

A RESPONSIVE TEACHING INTERVENTION FOR PARENTS OF CHILDREN
IDENTIFIED AS AT RISK FOR AN AUTISM SPECTRUM DISORDER AT 12
MONTHS

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ABSTRACT

DEVON FLORA HARTFORD: A Responsive Teaching Intervention for Parents of Children Identified as at risk for an Autism Spectrum Disorder at 12 months
(Under the direction of Gary Mesibov and Steve Knotek)

This study evaluated the novel application of an early intervention, Responsive Teaching (RT), with 14-18 month olds who have been identified as being at risk for an eventual diagnosis of an autism spectrum disorder (ASD) at 12 months. Children falling in the 95th percentile and above as indicated by overall risk status on the First Year Inventory (FYI), a screener, were invited to come in for a Time 1 evaluation ($n=23$). Children who met the criteria for the highest risk for ASD after this extensive assessment were randomized into treatment ($n=9$) and control ($n=4$) conditions. Parent-child dyads in the treatment group received 6 months of modified RT intervention, while the control group was referred for community services. The aim of this study was twofold. The first goal was to determine whether there is evidence that RT is an appropriate intervention for this specific population, parents of 12-month-olds at risk for ASD. Research has suggested a more intrusively directive interactional style employed by caregivers forces children to shift their focus of attention and may result in negative developmental outcomes. Level of caregiver directiveness was found to be positively correlated with the degree of autism displayed by the child ($r=.458, p<.05$), which suggests an intervention (such as RT) aiming to reduce directiveness to a more optimal, less intrusive level, would be appropriate for families of children at risk for ASD. The second goal of the study was to evaluate whether the intervention was achieving one of its aims, that is, to increase responsiveness and decrease directiveness displayed by caregivers when interacting with their children. Two two-sample t -tests were conducted to compare the mean change in

responsiveness and directiveness between the treatment and control groups. Likely due to the small sample size ($n=13$), results were not statistically significant, but the results were in the expected direction, and confirmed the trend that members of the experimental group increased responsiveness and decreased directiveness more than members of the control group. These findings suggest that parental interactional styles may potentially become more productive through intervention.

TABLE OF CONTENTS

LIST OF TABLES.....	vi
LIST OF FIGURES.....	vii
LIST OF ABBREVIATIONS AND SYMBOLS.....	viii
Chapter	
I. INTRODUCTION AND REVIEW OF LITERATURE.....	1
Review of Literature.....	2
The Role of Maternal Responsiveness in Child Development.....	8
Responsiveness and Directiveness in Mothers of Children with Disabilities.....	17
Responsive Teaching Interventions.....	29
Effects of Responsive Teaching Interventions.....	36
Limitations of Existing Literature.....	44
Other Evidence-Based Early Interventions.....	48
Research Goals and Research Questions.....	50
II. METHOD.....	54
Design.....	55
Participants.....	55
Benefits to Participation.....	58
Independent Variables.....	58
Measures.....	61

Procedures.....	66
Statistical Analyses.....	69
III. RESULTS.....	71
Hypothesis 1.....	71
Hypothesis 2.....	73
Supplementary Analyses.....	75
IV. DISCUSSION	76
Hypothesis 1.....	77
Hypothesis 2.....	79
Implications.....	83
Limitations.....	86
Future Directions.....	87
REFERENCES.....	103

LIST OF TABLES

Table

1. Pivotal Behaviors Targeted in RT.....	90
2. Components and Dimensions of Strategies for Interactive Behavior.....	91
3. FYI Return Rates by Month.....	94
4. Demographic Data for $n=23$	96
5. Cognitive Functioning in the Treatment vs. Control Groups.....	99
6. AOSI Scores of the Children in the Treatment and Control Groups.....	100
7. Average Change in Responsiveness and Directiveness in Treatment and Control Groups.....	101
8. Directiveness and Responsiveness (high, low, average) Between Treatment and Control Groups.....	102

LIST OF FIGURES

Figures

1. Responsive teaching curriculum.....89
2. Abbreviated EDP study procedure.....95
3. Scatterplot from bivariate linear regression analysis including outlier.....98

LIST OF ABBREVIATIONS AND SYMBOLS

ABA	Applied Behavior Analysis
AOSI	Autism Observation Scale for Infants
ASD	Autism Spectrum Disorder
DTT	Discrete Trial Training
EEG	Electroencephalogram
FYI	First Year Inventory
IQ	Intelligence Quotient
MBRS	Maternal Behavior Rating Scale
RT	Responsive Teaching
TEACCH	Treatment and Education of Autistic and Communication Handicapped Children
TRIP	Transactional Intervention Program
VLBW	Very Low Birth Weight
<i>M</i>	Mean
<i>N</i>	Population Size
<i>p</i>	P-value
<i>SD</i>	Standard Deviation
<i>SE</i>	Standard Error
%	Percent

CHAPTER 1

Introduction and Review of Literature

There is general consensus in the field of autism that research and principles of child development support early intervention. There is not uniform agreement as to what, in particular, early interventions for children with or who are at risk for an autism spectrum disorder should target. Because pre-school age children generally spend a significant portion of their time with their primary caregivers, it seems reasonable that an early intervention should include these caregivers. Research has highlighted the importance of parent-child interaction in child development, and two constructs in particular, levels of caregiver responsiveness and directiveness, have been identified as important players in child outcome.

An aim of this study was to examine constructs of parent-child interaction that have been identified in child development (i.e., responsiveness and directiveness in this paper) as they relate to children with autism spectrum disorders, and to determine whether these constructs can be effectively altered through early intervention. The paper begins with a general description of autism and the use of early risk markers to develop screeners to detect children who are at risk for an eventual diagnosis of an autism spectrum disorder. Such screeners make early detection feasible, which in turn enables participation in an early intervention for those who might benefit from such services. In Chapter I, the Literature Review section, an overview of research on maternal responsiveness, directiveness and the efficacy of responsive teaching interventions is

presented. The section concludes by stating the goals and research questions for this study. The Method is then described in Chapter II, including an overview of the study procedure, methods, and the analyses used to address the research questions. Findings from the statistical analyses are presented in the Results section, Chapter III, and their implications are explained in Chapter IV, the Discussion section.

This study piloted data from an ongoing and larger study called the Early Development Project (Principal Investigator: Grace Baranek, Ph.D.). This research was through the University of North Carolina at Chapel Hill, and was funded by Autism Speaks.

Review of Literature

Autism Spectrum Disorders, or Pervasive Developmental Disorders, are marked by impairments in reciprocal social interaction, verbal and nonverbal communication, and the presence of restricted and repetitive behaviors, interests, and activities (*DSM-IV-TR*; APA, 2000). Autistic Disorder is the prototypical form of the disorder (Reznick, Baranek, Reavis, Watson, & Crais, 2007). Characteristics of Autistic Disorder include impairment in nonverbal behaviors such as eye-eye gaze, failure to acquire developmentally-appropriate peer relationships, a lack of understanding of social convention, impairment in the ability to have a reciprocal conversation with others, stereotyped language, repetitive motor mannerisms, and adherence to nonfunctional routines, among others (*DSM-IV-TR*; APA, 2000). In this paper, the term “autism” was used to refer to Autistic Disorder, and the term “Autism Spectrum Disorder (ASD)” was used to refer to Autistic Disorder, Asperger’s Disorder, and Pervasive Developmental Disorder Not Otherwise Specified. These three disorders, in addition to Childhood

Disintegrative Disorder and Rett's Disorder, comprise the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition Text Revision (*DSM-IV-TR*) category "Pervasive Developmental Disorder" (PDD) (*DSM-IV-TR*; APA, 2000; Reznick, Baranek, Reavis, Watson, & Crais, 2007). The latter disorders are not a focus of the vast majority of the research reviewed in this paper. In addition, a feature of both Rett's Disorder and Childhood Disintegrative Disorder is the loss of previously acquired skills; consequently, these disorders are not likely to be identified at 12 months, which is the population studied in this paper. Thus, these disorders were not included in this discussion.

ASDs are more common than previously thought; one current estimate of ASD reported by the U.S. Centers for Disease Control and Prevention (CDC) is about 1 in 110 children (CDC, 2009), with a male to female ratio of about 3.7 to 1 (Sattler, 2002). Between 40% (Baird, Charman, Baron-Cohen, Cox, Swettenham, Wheelwright, Drew, & Kemal, 2000) and 50% of children with autistic disorder are estimated to be characterized by a level of intelligence in the range of mental retardation (P. Mundy, presentation, February 2010). In the past, it was estimated that approximately 50% of individuals with autism never developed language (Rutter, 1978); however, this estimate is believed to be decreasing with earlier diagnosis and intervention (Klinger, Dawson, & Renner, 2003).

The diagnosis of autism according to the *DSM-IV-TR* requires at least six symptoms, reflecting some degree of impairment in each of three areas: (1) social interaction, (2) communication, and (3) behavior (Sattler, 2002), with at least two from (1) and one each from (2) and (3) (*DSM-IV-TR*, APA, 2000). Abnormal functioning or development in one of these areas must occur before three years of age. To date, ASD

cannot be accurately diagnosed using biological markers or laboratory tests (Sattler, 2002). Instead, ASD is diagnosed based on standardized diagnostic instruments and clinical impressions (Klinger & Renner, 2000). Although all children with ASD must meet specified diagnostic criteria, presentation of behaviors and capabilities may vary widely between individuals due to their age, severity of symptoms, and cognitive ability (Beauchesne & Kelly, 2004). ASD manifests itself in deviations in development, and accompanying developmental delays may be present as well (Beauchesne & Kelly, 2004).

Although the onset of ASD is before 3 years of age by definition, the average age of diagnosis lags behind, approximately ranging from 3 to 6 years (Landa, 2008). However, there is increasing empirical support that clinicians can reliably identify ASD and/or related symptoms in children younger than two years, e.g., at 12 months (Mandell, Maytali, Novak, & Zubritsky, 2005). Charman and Baird (2002) reviewed research on ASD-related symptom presentation in preschool children, and found that many children with ASD demonstrate recognizable patterns of impaired social interactions even in their first year of life, in addition to lack of social smile and appropriate facial expression, hypotonia, and attentional difficulties. Research has suggested that one of the hallmarks of the disorder, an inability to relate in an ordinary way to people and situations, is present from the beginning of life (Beauchesne & Kelley, 2004). Evidence that markers of ASD are discernible by age 2 is bolstered by parents' retrospective reports, home videos, and case studies of children later diagnosed with ASD (Bryson, Rogers, & Fombonne, 2003). Researchers retrospectively examining family home videos of children later diagnosed with ASD have found that children with ASD significantly

differed from typically developing children in infancy (e.g., Baranek, 1999; Barthelemy, Adrien, Tanguay, Sauvage, & Lelord, 1990). In their review, Goin and Meyers (2004) found that family home videos, parent reports, and screening devices uniformly reported common characteristics in young children with ASD, including lack of eye contact, affective differences, inadequate social skills such as lack of joint attention and imitation, unresponsiveness, solitary/unusual play, and delays in communication.

Although early markers of ASD can be discerned in children within the first year of life, this does not mean that one-year olds can be accurately diagnosed with the disorder. However, these retrospective studies classifying early indicators of ASD have been used to develop screeners aiming to identify children at risk for ASD (Klinger & Renner, 2000; Watson, Baranek, & DiLavore, 2003). Screening tools for ASD can fall into three categories: Level I, Level II (Filipek, 1999; Siegel, 1998), and Level III (Watson, Baranek, & DiLavore, 2003). Level I screening tools target the general population and aim to identify children in need of a more specialized assessment. Level II screening tools are used for children with developmental delays or concerns to help determine the need for a more specialized ASD evaluation. Instruments in the Level III category are specialized and used to differentiate between different types of ASDs (Watson, Baranek, & DiLavore, 2003). Screeners with the goal of detecting children at risk for ASD at age one enable families to begin seeking appropriate support services earlier than the age of average diagnosis, which is age 4-4.5 years old (Stone, Lemanek, Fishel, Fernandez, and Altemeier, 1990). A 2005 study by Mandell and colleagues indicated more variability in the average age of diagnosis, with ages ranging from 3.1 years old for autistic disorder to 7.2 years old for Asperger's disorder within a sample of

nearly 1000 families of children with ASD (Mandell, Novak, & Zubritsky, 2005).

Landa's 2008 review reported the average age of diagnosis for ASDs to be between 3 and 6 years of age.

In sum, early detection is becoming more feasible. Moreover, early detection is desirable, as it allows for early intervention (Chakrabarti, Haubus, Dugmore, Orgill, & Devine, 2005; Glascoe, 2005; Goin & Myers, 2004). Although ASD is a lifelong disorder, participation in early intervention programs may result in significant behavioral improvement and may even optimize long-term prognosis (National Research Council, 2001; Stone, Lemanek, Fishel, Fernandez, and Altemeier, 1990). Consequently, early detection could facilitate the development of interventions targeted at minimizing or possibly preventing some of the deficits of the disorder (Sigman, Dijamco, Gratier, & Rozga, 2004). Early intervention with children with ASD prior to age 4 has been found to be associated with increased developmental rates and gains in language, social, and cognitive development (De Giacomo & Fombonne, 1998). For example, Rogers (1998) reviewed eight studies examining intervention outcomes in children with ASD. One finding (Fenske, Zalenski, Krantz, & McClannahan, 1985) was that children with ASD treated early (younger than 60 months, $M=49$ months) were significantly more likely to achieve a positive outcome (outcome being defined as placement, i.e., living with legal guardians versus a group home) compared to older children (older than 60 months) with ASD who received the same treatment. Rogers also reviewed work by Lovaas, Koegal, Simmons, and Long (1973) and Lovaas (1987), who reported sustained treatment gains with younger children ($M=32$ months old) versus lack of sustained effects with much older children during follow-ups in early childhood, late childhood, and adolescence. It

should be noted that there have been a number of critiques of the validity of the Lovaas 1987 study, including different IQ tests used at baseline and follow up, a reliance solely on IQ gains rather than incorporating social and behavioral gains as outcome measures, and the use of a relatively high functioning sample (Reed, Osborne, & Corness, 2007). Rogers hypothesized that the age at which an intervention begins is an important variable in an intervention's success; interventions begun earlier (younger than age 5) may result in more positive developmental outcomes and longer sustained treatment effects for children. Corroborating this hypothesis with more solid evidence is the more recent work of Wetherby and Woods (2006). These researchers found that 2-year-olds with ASD demonstrated more social communication-related benefits than did 3-year-olds with ASD who participated in the same intervention. However, it could be that this particular intervention works better at the younger age. While there is disagreement about the specifics as to whether earlier equates with better, or why early intervention appears to be more effective in some cases, there is general agreement in the field that "early intervention is critical based on the greater degree of brain plasticity found in younger children" (Rosenwasser & Axelrod, 2001, p. 674) and "developmental principles support early intervention" (Charman & Baird, 2002, p. 291). Thus, the literature indicates that early detection of ASD is possible and desirable, as early detection allows for early intervention. Research also suggests that an intervention may result in more favorable developmental outcomes if begun at an earlier rather than later age. What, then, should an early intervention for children with ASD target?

The Role of Maternal Responsiveness in Child Development

Researchers and caregivers have long grappled with the issue of finding an optimal style of parenting that best promotes social, emotional, and cognitive development among children. Baumrind (1966) compared and contrasted three models of parental control- permissive, authoritarian, and authoritative. From her research, which included a review of twelve relevant studies, she proposed that the authoritative approach, one that is marked by being responsive and demanding but not controlling, had the most empirical support. An authoritative parent would be one who is assertive and sets clear standards for behavioral conduct (demanding), but who is supportive and not intrusive or restrictive, instead encouraging self-regulation in their child (responsive) (Baumrind, 1991). Since then, numerous researchers have examined dimensions of parenting, and have reached similar conclusions about the importance of caregiver responsiveness in parent-child interactions (e.g., Blehar, Lieberman, & Ainsworth, 1977; Bornstein, 1989; Bornstein, Tamis-LeMonda, Hahn, & Haynes, 2008; Calkins, Smith, Gill, & Johnson, 1998; Kochanska, Forman, & Coy, 1999; Landry, Smith, Swank, Assell, & Vellet, 2001; Mahoney, Boyce, Fewell, Spiker, & Wheeden, 1998; Mahoney & Powell, 2001; Mahoney, Wheeden, & Perales, 2004). For instance, Mahoney, Wheeden, and Perales (2004) examined the developmental outcomes of 70 children from 41 preschool special education classrooms. The type of instructional model children received was classified as didactic, naturalistic, or developmental. Regression analyses suggested that children's rate of development was unrelated to which model of instruction the children received. Development was, on the other hand, significantly

related to parents' style of interaction with their children as rated by the Maternal Behavior Rating Scale (MBRS, Mahoney, 1999).

Implications of parent-child interaction have been reported for social, emotional, and cognitive development. Calkins et al. (1998) observed 65 mother-toddler dyads in a series of laboratory experiments, and found that negative controlling maternal behavior was associated with poor emotional, behavioral, and physiological regulation in their children, and that positive maternal guidance was related to compliance. Kochanska et al. (1999) discovered that maternal responsiveness and shared interactive positivity predicted a range of positive socialization effects. An observational study by Landry et al. (2001) also lent support to the importance of responsive caregiving. More specifically, the researchers found that preterm children benefited more than full-term children from consistent maternal responsiveness, implying that responsive caregiving is a protective factor for at risk children.

