Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009; Downer, Rimm-Kaufman, & Pianta, 2007).

Additionally, engagement may have been defined differently across studies. In the current study, children were recorded as engaged if they were interacting with materials even if this was incongruent with the current activity. For example, if children were intended to make numbers with play-doh, but the focal child was making balls with play-doh, the child was observed as engaged. Finally, previous studies focused on child engagement across settings (Odom et al., 2002; Brown et al., 1999). However, the current study only focused upon center time. Levels of engagement may have been lower had activities such as circle time, transition, or meals been observed where children may not be actively engaged, but rather exhibit forms of passive engagement (i.e. listening to peers or teachers) (Brown et al., 1999).

When children were engaged in activities, adults were most likely to be present but not actively participating (36% of the time) followed by actively participating (33% of the time) and not participating (31% of the time) with the focal child. When children were not engaged, adults were more likely to be actively participating (37% of the time), followed by passively participating (37% of the time) followed by not present (26% of the time). Kishida & Kemp (2006) found that when adults were involved in routine or one-to-one activities with preschool children, the children were passively or actively engaged for more than 80% of the time. These findings indicate that adult involvement may promote child engagement.

Interaction of adult participation and child engagement. The relationship between adult participation and child engagement was explored by examining the likelihood of a child being actively engaged based upon the levels of adult participation and using child to adult ratio, model type, and child characteristics (i.e. autism severity,

language ability, and problematic behaviors) as covariates. When adults were actively participating with focal children or present in a center with focal children, children were engaged 75% of the time versus 77% of the time when adults were not present. While no adult participation was statistically significant from both passive and active adult participation, adults not assisting children or being present in the center was associated with a very slight increase in engagement levels (2%). This significant finding could be a result of the very large sample size (190 participants, each with a 30-minute time sample observed at 10-second intervals). Based upon these findings, the level of adult participation does not seem to have an educationally meaningful impact on child engagement.

Yet, previous research found adult participation does impact child engagement. For example, McWilliam and colleagues (2003) found when adults addressed children individually, these children were engaged for 53% of the time compared to only 48% of the time when children were addressed in a group setting. Similarly, a study found when adults were in the same area as focal children, the children were engaged 51% of the time and engaged for 60% of the time when adults were not present (Powell et al., 2008). The researchers explained the presence of an adult could be reassuring and supportive leading to increased levels of child engagement (Powell et al., 2008; McWilliam et al., 2003). The previous research did not focus on children with autism. The current findings of minimal associations between level of adult participation and child engagement are perhaps due to the specific characteristics of these children. Therefore, these characteristics were examined as moderators to the relationship of adult participation and child engagement

Autism severity as moderator. While adult participation alone was not associated with large differences in child engagement, a child's autism severity did moderate this relationship. Specifically, active adult participation and no adult participation were associated with different patterns of children engagement when autism was used as a moderator for this relationship. For children with more severe autism, these children were engaged 77% of the time when adults were actively participating with them. However, when adults were present in a center or not present, child engagement dropped to 75% and 72% respectively. An opposite pattern was seen for children with less severe autism. These children had an increased likelihood of being engaged when adults were not present (81% of the time engaged) compared to when adults were present or actively participating with them (71% and 70% respectively). Therefore, the engagement of children with more severe autism may be enhanced from additional adult participation. However, for children with less severe forms, these children may benefit more from environments that facilitate their active engagement in activities.

Previous research supports these findings of the association between adult participation levels and child engagement. For example, adults are more likely to interact with children who are involved in solitary activities or engaged in passive forms of play (Coplan & Prakash, 2003; Harper & McCluskey, 2003). Given that children with more severe autism may be more isolated in classroom settings, adults may seek these children out to encourage interactions and promote engagement in activities. Additionally, de Kruif and McWilliam (1999) found that children who were more developmentally mature spent more time in higher levels of engagement activities. Perhaps children with less severe autism are more likely to engage in activities on their own, and children with more

severe forms of autism may need support and guidance from adults to engage in activities in the classroom setting.

Language ability as moderator. Like severity, language ability also moderates the relationship between adult participation and child engagement. While a similar pattern was seen across language abilities, there was a stronger association among children with less language ability. For children with more language ability, any level of adult participation was associated with higher levels of engagement when compared to children with less language ability. These children had the highest levels of child engagement when adults were not present (86% of the time) followed by when adults were present but not participating (81% of the time) and then adults actively participation (77% of the time). For children with less language ability, adults actively participating was associated with children being engaged less than half of the time (49%). However, these children were more likely to be engaged when adults were either present but not actively participating (68% of the time) or not present (64% of the time). In terms of language ability, creating classroom environments that enhance engagement may be particularly important for children with low language ability.

