IMPACT OF PARENT-IMPLEMENTED CONTINGENT IMITATION ON YOUNG CHILDREN AT-RISK FOR ASD

by

Susan R. Killmeyer

Bachelor of Science, University of Pittsburgh, 1979

Master of Education, University of Pittsburgh, 2007

Submitted to the Graduate Faculty of

the School of Education in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

University of Pittsburgh

2017

UNIVERSITY OF PITTSBURGH

SCHOOL OF EDUCATION

This dissertation was presented

by

Susan R Killmeyer

It was defended on

June 16, 2017

and approved by

Doug Kostewicz, Ph.D., BCBA-D, Associate Professor,

Department of Instruction & Learning

Rachel Robertson, Ph.D., BCBA-D, Assistant Professor,

Department of Instruction & Learning

Robert Noll, Ph.D., Professor, Department of Psychology

Dissertation Advisor: Louise Kaczmarek, Ph.D., Associate Professor,

Department of Instruction & Learning

IMPACT OF PARENT-IMPLEMENTED CONTINGENT IMITATION ON YOUNG CHILDREN AT-RISK FOR ASD

Susan R Killmeyer, PhD

University of Pittsburgh, 2017

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by pervasive deficits in social orienting and social engagement. Research suggests that parent-implemented interventions using responsive interactive techniques may be effective to increase social engagement in very young children with ASD, although more work is needed to examine how best to support a responsive parental style in this exceptionally heterogeneous population. Emerging evidence indicates that contingent imitation (CI) may be uniquely effective to increase social engagement in children with ASD. This study used a multiple-baseline-across-participants single case design to examine how three caregivers learned to use CI at home with fidelity with their young children at risk for ASD, how use of CI was associated with changes in directive adult behaviors and to identify associated changes in child social engagement and eye gaze. Results demonstrate that caregivers quickly acquired the accurate use of this simple technique at home and sharply reduced their use of questions and directives during play sessions. Child social engagement levels and social eye gaze demonstrated positive changes across intervention and maintenance phases. Implications for research and early intervention practice are discussed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PREFACE

This work was funded by the Office of Special Education Projects (OSEP), United States Department of Education, through an Apprenticeship in Special Education Research, Instruction and Leadership (ASPIRE) fellowship. The author would first like to thank the incredible families who participated in this research over the past years, and express her deep gratitude for all that they taught her. The author is also grateful for the extremely deliberate and insightful work of Amy Yelich, M.Ed., as she coded child and adult participant behaviors for two research studies over the past four years. She would also like to thank the University of Pittsburgh Autism Specialization Early Intervention team for their unflagging enthusiasm and creative collaboration over time, and the members of her Committee who provided such an amazing depth of knowledge and wisdom throughout the course of this research. She would especially like to thank her Advisor, Dr. Louise Kaczmarek, who opened the door to a life-changing opportunity for learning and working with great patience and attention. Most importantly, she would like to thank her family and friends who walked with her with so much love every step of the way.

1.0 INTRODUCTION

More than ever, many parents are learning that their children in the first years of life are at risk for or have an autism spectrum disorder (ASD); public awareness and effective screening practices have improved the chances that children with early signs of ASD will be identified as toddlers or even infants (CDC, 2014; McManus, Carle, & Rapport, 2012). This is good news, as early diagnosis creates the opportunity to address critical early differences in social attention and engagement seen in children with ASD (Volkmar, Lord, Bailey, Schultz, & Klin, 2004; Zwaigenbaum et al., 2009) and offers a unique "window" through which to impact lifelong developmental trajectories (Wallace & Rogers, 2010; Webb, Jones, Kelly, & Dawson, 2014). Although a late onset of verbal language is often the first signal that a child may be at risk for ASD (Zwaigenbaum et al., 2009), it is thought that language delay may represent a consequence of earlier-occurring and ongoing impairments in dyadic social orienting, triadic joint engagement (JE) and joint attention (JA; Adamson, Deckner, & Bakeman, 2010; Jones & Klin, 2013; Mundy & Crowson, 1997) and that the non-normative acquisition of JA and JE represent a foundational impairment in the development of children with ASD (Brian, Bryson, & Zwaigenbaum, 2015; Jones & Klin, 2013; Mundy, Sullivan, & Mastergeorge, 2009).

1.1 JOINT ENGAGEMENT

The development of critical early dyadic social skills (orienting to faces, mutual gaze, reciprocal vocal exchanges, imitation) and triadic JA behaviors (gaze-following, alternating gaze, and showing/pointing) occur in the context of engagement *states* that fluidly change throughout the day based on focus of attention and become more complex as children mature (see Table 1). As reported through decades of work by Lauren Adamson and her colleagues (Adamson, Bakeman, & Deckner, 2004; Adamson, Bakeman, Deckner, & Nelson, 2012, 2014; Adamson, Bakeman, Deckner, & Romski, 2008; Adamson et al., 2010; Bakeman & Adamson, 1984), infants first engage in social learning through intimate *person-engaged* (PE) interactions which are fueled by the intrinsic reward mechanisms of warmly positive caregiving behaviors. As infants grow, they become able to manipulate objects in a state of predominantly *object-engaged* play. It is through this engagement with objects that the opportunity arises for others to attend to the object play of infants and attribute meaning to that play by providing accompanying words, gestures, sounds and facial expressions, interactions referred to as "symbol-infused" (Adamson et al., 2004). Although infants are generally unable to talk at this age, adults commonly "surround" them with language and gestures (Adamson et al., 2004, p.72) while attributing meaning to the object and to their behaviors as they engage with objects, called *supported joint engagement* (SJE; Adamson et al., 2004). Importantly, adults often (but not necessarily) free the child of the expectation of social reciprocity during SJE, instead providing gestural, vocal/verbal and expressive symbols to map meaning onto object play as the children interact with objects (Adamson et al., 2004). In the relatively protected context of SJE, it is thought that children attend to these symbols provided by others and over time gain the ability to use these symbols themselves emerges. Finally, children begin to demonstrate *coordinated joint*

engagement (CJE) as they learn to respond to and initiate joint attention during social interactions. Given that JE is necessarily the product of both the behavior of the child and a communicative partner (usually the parent), researchers seeking to identify the mechanisms of JE often differentiate SJE states as either child-initiated SJE (CSJE) or adult-initiated SJE (ASJE; Adamson et al., 2014; Kasari, Gulsrud, Paparella, Hellemann, & Berry, 2015; Patterson, Elder, Gulsrud, & Kasari, 2013), important with regards to how learning may occur during states of SJE depending on the behavioral play style of the parent.

Table 1: Definitions of Engagement States

Engagement State*	Definition
Non-Socially Engaged (NSE)	Child is uninvolved with any specific person, people, objects or activity; child is on looking: watching the parent's activity but not taking part in that activity; child is object-engaged only: actively involved with playing with objects alone.
Person engagement (PE)	Child is involved solely with the caregiver as a social partner
Supported joint engagement (SJE)	Child and parent are actively involved with the same object, person, or event of interest but the child does not consistently acknowledge the parent. SJE will be coded as Adult-led (ASJE) if the adult chooses the play activity, and/or redirects the focus of attention from a child-selected object, person, or event. SJE will be coded as Child-led (CSJE) when the child chooses the activity or focus of attention.
Coordinated joint engagement (CJE)	Child and parent are actively involved with the same object, person, or event as the child repeatedly acknowledges the parent by alternating gaze with the parent from the point of shared focus throughout the interaction.

*Adapted from: From Interactions to Conversations: The Development of Joint Engagement During Early Childhood, Adamson L. B. et al., 2014; *Child Development*, *85*(3), 941–955.

1.1.1 Joint engagement and ASD

Children with ASD develop JE in highly variable ways in comparison to typical children and spend less time jointly engaged than typical children or children with other developmental delays (Adamson, Bakeman, Deckner, & Romski, 2008). In particular, they demonstrate ongoing differences in the acquisition of CJE and often begin to use symbols before they have acquired CJE, in stark contrast to typically developing infants and toddlers (Adamson et al., 2008). Despite these differences in the sequential acquisition of JE, it has been suggested that SJE, particularly CSJE, is a sensitive "facilitative context" for early language learning for all children, including those with ASD, as children attend to symbols, learning to respond to and eventually initiate joint attention (Adamson et al., 2008, p. 92). Further, there is evidence that parents who maintain a responsive and non-directive style during supported play more effectively promote initiations of social engagement in young children with ASD (Mahoney, 2013; Patterson et al., 2013; Siller, Swanson, Gerber, Hutman, & Sigman, 2014). This is important, as joint engagement has been positively associated with the emergence of expressive and receptive language (Adamson et al., 2014; Clifford & Dissanayake, 2009).

1.2 PARENT-IMPLEMENTED INTERVENTIONS AND ASD

Over the past several decades, researchers have targeted parent-child interactions through the use of parent-implemented interventions as a means of naturally integrating interventions for young children with Autism Spectrum Disorder (ASD) into the home environment to provide the frequency and intensity of intervention as recommended by the National Research Council

(NRC; 2001). A number of parent-mediated approaches designed to improve social communication, joint engagement and joint attention in young children with ASD have shown early promise, typically using a combination of evidence-based practices drawn from both behavioral and developmental theory. These approaches have largely evolved in response to a call for interventions that are appropriate for use with young children in the context of their natural environments. These combined approaches have been referred to as *naturalistic developmental behavioral interventions* (NDBI's; Schreibman et al., 2015) and include both basic tenets of behavioral learning theory (e.g., Lovaas, 1987) as well as elements of constructivist developmental theory (e.g., Bruner, 1978; Choe, Sameroff, & McDonough, 2013; Vygotsky, 1997), which presumes that children are active learners in the context of warmly affective social interactions and that learning is acquired in predictable developmental sequences. NDBI interventions have demonstrated variable but generally positive outcomes across a variety of developmental domains (Schreibman et al., 2015). Furthermore, an emerging body of evidence suggests that use of parent-mediated techniques is effective to influence JE specifically (Kasari et al., 2014; Kasari, Freeman, & Paparella, 2006; Kasari, Gulsrud, Wong, Kwon, & Locke, 2010; Kasari et al., 2015; Shire, Gulsrud, & Kasari, 2016). Despite this early encouraging evidence that parent-mediated approaches may effectively increase JE and other early social-communication targets, recent reviews have cited the need for increased rigor in these types of studies, especially with regards to the use of fidelity procedures, and to more closely address exactly how parents acquire and subsequently implement study techniques with their children over time (Lieberman-Betz, 2014; McConachie & Oono, 2013).

1.2.1 Intervention components

NDBI approaches currently represent the bulk of evidence that parent-delivered interventions may be effective to improve social-communication outcomes generally, although little is yet understood about how they influence JE specifically. NDBI models employ a range of techniques that extend from relatively structured behavioral techniques using adult-led prompting, shaping, chaining and reinforcement (e.g., Ingersoll & Schreibman, 2006; Koegel, Koegel, Vernon, & Brookman-Frazee, 2010) to the use of more responsive and developmentally-focused, relationship-based techniques with a sharper focus on the quality of dyadic interactions (e.g., Baranek et al., 2015; Mahoney & Perales, 2003; Siller, Swanson, Gerber, Hutman, & Sigman, 2014). Despite these differences, NDBI interventions share common elements, as described in a recent comprehensive review of NDBI treatments for children with ASD (Schreibman et al., 2015): 1) the presumptive utility of systematic *prompting and reinforcement procedures*, 2) the use of *manualized procedures and fidelity measures*, 3) *individualization* of child strategies and goals, 4) *ongoing progress monitoring,* 5) the use of *child-initiated teaching events to optimize child engagement*, 6) the incorporation of planned *environmental arrangements* to increase social interaction, 7) the use of *natural reinforcement in social contexts*, 8) the use of *supported turn-taking* to increase social reciprocity and social awareness, 9) the inclusion of *modeling strategies mapped onto child-identified foci of interest* and 10) the importance of *contingent imitation* to promote interpersonal awareness and synchronistic behaviors.

Many of the so-called "developmental" techniques typically used in NDBI interventions (following a child's focus of interest, maintaining face-to-face proximity, the provision of language and play models, contingent imitation) align with a substantive body of work which

suggests that social engagement, specifically social initiations, can be scaffolded through the use of a *responsive* parent interactive style (e.g., Feldman, 2007; Landry, Smith, & Swank, 2006; Mahoney, Kim, & Lin, 2007; Siller & Sigman, 2008). The active role of responsive parental interactions can be traced to early work in the areas of early development, attachment, as well as joint attention over a period of decades (e.g., Bruner, 1978; Hobson, 1993; Mundy & Crowson, 1997; Trevarthen, 1979; Tronick, 1989). This robust body of work suggests that precursors to joint attention can be seen in the context of early person-engaged reflexive smiling and proto-conversations, and develop further through responsive face-to-face imitation games. As children gain increased motor skills, they exhibit an increased ability to engage with and manipulate objects as parents join them in object play, often imitating play actions while providing communicative symbols. Through being imitated, it is thought that children learn awareness of their own actions and how a communicative partner understands these actions (e.g., Trevarthen & Aitken, 2001, Mundy et al., 2007). As children attend to objects in the presence of adults, they access a wide variety of social contingencies based on adult responses to their attention and actions. Through this social learning, the ability to reciprocate interactively and to coordinate attention increases as children begin to automatically understand and predict the attention and intention of others (e.g.,Trevarthen, 2011). The NDBI strategies outlined above appear to combine this seminal work with the notion that an increased and more focused level of teaching can occur with regard to specific skills after joint engagement has been consistently established, with the use of behavioral strategies involving more directive teaching techniques. Although these methodologically different groups of intervention techniques are often, if not always, combined within NDBI intervention packages, it is still not yet clear how any given technique or

set of techniques may be active to improve developmental outcomes individually in infants and toddlers.

1.2.2 Responsive and Directive Parent-Implemented Techniques

Research on parent-implemented interventions suggests that parent use of responsive techniques during social interactions with their young children with ASD is associated with increases in child joint engagement (Patterson et al., 2013), social initiations (Ruble, McDuffie, King, & Lorenz, 2008), and language acquisition (McDuffie & Yoder, 2010; Siller & Sigman, 2008). Further, a recent study has suggested that the use of responsive parenting techniques may differentially impact language outcomes of various populations of young children with ASD. Specifically, responsive comments during episodes of joint engagement were uniquely associated with improvements in child language in minimally verbal toddlers (using < 5 words) while directives for language following a child's focus of interest were associated with improved language outcomes in toddlers demonstrating a higher level of verbal development (Haebig, McDuffie, & Weismer, 2013). Descriptive research on parenting styles of children with ASD has revealed that parents of children with ASD often display a higher level of directiveness than those with typically developing children (Freeman & Kasari, 2013). This directive style is associated with lower levels of child engagement, social initiations, and language acquisition (e.g., Landry et al., 2012; Mahoney, 2013).