Responsiveness refers to a variety of behaviors employed by a caregiver during an interaction with their child. A responsive interactional style requires that the caregiver consistently monitor infant signals, perceive these signals accurately, and then respond to their infant appropriately and contingently (van den Boom, 1994). This definition is compatible with that provided by Karl (1995), who posited that maternal responsiveness is the mother's ability to consistently recognize infant cues and appropriately act on those cues. Responsiveness has been conceptualized as being child-oriented-- "the appropriateness of the parent's responses to the child's behaviors such as facial expression, vocalizations, gestures, signs of discomfort, body language, demands, and intentions" (MBRS, Mahoney, 1999). What does an appropriate response look like? An

appropriate response should be productive, resulting in the child being effectively engaged in the interaction with the caregiver. An example of a caregiver utilizing a responsive style is observing their child has lost interest in the toy they are currently playing with and is now eyeing a book, handing the book to the child, and helping the child read the book. It is unrealistic for caregivers to be responsive to their children 100% of the time, and it may even be undesirable. Van den Boom pointed out that there may be benefits to the child when a certain number of their cues are ignored, such as the development of self-reliance. However, van den Boom and other researchers in the field generally maintain that a fairly high level of caregiver responsiveness is beneficial, and even essential, to child development (van den Boom, 1994).

Responsive parenting has been shown to be positively associated with children's cognitive, language, and social-emotional development, beginning in infancy. Tamis-LeMonda, Bornstein, and Baumwell (2001) examined how maternal responsiveness predicted five early expressive language milestones in a sample of 40 children at 9 and 13 months. Using Events-History Analysis, the researchers found that maternal responsiveness contributed to the timing of achieving the milestones more than the children's own behavior. The authors concluded that because being responsive entails maintaining focus on the child's topic/object of interest, such an interactional style contributes to establishing joint attention, which is an important factor in early language acquisition and social development.

In a more recent study examining the relationship between maternal responsiveness and early language acquisition, Paavola, Kunnari, and Moilanen (2005) analyzed the interactive behavior of 27 Finnish mothers and infants in relation to the

infants' communicative and linguistic skills as measured by the Finnish version of the MacArthur Communicative Development Inventories and the Communication and Symbolic Behaviour Scales. These researchers found that maternal responsiveness predicted early receptive language skills; the more responsive the mother, the higher the infant's language abilities. Although a study by Gartstein, Crawford, and Robertson (2008) did not find that parental responsiveness/sensitivity predicted early language/vocalizations, responsiveness was a predictor for infant perceptual sensitivity, a domain of attentional capacity.

Other research has linked maternal responsiveness with children's interactional engagement. Kim and Mahoney (2004) assessed the mothers' style of interaction in a sample of 30 mother-child dyads. Thirteen of the children had disabilities, while 17 children did not. The authors found that mothers' responsiveness was highly associated with children's engagement. Regression analyses suggested maternal responsiveness was a stronger predictor of child engagement than was the child's developmental status.

Van den Boom (1994) was particularly interested in the effects of increasing maternal sensitive responsiveness on children's attachment security, discussing research that has demonstrated social and behavioral success for securely attached children relative to insecurely attached children. Participants from a low SES background were randomly assigned to treatment and control conditions, with 50 mother-child dyads in each group. Those in the treatment group participated in an intervention aiming to increase maternal sensitive responsiveness. The intervention was successful in altering maternal interactive behavior, and at the culmination of the intervention, children in the treatment group were found to be more sociable, able to self-soothe, and engage more

often in cognitively sophisticated exploration than were children in the control group. Follow-up three months later revealed that children in the treatment group were more securely attached than children in the control group, suggesting maternal responsiveness plays an important role in enabling infants to form secure attachments.

More recently, the related construct maternal sensitivity, measured as the parent's attunement and responsiveness to the child's signals while expressing warmth and positive affect, was found to be linked to secure attachment styles in children with autism spectrum disorders (Koren-Karie, Oppenheim, Dolev, & Yirmiya, 2009). The authors interpreted this finding as evidence that while children with ASD have impairments in their ability to communicate their needs, maternal sensitivity helps children use their mothers as a secure base, like their typically developing securely attached peers.

Although Koren-Karie et al. conceded that it is possible the children's security elicited more responsive behavior in their mothers rather than the mothers' sensitive interactional style occasioning the children's attachment, the authors noted this interpretation is less likely, as children's responsiveness was controlled for during the analyses.

In their review of 54 studies examining the related concept maternal sensitivity, Shin, Park, Ryu, & Seomun (2008) found that maternal sensitive behaviors were positively associated with infant comfort, attachment security, social development, emotional development, and cognitive development, as well as positive aspects of mood, social and play behavior and visual contact. The literature reviewed also suggested that a lack of maternal sensitivity led to negative emotion and behavior, and decreased play competence displayed by the child (Shin et al., 2008). It should be noted that the term "maternal responsiveness" has been used interchangeably in the literature with "maternal

sensitivity” and “sensitive mothering” (Shin et al., 2008). Shin et al. performed a concept analysis on 54 records using these three terms in order to identify critical components of sensitivity. These key elements include (1) dynamic process involving maternal abilities (changeability with child’s age and context, perceiving infant’s cues and responding to them); (2) reciprocal give-and-take with the infant (although infant’s responsiveness is a counterpart to the mothers’, the mother is considered primarily responsible for creating the dynamic); (3) contingency on the infant’s behavior (being aware of response-outcome relationships); and (4) quality of maternal behaviors (the appropriateness of the mother’s response) (Shin et al., 2008). The authors concluded that responsiveness and sensitivity are closely related constructs. The major difference cited between the two is that sensitivity takes into account the quality or appropriateness of maternal responsiveness to the infant, while responsiveness is only the promptness or frequency of the mother’s responses. However, this difference is not evidenced in this paper, the intervention implemented, or the measure used to document changes in responsiveness (please see Methods section for further discussion).

As previously discussed, numerous studies have documented the importance of parent-child interaction in the development of typical children, e.g., Bakermans-Kranenburg, van Ijzendoorn, and Juffer’s (2003) meta-analysis of 70 studies that provided support for sensitive and responsive maternal interactions for social-emotional development and secure attachment in children. Other studies, however, have found that parent-child interaction plays an equally significant role among at risk children (e.g., Cohen & Beckwith, 1979; Goldberg, Lojkasek, Gartner, & Corter, 1989; Klein, 1991; Resnick, Armstrong, & Carter, 1988). Cohen and Beckwith (1979) posited that the

quality of mother-infant interactions was related to cognitive, language, and sensorimotor performance at age 2 in a sample of 50 preterm infants. Resnick, Armstong, and Carter (1988) found an intervention facilitating quality infant-caregiver communication to have a significant, positive effect on infants' cognitive development compared to a control intervention consisting of more remedial approaches. Klein (1991) reported a positive association between the quality of parent-child interaction and cognitive performance among very low birth weight (VLBW) participants when studied at age 3. In fact, this variable was found to be a stronger predictor of cognitive ability than early measures of cognitive development or measures of developmental risk, such as APGAR scores.

More specifically, one construct of parenting, responsiveness, has been implicated in favorable developmental outcomes among high risk children as well as their typically developing counterparts. Beckwith and Parmalee (1986) examined EEG patterns of 53 preterm infants. The researchers found that during the first year of life, infants' EEG patterns were related to developmental scores. By age 2, however, responsiveness was related to an increase in IQ scores, over and above EEG patterns. This pattern remained consistent during follow up at ages 5 and 8, highlighting the importance of responsiveness for the development of children born prematurely.

Landry, Smith, Miller-Loncar, and Swank (1997) investigated the association between early parenting behaviors and children's cognitive, language, and social skills at 6, 12, 24, and 40 months. The sample consisted of 112 full term infants, and 187 VLBW infants, who were further subdivided into medically high risk ($n=73$) and low risk groups ($n=114$). Maternal responsiveness was found to be positively associated with cognitive development, language development, and social development for all groups, with the

strongest effects for the high risk group. That frequency of maternal responsiveness at early points in time predicted the quality of preterm infants' engagement at later points suggests a causal role of maternal responsiveness. Evidence for a causal role for maternal responsiveness in child development was also provided by Landry, Smith, and Swank (2006), which will be discussed shortly.

Moore, Saylor, and Boyce (1998) examined the relationship between parents' responsiveness and directiveness when interacting with their preterm 2-year-olds and the cognitive developmental outcomes of their children. The researchers found that higher rates of responsiveness were associated with higher scores on the Stanford-Binet IV, a standardized test measuring cognitive ability. Alternately, the authors reported that high directiveness among caregivers was associated with poorer developmental outcomes. Directiveness will be discussed in more detail later in this paper.

The effects of maternal responsiveness are not limited to preterm infants. Mahoney and Kim (2004) found similar effects for children who had been diagnosed with mental retardation or a developmental disability according to the *Diagnostic and Statistical Manual of Mental Disorders-4th Edition* criteria. The investigators compared the interactive engagement of children with disabilities to a sample of children without disabilities. As previously mentioned, correlational analyses suggested that maternal responsiveness was highly associated with children's engagement, and that responsiveness predicted child engagement over and above developmental status. In a longitudinal study on the development of children with developmental disabilities by Hauser-Cram, Warfield, Shonkoff, and Krauss (2001), the authors observed the quality

and frequency of mother-child interaction was positively correlated with the child's communication skills at age 3 and 10 years of age.

Still another study provided evidence for the significance of maternal responsiveness for children with ASD. Mahoney and Perales (2003) looked at the effects of a relationship-focused intervention on the social-emotional functioning of 20 young children with autism spectrum disorders. The authors found increases in maternal responsiveness to be correlated with significant improvements in children's social interaction and social-emotional functioning, suggesting a causal role for responsiveness. While numerous studies have demonstrated the association between responsive parenting and benefits to children's development, there is more recent evidence suggesting a causal role for maternal responsivity in positive developmental outcomes (Landry, Swank, & Smith, 2006). The researchers randomized participants into a control ($n=131$) and treatment group ($n=133$), who participated in an intervention aiming to teach mothers responsive behaviors. All mothers in the treatment group displayed an increase in responsive behavior. The authors used growth curve modeling and found that changes in maternal responsiveness resulted in increases in children's social, communicative, and cognitive skills, particularly for children born at VLBW.

The effects of parental responsiveness on development extend far beyond infancy. Developmental gains have been demonstrated to continue over time. Beckwith and Cohen (1989) conducted a follow up study twelve years later with their high risk sample and found responsiveness to be consistently related to intellectual competence. Moore et al. (1998) reported a predictive association between parental responsiveness and

directiveness and children's cognitive functioning at age 5 ½. Thus, responsiveness is not only important for early childhood development, but for later development as well.

In sum, the literature reviewed suggests that the quality of parent-child interaction plays an important role in child development. In particular, studies demonstrate one specific construct of parenting, maternal responsiveness, to be associated with positive developmental outcomes. It may be considered a limitation that most studies measure maternal responsiveness rather than paternal responsiveness or both. The term "maternal responsiveness" may be used interchangeably with parental and caregiver responsiveness, as is the case in the literature. In addition, some researchers use the term "responsiveness" while others use "responsivity" to refer to the same construct. Maternal responsiveness also often overlaps with the related construct "maternal sensitivity." Because maternal responsiveness has been shown to be positively associated with cognitive, language, and social-emotional development in typically developing children, at risk children, and children with disabilities, and the benefits of maternal responsiveness can be sustainable over time, it is fitting that early interventions aim to increase maternal responsiveness.

Responsiveness and Directiveness in Mothers of Children with Disabilities

Several studies looking at parent-child interactions have noted that mothers of children with disabilities are higher in directiveness when interacting with their children when compared to mothers of typically developing children, even when groups of children are matched on measures of developmental competence (Eheart, 1982; Jones, 1980; Konstantareas, Zajdeman, Homatidis, & McCabe, 1988; Landry & Chapieski, 1989; Mahoney, Fors, & Wood, 1990; Mahoney & Robenalt, 1986; Marfo & Kysela,

1988; Tannock, 1988). And while maternal responsiveness has been demonstrated to be associated with accelerated growth in a number of developmental domains, directiveness has been found to be negatively associated with developmental gains in children with disabilities, at least in certain contexts, or when applied intrusively (Landry, Garner, Pirie, & Swank, 1994; Landry, Garner, Swank, & Baldwin, 1996; Landry, Leslie, Fletcher, & Francis, 1985; Landry, Smith and Swank, 2006; Moore, Saylor, & Boyce, 1988; Tomasello & Farrar, 1986). One study has even found that directiveness is negatively correlated with responsiveness (Moore et al., 1988), although this trend has not been consistently demonstrated in research (Kim & Mahoney, 2004; Tannock, 1988).

Directiveness has been conceptualized as “the frequency and intensity in which the parent requests, commands, hints, or attempts in other manners to direct the child’s immediate behavior” (MBRS, Mahoney, 1999). An overly directive style is one in which the parent seems constantly “at” the child. For example, a caregiver displaying a high amount of directiveness may force the child to play with a new toy when the child is not finished playing with a different toy, keep switching from activity to activity at a pace far too fast for the child to keep up with, or frequently interrupt the child’s activity-in-progress (MBRS, Mahoney, 1999). Directiveness of this quality may be better described as “intrusive.” Additionally, high directiveness, or intrusiveness, should not be confused with principles such as structured teaching, which have been found to be effective for working with children and adults with ASD (e.g., Rutter & Bartak, 1973). Structured teaching involves organizing the physical environment and sequencing activities in order to make the environment more navigable for individuals with ASD (Mesibov, Shea, & Schopler, 2004). A more optimal level of directiveness during

interaction is low to moderate. At this level, the parent may make suggestions for effective implementation of the child's play activity while letting the child make his/her own choice, or influence the child's choice of play activity but allow the child independence in execution (MBRS, Mahoney, 1999). Using structured teaching principles and simultaneously maintaining a low to moderately directive interactional style is not incompatible. Moreover, being too low in directiveness (i.e., withholding suggestions when they are requested) may also be problematic for individuals with autism, who tend to be more successful with some structure (Schopler, Brehm, Kinsbourne, & Reichler, 1971).

Numerous studies have reported higher levels of directiveness among parents of children with cognitive impairments when compared to parents of typically developing children. For example, Mahoney, Fors, and Wood (1990) compared 18 mothers of children with Down syndrome to 18 mothers of typically developing children, and found that mothers of children with Down syndrome displayed more directiveness. Specifically, the mothers of children with Down syndrome made more requests for their children to perform actions, requested the children perform actions that were relatively difficult for them, and attempted to direct the children to objects not in their current focus of attention; these directives may be considered somewhat intrusive. From their findings, the authors surmised that the group differences appeared to be better explained by differences in maternal intention, rather than the child's behavior.

Children with disabilities may function differently during interactions with caregivers than typically developing children of the same age, but many studies make comparisons based on controls matched by chronological age. To better account for

differences in functioning, Marfo and Kysela (1988) added a group of controls matched by mental age, hypothesizing that mental age would have more of an effect on maternal behavior than chronological age. The researchers used five groups of nine mother child dyads: three groups of children with developmental delays (nonintervention, short intervention, long intervention) and two groups of typically developing children, one group matched by chronological age, the other, by mental age. The intervention utilized in this study did not specifically aim to modify caregiver-child interactions. Analyses revealed only two differences between groups of children. First, children with developmental delays demonstrated fewer “positive expressive gestures”, defined as “use of gestures to express need or interest, to respond to mother, to attain and/or direct mother’s attention,” than did both control groups (Marfo & Kysela, 1988, p. 84). Second, children in the chronological age match group demonstrated positive vocalizations consistently following maternal verbal stimulation, while children with developmental delays and their mental age matched controls did not. But despite the minimal differences between groups, mothers of children with developmental delays differed in several characteristics from mothers of typically developing children. Most relevant in this case, mothers of children with disabilities were more directive than mothers of typically developing children, evidenced by significantly more instructional behavior, even when matched by mental age. This finding provides support that the pattern of directiveness reported in previous studies using only controls matched by chronological age may in fact be unique to mothers of children with disabilities.

Tannock (1988) examined 11 preschool-aged children with Down syndrome and 11 children without Down syndrome matched for communicative ability, mental age, and

demographic information in order to compare maternal responsiveness between the two groups. The authors found that the mothers of children with Down syndrome demonstrated the use of more control in all aspects of directiveness evaluated, although the mothers were no less responsive. The children with Down syndrome were less likely to actively participate in interactions than their matched counterparts, although no causality can be inferred from this relationship. Likely the mothers became more directive in response to their child's passivity, which then reinforced their passivity for future interactions, a theory put forth by Mahoney and Robenalt (1986). In addition to finding that mothers of children with Down syndrome dominated communication, Mahoney and Robenalt (1986) reported the amount of dominance increased when the children's activity level decreased. The researchers surmised that while this seems like a logical reaction on the part of the mothers, increased maternal dominance whenever the child communicates less might reinforce the child's passivity in future interactions.

Research suggests that mothers of children with ASD are also more directive, as mothers of children with lower functioning ASD have been found to be higher in directiveness than mothers of children with higher functioning ASD (Konstantareas, Zajdeman, Homatidis, & McCabe, 1988). These researchers concluded that the mothers seemed to modify the degree of directiveness employed in response to their children's relative capabilities. Additionally, Watson (1998) examined 14 dyads of mothers and preschool children with ASD, and 14 matched dyads of mothers and typically developing preschool children in order to compare how the mothers use language related to the object of the child's attention. Watson found that the mothers of children with ASD directed verbalizations to something outside the child's focus of attention more

frequently than did the mothers of typically developing children. Watson interpreted that “this non-related input may have reflected the mothers’ attempts to adapt to their children’s difficulties in attention and interaction” (Watson, 1998, p. 51). Non-related input may be more difficult for the children to process, which will be discussed in more detail later in this paper.