Children with more language ability appear to be engaging in high levels of engagement regardless of adult support. However, for children with less language ability adult participation is associated with much lower levels of child engagement. Qi and colleagues (2006) found teachers interacted in a more positive manner with children with more language ability versus with children with low language ability. The children with low language ability also had less favorable interactions with teachers. While the current study did not focus on the quality of the interactions, perhaps the adults' manner of

interacting with these students with low language ability hindered the engagement of the students. Additionally, the adults may have focused their participation with these students to facilitate language development. For example, if adults were talking to these children, the coding system may not have identified a more passive form of child engagement (e.g. listening or watching). However, Rogoff (1990, 2003) noted the importance of this type of engagement in the learning and developmental process.

Problematic behavior as moderator. Finally, child behavior moderated the relationship between adult participation and child engagement. However, this relationship was not as strong a moderator as either autism severity or language ability. Passive and active adult participation were the only statistically significant participation levels that differed in post hoc analysis. Overall, children with more problematic behavior were less engaged compared to children with less problematic behavior. Yet, the levels only varied slightly across adult participation levels for children with more problematic behaviors. These children were engaged 74% of the time when adults were not present followed by 73% of the time when adults were actively participating and 71% of the time when adults were present but not supporting children. For children with less problematic behavior, the highest levels of child engagement were associated with the absence of adults (80% of the time) followed by when adults were present but not participating (79% of the time) and active adult participation (76% of the time).

The finding that children with more problematic behavior are less likely to be engaged has been found previously (Odom et al., 2002). The quality of interactions has been addressed in past research. Specifically, teachers were more likely to interact differently with children with more problematic behaviors by giving them more

commands versus praise (Dobbs & Arnold, 2009). Children with more externalizing behaviors had more negative interactions with teachers (Henricsson & Rydell, 2004; Colwell & Lindsey, 2003). While children with more aggression issues initiated more interactions with teachers, children who were more anxious and anti-social did not seek out teachers (Coplan & Prakash, 2003). Similarly, children who were more attention seeking received more instruction from teachers (Wehby et al., 2004). The current study did not address the quality of interactions, and no previous studies have examined how the level of adult participation impacts the engagement of children with problematic behavior. This study focused on the total problematic behaviors exhibited by children and did not examine the moderating effect of externalizing or internalizing behaviors. If behaviors were examined for the moderating impact perhaps a different relationship between adult participation and child engagement may have been found.

Summary. Children were actively engaged for more than 70% of the time during center time activities. Adult participation levels were associated with child engagement. Generally, the absence of an adult was associated with higher levels of child engagement. Children with less severe autism, more language ability, and less problematic behaviors had higher levels of engagement in activities. Furthermore, these children were more likely to be engaged in activities during center time when adults were not actively participating with them. For children with more severe forms of autism, adult participation was associated with higher levels of child engagement. However, for children with less language ability, active adult participation was associated with low levels of engagement when compared to when adults were present but not interacting directly with focal children and when adults were not present. Finally, problematic

behavior was correlated with lower levels of engagement overall. Yet, these children had higher levels of engagement when adults were not present.

Implications

The current study used observations. Analyses were based upon descriptive and correlational statistics. Therefore, recommendations for practice cannot be given, but implications are based upon interpretations of the data. The following suggestions for practice are hypotheses, and future research is needed to determine causal relationships.

Children with autism were more likely to be engaged in activities when adults were not participating with them. In general, the amount of child engagement did not vary a great deal between the various levels of adult engagement. However, given the statistically significant increase when adults were not present, arranging the environment to promote engagement is critical. Therefore, it is imperative that adults arrange the environment to facilitate active engagement of children. Furthermore, the arrangement of the environment to promote learning opportunities is considered best practice to enhance children's development (Sandall, Hemmeter, Smith, & McLean, 2005).

Additionally, the present study provided needed information on how adults can best support children's engagement based upon specific characteristics of the child. First, adults' support of children's engagement levels during center time activities could vary based upon the severity of the child's autism. Specifically, children with less severe forms of autism had higher levels of active engagement when adults were not participating with these children compared to when adults were actively participating (an 11% increase in child engagement). Therefore, adults can structure the environment to promote active child learning and participation of activities. Mesibov and colleagues

(2005) described how structured teaching supports the learning of children with autism. For example, arranging the physical environment based upon characteristic of autism, employing work systems, and visually structuring activities can maximize the learning of children with autism. This practice may be especially important for children with less severe forms of autism to reduce the need of adult supports in classrooms. However, children with more severe forms of autism may need the physical environment addressed to meet their needs as well as adult support to engage in activities. In the current study, for children with more severe forms of autism, active adult participation was associated with an increased likelihood of child engagement when compared to no adult participation (a 5% increase in child engagement). Thus, for children with more severe forms of autism, adult support enhances the level of engagement for these children. Overall, a teacher's knowledge of a child's severity level could assist in organizing the environment and providing appropriate levels of support to enhance the engagement of children with autism.