1.3 STATEMENT OF THE PROBLEM

Given that responsive parenting behaviors appear to be most appropriate for use with very young children with ASD, and that parents of children with ASD are more likely to manifest a directive parental style of interaction, researchers must identify the best ways to teach parents to manifest responsive behaviors with their child. Parent use of contingent imitation (CI) in particular may represent an exceptionally useful way to teach parents to attend responsively to the vocalizations, expressions, gestures, and affect of their children with ASD without directing/re-directing their actions, and has been uniquely associated with increases in alternating gaze (Ingersoll & Schreibman, 2006) as well as with overall JE (Gulsrud, Hellemann, Shire, & Kasari, 2015) in children with ASD. By identifying more precisely how parents learn and use responsive techniques such as CI in their homes with their young children with ASD and by examining specifically how the use of CI may be active to influence child joint engagement during play interactions, researchers may come closer to understanding how best to provide treatment to toddlers with ASD.

2.0 LITERATURE REVIEW

Contingent imitation has been used over the past decades in a variety of forms but is generally defined as the immediate and accurate imitation of child actions, vocalizations, gestures, and words, and affect in full view of the child. Some researchers instruct the participating adult to imitate only "appropriate" behaviors (e.g., JASPER; Kasari et al., 2010, 2008, 2014, 2015) but in general, the use of this procedure involves adult contingent imitation of any child behavior that is not considered harmful or destructive. As previously reviewed, it is thought that parents naturally imitate infants in the context of early face-to-face imitation "games," taking turns as an infant emits a vocalization, facial expression, or gesture and the parent contingently imitates the behavior and waits for a subsequent behavior. This early "serve and return" interaction is thought to be foundational to human social learning, and a primary influence in the development of early neural architecture (Shonkoff, 2010; Trevarthen, 2011). Unlike other responsive adult behaviors, it has been suggested that imitation in particular serves to synchronize social awareness between individuals, functioning as "social glue" (Lakin, Jefferis, Cheng, & Chartrand, 2003, p. 197) to strengthen social affiliation and to promote prosocial behaviors (e.g., van Baaren, Janssen, Chartrand, & Dijksterhuis, 2009). Indeed, the bi-directional action of imitation (being imitated and performing imitations) may be active in the first months of life, as infants acquire social learning in the context of their own behavior. It is thought that through being imitated, typical infants gain experience with predictable patterns of

social interaction as they learn that others do what they do (e.g., Meltzoff, 2007). Despite the obvious relevance of imitation to the development of early social skills, little research has been conducted focused on the effectiveness of CI to influence human social behavior across populations of children.

2.1 CI STUDIES WITH TYPICAL INFANTS

Evidence suggests that typical infants are likely to respond to CI using a variety of social behaviors including smiling, gaze shifts, object-focused behaviors, and/or non-imitative vocalizations, and that the level of infant responses to maternal CI may be associated with later vocabulary levels (Masur & Olson, 2008). An early study reported increases in infant vocalizations when adults provided CI vs. contingent non-imitative responses to typical infants (Field, Guy, & Umbel, 1985). More recently, a study by Carpenter et al., (2014) observed 48 typically-developing 18-month-olds who were either imitated or not imitated by a researcher, and then assessed for prosocial behaviors when a second researcher acted out a "needing help" motif (e.g., dropping sticks and failing to be able to open a cabinet door). The group of children that had been imitated were more likely to demonstrate prosocial helping behaviors than the group of children who had instead been provided with contingent but non-imitative comments (Carpenter, Uebel, & Tomasello, 2014). Finally, another recent study reported more imitative return vocalizations in infants during a CI condition compared with a yoked control (Hirsh, Stockwell, & Walker, 2014).

2.2 CI STUDIES WITH CHILDREN WITH AUTISM

Despite the need for more work specific to the use of CI with young children with ASD, existing evidence suggests that use of CI may positively influence child outcomes in this population, especially for early learners. In a 1984 correlational study, Dawson and Adams examined the responses of 15 children with ASD to three interactive procedures performed by a researcher in a clinical setting: 1) contingent imitation of child actions 2) model of a familiar action and 3) model of a novel action. It was found that children with low initial levels of imitative ability increased levels of social responsiveness, eye contact, and functional play in the contingent imitation condition, although children with higher levels of function responded similarly to all three conditions. Katagiri et al. (2010) examined changes in social eye gaze and prosocial behaviors of 16 two- and three-year old children with autism when a researcher introduced a CI procedure. In the first phase, the researcher manipulated a set of toys in front of the child. In the second phase, the researcher imitated all child actions, and then concluded with a final phase identical to the first phase. Significant increases in social eye gaze and prosocial behaviors (e.g., smiling, social vocalizations/verbalizing, touching) were reported. Similarly, researcher-implemented CI was associated with increased frequency and duration of social eye gaze in six non-verbal children with autism (Tiegerman & Primavera, 1984). A correlational study done by Dawson and Galpert (1990) examined the effect of 20-minutes a day for 2 weeks of mother-implemented CI on social eye gaze in 15 children between the ages of 2-6 with autism. A statistical analysis indicated an increase in social eye gaze across study phases.

In another group of studies, CI has been studied using a modification of the Still Face paradigm (Tronick, Als, Adamson, Wise, & Brazelton, 1978). For example, in 2000 Nadel et al. conducted a study in which twenty non-verbal/ minimally verbal school-aged children with

autism interacted with an unfamiliar adult over four phases: in the first phase, the child entered a room with a sofa, table, chairs and two sets of identical toys. An unfamiliar adult sat with a still face and body for three minutes. In the second phase, the adult imitated everything the child did with the use of the identical set of toys. In the third phase the condition reverted to the still face condition, and in the fourth phase the adult contingently responded (non-imitative) to spontaneous child bids for interaction. Results found that children showed increased rates of pro-social behaviors (looking at or touching the adult) in the second still-face condition (Nadel et al., 2000). Subsequent group studies employing a control condition (non-imitative contingent response) confirm that the use of CI alone resulted in increased proximal and distal social behaviors (Escalona, Field, Nadel, & Lundy, 2002; Field, Field, Sanders, & Nadel, 2001) as well as increased elicited imitation in a generalization setting (Heimann, Laberg, & Nordoen, 2006) in minimally verbal children between the age of 4-6 years of age with autism. A more recent study (Ezell, 2012) coded video from the Field (2001) study to document changes in joint attention behaviors in children with ASD and reported significant associations of referential looking and gaze following after use of CI as opposed to non-imitative contingent response. Sanefuji & Ohgami (2011) used the same procedural paradigm to examine the effects of maternal contingent imitation vs. maternal contingent response for use with a group of children with ASD in contrast with a group of typically developing children. The children with ASD were more likely to initiate communicative eye gaze in the imitation condition, while the typically developing children did not show a significant difference between conditions of eye gaze frequency. Most recently, Slaughter & Ong, 2014 also used a variation of the Still Face model to contrast the use of 3-minute periods of CI by mothers and by an unfamiliar adult with ten children with autism (mean age= 5 years, 5 months). Results indicate that although both proximal and distal social

behaviors increased, as did time spent playing alone when either partner used CI, the increases were greater when the mother implemented the procedures as opposed to the unfamiliar adult.

2.3 STUDIES ISOLATING CI WITHIN ASD INTERVENTION PACKAGES

A number of NDBI intervention packages designed for young children with ASD also include CI in some form (Ingersoll, Lewis, & Kroman, 2007; Ingersoll & Schreibman, 2006; Ingersoll & Wainer, 2013; Kasari et al., 2014, 2010, 2015; Kasari, Paparella, Freeman, & Jahromi, 2008; Schertz, Odom, Baggett, & Sideris, 2013; Schertz & Odom, 2007), although only two study groups have analyzed the action of CI alone on child outcomes when used in intervention packages. Specifically, in a multiple-baseline-across-participants study in 2006 (Ingersoll & Schreibman, 2006), the NDBI approach Reciprocal Imitation Training (RIT) was used to teach children imitation skills, where therapists began the intervention by using contingent imitation in conjunction with linguistic mapping in the first phase of the study. After this first phase, children were taught to imitate through the use of four additional phases during which contingent imitation was interspersed with linguistic mapping as well as play action models/expansions, pacing the rate at which models were provided, providing prompts to complete imitations, offering praise for completed imitations based on first familiar action models, and then gradually introduced novel action models. Although this study was not designed to measure the effects of study components separately, visual inspection of results suggested that an increase in alternating gaze (low-level initiating joint attention; IJA) was associated with the onset of CI in four of the five participant children. Interestingly, gains in alternating gaze were maintained across generalization to novel situations in the two children

who were minimally verbal, while the verbal participants who demonstrated initial increases in alternating gaze with the introduction of CI returned to baseline levels during generalization. In this study, overall results suggested that the combined use of all of the study techniques had a positive influence on both spontaneous and elicited imitation skills.

The NDBI joint attention intervention JASPER (Kasari et al., 2006, 2010, 2015, 2008) also included a CI component they call *Mirrored Pacing*. As in other NDBI approaches, this technique is packaged into a modular intervention where each technique is designed to support the acquisition and use of subsequent techniques. In JASPER, *Mirrored Pacing* is introduced as a second module, after parents are taught *Environmental Arrangement* as a means of facilitating face-to-face proximal engagement. Following *Mirrored Pacing*, instruction progresses into the use of modeling and expanding language and play (Communication), and finishes by teaching parents a more parent-directed set of techniques (Prompting) in the final module. Although other NDBI approaches share this general progression (e.g., Project ImPACT; Ingersoll and Dvortczak, 2010), little is known about how each of these mechanistically distinct modules may be active to improve child outcomes. In 2015, Gulsrud et al. (2015) conducted a statistical analysis of the Kasari et al. (2015) study to determine which, if any, of the components of JASPER mediated child JE outcomes. Results indicated that of all the included strategies, only the CI procedure mediated child JE outcomes.

2.4 CI STUDIES WITH OTHER POPULATIONS

Gazdag and Warren (2000) included three young children with intellectual disabilities, during which an adult contingently imitated child vocalizations in a multiple-baseline-across-participant design. Use of adult vocal CI was associated with an increased frequency of spontaneous imitations in all three children in the generalization phase, although elicited imitations were not improved. Finally, a study of maternal contingent vocal imitations of 11 infants at risk for developmental delay reported increases in the rate of infant vocalization in the CI condition as opposed to a DRO condition, and the authors suggest that increased vocalizations reflect the exceptional reinforcement value of maternal contingent imitation (Pelaez, Virues-Ortega, & Gewirtz, 2011).

2.5 SUMMARY

Little empirical work has been done to investigate the action of CI on human social behavior in any given population. There is some evidence that CI may be active to increase the social behaviors of typical infants at a very young age (Carpenter et al., 2013; T. Field et al., 1985; Hirsh et al., 2014; Masur & Olson, 2008) as well in infants at risk for developmental delay (Pelaez, Virues-Ortega, & Gerwirtz, 2011). In children with ASD, research suggests that the use of CI is most commonly associated with increased eye gaze and vocalizations, most often in minimally-verbal populations (Dawson & Adams, 1984; Escalona et al., 2002; Field et al., 2001; Heimann et al., 2006; Nadel et al., 2000; Sanefuji & Ohgami, 2011), although one study suggested that CI may also be associated with lower level IJA in this population (Ezell, 2012).

Finally, although CI is frequently included in NDBI intervention packages (e.g., Ingersoll & Dvortcsak, 2010; Ingersoll & Schreibman, 2006; Kasari et al., 2006; Schertz et al., 2013), very few of these approaches have analyzed the discrete action of CI within those packages. Of the two studies that reported on the effects of CI as it was used as a part of an intervention package (Gulsrud et al., 2015; Ingersoll & Schreibman, 2006), it appears that CI may indeed be active to influence alternating gaze and/or joint engagement outcomes. Virtually all existing research on the use of CI included early learners; very young infants (Hirsh et al., 2014; Masur & Olson, 2008; Pelaez et al., 2011), minimally-verbal children with ASD (Escalona et al., 2002; Ezell, 2012; Field, Sanders, & Nadel, 2001; Heimann et al., 2006; Nadel et al., 2000; Sanefuji & Ohgami, 2011; Tiegerman & Primavera, 1984) or non-verbal children with intellectual disability (Gazdag & Warren, 2000). Furthermore, studies also including typical children or higher-functioning participants noted that CI was not associated with significant and/or durable increases in social behaviors in those children (Dawson & Adams, 1984; Sanefuji & Ohgami, 2011, Ingersoll & Scheibman, 2006). These findings align well with research reporting that the use of responsive techniques may be effective specifically for minimally verbal populations of children with ASD (Haebig, McDuffie, & Weismer, 2013; Ruble et al., 2008), and suggest that CI may be uniquely appropriate for use with low-functioning or very young children with ASD.

Across the body of studies including children with ASD, authors suggest that CI facilitates social engagement in children with autism because a CI provides a focus on the child's existing behavior which is ostensibly interesting to the child without requiring a contingent social response (e.g., Sanefuji & Ohgami, 2013). Specifically, when an adult imitates a child's behavior, the child may attend to the social interaction free of the expectation of any specific response. The imitation may function as a representation of the child's own behavior as well as a

signal that this behavior was noticed and interesting to the communicative partner, thus increasing social synchronicity (e.g., Meltzoff, 2007). Researchers using a behavioral approach describe this action only slightly differently, stating that CI may serve to increase the saliency of social interaction for early learners by setting up a simple but highly recognizable set of social expectancies (e.g., Heimann et al., 2006).

Because CI is often included in intervention packages designed for young children with ASD and responsive parental behaviors (including CI) have been associated with increased social behaviors in early learners (Ruble et al., 2008), it is essential that researchers continue to examine the active mechanism of CI as a discrete procedure for use with very young children with ASD. If CI is indeed effective to increase early engagement behaviors of non-verbal populations, it may represent an exceptionally feasible first step for addressing the needs of infants and toddlers who have been identified as at-risk or have received a new diagnosis of ASD. More work is needed to determine precisely how the use of CI by a parent influences ongoing dyadic interaction and how these changes may then be associated with increased child engagement outcomes.

3.0 METHOD

As discussed, there is currently a dearth of evidence about how best to teach parents or other primary caregivers to adopt a responsive interactive style with their toddlers with at risk for or who have ASD, and more work is needed to identify the effectiveness of CI to increase levels of social engagement. Given this, the research questions are as follows: 1) what effect does the CI intervention package (i.e., didactics, implementation support, feedback) have on parent/caregiver use of CI with toddlers with ASD at home? 2) How do parents/caregivers maintain performance of CI at home with fidelity, once it has been attained, with the provision of weekly maintenance trainings and feedback sessions? 3) What effect does the CI intervention package have on parent/caregiver use of questions and directives during play interactions? 4) How is the use of CI with fidelity associated with changes in engagement and social eye gaze in children 3 years of age or younger with at risk for or who have ASD?

3.1 PARTICIPANTS

3.1.1 Recruitment procedures

Before study participants were recruited, the University of Pittsburgh reviewed and approved this study by expedited review under 45 CFR.110 and CFR.56.110. Subsequently, Part C Early Intervention providers serving Allegheny County (e.g., Service Coordinators, Developmental Therapists, Speech-Language Therapists, Physical Therapists) as well as provider agency administrators were provided with a flyer explaining the purpose of the study and providing details of participation. These personnel were asked to share the information with families as they saw appropriate, providing contact information of the primary researcher. Parents of children 36 months of age or younger at risk for or who were diagnosed with ASD were invited to participate in the study. Three parent-child dyads were recruited in total.