Bell and Harper (1977) theorized that maternal responsivity is affected by the child’s behavior and responsiveness (note: the child’s developmental level may contribute to the child’s behavior and responsiveness). For example, a difficult, or poorly regulated, temperament has been found to be associated with lower maternal responsivity and higher maternal control, including intrusive maternal behavior (Popp, Spinrad, & Smith, 2008). Accordingly, the child’s behavior and responsiveness are impacted by maternal responsivity. Moore et al. (1998) referred to the nature of parent and child behavior as “mutually reinforcing” and “circular” (p. 109). While there is evidence that mothers of children with disabilities are more directive than mothers of typically developing children, this does not suggest a causal relationship between the two variables. That is to say, a mother being highly directive does not cause the social, emotional, and cognitive impairments in her child with ASD. Rather, in instances in which the child has a disability where by definition the individual is likely to be less communicative, responsive, and social, as is the case with ASDs, this will likely have an effect on the mother’s interactional style. Consistently maintaining a responsive interactional style with a child with ASD or another disability may at times be somewhat of a challenge for any caregiver, even the most experienced, well-intentioned, and loving. Warren and Brady (2007) proffered that characteristics associated with developmental

delays and disorders may disturb maternal responsiveness, and that ultimately “these characteristics can create a relatively stable interaction pattern that may be directive” (Warren & Brady, 2007, p. 334). Additionally, there may be times when characteristics of ASD make it seem logical for a parent to be more directive during an interaction. One of the *DSM-IV* criteria for ASD is “restrictive and repetitive behaviors and interests.” When a child is not playing with a toy truck functionally, but rather fixating on spinning the wheel with his finger for an extended period of time, it seems only natural for the mother to try to redirect the child to play with the toy for its traditional purpose—this would be a productive level of directiveness. If a child keeps looking at and touching a piece of string on the floor, a mother may try to engage her child in a new object, such as a book or stuffed animal to play with. This action would be considered not maintaining the child’s focus of interest, but also appears to be a logical reaction and an attempt on the mother’s part to interact with the child. In these specific examples, the level of directiveness is not detrimental to the child; it is likely developmentally beneficial. It does, however, contribute to the establishment of a pattern of directiveness.

It is certainly possible that more directiveness might be better for children at lower developmental levels in some, if not many, situations. But while high directiveness might be useful for children in some contexts, and a natural reaction for mothers of children with disabilities, this interactional style has been shown to impede optimal development in this and similar populations of children when applied rigidly and across all contexts, i.e., intrusively. Several studies provide evidence that directiveness might not be an effective style for promoting development among children with disabilities—at least, not all the time, or at high levels.

Studies show a negative association between directiveness and development. Mahoney, Finger and Powell (1985) looked at the relationship between maternal behavioral style and cognitive development among 60 children with mental retardation, ranging from ages 1-3 years. A factor analysis revealed that control was negatively related to the children's developmental scores as measured by the Bayley Mental Development Index of the Bayley Scales of Infant Development. A child-oriented maternal interactional approach, however, was related positively to the children's mental development scores. However, it could be that, as in other cases, this study merely suggests that these mothers are responding to their child's capabilities.

Kim and Mahoney (2004), however, went beyond finding an association between dimensions of maternal interaction and developmental outcomes, and examined how maternal interactive behavior contributes to children's engagement. The investigators compared a group of 13 children with disabilities to a group of 17 children without disabilities in order to determine whether differences in engagement level between the groups could be attributable to developmental status only, or if the manner in which their mothers interacted with them also played a role. Through multivariate analysis of variance, the authors found that children with disabilities were less engaged than typically developing children, and that mothers of children with disabilities were less responsive and more directive (as measured by the Maternal Behavior Rating Scale; Mahoney, 1986). The authors used hierarchical multiple regressions to determine the relative contribution of responsiveness, affect, and disability to the children's engagement level. Correlational analyses revealed that while there was not a significant association between directiveness and children's engagement, mother's responsiveness was highly

associated with engagement level. The results of the regression analyses showed that responsiveness was a much stronger predictor of how engaged children were than was their disability status, accounting for at least 30% of the variance versus less than 10% of the variance, respectively. This still leaves the question of whether directiveness is associated with poorer developmental outcomes, or if there is any causality in the relationship that is reported by several other studies.

Directiveness may have different effects across contexts, being more appropriate and effective in some situations than others. Landry, Garner, Pirie, and Swank (1994) examined social context and maternal style of requesting in 56 mother-child dyads; 28 children had Down syndrome and 28 typically developing children were matched by mental age. Mothers of children with Down syndrome were more directive than mothers of typically developing children during an unstructured task (a tea party). Increased directiveness was not related to maternal responsiveness level; mothers of children with Down syndrome who were more directive still had similar levels of responsivity to mothers of typically developing children. The authors found that children with Down syndrome were comparatively compliant during child-initiated exchanges with their mothers, but this compliance decreased during mother-initiated exchanges. This effect was magnified in the more structured situation (puzzle task). However, the authors also found that children with Down syndrome increased compliance with directive maternal requests, but only in the unstructured situation. In the structured situation, directiveness appeared to have the opposite effect. The authors offered the explanation that perhaps the children with Down syndrome would benefit more from positive attention to their

interest in a situation with less defined social scripts, but mother-initiated exchanges require the child to shift between topics of interest.

Support for the latter explanation was provided when Landry, Garner, Swank, and Baldwin (1996) looked at maternal attention-directing behaviors with their full term versus preterm 6-month-olds with high versus low medical risk. The investigators observed that when mothers maintained their child's focus of attention and introduced new toys rather than redirected their child's attention, the child's complexity of play increased, especially that of the high-risk infants. These findings were consistent with those of Landry, Leslie, Fletcher, & Francis (1985), who posited that an interactive parenting style may support VLBW infants in shifting attentional focus and organizing behavior. The authors found that infants whose mothers made requests that maintained rather than redirected their interests showed greater increases in skills, providing evidence for a possible causal role. Maintaining the focus of interest is thought to be less demanding of the child's cognitive and attention-related abilities, which is an especially salient issue for children born preterm, with developmental delays, high medical risk, or disabilities. A similar pattern had been demonstrated in a study by Tomasello and Farrar (1986), which involved adults attempting to teach 17-month-olds a set of 10 novel words. The authors found that children were able to learn words better if the word presented was an object the child was already focused on, versus a word that redirected the child's focus. Landry et al. (1997) have explained that maintaining attention rather than requiring a shift is in line with the concepts of scaffolding a child's skills and operating within their zone of proximal development from Vygotsky's (1978) socio-cultural theory of development.

Landry, Smith and Swank (2006) elaborated on this concept, stating that supporting the infant's focus facilitates "higher levels of learning and self-regulation because it provides a structure, or scaffold, for infants' immature skills" (Landry, Smith, & Swank, 2006, p. 628). In this discussion, the authors cited a study by Bakeman & Adamson (1984), which determined that responsive parenting within a sociocultural framework should encourage joint engagement and reciprocity in dyadic interactions. Another experiment in the Tomasello and Farrar (1986) study provided more evidence that joint attention, rather than the more directive, intrusive approach of redirecting the infant's focus, facilitates optimal learning conditions. When watching videotapes of 24 children at 15 and 21 months interacting with their mothers, the authors identified episodes of joint attentional focus, and found that these episodes resulted in more utterances produced by both participants, that mothers used shorter sentences and made more comments, and pairs engaged in lengthier conversations. Similarly, Landry and Chapieski (1989) determined that shifting attention upon maternal redirection seemed to negatively impact a group of infants with Down syndrome as well as a group of infants born preterm. The authors also found that when mothers maintained their infants' focus of attention, the children were able to manipulate toys more successfully. The authors concluded that not taxing the infant's attention-shifting capacity is highly important in mother-child interactions, an issue particularly relevant for mothers of children with ASD, as these children are likely to struggle with initiating and maintaining joint attention by the nature of their disability.

The nature of directiveness can be complex. It may not be the amount of directiveness that impacts developmental outcomes in children, but rather, its quality.

However, Moore et al. (1998) reported that when the rate of parental directiveness is high, the directiveness also tends to be of lower quality (as defined by the Parent/Caregiver Interaction Scale measure of Quality and Appropriateness of Directiveness as well as the measure of Directiveness by the Maternal Behavior Rating Scale). Conversely, a rate of low parental directiveness is associated with high quality and appropriate directiveness. Another possible trend in directiveness found by Moore et al. (1998) is that responsiveness, previously discussed as positively influencing development, is negatively correlated with directiveness. The researchers analyzed the developmental outcomes of 88 preterm children with intraventricular hemorrhage at age 5-and-one-half years in relation to their parents' responsiveness and directiveness when the children were age 2. Maternal responsiveness was measured by the MBRS and the Parent/Caregiver Involvement Scale. The Stanford-Binet Intelligence Scale, Fourth Edition was administered to measure cognitive development. The investigators found higher rates of parental directiveness to be correlated with lower developmental progress among children, and higher rates of directiveness were negatively correlated with responsiveness.

Upon review of the literature, it seems that directiveness is not the opposite of responsiveness. What is often referred to as an overly directive interactional style may be better termed as "intrusive" (e.g., Feldman, 2010; Dollberg, Feldman, & Keren, 2010). Whereas being directive includes providing some appropriate guidance and instruction, an intrusive style would be constantly interrupting the child, forcing them to shift their focus of attention, or switching quickly from activity to activity at a pace that is too fast for the child. However, in the literature, this distinction is rarely made, and often, being

high in directiveness is simply labeled as undesirable, without taking into account the many instances in which directiveness may be beneficial. Although throughout this paper directiveness was the construct under review, please note that the term “intrusiveness” may be a better fit to describe high levels of the construct.

The literature reviewed supports the theory that a responsive interactional style encourages children’s interactive engagement. Although a child’s engagement is likely impacted by their disabilities, empirical evidence suggests that it is also affected by the manner in which their caregivers interact with them. Repeated exposure to a responsive style of interaction supports children’s engagement in constructive learning processes (Kim & Mahoney, 2004). While it is difficult to clarify the exact nature of the reciprocal, bidirectional relationship between caregiver interaction style and child development, there is evidence that responsiveness is associated with developmental gains, and high levels of directiveness (intrusiveness) is associated with comparatively negative developmental outcomes. These results provide support for Mahoney and Powell’s suggestion that early interventions for children with disabilities “should promote a responsive, child-oriented style of parent-child interaction” (Mahoney & Powell, 1988, p. 83). Fortunately, there is also evidence that maternal responsiveness and directiveness can be changed through intervention, and that these changes result in positive developmental outcomes for children. One such intervention is responsive teaching.

Responsive Teaching Interventions

Responsive Teaching is a comprehensive, parent-mediated intervention developed by Mahoney and MacDonald (2007) for children from birth to six years of age who have or are at risk for developmental delays. Responsive Teaching (RT) interventions help

caregivers to engage in more “balanced interactions that focus on the child’s interests and developmental level” in order to create an environment conducive to children’s development and learning (Mahoney & Powell, 1988, p. 84). This environment is thought to help children make progress in the developmental domains of cognition, language/communication, and social emotional functioning (retrieved from www.responsiveteaching.org on 11/14/08). Caregiver responsiveness is the particular attribute targeted because it has been found to be the primary parental characteristic to influence communication development (Bornstein, Tamis-LeMonda, & Haynes, 1999; Hoff-Ginsberg & Shatz, 1982; Nelson, 1973) (Mahoney & MacDonald, 2007). Mahoney and MacDonald also cited literature implicating responsiveness in social-emotional development, including Birigen & Robinson, 1991; Crockenberg & Litman, 1990; Isabella, 1993; van den Boom, 1995; Kochanska, Forman, & Coy, 1999; Kondo-Ikemura, 1997 & Vereijken, Ricksen-Walraven (Mahoney & MacDonald, 2007).

Three distinguishing features of RT are that it is based on contemporary child development theories, parent-mediated, and utilizes a multidisciplinary approach. The authors drew upon constructivist theories of cognitive development (Piaget, 1963; Vygotsky, 1978), communication theories of language development (Bruner, 1974, 1983), attachment theory (Bowlby, 1969; Goleman, 1995), and achievement motivation theory (Atkinson, 1964; Weiner, 1980) when developing RT (Mahoney & MacDonald, 2007). A main tenet of RT is the significant role parents play in their child’s development, in part because parents have more opportunities to interact with their children than other professionals or adults. Subsequently, RT strategies aim to teach parents to engage in a responsive interactional style with their children. Interventionists

support the parent's role in their child's development by helping parents interact with their children in ways that maximize their children's development and growth, rather than focusing solely on teaching the children discrete skills. Interventionists from a variety of domains such as speech pathology, occupational therapy, nursing, and psychology can work with parents and collaborate with other professionals throughout the intervention to form a multidisciplinary team (Mahoney & MacDonald, 2007).

Mahoney and MacDonald divided the RT curriculum into five main components, including intervention goals, intervention objectives, discussion points, responsive teaching strategies, and family action plans. The five components of the curriculum are presented in Figure 1. The *goals of the intervention* are for the child to make progress within the three developmental domains promoted by RT: cognition, communication, and social emotional functioning. *Intervention objectives* are the caregiver learning the 16 "pivotal behaviors", or processes thought necessary to promote learning, that help children increase their functioning within each developmental domain. The 16 pivotal behaviors targeted in the intervention are presented in Table 1. The authors provide more than 130 *discussion points*, which are used to guide discussions with parents about theories of development, what pivotal behaviors are, and how to use RT techniques to encourage children's attainment and use of pivotal behaviors. *Responsive teaching strategies* are the intervention procedures that parents and others can use during routine interactions to help encourage children's use of their pivotal behavior to attain intervention goals. Parents learn strategies such as "translate my child's actions, feeling or intentions into words," "expand to show my child the next developmental step," or "follow my child's leads" that model behaviors directly related to what children are

doing. Throughout the course of the intervention, parents are taught strategies and activities they can implement during daily interactions with their children. The 66 strategies used in RT encourage caregivers to engage in more responsive interactions with their children and can be found in Table 2. The authors have defined responsiveness in the context of this intervention as “a multifaceted style of interacting with young children” and have delineated five dimensions of a responsive, child oriented approach: reciprocity, contingency, shared control, affect, and match (retrieved from www.responsiveteaching.org on 11/14/08; Mahoney & MacDonald, 2007). The components and dimensions of the strategies for interactive behavior are presented in Figure 3. *Family action plans* are written plans that outline what parents will do to follow through with RT strategies and suggestions. At the start of the intervention and at each session, a Family Action Plan is developed to specify the logistics of how the parents will integrate the information from the RT into the child’s daily routine. At the culmination of the intervention, the role of interventionist is transferred from the multidisciplinary team to the parent; this is the role the parent has been training for and practicing throughout the intervention (retrieved from www.responsiveteaching.org on 11/14/08). In sum, the premise of RT is that RT strategies facilitate parental/adult responsiveness, leading to enhanced pivotal behaviors, which results in improved developmental functioning (Mahoney & MacDonald, 2007).

RT was developed in response to the criticism that interventions aimed at teaching specific skills to children might introduce more directives into parent-child interactions (Marfo & Kysela, 1988). Kim and Mahoney (2005) posited that more traditional early interventions (e.g., the didactic approach; Goodman, 1992) stressing direct teaching are

not entirely compatible with the concept of child-centered learning found in contemporary child development theories such as those of Vygotsky (1978) and Piaget (1963). For example, Piaget (1963) emphasized “child-initiated, constructivist activities in developmental learning” (Kim & Mahoney, 2005, p. 119). The authors elaborated that Piaget’s theory of cognitive development places importance on the child exploring, initiating, manipulating and problem solving within their world, being an active learner. Fostering an active learner might be difficult within the context of teaching the child discrete skills, which puts the child in a passive position. Alternately, Kim and Mahoney (2005) predicted that within the context of responsive parent-child interactions, parents will directly or indirectly “teach and encourage their children to become independent, active or constructive learners” (Kim & Mahoney, 2005, p. 117). RT aims to change parental directiveness from a level that is too high or too low to a more productive level (low to moderate). According to Vygotskian principles, skills are progressively mastered by children, and it is easier to learn something new when building upon a foundation. When children first begin learning a new skill, they may make errors, but after practice and feedback, will reach a level of mastery. In between novice and mastery levels is the zone of proximal development. Parents and caregivers are encouraged to scaffold children’s learning within the zone of proximal development by guiding and collaborating with the children, which, according to Vygotsky, will foster growth (Vygotsky, 1978). Scaffolding involves the use of guidance to help children discover solutions on their own, rather than providing intrusive step-by-step instructions (Byrnes, 2001). Alternately, instructing or interacting with a child well beyond the zone of proximal development will leave children confused and bored, and will not likely result

in growth (Byrnes, 2001). Vygotskian principles can be applied to interacting with infants and children with autism, as well, and are relevant to the aims of RT. For example, if a child is already focused on an object, it is more effective to engage with them using the object of their focus, rather than attempting to shift their attention to something new. In another example of applying this principle with children with autism, if the child is executing a play activity or strategy, the caregiver may involve the child in the same play activity but with a variety of objects. In both these instances, the caregiver may scaffold the child's learning by building upon the objects or play strategies with which the child is already engaged in, interested in, or familiar with, but is also introducing something new (a reciprocal interaction, a new toy with the same play theme, or a new strategy to playing with the familiar toy) that may facilitate learning or more sophisticated interactions. Moreover, there is some evidence that individuals with autism have more difficulty than typically developing peers engaging and disengaging their attention (e.g., Courchesne, Lincoln, Kilman, & Galambos, 1985; Courchesne, Townsend, Akshoomoff, Saitoh, Yeung-Courchesne, Lincoln, James, Haas, Schriebman, & Lau, 1994). Therefore, the more directive approach of requiring a child with autism to not only disengage their attention from one object but then shift their attention to engage in another is particularly difficult for and taxing on them.

Mahoney and Bella (1998) asserted that child development theories of the 20th century, and in particular, the past forty years, have contributed to the more widespread recognition that interventions should include the parents and recognize the importance of parent-child interaction in child development. The authors discussed Bronfenbrenner's ecological systems model (1979a) and other theories which viewed development within

the context of systems of the child's environment, such as the immediate family, school, society, and culture. Mahoney and Bella linked this literature with an increased awareness of the role parents play in children's development. Studies examining the relationship between parent-child interactions and children's positive developmental outcomes have been previously discussed in this paper (e.g., Baumrind, 1966; Blehar, Lieberman, & Ainsworth, 1977). Mahoney and Bella (1998) discussed Bronfenbrenner's (1979b) writings about the importance of involving parents directly in early interventions in order to maximize the benefits of the intervention for the child.