Like severity, language ability was also an important moderator of the relationship between child engagement and adult participation levels. For children with more language ability, once again, the absence of an adult and adult support was associated with higher levels of child engagement when compared to active adult participation (a 9% increase). As was the case with children with less severe forms of autism, the engagement of children with more language ability may be enhanced by less active adult participation. Rather, adults can structure activities and the environment to increase children's independence in activities thereby increasing the likelihood of active child engagement. Adults actively participating with focal children were also associated

with less child engagement for children with less language ability. Specifically, the presence of an adult (passive adult participation) was associated with the highest levels of active child engagement for these children, a 19% increase from active adult participation. The presence of adults may be comforting and reassuring for these children resulting in an increase in child engagement levels (McWilliam et al., 2003; Powell et al., 2008). For these children, the arrangement of the environment to promote independence in activities may lead to increases in child engagement levels.

Finally, adults may need to interact differently with children with problematic behaviors in preschool classrooms to promote active child engagement in activities. The pattern of adult participation was only associated with minimal increases in child engagement. For all children, the absence of an adult was associated with the highest levels of child engagement despite problematic behavior. Once again, arranging the environment could increase levels of child engagement for all children.

Overall, adults focusing upon arranging the environment and activities without interacting directly with children may support child engagement for most children with autism. However, children with more severe forms of autism may benefit from adult participation to increase engagement in center time activities. Knowledge of a child's specific characteristics will assist teachers in planning activities during center time and levels of adult participation for specific children to ensure children reach optimal engagement levels. This active child engagement has been linked to better academic outcomes for children (Downer et al., 2007; Ponitz et al., 2009).

Limitations

While the sample size of this study was very large, especially for an autism study, several limitations need to be noted. First, data used in the current analysis was only from pre-test data collection. Therefore, the levels of adult participation and child engagement were representative of levels at the beginning of the year. These levels could change throughout the course of the year. For example, as children become more familiar with expectations in classrooms and mature, children may have higher levels of engagement. Additionally, adults may alter their level of participation with children as the year progresses. Perhaps they begin to prepare children for kindergarten, by providing less support as children become older and prepare to leave these classrooms.

The sample of classrooms included various models: BAU, LEAP, and TEACCH. Although model type was covaried in analyses for in the present study, features of the classroom could impact the manner in which adults interact with students. For example, a feature of TEACCH classrooms is to arrange the environment based upon the characteristics of autism. In contrast, LEAP classrooms focus upon naturalistic teaching strategies and include typically developing children in classrooms. These fundamental differences between classrooms could result in different ways in which adults participate with children.

The manner in which data was collected is also a limitation. Videos were collected that were then used to code behaviors. Therefore, the coding of behaviors was reliant on the quality of the videos. Behaviors could not be coded when children were off screen. Also, some videos did not capture the context of the activity or area where the child was interacting. For example, a play partner or adult may have been off camera but

clearly interacting with the child. However, these interactions were coded as “Can’t Tell” because the partner was not visible.

Another possible limitation of this study was the definition of child engagement. As Brown and colleagues (1999) noted, definitions of child engagement using an ecobehavioral assessment differ from other engagement literature. For example, McWilliam and others (2003) used more precise child engagement codes (included: persistence, pretend, participation, undifferentiated, attentional, transitional, and nonengaged). These hierarchical codes developed by McWilliam and colleagues provided a way to assess more beneficial levels of engagement for children. While the engagement coding system used in this study did not provide as precise engagement information as McWilliam and colleagues (2003), the engagement coding system used in the current study provided needed information on the relationship between child engagement and adult participation levels in preschool classrooms serving children with ASD.

Additionally, adults may participate differently with children based upon the activity the child is participating in and their level of engagement. For example, adults may alter their level of participation when children are engaged in pre-academic activities versus when children are engaged in manipulatives. Furthermore, the current study did not address children’s passive engagement (i.e. when children are watching or listening to peers or adults). The coding system used did not capture such engagement. Rogoff (1990, 2003) noted children learn from observing the others and the environment, yet this information could not be addressed in the current study.

In addition to issues coding the engagement category, the manner of coding data could also be a limitation. The current study examined the co-occurrence of adult

participation and child engagement and the associations between these variables. However, the impact of adult participation on child engagement could not be addressed. Specifically, the response of the child in reaction to the support provided or not provided could not be examined.