3.1.1.1 Inclusion and exclusion criterion

Children were required to have either a diagnosis of ASD as described in the Diagnostic Statistics Manual – 5th Edition (DSM-5; APA, 2013) or have been identified at risk for ASD by a pediatrician or by a licensed psychologist using a standardized autism screener (e.g., The Modified Checklist for Autism in Toddlers (M-CHAT; Robins, Fein and Barton, 2009; Childhood Autism Rating Scale, 2nd Edition (CARS-2; Schopler, Van Bourgondien, Wellman, & Love, 2010). Included children were required to demonstrate low levels of social communication as described in the screening procedures section. In addition, the adult participant needed to be the primary caretaker of the child during the day. Children were excluded from the study if they had been diagnosed with comorbid medical or sensory impairments (e.g., Down Syndrome,

Cerebral Palsy) or if they manifested moderate or high levels of social communication as identified through the screening procedures below. Children who attended full-time child care programs or who were cared for full-time at home by anyone besides the participating adult were excluded from the study. In addition, children whose parents had already participated in a structured parent-training program designed to increase social communication were excluded.

3.1.2 Screening and pre-assessment procedures

Screening procedures were conducted to ensure that participants meet the inclusion criterion. To begin, participant parents were be asked whether or not they were the full-time caregiver of the child during the day and whether or not they had participated in any other parent training on interactive techniques for use with children with ASD. If they responded that they were the primary caregivers of the child during the day and that they had not participated in previous parent training, the parent was asked to provide a copy of the diagnostic assessment report documenting either a diagnosis of or risk for ASD. Subsequently, the primary researcher conducted the M-CHAT to further confirm symptoms of ASD. Finally, participating adults completed the MacArthur-Bates Communication Development Index (MB-CDI; Fenson, 2007), a well-validated parent-completed assessment used to determine current levels of early communication functioning. Each recruited child was required to use <10 functional words as reported on the CDI protocol. After each child was found to meet the inclusion criteria, pre-intervention assessment measures were conducted during the same session. Once children met the qualification criterion, participating adults completed the Parent Demographic Survey (Appendix A), which asks about parent age, education, current employment status, geographic

location, household size, ages and/or ASD diagnoses of other children in the household, current medications and about ASD-specific services provided to the participant child.

Subsequently, two pre-assessment measures were conducted to determine the degree of heterogeneity among child participants: a) the Mullen Scales of Early Learning (MSEL; Mullen, 1995) and b) The Communication and Symbolic Behavior Scales Developmental Profile DP-ITC (CSBS DP-ITC; Prizant & Wetherby, 2002). The MSEL is a standardized instrument designed to comprehensively assess the developmental functioning of children with neurodevelopmental concerns from birth-68 months of age. This assessment is conducted directly with the child to evaluate abilities across five developmental domains: gross motor, fine motor, visual reception, expressive language, and receptive language, and also yields a single standard score, the Early Learning Composite (ELC). The CSBS DP-ITC provides information about communication skills of child participants in the following areas: 1) emotion and eye gaze, 2) communication, 3) gestures, 4) sounds, 5) words, 6) understanding, and 7) object use.

3.1.3 Participant descriptions

3.1.3.1 Andy and his aunt

Andy was a 34-month old Asian male, an only child living at home with his father, his aunt, and his grandfather. As his father worked full-time, Andy was cared for at home every day by his aunt who was the adult participant in the study. His aunt was 41 years old and had traveled to this country after Andy was born to help care for him (Table 1). Although she did not have a high level of English proficiency, Andy's father and grandfather were both proficient English speakers and one or both of them were present during all of the study sessions to assist with communication. Andy's father reported that the family tried to use English consistently with

Andy, although much of the time their native language was used in the home. In the screening phase, Andy scored as high risk for ASD on the M-CHAT. He demonstrated low levels of cognitive and communication functioning on the MSEL and the CSBS-DP Behavior Sample during pre-assessment. Andy was reported to use a variety of communicative gestures on the MB-CDI, although he used only one word (Table 2). Andy received one hour each of speech-language therapy, occupational therapy, and developmental therapy weekly at home through Part C Early Intervention providers. During the last weeks of the study, Andy transitioned to a local public inclusive classroom for three afternoons a week (Table 2). Andy did not receive any wrap-around behavioral health services and received no medications. Andy's family described him as extremely active at all times and reported that he was often unresponsive when they tried to get his attention. Although Andy engaged with objects briefly in his playroom, he was most likely to engage in physical play such as running, hopping, and making karate-type movements.

3.1.3.2 Jack and his mother

Jack was a 32-month old Indian male living at home with his parents and typically developing 4-year old sister. Jack's mother was a 32-year-old professional who had chosen to stay home to care for her two children, although she planned to return to the career she engaged in before the birth of her children (Table 1). Although born and raised in India, both of Jack's parents were proficient English speakers although they often used their native language at home. Jack scored at high risk on the M-CHAT during the screening phase and had recently received a formal diagnosis of ASD from a local developmental pediatric agency. Jack demonstrated low cognitive and communication scores during pre-assessment as his mother reported few functional words and only two consistent communicative gestures on the MB-CDI. Jack had just started receiving 15 hours of wrap-around service provision per week at home, as well as 1 hour

each of speech-language therapy and occupational therapy weekly (Table 2). Jack did not receive any medications. Jack enjoyed solitary active play, playing computer or iPad games, and loved doing puzzles as he easily completed a variety of complicated patterns. At the end of the study, he was scheduled to begin participation in a local full-time LEAP classroom.

3.1.3.3 Ben and his mother

Ben was a 27-month old Indian male, an only child living with his parents at home. Like Jack's mother, Ben's mother had chosen to stay home to care for Ben after his birth, with plans to return to a professional career in the future. She was 26 years old (Table 1). Both of Ben's parents were proficient English speakers, although they most often used their native language at home. Like Andy and Jack, Ben scored at high risk on the M-CHAT during the screening phase. Ben also demonstrated low levels of cognitive and communication function during pre-assessment but attained a higher score on the CSBS-DP than either Andy or Jack. His mother reported the use of less than 10 words but indicated the use of a variety of communicative gestures on the MB-CDI. Ben received 1 hour each of weekly Part C services including speech-language therapy and occupational therapy (Table 2) and attended a local preschool 2 mornings a week. Like Andy and Jack, Ben did not receive any medications. Ben enjoyed active play as well as completing puzzles with his mother. He also consistently manipulated cars and trucks and pushed them along furniture and the floor.

Table 2: Adult Participant Description

Adult Participant	Age	Education (years)	Ethnicity
Andy's Aunt	41	12	Asian
Jack's Mother	32	18	East Indian
Ben's Mother	26	18	East Indian

Table 3: Child Participant Description

Participant	Age (months)	ASD Risk[a]	#Words/#gestures[b]	Cognitive Percentile rank[c]	Communication Percentile rank[d]	Non-study services (hours/week)
Andy	34	8 High risk	1/33	1	3	3-9
Jack	32	17 High risk	9/2	3	1	18
Ben	27	10 High risk	8/38	3	18	2

[a]Modified Checklist for Autism in Toddlers-Revised (2009). [b]MacArthur-Bates Communicative Development Inventories: Words and Gestures (2007). Mullen Scales of Early Learning, AGS Edition: Early Learning Composite (1995). [d]Communication and Symbolic Behavior Scales Developmental Profile: Behavior Sample Total Composite (2002).

3.2 SETTINGS AND STAFF

The screening/pre-assessment, baseline, intervention and maintenance sessions were conducted in the family home. Didactic training sessions were conducted in the room of the house where the child ordinarily played as identified by the parent or caregiver (e.g., the living room or playroom) and all play samples were recorded in this setting. Implementation support sessions were also conducted in this setting. The primary researcher acted as the trainer to conduct all assessment and training procedures and videotaped all sessions.

3.3 MATERIALS

Adult participants were provided with printed materials describing rationale and procedures for the use of CI to increase social engagement (Appendix B). A hand-held camera with a tripod was used to videotape all sessions, and a laptop computer was used for the purpose of videotape review and feedback to the parent about the use of the techniques with their child. A Participant Adherence CI Log (see Appendix C) was provided weekly and placed in a prominent location in the family home. This form included sections where daily play and caregiving routines were listed (e.g., play time in a variety of contexts such as outside play, bedtime, bath time) and parents/caregivers were instructed to enter specific times of day to document parent/caregiver implementation. In addition, several matching sets of toys were provided for the purpose of parent training so that the parent/caregiver could practice imitations of child

behaviors with the same type of toy the child manipulates during didactic training sessions. As long as the adult participant maintained mastery fidelity after completing the didactic parent training sessions and was participating solely in implementation support sessions, the use of CI focused solely on toys already available in the family's home.

3.4 DEPENDENT VARIABLES

3.4.1 Parent/caregiver outcomes

The primary parent/caregiver outcome was the accurate performance of CI as determined by the following components: 1) functional imitation of at least one of the child's behaviors, including actions, sounds and words while matching the child's vocal prosody, and /or affect 2) the timing of the imitation with regard to contingency immediately following the action of the child (within 3 s) while the child is oriented to the parent and 3) the positioning of the parent in full view and within arms length of the child when the imitation is performed. Frequency of correctly performed imitations was assessed across each 10-minute play sample. Use of adult participant questions and directives was also assessed, defined as any parent verbalization that obligated the child to respond (e.g., "what color is that car?" or "look at this!). Parent mastery fidelity was attained when the parent performed 25 contingent imitations or more with fidelity per play sample for three consecutive sessions. This frequency per play sample was determined through the observation of non-study video examples of parents using the imitation techniques from Project ImPACT with fidelity (Ingersoll et al., 2010).

3.4.2 Child outcomes

3.4.2.1 Engagement states

An engagement state is here defined as a period of at least 3 s characterized by the child's level of active interest in people, objects, and events (Adamson et al., 2012; Table 1). Any period shorter than 3s was incorporated into the preceding state. Definitions were derived from *The Communication Play Protocol* (Adamson et al., 2004). Engagement states were measured as duration of mutually exclusive states in seconds per 10-minute play sample: non-social engagement (NSE); person-engagement (PE); adult-led supported joint engagement (ASJE); child-led supported joint engagement (CSJE), and coordinated joint engaged (CJE).

3.4.2.2 Social eye gaze

Social eye gaze (SEG) was defined as any spontaneous visual gaze of the child toward the adult participant's face during play interactions.

3.5 INDEPENDENT VARIABLE

The independent variable was the introduction of a simple training to teach parents/caregivers to use CI, adapted and expanded from the Imitation section of the modular intervention used by Ingersoll & Dvortcsak (2010) *Teaching Social Communication to Children With Autism,* designed to increase joint attention and joint engagement (Appendix B). CI focuses on teaching parents/caregivers to contingently imitate functional child actions, sounds/words and affect to maintain and reinforce child social engagement.

3.6 EXPERIMENTAL DESIGN

A concurrent multiple-baseline design across participants was employed (Hensen & Barlow, 1984). This design offered the ability to assess experimental control by replicating the effects of the intervention technique across participants and time. The variable length of baseline phases across participants controlled for history effects and maturation (Kratochwill et al., 2012). Following all screening and pre-assessment procedures, all participant dyads began the study in baseline at the same time. The first dyad to demonstrate a stable baseline of at least 5 data points began the parent/caregiver training phase in the family home. Each visit during the intervention phase consisted of a Primary Training (PT) session followed immediately by an Implementation Support Training (IS) session during the same home visit. Two IS sessions were conducted later in the same week. One PT and three IS sessions were conducted weekly until the adult participant attained a mastery criterion for fidelity use of the technique, at which point three weekly IS sessions were conducted. Dyad 2 and Dyad 3 moved from baseline into the training phase after demonstrating a stable baseline and the preceding dyad had demonstrated an intervention effect. When each parent/caregiver demonstrated maintenance of mastery fidelity for nine consecutive play samples, the active training phase was concluded. Maintenance data was collected for 2-3 weeks following the termination of the intervention phase.

3.7 PROCEDURES

Study procedures advanced through the following phases: Screening/Pre-assessment (as described above), Baseline, Intervention, and Maintenance (See Appendix D). All sessions

across phases were recorded by the primary researcher using a tripod (during PT didactic sessions) or by holding the camera while the child and parent/caregiver moved about the play area (during IS sessions and for all play samples). During all videotaping procedures, the primary researcher was required to maintain a full view of both the child's and the adult caregiver's faces at all times.

3.7.1 Baseline phase

During the baseline phase, three 10-minute play samples were recorded weekly in participants' homes with no coaching/feedback. Parents/caregivers were asked to play with their child as usual, in the areas of the home that they preferred.

3.7.2 Intervention phase

Each intervention session began with the recording of a 10-minute play sample, during which parents/caregivers were asked to play with their child in the area of the home that the child typically plays and to use CI as she had learned it to date. If the child moved to another room in the home during this time, the adult was expected to follow the lead of the child to the extent that the child is normally permitted in that area of the home. During this time, no comments or feedback were offered. Following the 10-minute play session one of two types of sessions was conducted: *Primary Training* (PT) followed by *Implementation Support* (IS) or Implementation Support (IS) alone. The purpose of PT sessions was to teach the components of contingent imitation, and IS sessions following each PT session were conducted to reinforce use of the technique and to provide additional coaching and practice for the purpose of effective

implementation of the technique across daily play contexts and caregiving routines. Upon achievement of mastery fidelity levels using the contingent imitation technique, only IS sessions were conducted weekly as described below. Two additional IS sessions were conducted on subsequent days. One PT session and three IS sessions were conducted each week until mastery fidelity was attained by the adult participant, at which point three IS sessions were conducted weekly until the termination of the intervention phase.

3.7.2.1 Primary training sessions

Each PT session was 20-30 minutes long. During the PT session, the trainer introduced contingent imitation as presented in the printed educational materials, including: 1) rationale for the use of CI to increase social engagement and 2) introduction of the CI procedure, including three components: 1) exact imitation of child actions, sounds, gestures, words, and affect 2) the timing of the imitation with regard to contingency immediately following the action of the child (within 3 s) while the child is oriented to the adult 3) the positioning of the parent/caregiver in full view and within 3 feet of the child when the imitation is performed. Adults were encouraged to follow their instincts to pace the rate of CI in play, and to keep the interaction enjoyable for the child. Adults were permitted to use non-imitative comments toward that end as long as they continued to observe their child to see what he was doing rather than redirecting the source of his attention. The trainer explained that the goal of the intervention was to increase social engagement throughout the day. Each PT session included the following phases: a) the trainer elicited and responded to questions or concerns expressed by the parent/caregiver; b) the trainer conducted didactic teaching using printed materials outlining the rationale and use of contingent imitation provided for the adult participant; c) the trainer demonstrated use of the technique with the child as the parent/caregiver observed; d) the parent/caregiver practiced the technique with

the child as trainer provided immediate positive and constructive feedback; e) the trainer provided a summary of the content of the training session and elicited questions about the presented subject matter. Parents/caregivers received a PT session until mastery criterion of 25 correctly performed contingent imitations per play sample for 3 successive play samples were attained. If frequency of correct contingent imitations fell below 25 for two successive play samples, the following session would then have been a PT session until mastery fidelity was again attained.