Interventions that teach parents the most appropriate ways to interact responsively with their children might result in greater developmental outcomes (Moore et al., 1998). Shin et al. (2008) identified social support as one of the most influential factors in the nearly identically defined construct maternal sensitivity, elaborating that social support includes psychological help (e.g., interventions). Interventions that promote parental responsiveness and limited but appropriate directives are specifically endorsed (Moore et al., 1998). Such interventions have been referred to as responsive-teaching (Mahoney & MacDonald, 2007), relationship-focused (e.g., Kim & Mahoney, 2004, Mahoney & Perales, 2003), and family centered (e.g., Mahoney & Bella, 1998). These interventions share "a general approach to developmental intervention that encourages parents to use responsive interactive strategies (e.g., take one turn and wait; follow the child's lead) during routine interactions with their child" (Mahoney & Perales, 2003, p. 77). All interventions with this common focus will be considered responsive teaching interventions throughout the literature review.

Mahoney and colleagues (1999) reviewed research on involving parents in early interventions and found several criticisms. One study critiqued the imposition such interventions place upon parents (Rosenberg & Robinson, 1998). Another study suggested interventions aiming to modify parenting strategies and practices might implicitly place blame on the parents (Turnbull & Turnbull, 1990). Hanson and Hanline (1990) and Vincent and Beckett (1993) discussed the potential role conflict faced by parents who are attempting to be both caregivers and interventionists, and Hanson & Lynch (1995) asserted that parent education may be culturally biased (Mahoney, Kaiser, Girolametto, MacDonald, Robinson, Safford, & Spiker, 1999). Research suggests that while there may be many positive developmental outcomes associated with RT, such interventions may not be the best fit for all children and their families. There are numerous questions in need of answers regarding this approach to intervention, including the type of families most likely to respond to and benefit from this approach (Kim & Mahoney, 2005).

Effects of Responsive Teaching Interventions

A number of studies have demonstrated that responsive teaching interventions successfully change the behavior of parents of typically developing children. Girolametto (1988) looked at 20 mothers and their developmentally delayed preschoolers, aged 1.3-5.2 years, who participated in a parent-focused intervention. Compared to mothers in the control group, the nine mothers in the experimental group were more responsive and less controlling after participating in the 11 week training program. Child outcomes as well as parent outcomes were reported; in turn, the children in the experimental group initiated more interactions, exhibited more diverse vocabulary,

and were more receptive to their mother's interactional overtures. Not all parent-focused interventions have been quite as effective, however. Mahoney and Bella (1998) analyzed the impact of family-centered early intervention services on 47 families who attended 1 of 36 programs. The authors defined family-centered care as an "approach to intervention in which primary emphasis is on collaborating with and supporting parents" (Mahoney & Bella, 1998, p. 84). Children's rate of development during and after the intervention was observed to be generally similar to their rate prior to receiving services. It should be noted, however, that "family-centered" is not the same as "responsive teaching". The researchers had hypothesized that comprehensive services individually tailored to the families' needs would be associated with positive changes for children and parents. To account for the negative findings, the researchers suggested that perhaps the measures utilized were not sensitive enough to detect changes, and also urged readers to take into account that these programs, implemented in the field, may not have been carried out with high fidelity.

Bringing more clarity to the issue of what, exactly, makes an early intervention effective, Mahoney, Boyce, Fewell, Spiker, and Wheeden (1998) reviewed the results of four early intervention evaluation studies: the Infant Health and Development Program, the Longitudinal Studies of the Effects and Costs of Alternative Types of Early Intervention, the Play and Learning Strategies Program, and the Family-Centered outcome study. While the theoretical orientations underlying each study varied and the intervention techniques differed, each evaluated parent-child interaction using the MBRS (Mahoney et al., 1986). The authors reported that positive effects on children's

development were not likely to occur unless their mothers increased their level of responsiveness, regardless of the exact logistics of the intervention.

Landry, Smith, Swank, and Guttentag (2008) recruited a diverse sample for their study on the effects of a responsive parenting intervention, which included children born to term ($n=80$), as well as children born at VLBW ($n=86$) with a variety of medical conditions making them at risk for developmental delays. The investigators executed an intervention during infancy for a group of full term and a group of VLBW children, Playing and Learning Strategies I, and another during toddlerhood/preschool years for two matched groups, Playing and Learning Strategies II, in an attempt to determine whether there is an optimal time for responsive parenting interventions. The PALS I intervention was found to best cultivate maternal warmth, and the PALS II intervention was more successful in supporting cognitive responsive behaviors. PALS I and II were necessary for increasing mothers' ability to respond to the child's signals. Finally, mothers of typical children and mothers of children with VLBW both demonstrated increased responsivity after participating in the intervention. Children in both groups showed positive developmental outcomes, particularly children of VLBW.

Responsive teaching interventions have been demonstrated to be effective in improving maternal responsivity for mothers of children born at VLBW. Increases in mothers' interactional skills were associated with developmental gains in their children. As previously discussed, Klein (1991) found a positive relationship between the quality of parent-child interaction and cognitive performance among very low birth weight participants when studied at age 3, and reported that parent-child interaction was a better

predictor of cognitive ability than early measures of cognitive development or measures of developmental risk.

Other studies show that responsive teaching interventions increase maternal responsiveness in mothers of children with disabilities such as Down syndrome. For instance, Mahoney and Powell (1988) developed and implemented the Transactional Intervention Program (TRIP), an intervention curriculum for children with disabilities from birth to age 3 with the goal of modifying parent-child interactions. Forty-one mothers and their children with disabilities including Down syndrome, cerebral palsy, spina bifida, hydrocephalus, congenital infectious diseases, Rett Syndrome, microcephaly, and infantile glaucoma participated in the 28-month long intervention. The authors reported that although not all parents consistently implemented the TRIP strategies, those that did displayed significantly higher ratings in responsiveness and lower ratings in directiveness. The relationship between developmental gains was strongly associated with implementation of the TRIP strategies. The authors asserted that the developmental gains made by the participants could be attributed to the TRIP intervention, citing that positive developmental gains among children were associated with increased parental responsiveness and a decrease in parental directiveness. This suggests and provides further evidence that maternal responsiveness may promote developmental growth among children with disabilities. The authors conducted correlational analyses but did not identify other factors besides the TRIP strategies to explain the developmental gains made by children during the intervention.

Mahoney, Perales, Wiggers, and Herman (2006) implemented a responsive teaching early intervention curriculum targeting cognitive, language, and social

emotional needs of children with developmental delays. The authors examined a sample comprised of 50 children with developmental problems and their parents, and concluded that responsive teaching addressed the children's needs by accelerating their developmental behaviors. Rosenberg and Robinson (1985) studied 16 mothers of children with developmental delays, aged 3-34 months, who were trained in strategies aimed at enhancing the quality of mother-child interactions. The authors reported that mothers displayed positive changes in interactional style and observed related changes in child interest and involvement.

McCollum and Hemmeter (1997) reviewed 10 studies examining the effects of responsive teaching interventions on samples of at risk children and children with disabilities. A common factor across studies was that parents were taught similar strategies to encourage more responsive interactions with their children, and characteristics or qualities of caregiver-child interaction were primary targets of intervention. Children participating in the interventions ranged from typically developing controls to children with disabilities such as Down syndrome, Pervasive Developmental Disorders, cerebral palsy, language delays, and developmental delays. McCollum and Hemmeter found that changes in caregiver interaction characteristics were reported in all studies. Changes included increases in responsiveness and decreases in directiveness. Two of three studies measuring changes in caregiver affect reported increases in parental warmth, expressiveness, and enjoyment. Two studies reported that not all parents generalized intervention strategies to a second setting. Three of three studies examining maintenance reported that learned parent behaviors were maintained up to four months after intervention services were terminated. Positive child outcomes were reported, as

well. In studies identifying specific interaction skills and developmental indicators, the majority of these were documented to increase concurrently with changes in caregiver behavior. Three studies found that the characteristics of children's interactions improved, and while increases in child responsiveness were noted, such findings were not consistent across all studies. In sum, this meta-analysis provided evidence from ten studies that responsive teaching interventions successfully change parent behavior, and that generally such changes are associated with positive child outcomes. However, McCollum and Hemmeter cautioned that limited conclusions can be drawn regarding child effects due to methodological flaws in several studies.

The findings of McCollum and Hemmeter were replicated in a more recent meta-analysis. Bakermans-Kranenburg, van Ijzendoorn, and Juffer (2003) examined 70 published experimental intervention studies to determine whether early intervention could enhance parental sensitivity and infant attachment security. The authors concluded that early interventions could and did successfully increase parental sensitivity. The authors also found that when parental sensitivity increased, so did infant attachment, a finding which implies a causal role for the related construct responsiveness in infant attachment.

Finally, there have been a small number of studies investigating the effects of responsive teaching interventions on parents of children with ASD. These, too, have provided support that parent-focused interventions increase parental responsiveness, and reported positive child outcome data, as well. Drew, Baird, Baron-Cohen, Cox, Slonims, Wheelwright, Swettenham, Berry, and Charman (2002) conducted a randomized control trial of a parent training intervention for preschool children with ASD. Twenty-four

children with ASD and their parents were randomly assigned to a parent training condition or a control condition, where the children received services through local community supports. A follow-up at twelve months suggested that children in the parent-training group made more progress in language development than did children in the control group. Effects were not as large as had been predicted by the researchers, who cited study limitations including the fact that three participants in the control group received intensive, home-based services during the intervention.

A study encountering fewer methodological challenges was conducted by Mahoney and Perales (2003), which examined the effects of a relationship-focused intervention on 20 parents and their young children diagnosed with a pervasive developmental disorder. The authors defined a relationship-focused intervention as “a general approach to developmental intervention that encourages and supports parents to enhance their use of responsive interactive strategies during routine interactions with their children;” effectively, the equivalent of a responsive teaching intervention as defined in this paper (Mahoney & Perales, 2003, p. 77). The parents and children participated in weekly intervention sessions over the course of 8-12 months. The researchers then examined pre- and post- data, which suggested the intervention was successful at increasing maternal responsiveness in interactions with their children. These increases in responsiveness were subsequently correlated with improvements in the child’s social interaction and social-emotional functioning.

In 2005, Mahoney and Perales continued their research, and examined the effects of a year-long relationship-focused intervention of weekly sessions on toddlers and preschool-age children diagnosed with pervasive developmental disorders ($n=20$) or

developmental disabilities ($n=30$). Pre- and post- data demonstrated an increase in parental responsiveness, as well as an increase in children's use of pivotal developmental behaviors. Although both groups of children exhibited significant cognitive, communicative, and socio-emotional gains, children with pervasive developmental disorders made improvements of greater significance than their developmentally delayed counterparts. The authors reported that children's improvements on some measures were associated with increases in their own pivotal behavior in addition to their parents' heightened responsiveness.

A study by Kaiser, Hancock, and Hester (1998) also provided evidence that the effects of responsive teaching interventions are more sustainable over time than other interventions. Mahoney, Kaiser, Girolametto, MacDonald, Robinson, Safford, & Spiker (1999) summarized research by Kaiser and colleagues. Kaiser et al. compared a parent-implemented to a therapist-implemented language intervention, randomly assigning 72 preschool children with communication delays to the two treatment groups and a control group. After 6 months, children in both treatment groups demonstrated similar levels of progress in language skills that were significantly greater than the progress made by children in the control group. Six months after treatment, children in the parent-implemented group demonstrated more use of productive language than did children in the therapist-implemented group. This difference might be because parents in the parent-implemented group could continuously implement intervention strategies with their children after treatment, while the parents of children in the therapist-implemented group could not continue to support their child through the use of intervention strategies. Sustainable intervention effects are especially important for children with developmental

disabilities such as ASD, as these disabilities will persist over time (Kaiser, Hancock, & Hester, 1998; Mahoney, Kaiser, Girolametto, MacDonald, Robinson, Safford, & Spiker, 1999).

In sum, responsive teaching interventions have been demonstrated to improve the quality of parent-child interactions, and increased caregiver responsiveness has generally been correlated with improved developmental outcomes for children. In some studies, improved caregiver responsiveness has been shown to have a causal role in positive child outcomes. This trend has been demonstrated with typically developing children as well as children with a variety of disabilities. However, after reviewing literature on parent-focused interventions, Warren and Brady (2007) concluded that relatively little is known about the impact of responsive teaching interventions on parents of children with ASD.

Limitations of Existing Literature

Much of the literature reviewed assumes all children benefit from the same parenting style regardless of temperament; no study reviewed for this paper took temperament into account. Future researchers might address this issue by administering personality and temperament measures to both caregiver and child to determine if there is a certain child temperament-type that is most likely to benefit from responsive teaching strategies, and a parent personality-type most likely to successfully learn and implement responsive teaching strategies. It might be unrealistic to expect that one particular parenting style is universally optimal for all children. It seems more likely that certain children, due to temperament, biological makeup, culture, etc., would thrive in a parenting context not best suited for a different child.

In general, RT does not fully take culture into account. Research has indicated that maternal responsiveness is influenced by cultural factors. For example, Dixon, Tronick, Keefer, and Brazelton (1981) analyzed videotapes of mother-child interactions of dyads from the Gussii of Kenya and suburban Boston, and found Boston mothers attempting to engage in reciprocal exchanges more often than the Kenyan mothers; Kenyan mothers were reported to look away from their infant when he/she became excited. Richman, Miller, and LeVine (1992) expanded upon this research by comparing responsiveness in mothers from Kenya and mothers from Boston, specifically examining how maternal responsiveness is affected by cultural differences in the conventions of conversation. Although both groups of mothers demonstrated responsiveness, Boston mothers were found to be more verbally and visually responsive, while Gussii mothers were more physically responsive. From their results, the researchers concluded that both groups of mothers were responsive to signals from their children, but exhibited different behaviors that may be indicative of divergent goals and styles. To discern predictors of maternal responsiveness, Drake, Humenick, Amankwaa, Younger, and Roux (2007) had 177 mothers in the United States complete a survey assessing the variables of responsiveness. The authors used a multiple regression analysis which indicated that satisfaction with life, self-esteem, and number of children accounted for a statistically significant portion of the variance in maternal responsiveness scores, as self-reported; these variables may vary cross-culturally. Surprisingly, socio-demographic variables were not found to be predictors of maternal responsiveness. Only 15% of the variance was explained by variables identified in this study, suggesting further research is warranted. Dunst and Trivette (1988) reviewed literature that suggested multiple factors

can influence the interaction style of a caregiver of a child with a disability, including child diagnosis, child age and developmental status. Such factors may differentially affect parents in this sample, whose children have been identified as at risk for ASD as early as 12 months. RT is based on the assumption that a responsive parenting style is optimally suited for all caregiver-child dyads, regardless of cultural norms, values, and goals caregivers have for their children. Research suggests this assumption may be a dangerous one. Bornstein, Tamis-LeMonda, Tal, Ludemann, Toda, Rahn, Pecheux, Azuma, and Vardi (1992) contrasted child rearing beliefs of mothers from New York City, Paris, and Tokyo. Although the three cities share characteristics such as modernity, economics, and ecology, substantial differences have been reported with regard to the history, beliefs, and values mothers hold regarding child-rearing practices. Research has indicated that responsiveness is a multi-dimensional trait (e.g., Landry, Smith, & Swank, 2006; Bornstein, Tamis-LeMonda, Hahn, & Haynes, 2008). It is reasonable to believe that the different dimensions of responsiveness may vary by culture; this is what Bornstein et al. found with their French, Japanese, and American samples. Although mothers from all three cities shared many similarities on measures of responsiveness, the authors also found cultural differences. The researchers concluded that their results provide support for cultural universals in addition to culture-specific differences in maternal responsiveness. Additionally, studies examining the effects of RT have also typically utilized homogenous samples of individuals from Western cultures. Two studies, however, applied RT with samples of mothers and children from Korea (Kim & Mahoney, 2004; Kim & Mahoney, 2005). Results were very similar to findings from other studies; Korean parents demonstrated increased responsiveness as measured by the

MBRS. These changes in responsiveness were associated with improved child functioning relative to the control condition, who did not participate in a RT. Therefore, these studies provide evidence that RT can be applied with success to both Eastern and Western cultures, but more research in this area is needed.

Most of the studies reviewed focus on mother-child dyads. Although the MBRS can be used with a father or another caregiver, the M stands for “Maternal.” The existing research seems to use the term mother and parent interchangeably. Many children also spend a significant amount of time interacting with fathers or other caregivers. Sometimes two caregivers of a child will have significantly different parenting styles. Mahoney preemptively addressed this criticism, stating that because of the quality and quantity of time mothers spend with their children, in addition to the strong emotional relationship between mother and child, he and his colleagues consider mothers uniquely qualified as primary instructional agents for their children (Mahoney, 1988). Still, only analyzing parent-child interactions with one of potentially two (or more) caregivers does not consider that the two parent figures are not exactly the same and may both significantly influence their child’s development.

Despite these and other limitations in the research, there is strong evidence that RT can result in positive developmental outcomes by encouraging mothers to be accepting and responsive to the behaviors initiated by their children (Dunst & Trivette, 1988). However, there are gaps in the existing literature that need to and will be addressed by this study. Few studies have examined the effects of RT using a randomized experimental approach or have rigorously monitored treatment fidelity. Only a handful of studies have looked at the application of RT with children with autism, and none have

researched the application of the intervention with a sample composed solely of children identified as at risk for an ASD at 12 months. So although RT has been demonstrated to be effective with a wide variety of at risk populations, more research using a strong experimental design is needed to confirm its effectiveness with other populations.

Other Evidence-Based Early Interventions for Children with Autism Spectrum Disorders

Experts recommend several early-intervention programs for children with ASD, including Discrete Trial Training (DTT), TEACCH (Treatment and Education of Autistic and Related Communication Handicapped Children), Floor Time, and the most widely used, Applied Behavior Analysis (ABA) (Reffert, 2008). ABA is defined as the “systematic application of behavioral principles to change socially significant behavior to a meaningful degree. Research tools enable users of these principles to verify a functional relationship between a behavior and an intervention” (Alberto & Troutman, 2006, p. 419). ABA is largely influenced by the 19th century philosophical movement positivism (i.e., Darwin’s functionalism, Pavlov’s respondent conditioning, Thorndike’s associationism, Watson’s behaviorism, and Skinner’s operant conditioning). Major behavioral principles include positive reinforcement, negative reinforcement, punishment, consequences, extinction, antecedent control, modeling, and shaping. The use of behavioral principles to alter human behavior is referred to as behavior modification (Alberto & Troutman, 2006). Research on ABA with children with autism has demonstrated these methods “reduce inappropriate behavior and increase communication, learning, and appropriate behavior,” according to the surgeon general of the United States (Rosenwasser & Axelrod, 2001, p. 671).