While this study examined how child characteristics impacted the relationship between adult participation and child engagement, another limitation of the study was that teacher characteristics were not addressed. Each focal child interacted with a variety of adults in the videotaped center time segments. Therefore, it was not possible to identify when the child was interacting with the teacher versus another adult (e.g. a teacher assistant or a speech/language pathologist). Teacher characteristics (e.g. number of years teaching, experience teaching children with autism, education level) may also moderate the relationship between adult participation and child engagement levels. However, the current study could not examine these possible factors.

Finally, exploring the quality of the interactions between adults and children was beyond the scope of the current study. For example, McWilliam and colleagues (2003) examined how specific teacher behavior (e.g. elaborations, providing information) impacted child engagement. Additionally, past research has focused on how positive or negative interactions with adults impact child behavior (Burchinal, et al., 2008; Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Curby, Rimm-Kaufman, & Ponitz, 2009; O'Connor & McCartney, 2007). However, this study was unable to address the quality aspect of the interactions.

Future Research

The current study examined how levels of adult participation were associated with the engagement of preschool children with ASD. In order to better understand the relationships between adults and children with ASD, research in three areas is needed: (1) How do teachers and children interact and form relationships in classrooms? (2) What characteristics of teachers and young children lead to either optimal or less than optimal relationships between teachers and children? (3) What are the social and academic outcomes associated with either optimal or less than optimal relationships between teachers and children?

First, we need to learn more about how children and adults currently are interacting and forming relationships in classrooms. For example, we need to understand how adults are interacting with children in a more concrete manner. Thus, information is needed to determine the activities where adults are more likely to participate with children. Adults may be more likely to support children in higher-level activities such as preacademics or where children may need additional support such as self-care or self-help activities. However, adults may be less likely to provide support during manipulative (e.g. building with legos) or art activities.

Similarly, additional research is needed to understand child engagement in classrooms. The current study did not explore passive forms of engagement. While the current study found children were not engaged for about 28% of the time, if passive engagement had been coded perhaps the number of intervals during which engagement was categorized as “none” would have been smaller. Further research is also needed that explores the quality of the interactions between adults and children with autism.

Specifically, past research indicated positive interactions lead to better outcomes for children (Burchinal, et al., 2008; Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Curby, Rimm-Kaufman, & Ponitz, 2009; O'Connor & McCartney, 2007). Therefore, research is needed that explores the quality of interactions between adults and these children.

Second, we need to understand the characteristics of children and teachers that promote or hinder the development of such positive relationships. While the current study provides information concerning how child characteristics moderate the relationship between child engagement and adult participation, additional characteristics need to be explored. For example, perhaps child characteristics also influence the quality of relationships formed between children and adults. It may be harder to have more positive interactions for children with more severe forms of autism or less language ability.

Along with child characteristics, characteristics of teachers and adults working with children with autism need to be examined. For example, teacher training and experience may impact the relationships and interactions with children. Specifically, different treatment models focus on various aspects of children's development. The focus of these models could impact how teachers interact with children, thereby influencing the relationships formed. Furthermore, burnout needs to be examined more closely for these teachers. Hastings & Bham (2003) found regular classroom teachers experienced more burnout from students with problematic behavior. Since children with autism may exhibit more behavioral issues (Pandolfi et al., 2009), this in turn may lead to more teacher burnout impacting the relationship between teachers and children.

Finally, longitudinal studies are needed to examine the impact on both social and academic outcomes related to the quality of the relationships and interactions between young children with ASD and the adults in preschool classrooms. Specifically, researchers need to explore if high quality relationships between teachers and children with ASD mirror the findings from studies with typically developing research and promote better outcomes for these students.

As described above research needs to focus upon: (1) current state of interactions between adults and children and with autism; (2) characteristics of adults and children that impact the quality of relationships; and (3) outcomes related to the quality of relationships and interactions. With this information, interventions could be developed that target the relationships and interactions between teachers and children with ASD. Specifically, interventions could focus on adults to increase their ability to positively interact with children and form high quality relationships and promote child engagement. The ultimate goal is to promote the best possible outcomes for children with ASD.

Conclusion

This study addressed the relationship between adult participation levels and the engagement of children with ASD in preschool classrooms. Adults participated with focal children at various levels (active participation, passive participation, no participation). Children were engaged in center time activities the majority of the time (72%). Higher levels of child engagement were associated with no active adult participation. This finding was salient for children with less severe forms of autism, more language ability, and less problematic behavior. Additionally, higher levels of child engagement were also associated with no active adult participation for children with less language ability. For

these groups of children, adults can structure the environment and activities to promote active child engagement during center time activities. However, for children with more severe forms of autism, higher levels of engagement were associated with active adult participation. These children appear to benefit from the additional support offered by adults. This information can assist teachers and professionals in preschool classrooms enhance the engagement levels of children with autism based upon specific child characteristics. Active child engagement has been linked to better academic outcomes for children (Downer et al., 2007; Ponitz et al., 2009).