3.7.2.2 Implementation support sessions

Each IS session was 10-15 minutes long. Each IS session consisted of a review of the 10-minute play sample recorded at the start of the current home visit. The review included first positive (e.g., "you stayed face-to-face with him so well even though he was jumping and running!") followed by constructive feedback on the specific use of CI with fidelity, with discussion of non-example behaviors ("when you told him 'see here!' you could have instead imitated what he was doing as he walked around"). Following the play sample review and feedback component: 1) the trainer elicited and responded to questions or concerns expressed by the parent/caregiver; 2) the trainer asked about use of the Participant Adherence Log (Appendix C) kept by the parent/caregiver to document the use of the technique across a variety of daily play and caregiving routines, including a discussion of any challenges to the use of the techniques in any given play or caregiving routine. The parent/caregiver was asked to use CI at least five times a day during the course of the week in practice sessions from 5-10 minutes each and to document those sessions in the Participant Adherence Log. IS sessions immediately followed the PT session until the parent/caregiver attained mastery fidelity in three successive

play samples, at which point only IS sessions were conducted. In this manner, sessions were conducted three times weekly unless family circumstances forced a cancellation.

Following the termination of the Intervention phase, the primary researcher recorded 4-6 play samples in the absence of instruction or coaching for 2-3 weeks. Parents/caregivers were instructed to use CI as they currently used it at home, without any additional coaching/feedback. On the final meeting with the family, the parent/caregiver completed the Participant Satisfaction form (Appendix E) and participated in the short Participant Exit Survey (Appendix F).

3.7.3 Maintenance phase

Following the termination of the Intervention phase, the primary researcher recorded 4-6 play samples in the absence of instruction or coaching for 2-3 weeks. Parents/caregivers were instructed to use CI as they currently used it at home, without any additional coaching/feedback. On the final meeting with the family, the parent/caregiver completed the Participant Satisfaction form (Appendix E) and participated in the short Participant Exit Survey (Appendix F).

3.7.4 Data collection procedures

The primary researcher videotaped a 10-minute play sample at the start of each home visit across baseline, intervention, and follow-up phases of the study in the area of the home where the child typically plays for the purpose of data collection.

3.7.4.1 Parent/caregiver behaviors

The first author watched all videotaped play samples using BORIS©, a qualitative software data collection application, to obtain time stamps of each participant use of CI (see Appendix G). Each attempt was coded for fidelity based on: 1) exact imitation of at least one of the child's behaviors (actions, sounds and words while matching vocal prosody and/or affect) 2) the timing of the imitation with regard to contingency immediately following the action of the child (within 3 s) while the child is oriented to the parent/caregiver and 3) the positioning of the parent/caregiver in full view of the child (within 3 feet) when the imitation was performed. A correct use of contingent imitation was coded in the presence of all three criteria. This data was uploaded to an Excel macro to summarize frequencies based on initial times of each attempt. Similarly, the first author used the same BORIS© software to watch and code all video for adult use of questions and directives, defined as any adult utterance that obligated the child to respond and/or redirect their attention (e.g., "look at the train mommy has!" and/or "what color is this ball?" Data from the Boris© data forms were uploaded into an Excel macro for the purpose of summarizing frequency based on initial time of the behavior.

3.7.4.2 Child behaviors

The first author watched all recorded 10-minute play samples from all phases of the study for the purpose of recording child engagement states using HyperRESEARCH©, a qualitative analysis software package designed to record time stamps of the start and end of duration state episodes. JE state level and duration (non-socially engaged, object engagement, person engagement, adult-led/child-led supported joint engagement and coordinated joint engagement) were coded per second of the 600 s play sample (See Appendix H). States lasting three seconds or less were counted as a part of the immediately following engagement state. Coded data was

uploaded into a second Excel macro, where percentages of time spent in each mutually exclusive engagement state was calculated for each play sample.

3.7.5 Inter-observer reliability

For the purpose of establishing parent fidelity inter-observer agreement (IOA), the first author coded all study videos for parent CI fidelity using the criterion described above. A research assistant experienced with the use of behavioral coding participated in training with the first author until 90% agreement was reached using non-study related video samples for instances of the accurate performance of CI with fidelity. She then coded 33% of randomly selected baseline, intervention and follow-up sessions for CI fidelity using the criterion described previously. Agreement was determined by uploading the data from the BORIS© data forms into an Excel macro where the initial times of each coded CI of the assistant coder was compared to the primary author's data. In this manner, IOA was defined as the number of observer agreements divided by the total number of observer agreements + disagreements, resulting in a total percent agreement score. This research assistant coded parent questions and directives in the same manner, using BORIS© software. Codes were uploaded and compared between coders in a manner identical to the CI attempt data. Finally, the assistant also served as a second coder for child outcome measures, and the primary researcher trained her using non-study videotapes to ≥ 90% agreement on practice coding trials. After achieving mastery levels of proficiency, the research assistant coded 33% of randomly selected baseline and intervention sessions. During the coding period, weekly meetings were held between the primary author and the assistant coder to discuss and resolve any coding disagreements for both state and event behavior coding. After coding all randomly selected sessions, HyperRESEARCH© JE codes were uploaded into a

second Excel macro where the JE duration codes of the assistant coder and the primary author were compared using a point-by-point agreement formula for each second of the 10-minute play sample (see Appendix I). Agreement percentages are reported for each engagement state.

3.7.6 Procedural fidelity

The graduate assistant coder watched 33% of randomly selected baseline videos, PT/IS session videos and maintenance videos to assess implementation fidelity (how accurately the primary author implemented the baseline, intervention, and maintenance procedures) using the form adapted from Ingersoll and Dvortcsak (2012; See Appendix J). This form assesses the degree to which the primary researcher implemented each section of the study using prescribed procedures, clear language, checking for participant understanding, using clear demonstrations of the technique with the child for the participant to see, and coaching the participant to use the techniques with the child both in vivo and through the use of videotape review. This form uses a Likert-type scale from 1 (does not implement during session) to 5 (implements consistently throughout session).

3.7.7 Social validity

3.7.7.1 Parent satisfaction form

Each parent/caregiver completed a participant satisfaction form (see Appendix D) upon termination of the study to assess how they felt about aspects of the intervention (e.g., did the use of the technique feel comfortable, did the participant feel that the technique was useful, will they

continue to use the technique in the future) and whether they noticed an improvement in the social-communication skills of their children.

3.7.7.2 Participant adherence log

Each parent/caregiver was given a log (Appendix C) to document how often she practiced CI each day and to identify the routine she practiced it with. In this log, there was a section to comment on any challenges they encountered using the technique within those routines.

3.7.7.3 Parent/caregiver exit survey

Each participant was interviewed about the experience of participating in the intervention process (see Appendix D). Participants were asked to identify how learning and use of the strategies fit with their routines and how they experienced the use of the CI procedure. Participants were asked to identify any perceived barriers to the use of the routines and to describe both what was difficult about learning the strategies and what was enjoyable about them.

3.7.8 Data analysis

Visual analysis was used to assess the functional relationship between the implementation of the parent training and parent fidelity scores. Visual analysis was also used to analyze collateral changes in duration of JE states. Specifically, level, trend, consistency, and variability was analyzed within conditions, and level, trend, variability, overlap, immediacy, and consistency of data was assessed between conditions (Kratochwill et al., 2012). Parent fidelity

scores and frequencies of collateral parent behaviors were used to evaluate parent outcomes, and engagement state levels and duration were used to assess child outcomes.

4.0 RESULTS

Visual analysis was used to assess frequency of adult performance of CI and questions/demands (Figure 1). Similarly, child engagement durations (Figures 2-4) and social eye gaze frequency (Figure 5) were visually analyzed across baseline, intervention, and maintenance phases. As discussed, level, trend, consistency, and variability was analyzed within conditions, and level, trend, variability, overlap, immediacy, and consistency of data were assessed between conditions (Kratochwill et al., 2012).

4.1.1 Adult contingent imitation and questions/directives

4.1.1.1 Andy's aunt

Andy's aunt demonstrated no use of contingent imitation in baseline, and showed a variable trend and level in the use of questions/demands during her play with him. Upon the introduction of the CI training, her use of CI increased immediately as the use of questions/demands dropped well below baseline levels. Andy's aunt demonstrated use of CI with fidelity within the first three play samples by using 25 or more correctly performed imitations per play sample. Over the subsequent course of the intervention phase, use of CI showed a slightly decreasing trend before leveling out over the course of the final 4 data points while

maintaining fidelity. Questions/directives immediately decreased to absent or low frequency levels across the intervention phase, demonstrating a neutral and stable trend. In the maintenance phase, use of CI continued at or just above minimal fidelity levels showing an overall level trend, while use of questions/directives remained relatively low until the last maintenance session when questions and demands showed a marked increase.

4.1.1.2 Jack's mother

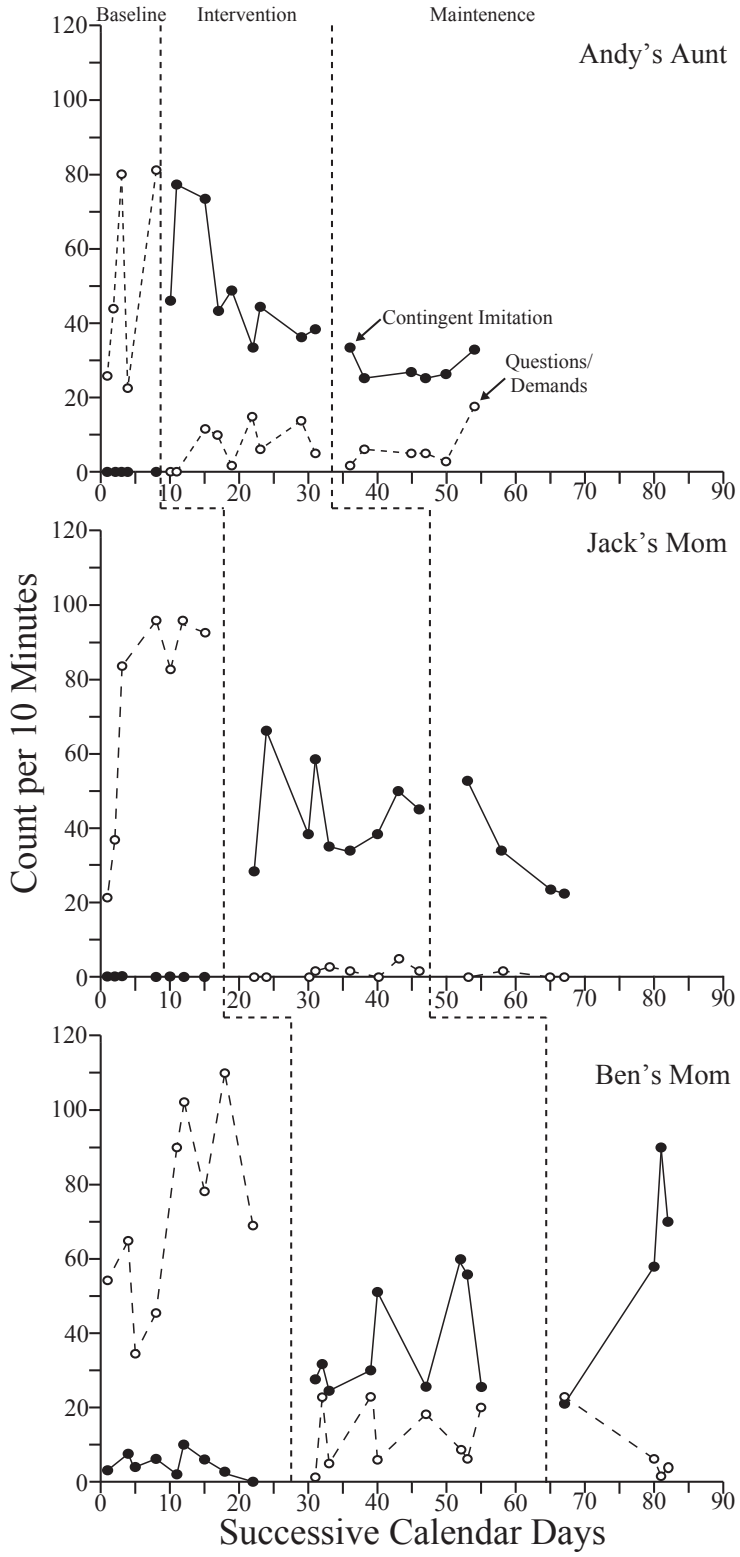
Jack's mother also showed no use of contingent imitation in baseline. Concurrently, she began with a moderate use of questions/demands for the first two data points, then displayed a steeply rising trend in the third baseline session and maintained that high level (82-100) over the last five baseline data points. Upon the introduction of CI training, her use of CI immediately increased to just over fidelity frequency, then spiked to a high level in the second play sample. From that point on, she maintained a relatively neutral trend with some variability well above fidelity level for the remainder of the intervention phase. Questions/demands were low to absent over the course of the intervention phase and like Andy's aunt, she attained CI mastery fidelity within the first three sessions. In the maintenance phase, she showed a declining use of CI as data points dipped just below fidelity levels in the last two play samples. Use of questions/directives remained low during this time.

4.1.1.3 Ben's mother

Ben's mother showed some use of CI in baseline (0-10) demonstrating a slightly downward trend, while she exhibited a high level of questions/demands with a generally rising trend. Immediately after the introduction of the CI training, CI frequency rose to just above fidelity levels for the first three intervention sessions, while the use of questions/demands dropped below

baseline levels. Like Andy's aunt and Jack's mother, Ben's mother attained mastery fidelity within the first three sessions. Over the course of the remaining intervention phase, use of CI showed a highly variable but slightly rising trend while remaining above minimum fidelity. The use of questions/demands demonstrated some variability and a slightly increasing trend. In the maintenance phase, Ben's mother demonstrated a reduced frequency of CI (just below mastery fidelity) for the first maintenance session, with a concurrent rise in questions/demands. The final three points show a marked increase in level and trend of CI use, with an accompanying reduction in question/demands (Figure 1).

Figure 1: Parent/caregiver behaviors



4.1.2 Child engagement states and social eye gaze

Durations of child engagement states were analyzed for each child in the following order: 1) total non-social engagement (TNSE) and total social engagement (TSE; Figure 2), 2) adult-led supported joint engagement (ASJE) and child-led supported joint engagement (CSJE; Figure 3), and 4) person-engagement (PE) and coordinated joint engagement (CJE; Figure 4). Levels will be described as low (0-200), moderate (200-400) and high (400-600). The reader will recall that engagement states are mutually exclusive, and that rises in the duration of one state necessarily result in the reduction of one or more alternate engagement states. Social eye gaze (SEG) was reported as a frequency per ten-minute play sample (Figure 5).

4.1.2.1 Andy

TNSE and TSE

During baseline interactions with his aunt, Andy demonstrated variable levels of TNSE, ranging from relatively low (144-162) to moderate-high (304-558), while levels of TSE showed a similar pattern of high variability. Upon introduction of the parent training, TNSE dropped to absent for the first five sessions, then demonstrated a slight rise in session six. For the remainder of the intervention and maintenance sessions, TNSE remained at absent or low levels while TSE remained concurrently high across all sessions (Figure 2).

ASJE and CSJE

Both forms of SJE were seen at relatively low levels across the baseline phase, although the last data point was moderate for ASJE. After the start of the intervention phase, levels of ASJE immediately became low or absent, and CSJE levels showed a highly variable pattern

between high-to-moderate levels until the seventh session, when they show a decreasing trend toward the end of the intervention period. In maintenance, neither ASJE nor CSJE was seen after the first maintenance session (Figure 3).