Despite empirical support and professional recognition for the use of ABA with children with autism, there are some limitations to the ABA approach. For example, mixed results have been reported with regard to language improvement. Although language gains accompanying participation in early ABA programs have been documented, many failures have been reported as well, or extremely slow progress (Rosenwasser & Axelrod, 2001). Language skills are particularly relevant to children with ASD, who have impairments in language and communication skills. Therefore, it is reasonable to investigate whether other early intervention programs may produce more consistent improvement in children's language abilities. However, it is interesting and noteworthy that ABA is an empirically supported intervention that has been shown to promote child development, and yet, it uses directive techniques. RT and ABA are not necessarily mutually exclusive; that is, it may be possible to use ABA techniques while maintaining a responsive interactional style that is moderately directive. It may also be that RT is more applicable in certain situations, and ABA, in others. For example, ABA would likely be more effective than RT for the purposes of toilet training or reducing self-injurious behaviors (Kroeger & Sorensen-Burnworth, 2009; Luiselli, 2009), but RT may be more appropriate than ABA to encourage joint attention and interactional engagement while maintaining the child's focus of attention (Girolametto, 1988; Landry et al., 2008; Mahoney et al. 1998). Both interventions may be relevant for different families at different times.

There may be time limits or constraints to the implementation of some early intervention services such as ABA (e.g., one year of treatment), or gaps in service delivery (e.g., school vacations and holidays). RT trains the caregiver to eventually

become the interventionist, so the intervention can continue when services do not, allowing the children to receive more consistent and constant treatment.

As previously discussed, research indicates that RT has been effective with similar populations as indicated by a number of outcome measures, including language scores. In addition, a preliminary review of research suggests that RT may be particularly appropriate for children with autism, as it aims to teach caregivers to interact more responsively with their children; there is evidence that mothers of children with autism are more directive than mothers of children without disabilities. Consequently, while ABA is an effective early intervention, an evaluation of RT used with this population of very young children at risk for ASD is warranted.

Research Goals and Research Questions

The first goal of this study was to provide empirical evidence that RT is a particularly appropriate intervention for this specific population, one-year-olds at risk for an eventual diagnosis of an ASD. A major aim of RT is to increase caregiver responsiveness and decrease caregiver directiveness to a less intrusive level. The literature clearly indicates the positive effects of a responsive interactional style with a variety of populations and ages; thus, an intervention with a goal of increasing responsiveness would be beneficial for many caregivers. Therefore, it would be worthwhile to determine whether reducing directiveness is appropriate for this population. The United States Congress passed the No Child Left Behind Act which was signed into law by President Bush on January 8, 2002. No Child Left Behind calls for the use of research-based reform, advocating for the utilization of replicated, generalized, rigorous studies with convergent findings. The Act places emphasis on using scientific

research to determine what programs and practices are effective (retrieved from www.ed.gov/nclb on 11/5/08). Because caregiver interactional styles have been found to be influenced by multiple determinants, including child diagnosis, child age, and developmental status (Dunst & Trivette, 1988), it is necessary to verify that RT is well-suited for this specific population. I will attempt to provide empirical evidence that RT is especially appropriate for this population because mothers of children with ASD are likely to be more directive during parent-child interactions due to the nature of their child's disability. Specifically, children with ASD are, by definition, likely to have communication and language impairments, as well as to engage in restricted and repetitive behaviors and interests. The presence of these characteristics may result in mothers more directly guiding conversation and play to stimuli outside the child's focus of interest during interactions, a style which may be more difficult for the children.

The second goal of this study was to evaluate whether the intervention is meeting its goal of increased parental responsiveness and decreased directiveness by comparing the effects of a 6-month relationship-focused RT program on parents to a no-RT control condition. In other words, if reducing directiveness and increasing responsiveness is in fact appropriate for this population, does this intervention accomplish this task? The literature reviewed has demonstrated that RT interventions successfully improve parental responsiveness and decrease directiveness in a variety of populations. It was investigated whether this trend is also found in the novel application of a modified RT program with this high risk population. Because this study involved random assignment to treatment and control groups, should findings be significant, its results would qualify as "strong

evidence” for this intervention’s effectiveness and appropriateness for one-year-olds at risk for autism (retrieved from www.ed.gov/nclb on 3/6/09).

These research goals lead to two hypotheses:

Hypothesis 1. Caregivers of children displaying a higher degree of ASD-related symptoms (as measured by the AOSI) will be more directive (as measured by the MBRS) than caregivers of children displaying a lower degree of ASD-related symptoms (prior to participation in the RT intervention).

Literature has indicated that mothers of children with developmental delays and developmental disabilities are more directive than are mothers of typically developing children (Eheart, 1982; Jones, 1980; Landry & Chapieski, 1989; Mahoney, Fors, & Wood, 1990; Mahoney & Robenalt, 1986; Marfo & Kysela, 1988; Tannock, 1988). This difference is hypothesized to be an adaptation on the part of the mother to her child’s limitations (Konstantareas et al., 1988). However, research has also demonstrated that, when applied too rigidly or intrusively, a directive style during parent-child interactions is associated with negative developmental outcomes (Kim & Mahoney, 2004; Landry, Garner, Pirie, & Swank, 1994; Landry, Garner, Swank, & Baldwin, 1996; Landry, Leslie, Fletcher, & Francis, 1985; Landry, Smith & Swank, 2006; Moore, Saylor, & Boyce, 1988; Tomasello & Farrar, 1986). Work by Konstantareas et al. (1988) suggested that mothers of children with a higher degree of ASD are likely to be more directive than mothers of children with a lower degree of ASD. Children used in this sample ranged from 28-117 months old. Therefore, examining this association between ASD and responsiveness with 12-to 14-month olds is worthwhile; no study has looked at maternal responsiveness in 12-month olds at risk for ASD. If an association is found between

maternal directiveness and degree of autistic symptoms in the children in this sample, this would suggest that RT would be especially appropriate for this population; RTs have been found to increase parental responsiveness and decrease directiveness.

Hypothesis 2. Caregivers receiving the Responsive Teaching intervention will display a significant increase in their responsiveness and decrease in their directiveness (as measured by the MBRS) relative to members of the control group.

Mahoney et al. (1998) stated there was a need for more research to determine how parent-child interactional principles impact the development of high-risk and low-incidence populations, specifically using children with ASD as an example. It is important to examine parent-outcome data, as with RT interventions, children's improvements are predicted to be related to the degree their caregivers increased responsiveness. Although the ultimate goal of RT is improved child functioning, it is the more distal goal in relation to the immediate goal of increased parental responsivity. RT has been demonstrated to change parent behavior when used with other populations (Drew et al., 2002; Girolametto, 1988; Mahoney & Bella, 1998; Mahoney, Boyce, Fewell, Spiker, & Wheeden, 1998; Mahoney & Perales, 2003; Mahoney & Perales, 2005; Mahoney et al., 2006; Mahoney & Powell, 1988). However, RT has never been applied to a sample of parents of children this young, determined to be at risk for ASD based on a screening instrument.

CHAPTER 2

Method

A goal of this study was to identify evidence that Responsive Teaching is a particularly appropriate intervention for the population of children identified as being at risk for autism at one-year-old. Consequently, an associational research design was used to examine the relationship between caregiver directiveness and autism symptom presentation in the child; the establishment of a positive relationship between these two variables would suggest that caregivers of 12-month-olds at risk for ASD and their children are good candidates for an intervention that aims to change levels of directiveness, e.g., Responsive Teaching. A second goal of this study was to assess whether the intervention was doing what it set out to do; that is, does participating in a RT intervention decrease levels of directiveness and increase levels of responsiveness in caregivers? A randomized experimental design using treatment and control groups was employed to evaluate whether the intervention significantly changed levels of caregiver responsiveness and directiveness.

The Method chapter is divided into six sections. The first section describes the research design employed to address the goals of the study. The second section describes the study participants, including the recruitment process and eventual randomization into treatment and control groups. The third section describes the independent variables, providing information on the intervention itself. The measures used are discussed next,

including information about validity and reliability. An overview of the procedures of the larger project, the Early Development Project, is discussed in relation to this paper. The sixth and final section describes the statistical procedures used to evaluate the research questions.

Design

This study used a pretest-posttest control group randomized experimental approach, between-groups design. A variety of data collection techniques were employed. Parent report data were collected when the child was 12 months of age using the First Year Inventory. Systematic, direct observation of behavior were coded using the Maternal Behavior Rating Scale, a standardized instrument, at 12-14 months and 20-24 months. The settings for the observations were a clinic and on occasion, in the participants' homes. Other standardized tests and parent-report measures were administered at 12-14 months and 20-24 months. As part of the Early Development Project, further assessments were conducted at approximately 30 months of age, although data from the Time 3 evaluations is not included in this paper. To explore Hypothesis 1, an associational research approach was used, investigating the relationship between one independent variable (degree of autism-related symptoms) and one dependent variable (maternal directiveness). To evaluate Hypothesis 2, children were randomly assigned to control and treatment groups and two comparisons of means tests were conducted.

Participants

The inclusionary/exclusionary criteria for the participants of the Early Development Project was as follows: (1) between the ages of 12 to 14 months upon entry into the study; (2) scored above the 95th percentile on the FYI; (3) no known

genetic/medical conditions (e.g., Down syndrome, Fragile X syndrome, cerebral palsy, etc.); (4) no known sensory deficits (i.e., not blind or deaf); (5) not born significantly pre-term; and (6) fluent in English.

The First Year Inventory (FYI; Baranek, Watson, Crais, & Reznick, 2003), a questionnaire completed by parents of 12-month-olds to assess for infant behaviors linked to an eventual diagnosis of autism or developmental delays, was mailed on a monthly basis to 11,853 families in a diverse tri-city urban area, as well as several rural counties, within 30 miles of Chapel Hill, North Carolina. Data collection for the current sample began in February 2008 and ended June 2009, although FYI mailings continued past this date as part of the larger Early Development Project. Concerning the data collected between February 2008 and April 2009, 2254 forms were completed for a return rate of 19.01%. For return rates by month, please see Table 3. Although one participant was enrolled in the sample past April 2009, there is no reason to believe that the return rates were drastically different between the 14 month period of February 2008 through April 2009 and the two month period of April 2009 through June 2009, for which the FYI return rate data is not available.

Children scoring in the 0-94th percentile for being at risk for autism as measured by the FYI received no follow-up, while children falling in the 95th percentile and above were invited to participate in the Early Development Project. As of October 2009, .56% ($n=62$) of the 10,715 families who received the packet met this eligibility criteria, and 38.7% ($n=24$) of those who screened positive came in for a baseline assessment, referred to as the Time 1 evaluation. Of the 24 assessed, 5 were found not to be eligible for the second phase of the study, 19 were found eligible, and 3 of those 19 eligible families

chose not to participate further. These data are reflective of the Early Development Project; the last participant in the sample studied in this paper came in for a Time 1 evaluation in June 2009. However, these percentages are still reflective of the smaller sample and thus merit mention. Children determined to be at highest risk for autism after the Time 1 evaluation were randomly assigned to the treatment or the control group. Concerning the sample studied in this paper (as opposed to the Early Development Project), the treatment group was composed of $n=9$ parent-child dyads, and the control group was composed of $n=4$ dyads. Within the treatment group, 2 of the 9 caregiver-child dyads were comprised of a father and child, and all the control dyads were composed of mother-child dyads. Please see Table 5 for a summary of the cognitive functioning of children in the treatment versus control groups as measured by the ELC of the Mullen. Please see Table 6 for a summary of the autism-related characteristics displayed by the children in the treatment versus control groups as measured by the AOSI.

Families that came in for a Time 1 evaluation composed the sample of caregiver-child dyads ($n=23$) that was used to look at the association between maternal directiveness and degree of autism related symptoms. This sample was composed of 22 male children and one female child. An uneven division such as this is not uncommon in the field of autism research, as the disorder is more common in males than in females, with an approximate ratio of 4:1 (Sattler, 2002). Nineteen of these children were paired with their female caregivers, while four dyads were composed of the child and their male caregiver. With regard to race, 16 of the children were white, 2 were Black/African American, and 2 were of mixed race. Ethnically, 17 of the children were Not

Hispanic/Latino, while ethnicity was not reported for six. Of the mothers, 18 were white, two were Black/African American, and race was not reported for three. Concerning maternal education, the majority of the sample was college educated or higher; nine had a college degree and seven earned a Master's degree. Additionally, two had courses toward college, one had a professional degree, one had courses toward college and a vocational degree, and three have unknown educational levels. For more demographic information about this sample, including paternal race and ethnicity, total household income, paternal education, marital status, siblings, and the primary language spoken at home, please see Table 4.

Benefits of participation

Children in the control group were screened at 12 months and therefore referred for earlier intervention through community services. Referral information was provided to all families whose children score at or above the 95th percentile. In addition, all participants received a diagnostic evaluation with a clinical psychologist at the age of 30 months. Children and their caregivers in the treatment group received evidence-based intervention services, the Responsive Teaching intervention.

Independent Variables

For Hypothesis 1, degree of autism-related symptoms as measured by the AOSI was conceptualized as the predictor, or attribute, independent variable. For Hypothesis 2, participation in the Responsive Teaching intervention was the active independent variable. Responsive Teaching (Mahoney & MacDonald, 2007) is a manual-based comprehensive parent-mediated intervention for children from birth to 6 years of age who have or are at risk for developmental delays. The intervention uses a parent-as-therapist

model of interaction aiming to help caregivers engage in more balanced daily interactions focusing on the child's interests and developmental level, with the ultimate goal of improved cognitive and social-emotional functioning in the child. RT has as its theoretical basis research which has suggested a positive relationship between caregivers' level of responsiveness when interacting with their children and children's cognitive (e.g., Klein, 1991), language (e.g., Tamis-LeMonda, Bornstein, & Baumwell, 2001), and social-emotional development (e.g., Kim & Mahoney, 2004). Meta-analyses by McCollum and Hemmetter (1997) and Bakermans-Kranenburg, van Ijzendoorn, & Juffer (2003) reported positive parent and child outcomes as a result of participating in relationship-focused interventions.

As part of the RT, an individualized program was developed for each child based on a profile of his/her strengths and weaknesses in the domains of social-communication and sensory-regulatory problems. Specifically, Pivotal Behavior Wizard software developed by Mahoney and MacDonald (2007) was used to organize the behaviors the child is displaying and the behaviors the child has not attained yet into intervention objectives. For instance, if the child “can sustain reciprocal interactions with adults, but usually waits for the adult to decide what to play with or how to play”, and “chooses what to play with and/or how to play less than half of the time that the child plays with an adult,” a subsequent intervention objective generated for this child might revolve around initiation. The intervention objectives are flexible in that they can be revisited or reordered to fit with what the child is doing in real time. The RT intervention lasted 6 months or 36 sessions, whichever came first. The first three months of the intervention were the most intensive—during the first month, the families received two in-person

sessions per week; for the next two months, the families received one in-person session and one email/phone call session per week. During the next three months, the families received one in-person session per week. Sessions lasted for one hour, during which trained interventionists met with caregiver/s and the child in the family's home. The sessions involved a combination of parent education, modeling of behavioral techniques and support strategies, and implementation by the parent with therapist feedback. One or two pivotal behaviors were addressed in each session, explained by the interventionist using discussion points. After each session, a Family Action Plan was developed by the interventionists and parents to aid the parent in implementing the intervention strategies at home. The RT implemented in this study was adapted from Mahoney and MacDonald's model of RT in the following ways: (1) Parent training modules were added to the beginning of the intervention to ensure the parents receive clear and specific information on their roles, the dimensions of responsiveness, and the intervention strategies; (2) Sensory processing was added as an area to target through intervention, as children at risk for developmental disabilities often have difficulty in this domain; and (3) progress tracking and record keeping were enhanced (Early Development Project, 2008). Interventionists, a member of the University of North Carolina at Chapel Hill staff, a speech language pathologist/early interventionist, and a graduate student in a doctoral program in Occupational Therapy, were trained in Responsive Teaching methods by its developer, Dr. Gerald Mahoney, Professor at Case Western University. In order to assess treatment fidelity, the interventionists were videotaped at least once per month working with the families. Two master's students in Occupational Therapy pulled videotapes at random and completed a fidelity measure, the Adapted RT Intervention Fidelity

Checklist. A total of 11 videotapes of two of the three interventionists were reviewed. The checklist required the coder to determine whether the interventionist demonstrated effectiveness in the following areas: rapport and review, purpose and rationale, demonstration and practice of RT strategies, family action planning, and documentation. A rating of 80% fidelity or greater was considered to be acceptable. Ratings for the interventionists ranged from 91-99%, with an average rating of 95.84%.

For 6 months after the intervention period (following the Time 2 Evaluation), all services for the intervention and control groups were tracked, until the Time 3 Evaluation and diagnostic report, which occurred when the child was approximately 30 months. During the time period between Time 2 and 3 evaluations, it was hoped that the parents would assume the role of interventionist and continue using the intervention strategies learned while participating in the 6-month intervention. Data collected at the Time 3 intervention were not included in this study, but will be included as part of the Early Development Project.