References

- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment*. Hillsdale, NJ: Erlbaum.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC.
- Birch, S. H. & Ladd, G. W. (1998). Children's interpersonal behaviors and the teacher-child relationship. *Developmental Psychology*, *34*, 934-946. doi: 10.1037/0012-1649.34.5.934
- Brophy-Herb, H. E., Lee, R. E., Nievar, M. A., & Stollak, G. (2007). Preschoolers' social competence: Relations to family characteristics, teacher behaviors and classroom climate. *Journal of Applied Developmental Psychology*, *28*, 134-148. doi: 10.1016/j.appdev.2006.12.004
- Brown, W. H., Odom, S. L., Li, S., & Zercher, C. (1999). Ecobehavioral assessment in early childhood programs. *Journal of Special Education*, *33*, 138-153. doi: 10.1177/002246699903300302
- Burchinal, M., Howes, C., Pianta, R., Bryant, D., Early, D, Clifford, R., & Barbarin, O. (2008). Predicting child outcomes at the end of kindergarten from the quality of pre-kindergarten teacher-child interactions and instruction. *Applied Developmental Science*, *12*, 140-153. doi: 10.1080/10888690802199418
- Burchinal, M. R., Peisner-Feinberg, E., Pianta, R. C., & Howes, C. (2002). Development of academic skills from preschool through second grade: Family and classroom predictors of developmental trajectories. *Journal of School Psychology*, *40*, 415-436.
- Carta, J. J. & Greenwood, C. R. (1985). Eco-behavioral assessment: A methodology for expanding the evaluation of early intervention programs. *Topics in Early Childhood Special Education*, *5*, 88-104. doi: 10.1177/027112148500500209
- Chien, N. C., Howes, C., Burchinal, M., Pianta, R. C., Ritchie, S., Bryant, D. M. et al. (2010). Children's classroom engagement and school readiness gains in prekindergarten. *Child Development*, *81*, 1534-1549. doi: 10.1111/j.1467-8624.2010.01490.x
- Colwell, M. L. & Lindsey, E. W. (2003). Teacher-child interactions and preschool children's perceptions of self and peers. *Early Child Development and Care*, *173*, 249-258. doi:10.1080/03004430303096
- Coplan, R. J. & Prakash, K. (2003). Spending time with teacher: Characteristics of preschoolers who frequently elicit versus initiate interactions with teachers. *Early*

- Childhood Research Quarterly*, 18, 143-158. doi:10.1016/S0885-2006(03)00009-7
- Curby, T. W., Rimm-Kaufman, S. E., & Ponitz, C. C. (2009). Teacher-child interactions and children's achievement trajectories across kindergarten and first grade. *Journal of Educational Psychology*, 101, 912-925. doi: 10.1037/a0016647
- Data Accountability Center. Data tables for OSEP state reported data: IDEA Part B child count (2007). Retrieved from https://www.ideadata.org/arc_toc9.asp#partbCC
- de Kruif, R. E. L., & McWilliam R. A. (1999). Multivariate relationships among developmental age, global engagement, and observed child engagement. *Early Childhood Research Quarterly*, 14, 515-536.
- de Kruif, R. E. L., McWilliam, R. A., Maher Ridley, S. & Wakely, M. B. (2000). Classification of teachers' interaction behaviors in early childhood classroom. *Early Childhood Research Quarterly*, 15, 247-268.
- Dobbs, J. & Arnold (2009) Relationship between preschool teachers' reports of children's behavior and their behavior toward those children. *School Psychology Quarterly*, 24, 95-105. doi: 10.1037/a0016157
- Doumen, S., Verschueren, K., Buyse, E., Germeijs, B., Luyckx, K., & Soenens, B. (2008). Reciprocal relations between teacher-child conflict and aggressive behavior in kindergarten: A three-wave longitudinal study. *Journal of Clinical Child & Adolescent Psychology*, 37, 588-599. doi: 10.1080/15374410802148079
- Downer, J. T., Rimm-Kaufman, S. E., Pianta, R.C. (2007). How do classroom conditions and children's risk for school problems contribute to children's behavioral engagement in learning? *School of Psychology Review*, 36, 413-432.
- Giangreco, M. F., Broer, S. M., & Edelman, S. W. (2001). Teacher engagement with students with disabilities: Differences between paraprofessional service delivery models. *Journal of the Association for Persons with Severe Handicaps*, 26, 75-86. doi: <http://dx.doi.org/10.2511/rpsd.26.2.75>
- Gunter, P. L., Denny, R. K., Shores, R. E., Reed, T. M., Jack, S. L., & Nelson, C. M. (1994). Teacher escape, avoidance, and countercontrol behaviors: Potential responses to disruptive and aggressive behaviors of students with severe behavior disorders. *Journal of Child and Family Studies*, 3, 211-223. doi: 10.1007/BF02234068
- Hamilton, D. (2005). An ecobehavioral analysis of interactive engagement of children with developmental disabilities with their peers in inclusive preschools. *International Journal of Disability, Development, and Education*, 52, 121-137. doi:10.1080/10349120500086363