PE and CJE

Levels of PE were moderate in the first baseline play sample, then dropped to low or absent for the remainder of the phase. Andy demonstrated no CJE in baseline. After the introduction of the parent training, PE demonstrated a highly variable increase after the second session, which continued throughout intervention and maintenance phases until the final session. CJE showed an immediate rise in level after the introduction of the CI training in the first play sample, then maintained a highly variable but rising trend over the course of the intervention phase, demonstrating a slightly downward trend for the last 2 data points of that phase. In maintenance, CJE continued to demonstrate a highly variable but increased trend and level throughout.

SEG

Andy demonstrated a relatively low and moderately variable frequency of SEG ranging between 4-17 instances per play sample in baseline. Upon the introduction of the parent training, an immediate but variable increase in level and trend was seen across the intervention phase (11-51), which continued at a consistently increased level in contrast to baseline through the maintenance phase (24-42).

4.1.2.2 Jack

TNSE and TSE

Jack showed moderate to high levels of TNSE with a decreasing trend in baseline interactions with his mother while levels of TSE ranged from low to moderate with an increasing trend. With the onset of the parent training, TNSE dropped to absent for the first five sessions, then increased to moderate levels for the sixth, seventh, and ninth play sample. Concurrently, TSE immediately rose to show social engagement throughout the session across the first five samples and then decreased to moderate levels across the final four intervention play samples. In maintenance, TNSE again dropped to absent levels while TSE was fully maintained across each of the maintenance play samples (Figure 2).

ASJE and CSJE

ASJE appeared at low levels for the first 2 play samples in baseline, then showed a marked rise in trend and level over the course of the baseline phase while CSJE remained low or absent throughout. With the introduction of the parent training, ASJE immediately decreased to absent while CSJE rose to a high level with a decreasing trend across the first four play samples. CSJE decreased across the fifth and sixth play samples then rising to moderately high (406) for the last intervention play sample. In maintenance, CSJE levels remained significantly elevated in contrast to baseline (Figure 3).

PE and CJE

PE was low or absent, and no CJE was seen during the baseline phase. Upon introduction of the CI training in the intervention phase, PE remained absent in the first play sample of intervention, then demonstrated an increase in trend and level over the course of the intervention

phase until the final play sample, during which PE was again absent. No CJE was seen in the intervention phase. In maintenance, PE appeared at a low level for the first play sample, increased to moderate levels in the second, and was absent for the final two maintenance samples. No CJE was seen in the maintenance phase (Figure 4).

SEG

In baseline, only one instance of SEG was seen in the first three play samples, increasing to 4-6 instances in the second and third samples and then reducing to absent in the final sample. In the intervention phase, SEG showed a gradual rise in trend and level (2-19) across sessions until the final intervention data point. In maintenance, SEG remained elevated in contrast to baseline, demonstrating a moderately level trend (9-16; Figure 5).

4.1.2.3 Ben

TNSE and TSE

Ben displayed a highly variable pattern of both TNSE and TSE in baseline. The first baseline session showed a high level of TNSE, which decreased to absent in the subsequent two play samples, then demonstrated a variable rising trend until the final baseline play sample where he showed only moderate levels of TNSE. As expected, TSE showed the same high degree of variability with a reversed trend, beginning low and increasing over the second and third sessions, then decreasing until the final baseline data point. Immediately following the introduction of the parent training, TNSE dropped to low or absent levels while TSE increased to high levels for the duration of the intervention phase. In maintenance, NTSE was completely absent and Ben maintained maximal TSE across all four maintenance play samples (Figure 2).

ASJE and CSJE

Ben displayed a variable rate of ASJE in baseline, ranging from absent levels in the first sample to engagement in ASJE for the entire second play sample. Ben maintained this variable rate of ASJE for the remainder of the baseline phase. In contrast, CSJE was consistently absent or minimal across the baseline phase. Immediately following the introduction of the parent training, ASJE levels dropped to absent for the entire intervention phase. CSJE were moderately high for the first and the fourth play sample but leveled out over the course of the intervention session as moderately elevated over baseline levels. In maintenance, ASJE remained absent and CSJE showed a slightly elevated increased level over both baseline and intervention levels with a moderately rising trend (Figure 3).

PE and CJE

Both PE and CJE were either low or absent in baseline. PE remained low in the first intervention play sample and then showed a rising but highly variable trend over the next five play samples. A decreasing trend in PE is seen over the final four intervention data points. In contrast, CJE remained low in the first part of the intervention phase, then began to rise in level and trend over the final 4 data points. During the maintenance phase, CJE remained elevated well above baseline levels, while PE decreased to low or absent (Figure 4).

SEG

Ben displayed a relatively low level of SEG in baseline (4-13) with a slightly falling trend. When CI training was introduced, SEG remained low during the first play sample then displayed a marked increase in level and trend across the intervention phase. During the maintenance phase, SEG remained elevated above baseline levels (21-29; Figure 5).