Measures

The First Year Inventory (FYI; Baranek, Watson, Crais, Reznick, 2003) is a parent-report instrument that focuses on identifying infants who are at risk for an eventual diagnosis of autism. The FYI utilizes a format that allows for a broad range of response categories, and takes approximately 20 minutes to complete. The behaviors and symptoms targeted by the FYI that could suggest risk for autism were identified from retrospective and prospective literature. The questions were designed to elicit parent report of the relative frequency that their infant exhibited the targeted behaviors. The FYI is comprised of 63 items and measures two developmental domains: Communication and Sensory-

Regulatory functions, and provides a general risk index as well as risk scores for each subcategory. Prospective and retrospective studies have been conducted to examine the effectiveness of the FYI (Baranek et al., IMFAR 2006; Reznick et al., 2007 under review; Watson et al., 2007, in press), with results suggesting that 92% of children with ASD are correctly identified with the FYI retrospective version using a risk score cutoff of >90%ile.

The Autism Observation Scale for Infants (AOSI; Bryson, Rombough, McDermott, Brian, & Zwaigenbaum, 2005) is a direct observational assessment tool utilizing 18 specific risk markers to identify infants aged 6-18 months at the highest risk for autism. During the 20-30 minute assessment, infants are engaged in semi-structured play and presses are used to assess target behaviors consistent with a diagnosis of autism, such as visual tracking, attentional disengagement, coordination of eye gaze and action, imitation, affective responses, early social-communicative behaviors, behavioral reactivity, and sensory-motor development. Target behaviors are scored from 0-2 or 0-3, with 0 representing typical behavior; 1 representing inconsistent, partial, or questionable behavior; 2 representing atypical behavior; and a score of 3 representing a complete lack of the behavior (Bryson, Zwaigenbaum, McDermott, Rombough, & Brian, 2007).

Possible overall scores range from 0 to 34. For the inclusion/exclusion criteria for determining level of autism risk after the Time 1 Evaluation in this study, children whose AOSI scores were 7 or greater were considered to be at higher risk for autism (and/or whose ADOS-T score was greater than or equal to 12). Thus, for the participants included in Hypothesis 1 and 2, AOSI scores may range from 0-34; participants

randomized into treatment and control have a higher likelihood of having AOSI scores of 7 or greater.

Bryson and colleagues (2007) investigated the reliability of this measure. The researchers reported good to excellent inter-rater reliability for total scores and total number of endorsed items at 6 (total marker count=.68, total scores=.74), 12 (total marker count=.92, total scores=.93), and 18 months (total marker count=.93, total scores=.94), and across ages (total marker count=.90, total scores=.92). Bryson and colleagues also reported test-retest reliability at 12 months of age as well within acceptable limits (total marker count=.61, total marker counts =.68). Lower estimates of reliability were obtained for a subset of items, mostly in 6-month-olds, and therefore not a major concern for this study, where children are seen after 12 months of age.

In this study, the AOSI was used to investigate Hypothesis 1 (the association of degree of autism related symptoms and maternal responsiveness) as the measure of degree of autism related symptoms.

The Maternal Behavior Rating Scale (MBRS; Mahoney, Finger, & Powell, 1985; Mahoney, 1999) is a global rating scale used by a trained observer to evaluate the quality of maternal responsiveness exhibited during mother-child interactions. The MBRS is a 12-item scale. Each item is rated on a 5-point Likert scale, with 1 indicating a low incidence of the observed quality and 5 suggesting a high incidence. The MBRS assesses four dimensions of parenting and thus results in four subscale scores: Responsive/Child Oriented (Responsiveness, Sensitivity, Effectiveness); Affect (Acceptance, Enjoyment, Expressiveness, Inventiveness, Warmth); Achievement Orientation (Achievement Orientation, Praise); and Directiveness (Directiveness, Pace) (Mahoney & Bella, 2004).

The Responsive/Child Oriented rating measures the appropriateness of the parent's responses to the child's behavior. The Directiveness rating measures of the frequency and intensity of the parental attempts to dictate the child's immediate behavior. For all four subscales, it is possible to receive a score ranging from 1 to 5. On the Responsive/Child Oriented subscale, higher scores indicate the most productive and appropriate levels of responsivity (with a maximum score of 5). In contrast, on the Directiveness subscale, extreme ratings (1 and 5) indicate less productive levels of the interactional style (5 indicating what may be conceptualized as "intrusiveness"), while a score of 2 or 3 indicates a more optimal level of directiveness.

The MBRS was first piloted as an 18-item form with a group of 60 children with developmental disabilities. Videotapes of mothers interacting with their children were rated with the MBRS and then analyzed. Many of the items on the scale were determined to be conceptually similar, and a factor analysis was used to reduce the items to a smaller set of variables (Mahoney, Powell, & Finger, 1986).

The MBRS has been used in a number of studies (e.g., Chiarello, Huntington, & Bundy, 2006; Kim & Mahoney, 2004; Mahoney, Boyce, Fewell, Spiker, & Wheeden, 1998; Mahoney, Wheeden, & Perales, 2004; Mayers, Hager-Budny, & Buckner, 2008; Moore, Saylor, & Boyce, 1998; Wang, 2008). Moore and colleagues found evidence for concurrent validity of the MBRS, reporting moderate to high levels of correlation between the MBRS and similar constructs from other parent rating scales (Moore et al., 1998).

The authors have reported that the MBRS "is sensitive to parental characteristics that are statistically related to children's developmental functioning" (Mahoney et al., p.

48, 1985). This scale is intended to be used to evaluate the effects of intervention programs that aim to change maternal interactive behaviors (Mahoney, Powell, & Finger, 1986). Evidence of the scale's sensitivity to changes in parental interaction style following a responsive teaching intervention has been demonstrated in studies such as Mahoney and Powell (1988) and Mahoney, Wiggers, and Lash (1996) (Mahoney, Boyce, Fewell, Spiker, & Wheeden, 1998). Bakeman and Brown (1980) proffered that the use of rating scales is particularly appropriate for evaluating the behaviors that impact maternal responsiveness, as they are dispositional variables.

In this study, the Directiveness scale of the MBRS was used to investigate Hypothesis 1 (the relationship between degree of autism related symptoms and maternal directiveness) as the measure of caregiver directiveness. Directiveness was defined as “the frequency and intensity in which the parent requests, commands, hints, or attempts in other manners to direct the child’s immediate behavior” and “the parent’s rate of behavior” (MBRS, 1999). The Responsive/Child Oriented and Directiveness scales of the MBRS were used to evaluate Hypothesis 2 to measure change in parent interactional behavior as a result of participation in RT. Directiveness continued to be defined as previously stated. Responsiveness was defined as “the appropriateness of the parent’s responses to the child’s behaviors such as facial expression, vocalizations, gestures, signs of discomfort, body language, demands, and intentions...the extent to which the parent seems aware of and understands the child’s activity or play interests...and the parent’s ability to engage the child in play interaction” (MBRS, 1999).

The Mullen Scales of Early Learning (MSEL; Mullen, 1995) is a measure of early cognitive development for infants and preschool children ages birth through 68 months.

The Mullen assesses a child's abilities in visual, linguistic, and motor domains and distinguishes between receptive and expressive language processing. The Early Learning Composite (ELC) provides a summary score of the child's overall performance and represents overall intellectual development. The ELC standard score has a mean of 100 and a standard deviation of 15. The MSEL was used in Hypothesis 1 to control for cognitive development when examining the relationship between degree of autism in the child and degree of directiveness in the caregiver.

Procedures

Early Development Project Procedures: Packets containing the FYI, consent forms, and incentives in the form of coupons were mailed weekly to parents two weeks prior to their child's first birthday, using a database developed by Steven Reznick, Ph.D. Children scoring in the 95th percentile and above as measured by the overall FYI risk score were invited to participate in the Early Development Project. At age 12-14 months, an evaluation (Time 1) was conducted. Assessments administered at this time include the Autism Observation Scale for Infants (AOSI; Bryson et al., 2005), The Communication and Symbolic Behavior Scales-Developmental Profile (CSBS-DP; Wetherby & Prizant, 2002), The MacArthur-Bates Communicative Development Inventory (MCDI; Fenson, Marchman, Thal, Dale, Reznick, & Bates, 1993), The Sensory Processing Assessment for Young Children (SPA; Baranek, 1999b; Baranek et al., in press AJMR), The Sensory Experiences Questionnaire (SEQ; Baranek, 1999c; Baranek et al., 2006), The Infant-Toddler Social Emotional Assessment (ITSEA; Carter & Briggs-Gowan, 2005), The Mullen Scales of Early Learning (MSEL; Mullen, 1995), The Vineland Adaptive Behavior Scales (VABS-II; Sparrow, Cicchetti, & Balla, 2005), The Maternal Behavior

Rating Scale (MBRS; Mahoney, Finger, & Powell, 1985; Mahoney, 1999), The Caregiver Strain Questionnaire (CGSQ; Brannan, Heflinger, & Buckman, 1997), and The Autism Diagnostic Observation Schedule-Toddler (ADOS-T; Lord, 2007). Infants determined to be at lower autism risk after the assessment battery received limited follow-up and referrals as needed. Children at highest autism risk were invited to participate and randomized into treatment (receiving the RT) and control (no intervention) groups via a random numbers table in Excel using a 2:1 randomization in favor of the treatment group. High risk for autism was defined as children who met criteria for highest autism risk on the AOSI (a score of greater than or equal to 7) and/or the ADOS-T (a score of greater than or equal to 12), and who exhibited impairments in both social-communicative (as measured by the CSBS-DP and MCDI) and sensory-regulatory areas (as measured by the SPA, SEQ, and ITSEA). All children meeting the criteria were referred for community services, as were children who were found to have other developmental concerns. The treatment group, composed of $n=9$ parent-child dyads, received 6 months of RT. Additional services received were tracked. The control group ($n=4$), was followed for 6 months and any services received were tracked monthly. An evaluation at approximately 20-22 months (Time 2) was conducted. The assessment tools used at Time 2 were identical to the instruments used at Time 1, except the AOSI and ADOS-T were not administered. After the Time 2 evaluation, the treatment group received monthly follow-up, and for the control group, services were continued to be tracked monthly. A final evaluation was conducted along with a diagnostic report at 30 months (Time 3). The Time 3 evaluation was comprised of an assessment battery identical to that administered at Time 2, with the addition of the Autism Diagnostic

Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 2001), and the Social Responsiveness Scale-Preschool (SRS-P; Constantino et al., in press). All evaluations were conducted by a blind qualified assessor. Diagnostic evaluations were conducted by a blind clinical psychologist. All evaluations were supervised by a blind postdoctoral fellow. Families received summaries of the evaluations within one month of the examination (IRB Study #06-0761 “Early Development Project”, 2008). The procedures of the portion of the Early Development Project yielding data included in this paper are presented in Figure 2.

Home observation and coding procedure

During the Time 1 evaluation, caregivers were videotaped playing with their children with the same standard set of developmentally appropriate toys for 5 minutes in a lab setting. Caregivers received instructions to simply play with their children as they typically would, and observers left the room. During the Time 2 and Time 3 evaluations, the caregiver and child dyad were videotaped for 5 minutes with similar toys, in the lab setting or in their home. The 5 minute segments were coded by Devon Hartford, B.S., after being trained on the measure and obtaining 100% reliability within 1 rating point, and approximately 80% exact agreement with a speech therapist on the project. The coder viewed the clips in real time up to 3 times, and could stop them at any point. To insure intra-rater reliability over time, one-third of the data were selected at random and recoded by the original blind rater at least 8 months after being coded initially, toward the end of the data coding process. An intraclass correlational coefficient was computed to estimate intra-rater reliability. The single measure intraclass correlational coefficient was .916, $p < .001$, suggesting high intra-rater reliability. In other words, the original blind

rater maintained a high level of consistency when completing the MBRS throughout the coding process.

Bornstein and colleagues advocate that videotaped interactions are likely good representations of mother-child interaction, stating that because “neutral to positive contexts reflect the vast majority of children’s time... it may be equally if not more important to examine responses in situations that are not distressing to the child” (Bornstein et al., 2008, p. 871).

Regarding missing data, the AOSI was not administered/was lost for two cases. These cases were subsequently not included in the analysis of question 1, resulting in $n=21$ used in the analysis. Demographic data were not reported for one case included. Not all demographic information was reported for one case, but of the information available, the case does not deviate greatly from the sample’s mean characteristics (e.g, white child, white parents, college or graduate-educated parents).

Statistical Analyses

To investigate Hypothesis 1, a bivariate linear regression analysis was conducted examining the relationship between degree of autism-related symptoms (as measured by the AOSI) and caregiver directiveness (as measured by the directiveness scale of the MBRS) using $n=21$. Two cases from the full sample ($n=23$) were not able to be used in the analysis due to missing data. An additional bivariate linear regression analysis was conducted controlling for cognitive ability to assess whether the relationship found between directiveness and autistic characteristics could be better explained by a third variable.

In order to investigate Hypothesis 2, comparisons of means tests were conducted. Specifically, two two-sample *t*-tests were conducted, comparing the means of the control group compared with the experimental group on mean change of responsiveness and mean change of directiveness. The focus of this analysis is average difference between paired scores (responsiveness at Time 1 and Time 2 for *t*-test 1 and directiveness at Time 1 and Time 2 for *t*-test 2) in the control and the experimental group. Therefore, the null hypothesis tested is that the average difference score in the control group will be equal to the average difference score of the experimental group, suggesting the two samples could be thought of as having been drawn from one population. If the null was true, this would indicate improvement made by the experimental group could be attributed to chance alone rather than the success of the intervention. Theoretically, some cases could have started at the lowest level of directiveness (i.e., a score of 1) and would be aiming to increase their directiveness toward a 2 or 3; this was not the case with this sample. To achieve or remain at the more desired level of directiveness (i.e., a score of 2), these caregivers needed to decrease of their directiveness. To confirm the findings from the *t*-tests, two permutation, or randomization, tests, were conducted.

CHAPTER 3

Results

The Results chapter is divided into three sections. First, the findings for Hypothesis 1 are discussed. In the second section, the findings of Hypothesis 2 are presented.

Hypothesis 1

A bivariate linear regression analysis was conducted to evaluate the prediction of level of parental directiveness (as measured by the Directiveness subscale of the MBRS) from the presence of autism-related symptoms displayed by the child (as measured by the AOSI score) using $n=21$. Scores on Directiveness ranged from 2 to 4.5, with an average score of 3.5. AOSI scores ranged from 1 to 15, with an average score of 6.57. A one-tailed test was conducted, as high symptom presentation of autism in children was hypothesized to predict high levels of directiveness in caregivers. The scatterplot for the two variables indicated the variables are linearly related, although not strongly. The regression equation for predicting the level of directiveness is as follows:

$$\text{Predicted Directiveness} = 3.221 + .05 * \text{autistic characteristics}$$

The 95% confidence interval for the slope, -.018 to .117, contains the value of zero, and therefore level of directiveness is not significantly related to degree of autistic-related

symptoms. Caregivers of children displaying a higher degree of characteristics associated with autism spectrum disorders were not found to interact with their children in a more directive style. Precision in predicting level of directiveness was an R-squared value of 0.112. The correlation between directiveness and degree of autistic characteristics was nonsignificant at the .05 level, showing no association between the variables. Using the less conservative .10 level, the correlation between variables was moderate, at .335 ($p=.069$). Approximately 11.2% of the variance of the directiveness index was accounted for by its linear relationship with the Autism index.

The small sample size suggested weak power, which increases the likelihood of incorrectly accepting a false null hypothesis and decreases the likelihood of obtaining significant results. In order to obtain a power of 0.8 at the .05 significance level, 40 cases would be needed (versus the current 21 cases available). Thus, with a sample size of 40, the results would likely be significant.

Upon inspection of Cook's Distance, Mahalanobis Distance, and residual scores, it was determined that the aforementioned outlier unduly influenced the regression, especially when taking into consideration the small sample size. Please see Figure 3, a scatterplot of the original analysis with the outlier highlighted. When rerunning the analysis with the outlier subtracted, the two variables were found to be linearly related and moderately correlated ($r=.458$, $p=.021$), in accordance with the hypothesis. Approximately 21% of the variance of the directiveness index was accounted for by its linear relationship with the autism index. The regression equation for predicting the level of directiveness in this analysis is as follows:

$$\text{Predicted Directiveness} = 3.258 + .056 * \text{autistic characteristics}$$

The 95% confidence interval for the slope, .002 to .111, does not contain the value zero, and therefore level of directiveness is significantly related to degree of autistic symptoms. Caregivers of children displaying a higher degree of characteristics associated with autism spectrum disorders were found to interact with their children in a more directive style. Precision in predicting level of directiveness was an *R*-squared value of .210.

An additional bivariate linear regression analysis was conducted to evaluate the prediction of level of parental directiveness from the presence of autism-related symptoms displayed by the child, this time controlling for child developmental ability (as measured by the Early Learning Composite score from the Mullen Scales of Early Learning). Mullen scores were missing/lost for two additional cases, resulting in $n=19$ used in this analysis. The ELC scores for this sample ranged from 53 to 140, with an average score of 92.6. Once again, a one-tailed test was conducted. When controlling for developmental functioning results were no longer statistically significant ($r=.24$, $p=.18$).

Hypothesis 2

Two two-sample *t*-tests with equal variances were conducted to investigate whether the changes in responsiveness and directiveness exhibited by participants in the treatment condition were significantly different than the changes in responsiveness and directiveness exhibited by the control group, or if the progress made by the experimental group could have been the result of chance alone. Thus, the mean change demonstrated by both groups for each variable as measured by the MBRS was compared.

The results indicated that the mean change in responsiveness in the treatment group ($M = .41$, $SD = .76$, $SE = .21$) was not significantly greater than the mean change in responsiveness in the control group ($M = .08$, $SD = .56$, $SE = .40$), $p = .40$. The 95% confidence interval for the mean difference between the two ratings was $-.49$ to 1.14 . Although the difference between the means is not statistically significant, the experimental group increased their average level of responsiveness more than the control group, a trend consistent with the hypothesis. Testing the alternative hypothesis that the treatment group would exhibit more change (specifically, an increase in responsiveness) than the control group yielded a one-tailed p -value $= .20$.