- Harper, L. V. & McCluskey, K. S. (2003). Teacher-child and child-child interactions in inclusive preschool settings: Do adults inhibit peer interactions? *Early Childhood Research Quarterly, 18*, 163-184. doi:10.1016/S0885-2006(03)00025-5
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher-child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development, 72*, 625-638. doi: 10.1111/1467-8624.00301
- Henricsson, L. & Rydell, A. M. (2004). Elementary school children with behavior problems: Teacher-child relations and self-perception. A prospective study. *Merrill-Palmer Quarterly, 50*, 111-138.
- Howard, J. S., Sparkman, C. R., Cohen, H. G., Green, G., & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities, 26*, 359-383. doi:10.1016/j.ridd.2004.09.005
- Howes, C., Phillipsent, L., & Peisner-Feinberg, C. (2000). The consistency and predictability of teacher-child relationships during the transition to kindergarten. *Journal of School Psychology, 38*, 113-132. doi: 10.1016/S0022-4405(99)00044-8
- Kamps, D. M., Leonard, B. R., Dugan, E. P., Boland, B., & Greenwood, C. R. (1991). The use of ecobehavioral assessment to identify naturally occurring effective procedures in classrooms serving students with autism and other developmental disabilities. *Journal of Behavioral Education, 1*, 367-397. doi: 10.1007/BF00946773
- Kishida, Y. & Kemp, C. (2006). A measure of engagement for children with intellectual disabilities in early childhood settings: A preliminary study. *Journal of Intellectual & Developmental Disability, 31*, 101-114. doi:10.1080/13668250600710823
- Kesner, J. E. (2000). Teacher characteristics and the quality of child-teacher relationships. *Journal of School Psychology, 28*, 133-149. doi: 10.1016/S0022-4405(99)00043-6
- Kuehn, B. M. (2007). CDC: Autism spectrum disorders common. *JAMA: Journal of the American Medical Association, 297*, 940-940. doi: 10.1001/jama.297.9.940
- Logan, K. R., Bakeman, R., Keefe, E. B. (1997). Effects of instructional variables on engaged behavior of students with disabilities in general education classrooms. *Journal of Exceptional Children, 63*, 481-497.
- Long, J. S. (1997). *Regression models for categorical and limited dependent variables: Advanced quantitative techniques in the social sciences*. Thousand Oaks: Sage Publications.

- Love, J. R., Carr, J. E., LeBlanc, L. A. (2009). Functional assessment of problem behavior in children with autism spectrum disorders: A summary of 32 outpatient cases. *Journal of Autism Developmental Disorders*, 29, 363-372. doi: 10.1007/s10803-008-0633-z
- Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer J. T., Barbarin, O. A., Bryant, D., et al. (2008). Measures of classroom quality in prekindergarten and children's development of academic, language, and social skills. *Child Development*, 79, 732-749. doi: 10.1111/j.1467-8624.2008.01154.x
- McWilliam, R. A., & Bailey, D. B. (1995). Effects of classroom social structure and disability on engagement. *Topics in Early Childhood Special Education*, 15, 123-147. doi: 10.1177/027112149501500201
- McWilliam, R. A., Scarborough, A. A., & Kim, H. (2003). Adult interactions and child engagement. *Early Education & Development*, 14, 7-27. doi: 10.1207/s15566935eed1401_2
- McWilliam, R. A., Trivette, C. M., & Dunst, C. J. (1985). Behavior engagement as a measure of the efficacy of early intervention. *Analysis and Intervention in Developmental Disabilities*, 5, 59-71.
- Mercer, S. T. & DeRosier, M. E. (2008). Teacher preference, peer rejection, and student aggression: A prospective study of transactional influence and independent contributions to emotional adjustment and grades. *Journal of School Psychology*, 46, 661-685. doi: 10.1016/j.jsp.2008.06.006
- Mercer, S. T. & DeRosier, M. E. (2009). A prospective investigation of teacher preference and children's perceptions of the student-teacher relationship. *Psychology in the Schools*, 47, 184-192. doi: 10.1002/pits.20463
- Mesibov, G. B., Shea, V., & Schopler, E. (2005). *The TEACCH approach to autism spectrum disorders*. New York: Kluwer Academic/Plenum Publishers.
- Mullen, E. M. (1995). *Mullen Scales of Early Learning (AGS Edition)*. Los Angeles: Western Psychological.
- Myers, S. S. & Pianta, R. C. (2008). Developmental commentary: Individual and contextual influences on student-teacher relationships and children's early problem behaviors. *Journal of Clinical Child & Adolescent Psychology*, 37, 600-608. doi: 10.1080/15374410802148160
- National Institute of Child Health and Human Development and Early Child Care Research Network, (2002). The relation of global first-grade classroom environment to structured classroom features and teacher and student behaviors. *Elementary School Journal*, 102, 367-387.