Figure 2: Total non-social and total social engagement

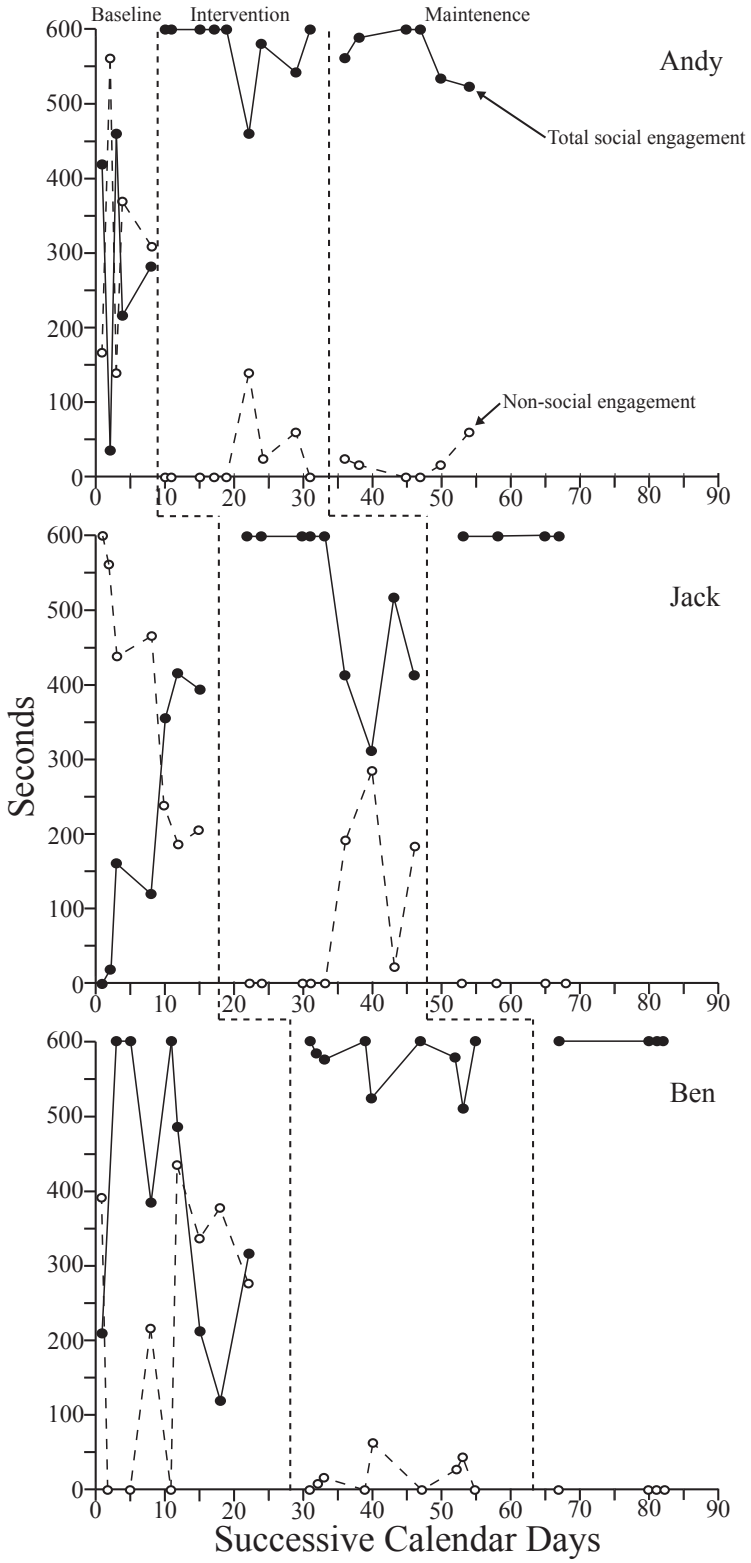


Figure 3: Adult- and child-led supported joint engagement

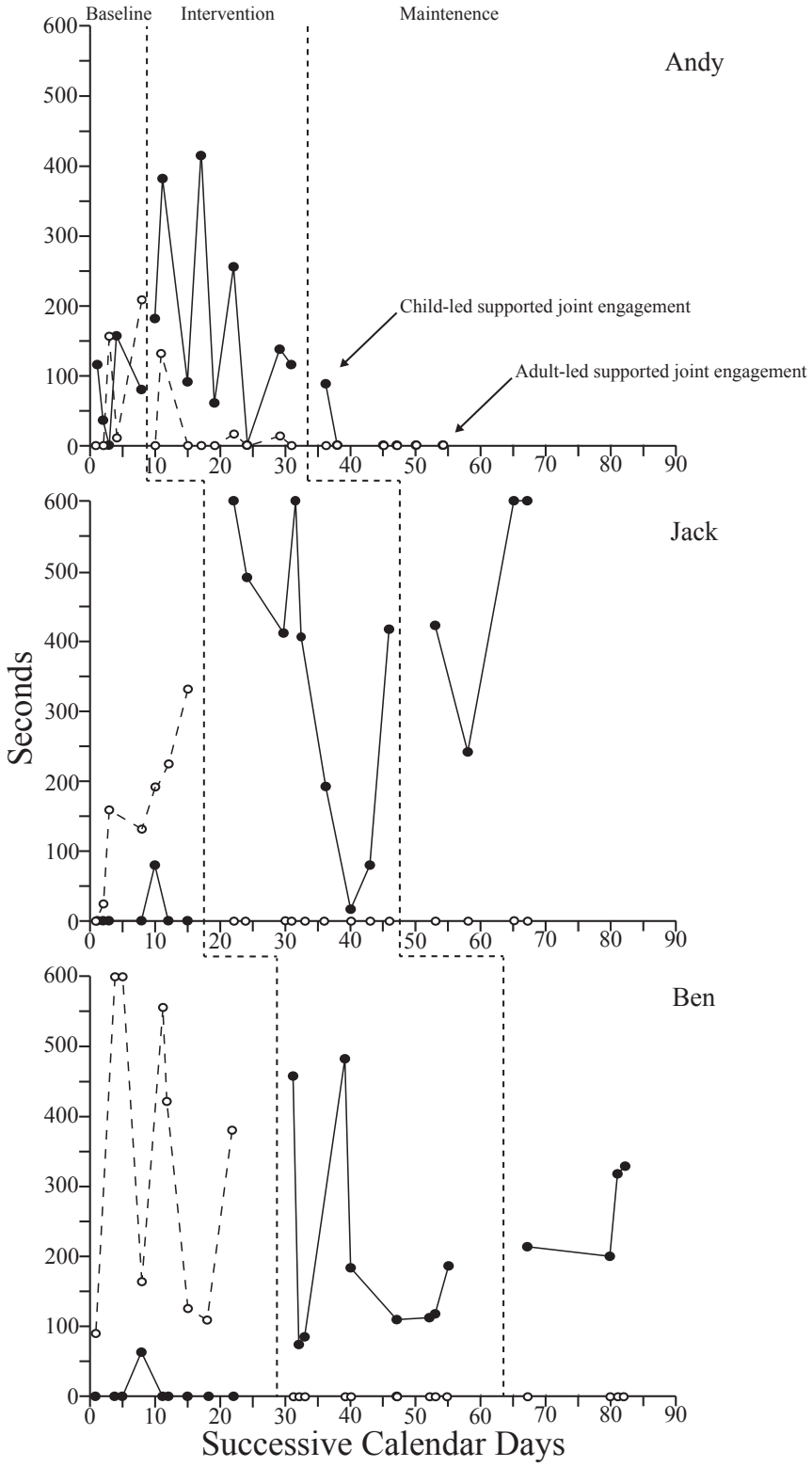


Figure 4: Person engagement and coordinated joint engagement

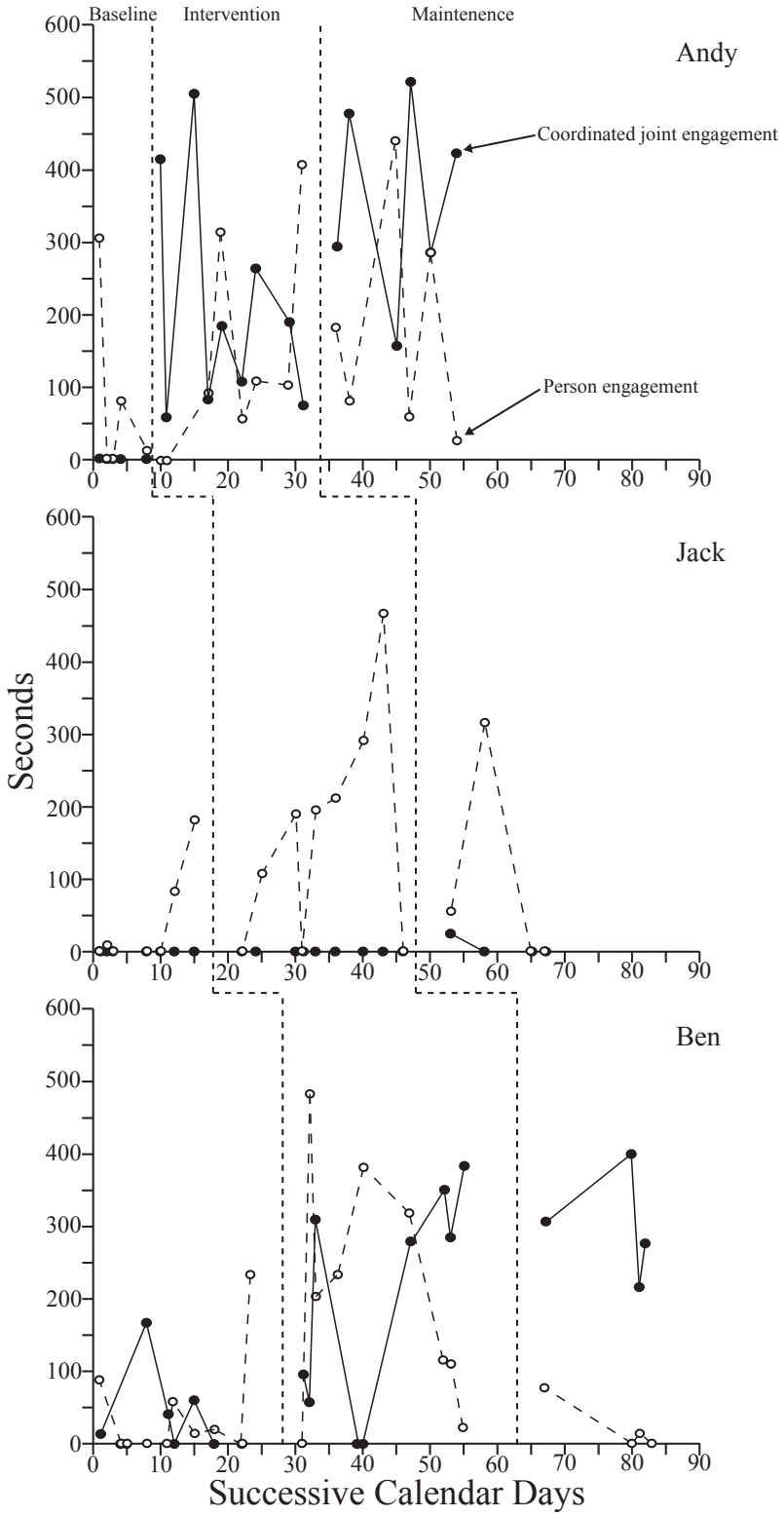
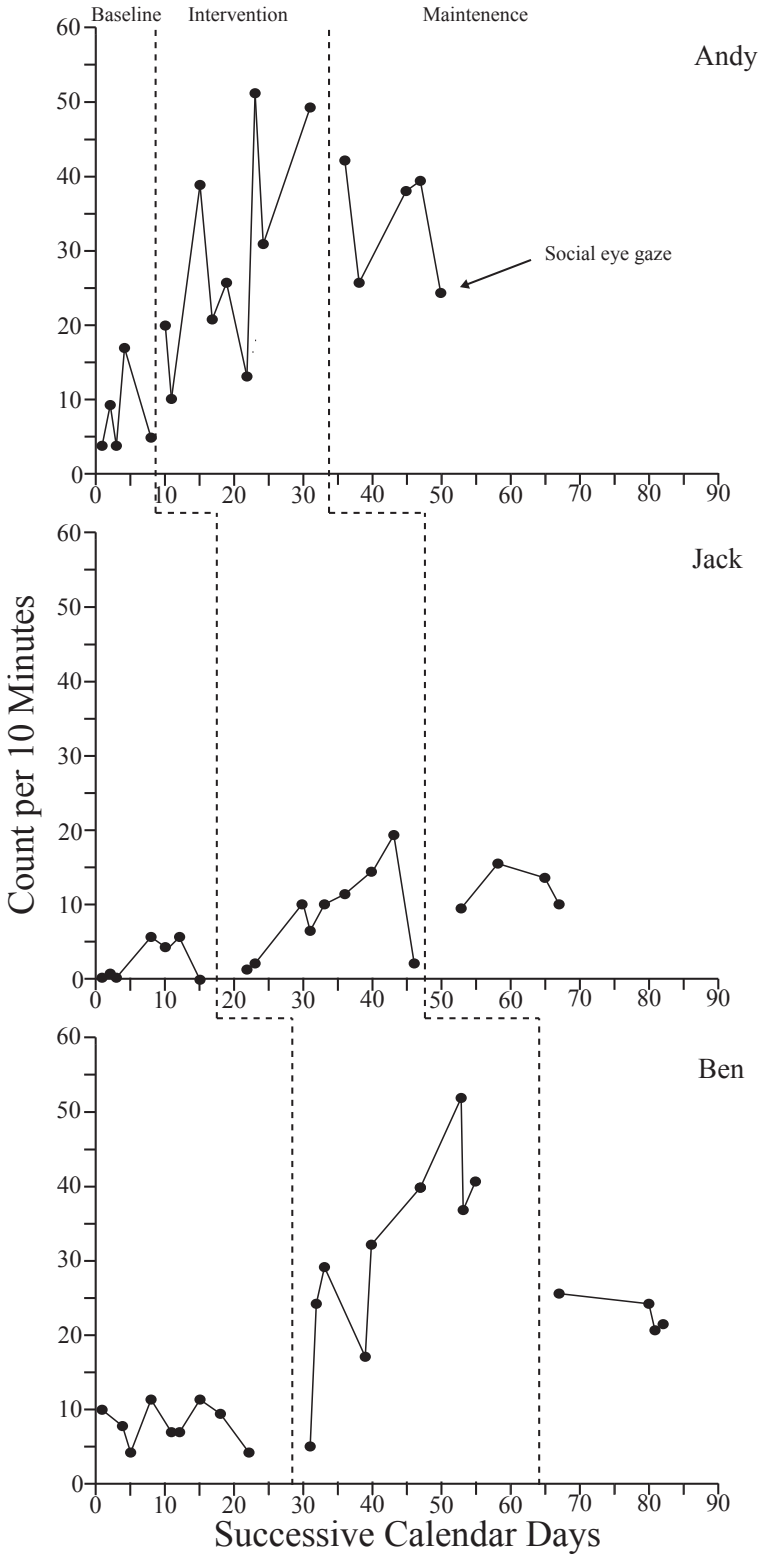


Figure 5: Social eye gaze



4.1.3 Generalization and social validity

4.1.3.1 Participant adherence log

Participants reported that it was difficult to maintain an accurate recording of time and duration of home use of CI during the day, as they often chose to use CI "on the spot" for short periods of time (3-5 minutes) during daily interactions without writing these instances down and felt that 10 full minutes was too long. Andy's aunt and Ben's mother verbally reported using CI at least five times each day, while Jack's mother reported using it sporadically during daily play interactions. All three participant adults indicated that use of CI became a familiar part of specific play routines: Andy prompted his aunt to play this way every morning by leading her to two identical play bikes and handing her an identical item to hold, while Ben often initiated a vocal/verbal imitation game with his mother (e.g., saying the name of someone in a sing-song voice while smiling and making eye contact) during their morning play sessions, and also routinely initiated an imitative game with his own set of play bikes (getting on his bike while smiling and alternating gaze from his mother's face to his other bike). Jack's mother noted that when she imitated him, he would at times jump up to run while looking back with a smile to see if she was following him, then jumped onto the sofa laughing as he watched her do the same.

4.1.3.2 Parent satisfaction form and parent exit interview

Each adult reported that the ongoing use of CI seemed to increase their child's engagement with them, and that they found the use of the technique useful for this purpose. All three adults reported that they initially found the use of CI unusual and were at first not convinced that the simple use of imitation would help their child. Jack's and Ben's mothers mentioned the difficulty of refraining from direct teaching and described the importance of

intensive direct teaching of young children to help them excel. Each adult noted the difficulty of imitating the actions of their active two-year olds, while reporting that it was the imitation of large motor activities (jumping, running, pushing their play bikes) that their children appeared to enjoy the most. Andy's aunt and Ben's mother reported that the use of CI was enjoyable because it helped them feel even more connected to their children. Jack and Ben's mothers reported increases in their child's use of words over the course of the intervention period. All three adult participants described the use of CI as enjoyable for their child and said that they would continue to implement CI in the future.

4.1.4 Inter-observer agreement and procedural fidelity

Inter-observer agreement (mean, range) for each adult outcome was as follows -- CI use: 95.8 (90.2-100.00); Questions and Directives: 98.2 (90.0-100.00). Child Engagement state agreement -- NSE: 96.3 (90.1-100.00); PE, 97.5 (90.9-100.00); ASJE, 99.8 (91.7-100.00); CSJE, 99.0 (90.9-100.00); CJE 99.5 (95.5-100.00). Child SEG agreement -- 97.2 (90.0-100.00). Average Procedural Fidelity: 99.2 (98.5-100.00).

5.0 DISCUSSION

The purpose of this study was to examine how parents/caregivers learned to use CI with fidelity at home with their children at risk for or who had ASD, how use of adult questions and directives changed as a result of the provision of the CI training package and how adult use of CI was associated with changes in joint engagement and child social eye gaze. As discussed, evidence suggests that a responsive parental style enhances child engagement (G. Mahoney, 2013) and early language acquisition (McDuffie & Yoder, 2010), especially in early learners (Haebig, McDuffie, & Ellis Weismer, 2013). In addition to being a responsive parental behavior, CI is thought to be uniquely active to increase social engagement. By being imitated, research suggests that children may access a shared mutuality with others as they realize that others are "like me" (Lakin et al., 2003), a first step towards understanding the intentions of others (Meltzoff, 2007; Nadel & Dumas, 2014). Two parents and an aunt quickly learned to use CI with fidelity at home with their young children during play while sharply reducing the use of questions and directives. Adults continued the use of CI with relatively good fidelity after coaching sessions were terminated, although a decline was noted for Jack's mother in maintenance. As adult participants used CI across intervention and maintenance phases of the study, each child increased their individual levels and duration of joint engagement from baseline, and demonstrated a higher frequency of social eye gaze.

5.1.1 Parent implementation at home

As discussed, children are often identified as at at-risk for or diagnosed with ASD before the age of three (CDC, 2014). Parent-implemented approaches have been shown to be a feasible method of delivering intensive treatment suited to the needs of the young child, embedded in the context of nurturing dyadic caregiving routines (Schultz, Schmidt, & Stichter, 2011). Indeed, parent-implemented approaches designed for young children with ASD have shown early promise for use with this population in studies teaching parents across a variety of settings (Beaudoin, Sébire, & Couture, 2014). Despite recent calls in the research community for socially and ecologically valid parent training methods (Kasari, 2015; Stahmer & Pellecchia, 2015), less has been reported about how parents and other caregivers acquire intervention techniques in the home environment and how they implement techniques at home over time after the training is completed (Lieberman-Betz, 2014; Meadan, Ostrosky, Zaghlawan, & Yu, 2009).

In this study, two parents and an aunt were provided a simple training guided by a trainer implementation fidelity measure (Appendix I). Each adult learned to use the technique with fidelity during the first week of training without the need for additional didactics. Ongoing coaching with feedback ensured that each adult gained the practice she needed to continue use the intervention with fidelity over a period of nine home-based sessions. These results align well with other studies reporting that parents and other caregivers were able to learn and use intervention techniques with fidelity in home-based settings through the use of in-home parent coaching (e.g., Carter et al., 2011; Schertz, Odom, Baggett, & Sideris, 2013; Siller, Hutman, & Sigman, 2013). During the maintenance phase of this study, parents continued to use CI with their child at or just below criterion fidelity, although Jack's mother displayed a falling trend in the use of CI in the ongoing absence of coaching/feedback. Adults reported that the technique

was easy to learn and use, and that each used CI during at least one daily play routine. These results suggest that use of CI may be beneficial as a simple and active technique to share with parents when they are referred for services after their child under the age of three is identified as at-risk for ASD. As those who provide home-based early intervention services for children with a newly-identified delay know, parents are often overwhelmed and may find it challenging to learn and implement complex intervention strategies. A number of authors have called for increased simplicity in the design of parent trainings, ideally including only one or two active components at a time to make interventions easier to use during everyday interactions in natural environments (Meadan et al., 2009; Stahmer & Pellecchia, 2015).

Furthermore, use of CI may serve as a natural template for responsive parental play. As discussed, parents of children with developmental delays have been shown to demonstrate a less responsive interactive style with their children, in contrast to parents of typically developing children: parents are more likely to choose the child's play activity and/or redirect the child's focus of attention and less likely to attend to the child's focus of interest or to notice child social cues (G. Mahoney, 2013). Furthermore, responsive parent behaviors are by definition "immediate, contingent, and affectively positive" (Ruble, McDuffie, King, & Lorenz, 2008, p.1). Although the use of CI directly targets imitation of child behaviors, this technique naturally requires adults to remain close to children during play, to observe their behaviors, and to respond to them in a specifically non-directive manner (with an imitation). Through the accurate use of CI, adults in this study transformed their interactive style immediately after the initial training and coaching session while they were using the technique: they succeeded in remaining in face-to-face proximity while observing their child's actions and immediately imitated their child's actions/sounds/words/affective expressions. Simultaneously and as instructed within the CI

training package, they reduced the use of directives and questions, effectively allowing the child to choose the focus of their shared attention. Given the simplicity of the intervention technique and the fact that the use of CI effectively incorporates a range of responsive behaviors thought to be important to enhance early social engagement, CI may serve as an exceptionally relevant technique that early intervention service providers can learn to teach parents and to reinforce through coaching during weekly home visits. Furthermore, CI is by all accounts highly socially acceptable for both the adult and the child: each adult reported that use of CI felt like play because it often turned into a fun game full of positive affect, in contrast to the "work" that they typically did in the presence of other service providers. (Interestingly, the CI sessions for all three children needed to be conducted in alternate play spaces from where they typically received therapy from other providers because the children often did not want to go into those rooms). Finally, the fact that each adult continued to use CI with generally good fidelity in the absence of coaching for several weeks suggests that the use of this technique may have gained traction in daily play routines by virtue of habit of the child himself: parents reported that each child often attempted to engage their parent/caregiver in the "imitating game" at some point during the day with objects they commonly used for CI during coaching sessions (e.g., toy cars and matching objects for Andy, toy cars for Ben) or by playfully initiating a familiar sequence of physical actions (e.g., running and then jumping on sofa) while looking back expectantly at the adult (Jack).

Despite encouraging evidence that participant adults maintained generally good use of CI during the maintenance phase, Jack's mother's CI use demonstrated a progressively decreasing trend. This result suggests that ongoing weekly coaching will be needed to support the use of the technique and to reinforce parent/caregiver "buy-in" concerning the notion that social

engagement is an important early intervention goal. Like many parents of children with ASD, Jack's mother was most concerned with his use of words even if they had to be prompted and reinforced non-socially and may not have fully recognized the value of his willing participation in a simple physical imitation game involving running and jumping, which was the parent imitation he most often responded to. Indeed, a central problem in the teaching of responsive parent interactive behaviors and parent acceptance of social engagement as a critically important intervention goal may be inherently systematic (G. Mahoney, 2013; G. Mahoney et al., 2007). Early intervention goals are generally written in such a way that targets the direct teaching of specific behaviors (e.g., a certain number of words, labeling a variety of objects) without addressing the importance of social engagement as a foundational/pivotal capacity needed to attend to social stimuli and to learn from contingencies that emerge from ongoing social interactions. Given that children under the age of three identified as at-risk for ASD do not consistently orient to social stimuli and prefer non-social play (Jones & Klin, 2013), it is essential for the early intervention community at large to formally incorporate the importance of social engagement as a core intervention target from which all other functional social communication skills emerge (Jones & Klin, 2013; Mahoney, 2013). As very young children begin to attend more consistently to social stimuli and to remain willingly in social interactions in the context of responsive adult behaviors, direct teaching methods will be more effective in the presence of the child's functional attention to words, gestures, and expressions (Mundy & Newell, 2007).