The second two-sample t -test indicated that the mean change in directiveness demonstrated by the treatment group ($M = -.17$, $SD = .75$, $SE = .25$) was not significantly greater than the mean change in directiveness demonstrated by the control group ($M = 0.0$, $SD = .82$, $SE = .41$), $p = .73$. The 95% confidence interval for the mean difference between the two ratings was -1.18 to $.85$. Again, although the difference between the two means was not statistically significant, the differences between groups were in the expected direction, and with a much larger sample, the results could potentially be statistically significant. Testing the alternative hypothesis that the treatment group would exhibit more change (specifically, a decrease in directiveness) than the control group yielded a one-tailed p -value of $.36$. Please see Table 7 for a summary of changes in responsiveness and directiveness in the treatment group versus the control group. Please see Table 8 for more information comparing ratings of directiveness and responsiveness between conditions.

Supplementary Analyses

In order to confirm these findings, two permutation tests were conducted. The focus of this analysis is difference between paired scores (responsiveness at Time 1 and Time 2 for Permutation Test 1 and directiveness at Time 1 and Time 2 for Permutation Test 2) between the control and the experimental group. Once again, the null hypothesis tested is that the average difference score in the control group will be equal to the average difference score of the experimental group, suggesting the two samples could be thought of as having been drawn from one population. If the null was true, this would indicate improvement made by the experimental group could be attributed to chance alone rather than the success of the intervention. The resampling procedure is based on the idea that if the null hypothesis was true, the parents in the control group would show improvements in interactional behavior (indicated as increases on the Responsive/Child Oriented scale on the MBRS, with a maximum score of 5, and decrease on the Directiveness scale of MBRS) equal to improvements made by the experimental group. For each of the two permutation tests, 10,000 repetitions of resampling were used to calculate the p -values of the likelihood of obtaining differences in paired scores greater than and less than the observed differences. For permutation test 1, the p -value for obtaining a difference in responsiveness greater than .32 is .20 (or one-tailed $p=.10$), which is generally consistent with the results of the first t -test. For permutation test 2, the p -value for obtaining a decrease in directiveness greater than -.17 is .71 (or one-tailed $p=.36$), consistent with the results obtained from the second t -test.

CHAPTER 4

Discussion and Implications

One goal of this study was to determine whether caregivers of children with higher autistic symptom presentation were more directive than caregivers of children displaying a lesser degree of autistic symptoms. Documenting this relationship would provide evidence that caregivers of children with/at risk for a diagnosis of autism would be ideal participants in a RT intervention, which aims to decrease levels of directiveness that could be characterized as more intrusive. The positive, linear relationship between degree of autistic symptoms in the child and level of directiveness in the caregiver is discussed in the first section of the Discussion chapter. Another objective of this study was to determine whether or not participating in a RT intervention did, in fact, lower levels of directiveness and increase levels of responsiveness in caregivers. The results of the two two-sample *t*-tests with equal variances which were conducted to compare mean changes in responsiveness and directiveness in the treatment versus the control condition suggested that the intervention group exhibited greater changes than did the control group, but not at a level of statistical significance, likely due to the small sample used. These results are further discussed in the second section of the Discussion. Implications of the findings, limitations of the study, and directions for future research conclude the Discussion.

Hypothesis 1

The first hypothesis was that caregivers of children displaying a higher degree of characteristics of autism (as measured by the AOSI) would be more directive (as measured by the MBRS) than caregivers of children displaying a lower degree of characteristics of autism (prior to participating in the RT intervention). It should be noted that although the term in the literature and in the measure used in this study is “directiveness,” higher levels of directiveness are very closely related to intrusiveness. Initial analyses did not support this hypothesis at a level of statistical significance ($p=.069$). Results did support this hypothesis, however, when the analysis was rerun excluding one outlier.

This finding is consistent with current literature. Numerous studies have documented that mothers of children with developmental delays and developmental disabilities tend to be more directive than mothers of typically developing children (e.g., Eheart, 1982; Jones, 1980; Landry & Chapieski, 1989; Mahoney, Fors, & Wood, 1990; Mahoney & Robenalt, 1986; Marfo & Kysela, 1988; Tannock, 1988). The finding is also consistent with a study by Konstantareas et al. (1988), which suggested that mothers of children with ASD are likely to be more directive than mothers with a lower degree of ASD in a sample of children ranging from 28-117 months old. This study adds to the present literature by replicating this association with a different population, that is, children ages 12-16 months who were identified at 12-months-old as being at risk for an eventual diagnosis of an ASD. The current study demonstrates how early this relationship between parent interactional style and children’s disability can begin. It should be noted that when rerunning the analysis when controlling for cognitive

functioning using the Early Learning Composite of the Mullen Scales of Early Learning, results were no longer statistically significant ($p = .18$). Considering the use of only $n = 18$, this does not provide strong evidence against the relationship between child autism and caregiver directiveness. Additionally, children's IQ scores are generally not considered to be stable prior to age 6; consequently, the IQ scores of the children in this sample, younger than age 2, will likely fluctuate over time before ultimately stabilizing (Sattler, 2002). Regardless, this finding may imply that developmental level, in addition to degree of autism related characteristics, impacts level of caregiver directiveness in this specific population. Further investigation is warranted in this area with a larger sample in order to further clarify this possibility.

It has been hypothesized that the higher level of directiveness displayed by mothers of children with more ASD-related characteristics is an adaptation on the mothers' part to her child's limitations (Konstantareas, 1988). Because children with autism, by definition, have impairments in reciprocal social interaction as well as communication delays, it seems natural that mothers of children with autism adopt a more directive interactional style. There are certainly times when a more directive style may be beneficial for the child, such as when a child is perseverating on playing with a part of a toy nonfunctionally to the exclusion of appropriate play (e.g., spinning the wheels of a toy truck for an extended period of time), or engaging in self-injurious behaviors. However, when applied too rigidly and across contexts, research suggests that a more directive style, one that may be described as intrusive, is associated with negative developmental outcomes for the children (e.g., Kim & Mahoney, 2004; Landry, Garner, Pirie, & Swank, 1994; Landry, Garner, Swank, & Baldwin, 1996; Landry, Leslie,

Fletcher, & Francis, 1985; Landry, Smith & Swank, 2006; Moore, Saylor, & Boyce, 1988; Tomasello & Farrar, 1986). For example, a more intrusively directive approach, when compared to a less directive interactional style, has been associated with less successful manipulation of toys (Landry and Chapieski, 1989), shorter conversations and decreased word learning (Tomasello and Farrar, 1986), and less of an increase in skills (Landry et al., 1985). Landry et al. (1997) theorized this may be because a more directive style requires the child to shift their attention from one activity or object to a different one. Shifting attention is more challenging for children with developmental disabilities such as autism, who in particular exhibit difficulty engaging and disengaging their attention (Mesibov et al., 2004). Therefore, decreasing maternal directiveness to a more balanced, less intrusive, level; such that the parent occasionally makes suggestions, or tries to influence the child's choice of activity but allows him independence in the execution of play, or lets the child make his own choice but models or assists with effective implementation (Mahoney, 1999); would be less taxing on children's attention-shifting capacity, and likely be beneficial for children with autism.

RT interventions, developed by Gerald Mahoney, aim to increase responsiveness and get directiveness to a more optimum level (typically this is a decrease in directiveness), leading to the second hypothesis investigated in this study.

Hypothesis 2

The second hypothesis was that caregivers receiving the Responsive Teaching intervention ($n=9$) would display a significant increase in their responsiveness and decrease in their directiveness (as measured by the MBRS) relative to members of the control group ($n=4$). Two two-sample t -tests were conducted to in order to compare the

mean level of change of the aforementioned dependant variables between the two groups. The results indicated that the mean change in responsiveness in the treatment group ($M = .41$, $SD = .763$, $SE = .21$) was not significantly greater than the mean change in responsiveness in the control group ($M = .08$, $SD = .56$, $SE = .28$), $p = .40$. The mean change in directiveness demonstrated by the treatment group ($M = -.17$, $SD = .75$, $SE = .25$) was also not significantly greater than the mean change in directiveness demonstrated by the control group ($M = 0$, $SD = .82$, $SE = .41$), $p = .73$. One-tailed p -values for responsiveness ($p = .20$) and directiveness ($p = .36$) were also not statistically significant. Given the very small sample size ($n=13$), the trends indicated that with a larger sample, the results could potentially be significant. The results from this pilot data are consequently encouraging. On the other hand, these nonsignificant results may be suggestive that levels of caregiver directiveness may not change as the result of a RT intervention for this particular population.

Although not statistically significant, the trend documented with this sample is consistent with the literature. Numerous studies have reported that RT interventions increase caregiver responsiveness and decrease directiveness (Drew et al., 2002; Girolametto, 1988; Mahoney & Bella, 1998; Mahoney, Boyce, Fewell, Spiker, & Wheeden, 1998; Mahoney & Perales, 2003; Mahoney & Perales, 2005; Mahoney et al., 2006; Mahoney & Powell, 1988). In this sample, the mean change in responsiveness in the experimental group was an increase of .41, compared with the mean change found in the control group ($M=.08$). The mean change in directiveness in the experimental group was a decrease of .17, while the average change of directiveness in the control group was 0. These findings suggest that the experimental group demonstrated more changes in

their levels of responsiveness than their levels of directiveness, although not at a level of statistical significance. With an extremely small sample such as this, it is difficult to draw conclusions regarding this possible trend. There were several experimental cases that decreased their levels of directiveness quite a bit, while others demonstrated no change. One caregiver participating in the RT intervention actually increased his level of directiveness, although he increased responsiveness and demonstrated other positive changes in interactional style that were not examined in this paper (e.g., increased warmth, the increased use of play strategies that foster child development). With this specific case, the directives he employed with his child were quite frequent, but also seemed appropriate, as his child was particularly difficult to engage. Therefore, this may be a limitation of the measure used to examine directiveness rather than a reflection of the ineffectiveness of the intervention. This is an instance that highlights the usefulness of distinguishing between directiveness and intrusiveness, or forcing the child to shift their focus of attention. This parent would not have been rated as being intrusive—he did not force the child to shift her focus of attention, but rather, employed directives (albeit frequently) that better engaged her in the interaction. However, as measured by the MBRS, he rated high in directiveness. Although the pilot data does suggest promise with regard to the RT intervention, further analysis with use of a larger sample will likely be illuminating in terms of further examining changes in caregiver directiveness.

It can be inferred that these results can be attributed to the RT intervention rather than other factors, such as community services. Three of the four members of the control group received community services, compared to only two member of the treatment group ($n=9$), and still, it was members of the treatment group that displayed more

increases in responsiveness and decreases in directiveness. More support for the influence of the RT intervention versus outside variables is the fidelity with which the intervention was implemented. Eleven tapes of hour-long RT sessions were pulled at random by graduate students in Occupational Therapy, who then rated the interventionist using a 24 point intervention fidelity checklist. Ratings for the interventionists ranged from 91-99%, with an average rating of 95.84%, indicating the interventionists implemented the RT intervention with high fidelity.

There are a variety of empirically supported treatments and early intervention techniques for children at risk for or diagnosed with developmental disabilities such as ASDs. Thus, although the findings presented in this paper were likely not significant due to the small sample size, there is no consensus regarding the absolute “best” treatment for ASDs. Despite strong evidence reviewed in this paper that a responsive, less directive interactional style is desirable as it is associated with developmental gains, it is worth mentioning that ABA strategies have been shown to promote development as well, and ABA strategies can be fairly directive. Why this apparent discrepancy? It may be that RT strategies and ABA strategies work better for different children and families, depending upon the individual situation and context. Although the overall aim of RT and ABA is the same (to improve a child’s development), the two intervention techniques differ in other goals, as previously discussed (e.g., RT aims to teach parents developmentally appropriate and responsive ways to interact with their children, and ABA sets out to decrease problematic behavior and increase desirable behavior). The results of the two interventions have been shown to be different, as well. Reported outcomes of RT strategies or associated with high levels of maternal responsiveness include more secure

attachment, more cognitively sophisticated exploration, more verbalizations during interactions, and higher levels of engagement (e.g., van den Boom, 1994). Behavioral techniques have been shown to teach children discrete skills and decrease problematic behavior. The two intervention strategies are not necessarily mutually exclusive; it may be possible to provide positive and negative reinforcement during an interaction while maintaining a responsive, low-to-moderately directive interactional style. Future research may clarify this possibility. At this time, it can be concluded that both interventions may be more relevant to particular families or at different points in a child's development. For example, ABA is likely a better fit for a child when the immediate goal is to reduce self-injurious behavior or to toilet train (e.g., Kroeger & Sorensen-Burnworth, 2009; Luiselli, 2009). RT is better suited to teach caregivers play and communication techniques that will help their children better engage in interactions without forcing them to shift their focus of attention (e.g., Girolametto, 1988; Landry et al., 2008; Mahoney et al., 1998). Perhaps a mix of the approaches (e.g., ABA for toilet training, RT for fostering child-centered play and language development) would be a viable and effective treatment option. Research does indicate that RT is associated with positive developmental outcomes; this paper suggests RT may be appropriate and effective for improving the productivity of caregiver interactional style with their 12-18 month-olds at risk for an ASD.

Implications

Because this and other studies have provided evidence that mothers of children with more autistic characteristics tend to be more directive than mothers of children displaying less autistic characteristics, and because research suggests a directive style is

not optimal for children with developmental disabilities, it stands to reason that caregivers of children with/at risk for autism are appropriate candidates for interventions aiming to increase responsiveness and decrease directiveness. Given that caregivers of children with ASDs have generally been found to have comparable levels of responsiveness when compared with mothers of typically developing children, and because increased responsiveness is considered developmentally beneficial for most caregiver-child dyads, this paper focused on the association between directiveness and autistic symptom presentation. Documenting this correlation may help dictate treatment plans for many families that are more individualized to this population's specific needs. This study provides empirical support for using responsive teaching or relationship focused interventions with parents of children 12-18 months who have been identified as at risk for an ASD. Although the changes in responsiveness and directiveness demonstrated by the treatment group were not significantly different than the changes in responsiveness and directiveness demonstrated by the control group, the changes in the intended direction do indicate the presence of a difference. Specifically, participants in the treatment group demonstrated a mean increase in responsiveness that was greater than the control group, and a mean decrease in directiveness that was greater than the control group. Considering the extremely small sample size, the results of this pilot data suggest that the RT intervention is impacting parent interactional style in the intended and hypothesized direction (i.e., increase responsiveness, decrease directiveness), and thus provide promising evidence that RT interventions could potentially be effective with this specific high-risk population. This RT intervention likely affected parent interactional style, and continuation of this research as part of the Early Development Project may

document associated positive developmental outcomes in the children in the experimental group relative to the controls, consistent with literature suggesting that changes in caregiver interactional behavior have been associated with gains in the child (Drew et al., 2002; Girolametto, 1988; Mahoney & Bella, 1998; Mahoney, Boyce, Fewell, Spiker, & Wheeden, 1998; Mahoney & Perales, 2003; Mahoney & Perales, 2005; Mahoney et al., 2006; Mahoney & Powell, 1988). The findings presented in this paper suggesting that RT is a well suited intervention specifically for caregivers of children at risk for an ASD, and that RT shows promise in improving caregiver interactional style in this aforementioned population, are relevant for professionals in the field of developmental disabilities and early intervention, as well as for families seeking empirically supported treatments for their children.

Some argue that early identification may lead to undesirable labeling. Accepting a diagnosis or label can be an emotional process for a parent or caregiver, as well as for the individual receiving the diagnosis (Huws, & Jones, 2008). A valid concern of professionals and parents is that a label will “follow” a child throughout his or her life, resulting in self-fulfilling prophecies, discrimination, lowered expectations, and stereotyping (Leigh, 1983). Proponents of this school of thought may be opposed to completing screeners like the FYI to determine the risk status of children who may consequently participate in an early intervention such as RT. Although early identification enables participation in early interventions, which have been shown to help children attain skills and to improve development, it is important to remember there is no universal formula applicable to every family and every child.

Limitations

There are several potential limitations related to the MBRS coding procedure, one of which is the generalization of parent-child interaction clips coded using the MBRS. Parents were videotaped for only 5 minutes playing with their children, and on as few as one occasions in one to two settings (lab and home). Although this is not atypical for interactional research, for some participants, these brief moments may not accurately capture their response style when interacting with their children across settings.

Although the rater was blind to whether the participants were assigned to the treatment or the control condition, the rater did know the MBRS scores for each participant at Time 1 before coding Time 2. Although this did not prove to be a major methodological flaw, it may have been better research practice to not have access to this information prior to coding. In addition, it may have been helpful to supplement the information garnered using the MBRS with another similar measure, such as the Parent/Caregiver Involvement Scale (P/CIS; Farran, Kasari, Comfort, & Jay, 1986), a parent interaction rating form, for example, the Maternal Infant Responsiveness Instrument (MIRI; Amankwaa, Younger, Best, & Pickler, 2002), or to design a new system to measure behaviors more related to the concept of intrusiveness. Finally, the MBRS may not be appropriate for use with all populations. Parenting practices vary between cultures and ethnicities, and the MBRS may not adequately take this diversity into account. For that matter, Responsive Teaching may not adequately take diversity into account—as previously discussed, RT assumes that higher levels of responsiveness and lower levels of directiveness are optimal for all caregiver-child dyads, regardless of social, cultural, and familial norms. Although RT has been demonstrated to be associated with positive child outcomes in Eastern

cultures such as Korea, more evidence is needed on the applicability and generalizability of RT strategies on different cultures.

Another limitation of this study is the small sample size. The sample size used to analyze Hypotheses 1 and 2 did not lend itself to adequate power to detect statistically significant results. The small sample size used to investigate Hypothesis 2 also limited the type of statistical procedure that could be used, e.g., the sample size was not big enough to conduct a multivariate analysis of variance (MANOVA). In addition, as previously discussed, although results of Hypothesis 2 were not statistically significant, the trend that the treatment group evidenced more change on both variables than did the control group did exist, and results may have approached significance with a larger sample.