- National Research Council (2001). *Educating children with autism*. Washington, DC: National Academy Press.
- O'Connor, E. & McCartney, K. (2007). Examining teacher-child relationships and achievement as part of an ecological model of development. *American Educational Research Journal*, *44*, 340-369. doi: 10.3102/0002831207302172
- Odom, S. L., Boyd, B. A., Hall, L. J., & Hume, K. (2010). Evaluation of comprehensive treatment models for individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *40*, 425-436. doi: 10.1007/s10803-009-0825-1
- Odom, S. L., Brown, W. H., Schwartz, I. S., Zercher, C., & Sandall, S. R. (2002). Classroom ecology and child participation. In S. L. Odom (Ed.), *Widening the circle* (pp. 25-45). New York: Teachers College Press.
- Odom, S. L., & Peterson, C. (1990). Ecobehavioral analysis of early education/specialized classroom settings and peer social interaction. *Education and Treatment of Children*, *13*, 316-331.
- Pandolfi, V., Magyar, C. I., & Dill, C. A. (2009) Confirmatory factor analysis of the child behavior checklist 1.5-5 in a sample of children with autism spectrum disorders. *Journal of Autism and Developmental Disabilities*, *39*, 986-995. doi: 10.1007/s10803-009-0716-5
- Pianta, R. C., (1999). *Enhancing relationships between children and teachers*. Washington, D.C.: American Psychological Association.
- Pianta, R. C., La Paro, K. M., Payne, C., Cox, M. J., & Bradley, R. (2002). The relation of kindergarten classroom environment to teacher, family, and school characteristics and child outcomes. *Elementary School Journal*, *102*, 225-238.
- Ponitz, C. C., Rimm-Kaufman, S. E., Grimm, K. J., & Curby, T. W. (2009). Kindergarten classroom quality, behavioral engagement, and reading achievement. *School Psychology Review*, *38*, 102-120.
- Powell, D. R., Burchinal, M. R, File, N., & Kontos, S. (2008). An eco-behavioral analysis of children's engagement in urban public school preschool classrooms. *Early Childhood Research Quarterly*, *23*, 108-123. doi:10.1016/j.ecresq.2007.04.001
- Qi, C. H., Kaiser, A. P., & Milan, S. (2006). Children's behavior during teacher-directed and child-directed activities in Head Start. *Journal of Early Intervention*, *28*, 97-110. doi: 10.1177/105381510602800202
- Raudenbush, S. W. & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks: Sage Publications.

- Reinhartsen, D. B., Garfinkle, A. N., & Wolery, M. (2002). Engagement with toys in two-year old children with autism: Teacher selection versus child choice. *Research & Practice for Persons with Severe Disabilities, 27*, 175-187. doi: 10.2511/rpsd.27.3.175
- Ridley, S. M., McWilliam, R. A., & Oates, C. S. (2000). Observed engagement as an indicator of child care program quality. *Early Education & Development, 11*, 133-146. doi: 10.1207/s15566935eed1102_1
- Rimm-Kaufman, S. E., Early, D. M., Cox, M. J., Saluja, G., Pianta, R. C., Bradley, R. H., & Payne, C. (2002). Early behavioral attributes and teachers' sensitivity as predictors of competent behavior in the kindergarten classroom. *Applied Developmental Psychology, 23*, 451-470
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. Oxford University Press: New York.
- Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press: New York.
- Rotholz, D. A, Kamps, D. M., & Greenwood, C. R. (1989). Ecobehavioral assessment and analysis in special education settings for students with autism. *Journal of Special Education, 23*, 59-81. doi: 10.1177/002246698902300106
- Sandall, S., Hemmeter, M. L., Smith, B. J., & McLean, M. E. (Eds.) (2005). *DEC recommended practices: A comprehensive guide for practical application in early intervention/early childhood special education*. Missoula, MT: Division for Early Childhood (DEC), Council for Exceptional Children (CEC).
- Sameroff, A. (2009). The transactional model.. In A. Sameroff (Ed.), *The transactional model of development: How children and contexts shape each other*. Washington, D.C.: American Psychological Association.
- Sameroff, A. J. (2000). Developmental systems and psychopathology. *Development and Psychopathology, 12*, 297-312. doi: 10.1017/S0954579400003035
- Sameroff, A. J. & Mackenzie, M. J. (2003). Research strategies for capturing transactional models of development: The limits of the possible. *Development and Psychopathology, 15*, 613-640. doi: 10.1017/S0954579403000312
- Schopler, E., Reichler, R., & Renner, B. (1988). *The Childhood Autism Rating Scale (CARS)*. Los Angeles: Western Psychological Services.
- Shim, J., Hestenes, L., & Cassidy, D. (2004). Teacher structure and child care quality in preschool classrooms. *Journal of Research in Childhood Education, 19*, 143-157. doi: 10.1080/02568540409595061