5.1.2 CI and child outcomes

In this study, two parents and an aunt contingently imitated the words, sounds, actions, and expressions of their children over the course of 8-10 weeks. As is common for children at-risk for or who have ASD, each child demonstrated a unique developmental profile in baseline: Ben spent most of his time in NSE or in CSJE and ASJE, while Jack alternated between NSE and ASJE. Ben spent most of his time in ASJE in baseline. All three children showed relatively low levels of PE, and little to no CJE in the baseline phase. With the introduction of the parent training, each child concurrently demonstrated a marked reduction in NSE and demonstrated individual patterns of increases in joint engagement: Ben demonstrated immediately increased levels of CJE and variable increases in PE with attendant reduced levels of either type of SJE. Jack demonstrated a sharp increase in CSJE and some increases in PE, while Ben demonstrated a clear transition from ASJE to CSJE while increasing levels of CJE throughout the intervention phase. All children maintained decreased or absent levels of NSE in the maintenance phase. In addition, each child continued the gains in joint engagement attained in the intervention phase: Over the course of the maintenance phase, Andy continued to consistently manifest CJE, Jack maintained increased levels of CSJE, and Ben continued to display CJE. Finally, all three children showed an increase in SEG across the course of the intervention and maintenance phases, although Jack's gains were more modest as compared to Andy and Ben.

These findings support the notion that the children's experiences of being imitated may have increased attention to or awareness of the imitating adult, thus creating the opportunity for the child to respond based on each child's individual level of development. As adults used CI at home, all three children displayed lower levels of NSE than they did in baseline. How they changed their joint engagement behavior from baseline was highly individual: Andy and Ben

quickly demonstrated higher-level responses in the form of CJE and frequent SEG, while Jack's responses to his mother's CI were developmentally earlier, in the form of a higher rate of CSJE and moderately increased SEG.

These observations may be considered in light of current social cognitive theory positing that imitation recognition and production is an innate human capacity, a mechanism to acquire understanding about the intentionality of others (Meltzoff, 2007; Tomasello, Carpenter, Call, Behne, & Moll, 2005). Imitation may serve as a highly accessible and bi-directional communication schema that enables both individuals to understand that the other is like themselves, enhancing a shared understanding of how others behave in relation to their own behaviors (Lakin et al., 2003). Indeed, human infants reliably respond to being imitated (Carpenter et al., 2013; Tiffany Field et al., 1985; Masur & Olson, 2008): for example, infants have been found to increase their social attention to and smiling at an imitating adult more often than one who is providing a non-imitative contingent response from the age of 9 months old (Agnetta & Rochat, 2004). As discussed, although children with ASD demonstrate deficits in imitation recognition and production (e.g., Ingersoll, 2008), they also appear to be responsive to being imitated by others by increasing proximal and distal social behaviors including mutual eye gaze (Dawson & Galpert, 1990; Escalona et al., 2002; T. Field et al., 2001; Katagiri, Inada, & Kamio, 2010; Sanefuji & Ohgami, 2011). When each adult in this study provided a contingent imitation to their child, they were ostensibly introducing three discrete elements into the interaction: 1) a signal that the adult was paying attention to what the child found interesting, an important aspect of a responsive parental style; 2) the provision of a visual or audible mirror of what the child was doing in the form of the imitation, which as discussed may be innately interesting to the child (e.g., Meltzoff, 2007; Tomasello et al., 2005; Trevarthen, 2005); and 3) a

non-demand opportunity to respond to the imitation socially (e.g., a social gaze, positive affect, a return imitation, or a variation in the original imitation depending on the developmental level of the child (e.g., Berger & Ingersoll, 2009). Mechanistically, CI does not place a demand for a contingent response, thus freeing children to continue to attend to the object or activity they were engaged with, but it does provide a clear opportunity to reciprocate. As researchers and parents alike know, children with ASD are likely to escape adult demands for social attention (Adamson, McArthur, Markov, Dunbar, & Bakeman, 2001).

Although research clearly suggests that a responsive parental style is associated with increased social engagement in young children with ASD (G. Mahoney & Perales, 2005; Patterson et al., 2013; Siller et al., 2013), CI in particular may be uniquely active to increase social behaviors in this population: four studies examining the efficacy of CI to increase social behaviors in contrast with non-imitative contingent responsiveness reported that increased levels of social engagement (e.g., eye gaze, approaching and touching the adult, smiling, joint attention behaviors) occurred only in the CI condition (Escalona et al., 2002; T Field et al., 2001; Heimann et al., 2006; Sanefuji & Ohgami, 2011). Because this study was designed to teach parents and caregivers to use CI in the natural context of familiar play interactions, the adults in this study were encouraged to use CI as a means of making the interaction enjoyable for the child. As such, parents were not discouraged from using playful non-directive language with their children between CI episodes. Although results of this study support the notion that parent-implemented CI served to increase child social engagement and eye gaze, the concurrent presence of other naturally occurring responsive behaviors highlight the need to examine how the use of CI may be further enhanced by adult use of other forms of responsive behavior.

Finally, although the adults in this study learned to use CI with fidelity during study play samples, each reported that 5-10 minutes of CI felt like too long at one time when they used it throughout the day. Each adult said they were more likely to sprinkle use of the technique throughout their day in shorter bursts during daily play routines. This feedback may serve to affirm how CI is often infused into intervention packages combining CI with other responsive techniques such as providing word and play models during social interactions (e.g., Siller et al., 2014; Solomon, Van Egeren, Mahoney, Quon Huber, & Zimmerman, 2014). Given that parental use of CI may create a useful context for social engagement for the youngest learners with ASD, it may be important moving forward not only to intersperse the use of parent-implemented CI within intervention packages, but also to systematically monitor level/duration of child engagement as a means of assessing readiness for the introduction of direct teaching techniques within an overarching framework of parental responsiveness.

Alternatively, it may be that the use of short bursts of CI in isolation from other intervention techniques may be valuable: Dawson and Galpert (1990) found that when mothers used three 3-minute sessions of CI daily for two weeks, their children with ASD attended to their mothers faces more consistently. Sanefuji et al. (2011) reported that two 2-minute sessions of CI by mothers resulted in increased attention to faces during a Still Face procedure, and Slaughter & Ong (2014) demonstrated that two 3-minute episodes of CI increased a variety of social behaviors including social eye gaze during the same procedure. More research will be needed to confirm how the action of parent-implemented CI used in 2-3 minute sessions several times a day may be active either in isolation or in combination with other responsive parenting behaviors to increase social engagement in very young children during home-based routines.

5.1.3 Social engagement: Implications for practice

As proposed by Lev Vygotsky (e.g., Vygotsky, 1980), social cognition emerges from birth through ongoing interactive experiences with others. This seminal concept is supported by the work of neuroscience over the past several decades demonstrating that experiences in the first years of life influence the very foundation of brain architecture (Mundy & Newell, 2007; Pedersen & Shonkoff, 2010). As such, early experiences serve to establish the saliency of certain types of environmental or social stimuli over others as myriads of contingencies emerge and shape lifelong developmental trajectories (e.g., Pedersen & Shonkoff, 2010). Infants who will go on to be diagnosed with ASD display early and pervasive differences in social orienting, preferring to attend to non-social rather than social stimuli (Jones & Klin, 2013). As these infants and toddlers continue to acquire information about the world through a non-social experiential lens, they fail to acquire the knowledge they need to function as social beings: they quickly fall behind their typically developing peers in the acquisition of social gestures, words, and the ability to understand the intentionality of others (Jones & Klin, 2013; Nichols et al., 2005). By virtue of increased use of early screening for ASD at 18-month well child check-ups, early intervention providers are currently in position to provide parents with critically important early strategies to increase social engagement during a time of exceptional neuroplasticity. The central challenge for early intervention providers is to recognize the core importance of social engagement as a means of making discrete social communication goals more proximal. Recall that typical social engagement unfolds in a relatively hierarchical manner (Adamson et al., 2004, 2014, 2010; Bakeman & Adamson, 1984): infants quickly transition in and out of non-social engagement to periods of person-engaged interactions where they contact positive affect, facial expressions, gestures and words and draw associations from those experiences. As they grow and

begin to interact with objects, adults first join them in their play in a relatively non-directive manner in CSJE as they imitate child actions with objects, talk about the objects and infuse positive affect into the play interaction. As children begin to coordinate attention to both object and others in the form of CJE they are then equipped to fluently reciprocate with initiations of their own to share attention with words and gestures and to respond to bids to share attention with others. As discussed, children with ASD do not consistently prefer social engagement and are likely to escape bids for social attention (Adamson et al., 2001). Toddlers at-risk for or who have a diagnosis of ASD are likely to spend much of their time non-socially engaged. Alternatively (as with Ben and Jack in baseline), they may be actively directed to remain in supported joint attention interactions with their caregivers as a result of adult directives and/or physical restraint. As discussed, children with ASD are more likely to remain socially engaged with adults and to initiate eye gaze when adults follow in on the child's focus of interest (L. K. Koegel, Vernon, Koegel, Koegel, & Paullin, 2012; Schertz & Odom, 2007; Solomon et al., 2014; Vismara & Lyons, 2007), and child-selected activities often result in longer discrete periods of social engagement (Patterson et al., 2013). By teaching parents to use CI, early intervention providers can provide a simple way for parents to incorporate a responsive parental style with their very young children and to concurrently share with parents the importance of social engagement as an important learning context. Results from this study highlight calls from the research community to design parent trainings for very young children or early learners specifically focused on the durable acquisition of social engagement itself as a foundational capacity, to build developmental readiness for specific functional language outcomes (Kasari, 2015; G. Mahoney et al., 2007). So often, early intervention goals fail to address the importance of social engagement as a first step towards the acquisition of discrete social communication

skills. As a means of clarifying the concept of social engagement for parents, the well-validated taxonomy of engagement states of Adamson and colleagues (2004) may be useful to structure data collection based on short behavior samples from home-based sessions, and goals can be written based on the child's current levels of engagement to monitor social engagement outcomes. Goals such as these relate directly to the benefits of responsive parent interactive behaviors generally, including CI, and as such will be highly sensitive to the necessarily global developmental progress of the very young child over time (G. Mahoney, 2013).

5.1.4 Limitations and implications for future research

This study included several limitations. It is important to note that the three children in the sample showed variable initial use of symbolic gestures on the MB-CDI assessment before the start of the intervention phase: Andy and Ben both used a variety of symbolic gestures while Jack demonstrated only two meaningful gestures. The fact that all three children were acquiring language in a bilingual home complicated their developmental profile with regard to each child's language delay: it is thought that the process of learning two languages at the same time may initially slow the emergence of early language in typically developing children (e.g., Hoff et al., 2012), although bilingualism would not be expected to influence social engagement/social orienting measures or the use of non-verbal gestures. Furthermore, each child showed a highly variable pattern of level and duration of social engagement in baseline, making it difficult to identify a stable baseline level and trend for each engagement state. Similarly, although all three children were identified as at-risk when they were first contacted to be in the study, Jack was diagnosed with ASD before the start of the study while the other two children remained "at-risk" rather than as having a certain diagnosis of ASD: a more homogeneous sample would provide a

higher level of experimental control. Furthermore, this study did not examine how different forms of imitation (vocal/verbal, imitation with objects, or imitation of physical actions in the absence of objects) may have produced different results. More work is needed to understand which types of imitation may be most active with children under the age of three. Another limitation of this study involved the measurement of implementation over time; the study's Adherence Log was not useful for providing ongoing measurement of implementation throughout the family's day. In future, perhaps the use of a confidential shared web page could serve as a daily point of contact for the family to share short smart phone videos of when they used the technique every day to document implementation and as an added way to deliver reinforcing feedback to parents and caregivers. Finally, many families (like those in this study) carry with them different cultural norms with regards to responsiveness and directive teaching behaviors. For instance, Chinese mothers may demonstrate a higher level of directive-authoritarian behaviors with their children than Western mothers as they place a high value on early child training to teach academic skills (e.g., Chao, 2000). Indeed, the adult participants in this study each spoke of the importance of direct teaching for their child's optimal development. This facet of training/coaching parents to use a more responsive interactive style must not be overlooked in future research and practice; interventionists are obliged to recognize how parents feel they can best help their child and to tailor parent training around those existing beliefs. By providing the opportunity for parents to understand how increased social engagement gained through responsive parent behaviors will prepare their child to be ready for skills training while acknowledging the importance of directive teaching as a valued parental role, service providers can individualize how they may best support a responsive parental style for families from many cultures.

5.2 CONCLUSIONS

During the course of this study, two parents and an aunt were provided with a simple didactic and coaching training to use CI at home with their young child at-risk for or who had a diagnosis of ASD. Each adult immediately performed the technique with fidelity during play sample sessions and maintained the use of CI across intervention phases. A declining trend in fidelity for Jack's mother, and a slightly increasing trend in questions and directives for Ben's mother in the maintenance phase highlights the need for ongoing home-based coaching support. Furthermore, through the accurate use of CI, each adult maintained an overarching responsive parental interactive style as they refrained from questions and directives during play sessions over the course of the intervention. Finally, children in this study demonstrated individual changes in engagement levels as their parent/caregiver used the techniques during study sessions, and each demonstrated increases in social eye gaze. These results indicate that CI may be an exceptionally relevant technique for early intervention providers to teach parents in the context of home visits to support a responsive interactive style: CI is easy to teach, is enjoyable for both adults and children, appears to facilitate responsive parent behaviors and may be uniquely active to enhance social engagement. Researchers must continue to identify how parents effectively learn and maintain use of intervention techniques at home with their very young children and to examine further how individual techniques may be specifically active to support social engagement over time. By more fully understanding how parents and other caregiving adults can influence social orienting and engagement in young children at-risk for or who have ASD during this time of rapid neural development, research can positively impact lifelong developmental trajectories.

APPENDIX A

PARENT DEMOGRAPHIC QUESTIONNAIRE

Figure 6: Parent Demographic Questionnaire

Q. What is your age?

- 18-24 years old
- 25-34 years old
- 35-44 years old
- 45-54 years old
- 55-64 years old
- 65-74 years old
- 75 years or older
- I prefer not to respond to this question

Q. Please specify your ethnicity.

- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian
- Asian / Pacific Islander
- East Indian
- Other
- I prefer not to respond to this question

Q. What is the highest degree or level of school you have completed? *If currently enrolled, highest degree received.*

- No schooling completed
- Nursery school to 8th grade
- Some high school, no diploma
- High school graduate, diploma or the equivalent (for example: GED)
- Some college credit, no degree
- Trade/technical/vocational training
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree
- I prefer not to respond to this question

Q. What is your marital status?

- Single
- Married or domestic partnership
- I prefer not to respond to this question

Q. What is your employment status?

- Employed
- Self-employed
- Out of work
- A homemaker
- A student
- I prefer not to respond to the question

Q. How many adults live in your household? Please list them and include their relationship to your child:

Q. What is the age of each child in your household?

Q. Do any of the other children in the household have a diagnosis of ASD?

- Yes.
  If so, what therapies have you participated in with this child/these children?

- No.

Q. Please describe the area of the state that you live in (e.g., urban neighborhood, suburban, country):

Q. What services does you child currently receive?

- Early Intervention (please list speech-language, occupational therapy, or other therapies separately).
  Hours per week:

- Wrap-around
  Hours per week:

- Private clinical therapy (please list speech-language, occupational therapy, or other therapies separately).