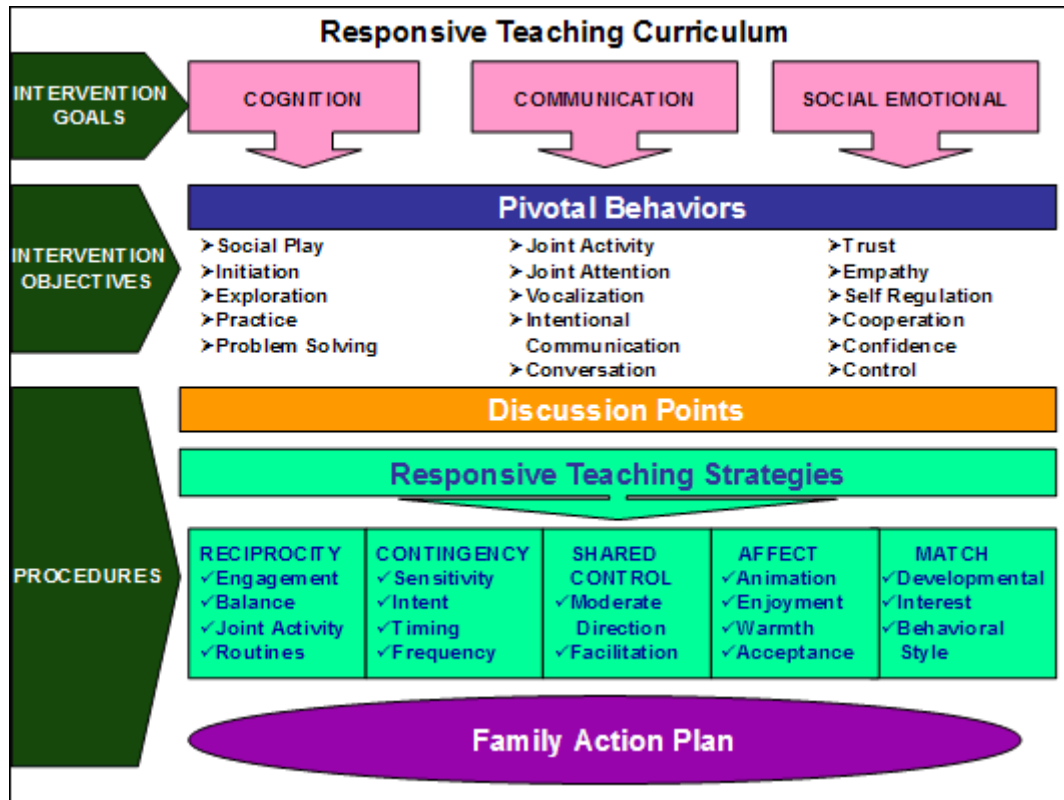
Future Directions

Future researchers may wish to replicate a similar study using a larger sample size, which would enable a higher power and the ability to use a variety of statistical analyses, such as MANOVA. Other useful methodological additions would be using two measures of parental directiveness and responsiveness, or having a second person trained on the MBRS and double code all clips, to mitigate the potential for subjectivity in such rating scales. Given the reasoning that styles of interaction are reinforcing and circular in nature (e.g., the child's behavior influences the way in which the caregiver responds, the way in which the caregiver responds influences future child behavior), it would be interesting to measure the child's interactional style using an instrument such as the Child Behavior Rating Scale (CBRS; Mahoney & Wheeden, 1998), and examine the relationship between child's and caregiver's interactional style. It would also be

worthwhile to examine the role parent stress or anxiety level plays in their level of directiveness. In addition, it would be useful to explore the effects of RT strategies on a variety of cultures that may differ in their parenting values and interactional styles. Finally, research or recommendations on how many hours per week RT should be implemented for maximum effect would be worthwhile.

To conclude, this study adds to the existing literature in that it identifies a relationship between early childhood autistic symptom presentation and caregiver interaction style. More specifically, the more autistic characteristics a child demonstrates, the more likely his/her parent is to interact with him/her in a directive manner, and this association begins early; it is evident when the child is only 12-14 months old. The documentation of this relationship dictates appropriate, evidence-based treatment approaches. Because literature suggests that a less directive interactional approach is desired, and because parents of children with autism are more likely to be more directive than parents of typically developing children, it follows that parents of children with autism or at risk for autism are good candidates for a Responsive Teaching intervention.

Figure 1. Responsive teaching curriculum



(retrieved from www.responsiveteaching.org on 11/14/08)

Table 1. Pivotal Behaviors Targeted in RT

Cognition	Communication	Social-Emotional Functioning
Social Play	Joint Activity	Trust
Initiation	Joint Attention	Empathy
Exploration	Vocalization	Cooperation
Problem Solving	Intentional Communication	Self Regulation
Practice	Conversation	Feelings of Confidence Feelings of Control

Table 2. Components and Dimensions of Strategies for Interactive Behavior

RECIPROCITY – frequent episodes of interaction that are characterized by a balanced, “give and take” relationship

Engagement

- Be physically available and interactive
- Play frequently together
- Get into my child’s world
- Use mirroring and parallel play to join an activity
- Expect my child to interact

Balance

- Take one turn and wait
- Keep my child for one more turn than usual
- Play back and forth with sounds
- Get from my child as much as I give
- Communicate less so my child communicates more

Joint Activity Routines

- Play face-to-face games without toys
- Sustain repetitive play or action sequences
- Join perseverative play (make it interactive)
- Play with my child with toys
- Make a habit of communicating during joint activity routines

CONTINGENCY – interactions that have an immediate and direct relationship to a child’s previous behaviors that support and encourage the child’s actions, intentions, and communications

Awareness

- Observe my child’s behavior
- Take my child’s perspective
- Be sensitive to my child’s state

Timing

- Respond quickly to my child’s signals, cries, or nonverbal requests
- Respond immediately to little behaviors
- Discipline promptly and comfort

Intent

- Respond to unintentional vocalizations, facial displays, and gestures as if they were meaningful conversations
- Accept incorrect word choice, pronunciation, or word approximations by responding to my child’s intention
- Translate my child’s actions, feelings, and intentions into words
- Rephrase unclear vocalizations and word approximations with words that match my child’s actions or intentions
- Interpret noncompliance as a choice or lack of ability

Frequency

- Explore how RT strategies can be used to enhance my child’s participation throughout daily routines
- Encourage multiple caregivers to use RT strategies

SHARED CONTROL – guidance and direction that facilitates and expands the actions and communications which the child initiates or leads

Moderate Direction

- Communicate without asking questions
- Imitate my child's actions and communications
- Give my child frequent opportunities to make choices

Facilitation

- Expand to show my child the next developmental step
- Expand to clarify my child's intention or to develop my child's topic
- Wait silently for a more mature response
- Play for a purpose
- Change the environment

AFFECT – expressive, animated and warm interactions that are characterized by enjoyment or delight in interacting with the child

Animation

- Be animated
- Wait with anticipation
- Respond to my child in playful ways
- Be more interesting than my child's distractions
- Accompany my communications with intonation, pointing, and nonverbal gestures

Enjoyment

- Act as a playful partner
- Interact for fun
- Turn routines into games
- Repeat activities my child enjoys

Warmth

- Be physical but gentle
- Respond affectionately to my child's cries and needs for attention
- Comfort my child when he or she is fussy, irritable, or angry

Acceptance

- Value what my child is doing
- Treat my child's fears as meaningful and legitimate
- Accept whatever my child does
- Talk about the novel, funny, and good things my child is doing

MATCH – interactions and requests that are adjusted to the child's developmental level, current interests, and behavioral style or temperament

Developmental Match

- Interpret my child's behavior developmentally
- Know the developmental skills my child seems ready to learn
- Request actions that match my child's developmental level
- Act in ways my child can act
- Communicate the way my child communicates
- Have developmentally appropriate rules and expectations

Interest Match

- Read my child's behavior as an indicator of interest

- Follow my child's focus of attention
- Follow my child's lead

Behavioral Style Match

- Be sensitive to my child's sensations
- Observe how my child ordinarily engages in interaction
- Respond to my child's behavioral state
- Have expectations that conform to my child's behavioral style
- Match my child's interactive pace

Table 3. FYI Return Rates by Month

Year	Month	Labels printed	Responses	Response rate
2008	Feb	740	173	23%
	March	885	193	22%
	April	850	180	21%
	May	876	177	20%
	June	868	204	24%
	July	882	164	19%
	Aug	871	148	17%
	Sept	898	137	15%
	Oct	380	17	5%
	Nov	795	138	17%
	Dec	892	174	19%
2009	Jan	880	195	22%
	Feb	937	163	17%
	March	899	162	18%
	April	200	29	14%
Total		11,853	2254	19%

Figure 2. Abbreviated EDP study procedure

Aspects of Early Development Project Utilized in this Paper

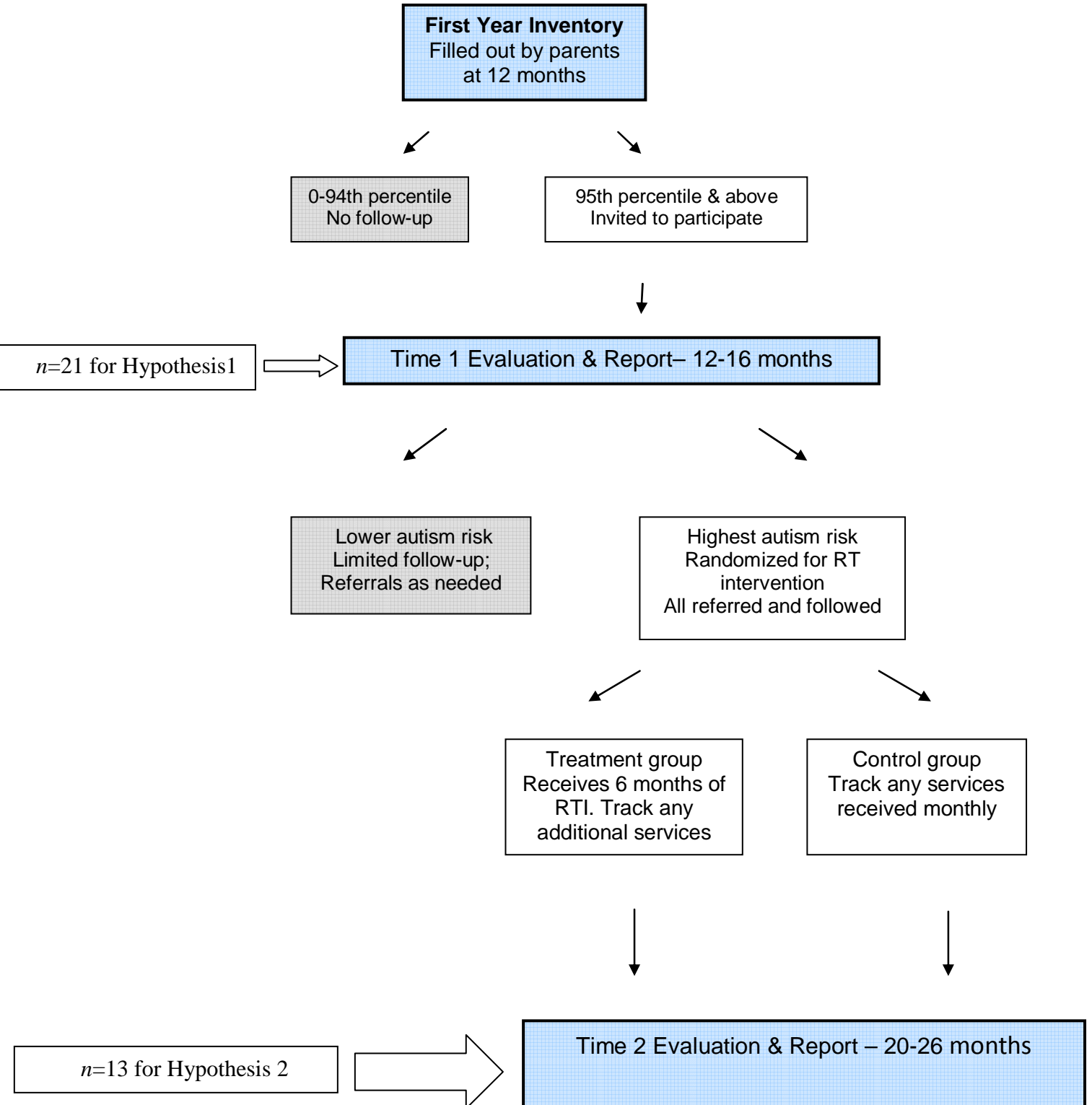


Table 4. Demographic Data for $n=23$

Child Gender

Male: $n=22$; 96.65%

Female: $n=1$; 4.35%

Child Race

White: $n=16$; 69.56%

Not reported: $n=3$; 13.04%

Black/African American: $n=2$; 8.70%

Half Asian, Half European: $n=1$; 4.35%

Half White, Half Black/African American: $n=1$; 4.35%

Child Ethnicity

Not Hispanic/Latino: $n=17$; 73.9%

Not reported: $n=6$; 26.1%

Mother Race

White: $n=18$; 78.26%

Not reported: $n=3$; 13.03%

Black: $n=2$; 8.70%

Mother Ethnicity

Not Hispanic/Latino: $n=17$; 73.9%

Not reported: $n=6$; 26.1%

Father Race

White: $n=16$; 69.56%

Black/African American: $n=3$; 13.04%

Nor reported: $n=3$; 13.04%

Asian: $n=1$; 4.35%

Father Ethnicity

Not Hispanic/Latino: $n=17$; 73.9%

Not reported: $n=6$; 26.1%

Total Household Income

30,001-35,000: $n=1$; 4.35%

35,001-40,000: $n=0$; 0%

40,001-45,000: $n=0$; 0%

45,001-50,000: $n=2$; 8.7%

50,001-60,000: $n=1$; 4.35%

60,001-70,000: $n=2$; 8.70%

70,001-80,000: $n=1$; 4.35%

80,001-90,000: $n=0$; 0%

90,001-100,000: $n=4$; 17.39%

100,001-150,000: $n=3$; 13.04%
150,001-200,000: $n=2$; 8.70%

Mother Education

Associates/Two year degree: $n=0$; 0%
Courses toward college: $n=2$; 8.70%
College degree: $n=9$; 39.13%
Master's degree: $n=7$; 30.43%
Professional degree: $n=1$; 4.35%
Courses toward college and vocational degree: $n=1$; 4.35%
Not reported: $n=3$; 13.04%

Father Education

Associates/2 year degree: $n=4$; 17.39%
Courses toward college: $n=1$; 4.35%
College degree: $n=11$; 47.35%
Master's degree: $n=2$; 8.70%
Professional degree: $n=2$; 8.7%
Not reported: $n=3$; 13.04%

Marital Status

Married: $n=16$; 69.557%
Divorced: $n=1$; 4.35%
Not reported: $n=6$; 26.09%

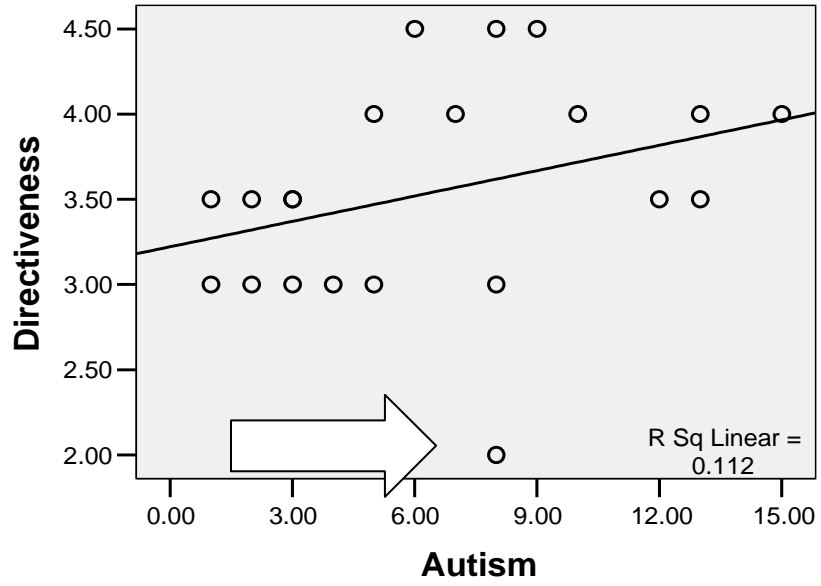
Siblings

None: $n=11$; 47.83%
1 older: $n=7$; 30.43%
1 younger: $n=1$; 4.35%
2 older: $n=1$; 4.35%
Not reported: $n=3$; 13.04%
Of these siblings, diagnosed with autism: $n=1$; 4.35%

Primary Language spoken/heard in home

English: $n=17$; 73.91%
Not reported: $n=6$; 26.09%

Figure 3. Scatterplot from Bivariate Linear Regression Analysis Including Outlier



Arrows indicate outlier, subsequently removed from follow up analysis

Table 5. Cognitive Functioning in the Treatment vs. Control Groups

ELC	Treatment	Control
Low ELC score	58	80
High ELC score	140	102
Average ELC score	91	93

Table 6. AOSI scores of the Children in the Treatment and Control Groups

AOSI	Treatment	Control
Low AOSI score	3	2
High AOSI score	15	13
Average AOSI score	7.9	6

Table 7. Average Change in Responsiveness and Directiveness in Treatment and Control Groups

	Treatment	Control	Results
Avg Change in Responsiveness	+0.41	+0.08	$p=.20$
Avg Change in Directiveness	-0.17	+0.0	$p=.36$

Table 8. Directiveness and Responsiveness (high, low, averages) Between Treatment and Control Groups

	Treatment	Control
Directiveness at Time 1 (high)	4	4.5
Directiveness at Time 1 (low)	2	3
Avg Directiveness Time 1	3.34	3.63
Avg Directiveness Time 2	3.17	3.63
Responsiveness at Time 1 (high)	4.3	4
Responsiveness at Time 1 (low)	2	3
Avg Responsiveness at Time 1	3.18	3.41
Avg Responsiveness at Time 2	3.59	3.5

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