- Smith, J., Warren, S. F., Yoder, P. J., & Feurer, I. (2004). Teachers' use of naturalistic communication intervention practices. *Journal of Early Intervention, 27*, 1-14. doi: 10.1177/105381510402700101
- Strain, P. S. & Bovey, E. H.(2011). Randomized, controlled trial of the LEAP model of early intervention for young children with autism spectrum disorders. *Topics in Early Childhood Special Education, 31*, 133-154. doi: 10.1177/0271121411408740
- Strain, P.,& Cordisco, L. (1994). LEAP Preschool. In. S. H. J. Handleman (Ed.), *Preschool education programs for children with autism* (pp. 225-244). Austin, TX: PRO-ED.
- Strain, P. & Hoyson, M. (2000). The need for longitudinal, intensive social skills intervention: LEAP follow-up outcomes for children with autism. *Topics in Early Childhood Special Education, 20*, 116-122. doi: 10.1177/027112140002000207
- Sutherland, K. S., Lewis-Lamer, T., Stichter, J., & Morgan, P. L. (2008). Examining the influence of teacher behavior and classroom context on behavioral and academic outcomes for students with emotional or behavioral disorders. *Journal of Special Education, 41*, 223-233. doi: 10.1177/0022466907310372
- Sutherland, K. S. & Oswald, D. P. (2005). The relationship between teacher and student behaviors in classrooms for students with emotional and behavioral disorders: Transactional processes. *Journal of Child and Family Studies, 14*, 1-14. doi: 10.1007/s10826-005-1106-z
- Tapp, J. & Walden, T. A. (2000). *PROCODER*: A system for collection and analysis of observational data from videotape. In T. Thompson, D. Felece, & F. J. Symons (Eds.), *Behavioral observation: technology and applications in developmental disabilities* (pp. 61-70). Baltimore: Paul H. Brookes Publishing Co.
- Tsao, L., Odom, S. L., & Brown, W. B. (2001). *Code for active student participation and engagement- Revised (CASPER III): A training manual for observers*. Bloomington, IN: Indiana University.
- Tsao, L.L., Odom, S. L., Buysse, V., Skinner, M., West, T., Vitzum-Komaneki, J. (2008). Social participation of children with disabilities in inclusive preschool programs: Program typology and ecological features. *Exceptionality, 16*, 125-140. doi: 10.1080/09362830802198203
- Van Acker, R., Grant, S. H., & Henrey, D. S. (1996). Teacher and student behavior as a function of risk for aggression. *Education and Treatment of Children, 19*, 316-334.
- Wehby, J. H., Tally, B. B., & Falk, K. B. (2004). Identifying the relation between the function of student problem behavior and teacher instructional behavior.

Assessment for Effective Intervention, 30, 41-51. doi:
10.1177/073724770403000104

Yeargin-Allsopp, M. Rice, C., Karapurkar, T., Doernberg, N., Boyle, C., & Murphy, C. (2003). Prevalence of autism in a US metropolitan area. *Journal of American Medical Association*, 289, 49-55. doi: 10.1001/jama.289.1.49

Zahner, G., & Pauls, D. (1987). Epidemiological survey of infantile autism. In D. J. Cohen & A. M. Donnellan (Eds.), *Handbook of autism and pervasive developmental disorders* (pp. 199-207). Toronto, Canada: Wiley.

Zimmerman, I., Steiner, V., & Pond, R. (2003). *Preschool Language Scale-IV*. San Antonio, TX: Psychological Corporation.