  Hours per week:

- Other therapies or services (including child care or special activities)
  Hours per week:

- I prefer not to respond to this question

APPENDIX B

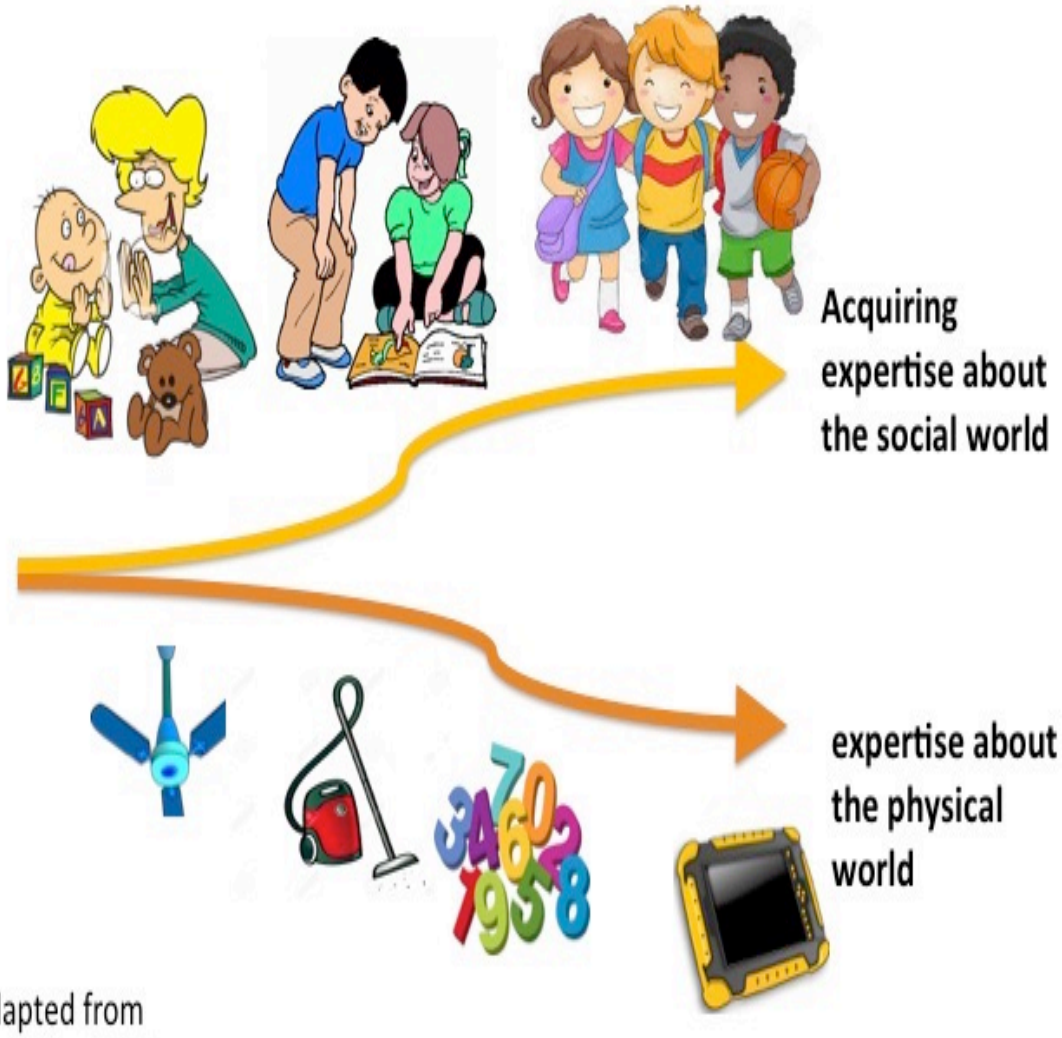
PARTICIPANT TRAINING MATERIALS

Figure 7: Participant Training Manual

Early Brain Science

- At around 3 months, infants with low social engagement begin to show a preference for the physical world, and do not orient to social interactions as often as typical infants
- Brains are still being shaped very actively during this time, and by gaining child social engagement, important changes can be made in what a child pays attention to and learns from

Differing Developmental Trajectories



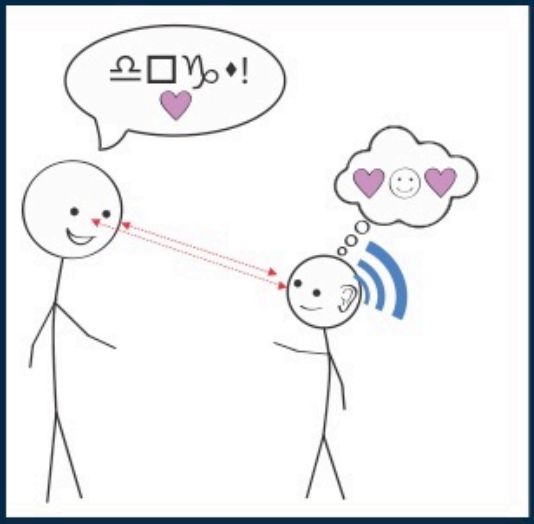
Adapted from
Ami Klin, 2015


Non-Social Engagement
Unengaged, On looking, Object Engaged


Social Engagement
Person Engagement
Supported Joint Engagement
Coordinated Joint Engaged

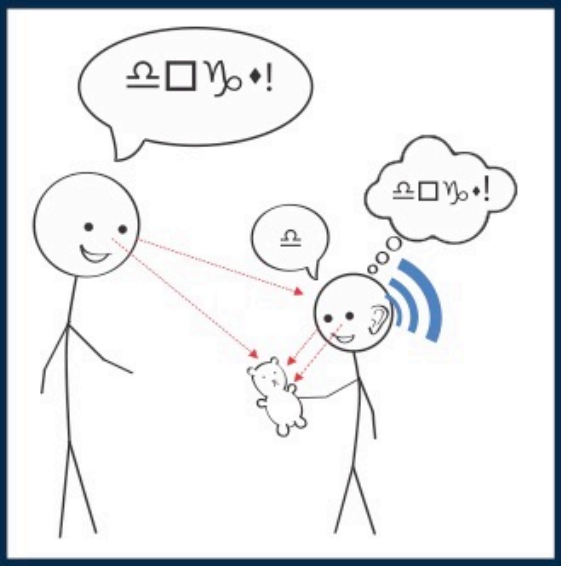
Person-Engagement

- Children and adults engage in *face-to-face* interactions without focusing on an external object or event of focus



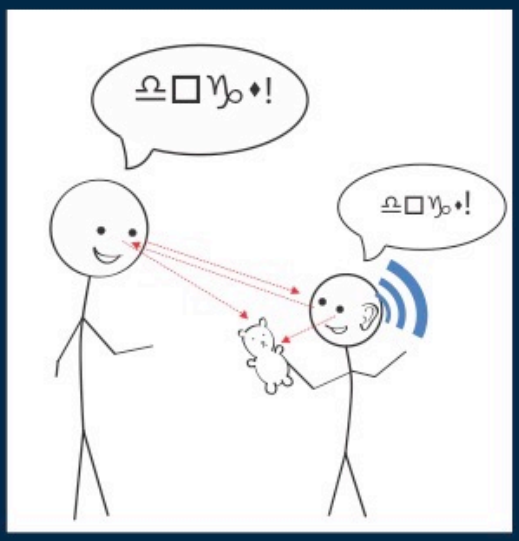
Supported Joint Engagement

- Adult & child shared attention to common focus
- "Supported" because child may not acknowledge adult
- Parent creates social learning by offering gestures, sounds, and words about child play
- Parent acts in ways that impact child's experience with the toy



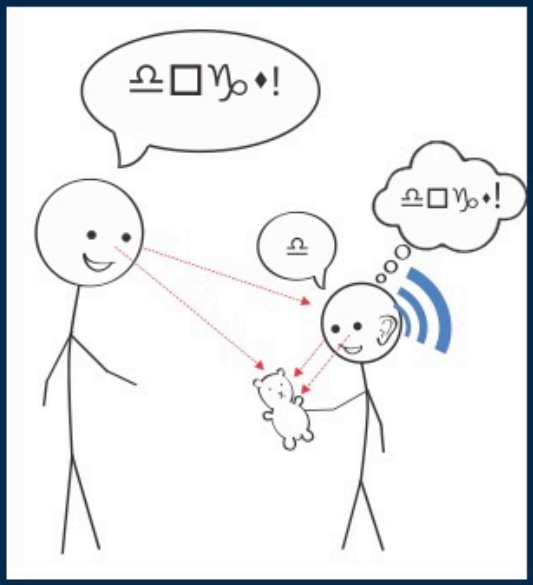
Coordinated Joint Engagement

- Adult & child share attention to common focus
- Child actively responds to and initiates bids to share attention through the use of alternating looks, gestures, sounds and eventually words
- Adult responds to child's bids for joint attention
- Adult supports social learning by offering gestures, sounds, and words about child play



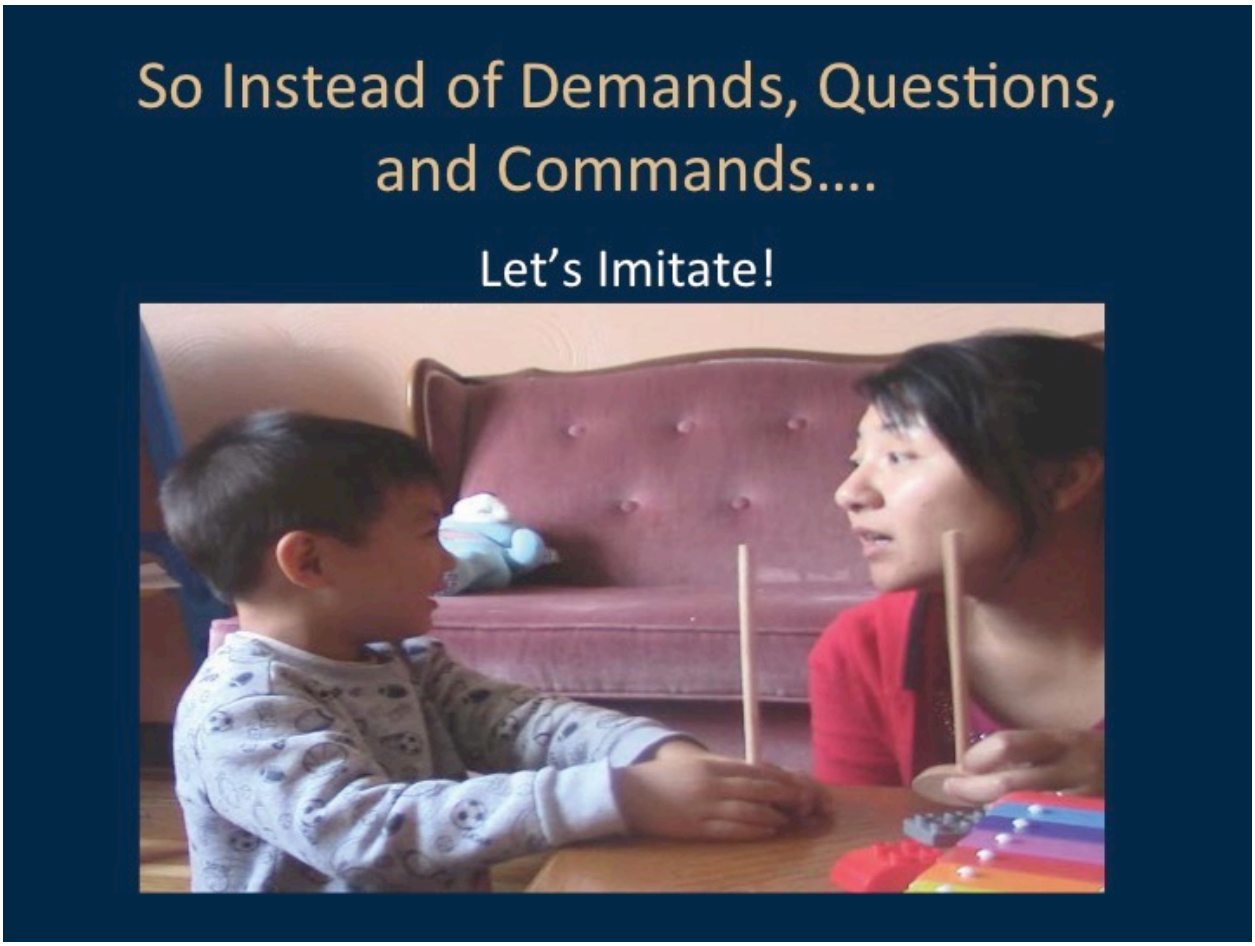
Contingent Imitation
Making Play Interactive

- We make the transition from object-engagement to supported joint engagement
- Leave open opportunities for the child to initiate social engagement
- Motivate child to remain engaged



Adult-Directed vs. Child-Led Play

- By selecting the activity, the child is demonstrating preference
- Child-led play increases the likelihood of social engagement
- When adults refrain from directing behavior, opportunities for initiations are increased
- Parents of children identified with a delay typically use a more directive interactive style


So Instead of Demands, Questions, and Commands....
Let's Imitate!

Why use Contingent Imitation?

Will help your child:

- Learn that others see his actions, expressions
- Learn that others hear the sounds he makes
- Learn that you can connect with the things that interest him
- You remain socially present in a non-demanding way
- You support an emerging awareness of how others are part of his world
- Increases his understanding of himself as others see him

CI in a nutshell

You will be a mirror for your child!

CI 101

Imitate Within 3 Seconds

- Facial expressions
- Body movements
- Gestures
- Sounds
- Words
- Do not imitate challenging behaviors

Key Points

- Let your child choose the activity
- Stay face to face with your child
- Imitate play with toys
- Imitate gestures and body movements
- Imitate all sounds and match his tone
- Mirror expressions
- Watch for signs that child is paying attention when you imitate
- Child is not required to do anything specific

Maintaining Engagement

- Once you have gained engagement, watch to see how you can maintain it
- Often, your child was interested in the imitation, and would love to see it happen again
- The object of the interaction is to keep the social interaction going, not to get him to make any particular response

Long-Term Goals

- Teaching a child to consistently orient to and prefer social interaction takes time
- It will take patience to spend these weeks using contingent imitation exclusively
- Over time, engagement should gradually increase and new techniques will become appropriate
- At the end of the intervention, we will re-evaluate engagement levels to determine next steps

APPENDIX C

PARENT ADHERENCE LOG

Figure 8: Parent Adherence Log

ID:							
Date:							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Waking up/dressing							
Breakfast							
Morning Play							
Lunch							
Nap Routine							
Outside play							
Afternoon play							
Snack Time							
Dinner							
Bath Time							
Bedtime Routine							

Directions:

- **This log will help you incorporate CI into your daily routines with your child!**
- **During our training sessions, you will choose at least 2 routines you will use to practice the CI technique with your child throughout the coming week.**
- **Your goal is to incorporate at least 5 practice sessions (5-10 minutes) of CI a day into your routines.**
- **Although you will be focusing on different specific routines each week, feel free to use your CI technique any time a good opportunity arises.**
- **Each time you practice CI with your child, please enter the time you started and the time you ended your practice under the name of the daily routine you used to practice the CI technique.**
- **If you encountered a challenge in the use of the technique, please describe what challenged the use of CI during that routine in the section below.**

CHALLENGES:

APPENDIX D

STUDY PROCEDURES FLOW CHART

Figure 9: Study Procedures Flow Chart

APPENDIX E

PARENT SATISFACTION FORM

Figure 10: Parent Satisfaction Form

Parent Satisfaction Form

Date: _____

Participating Parent _____

	Strongly Agree	*Agree*	*Not Sure*	*Disagree*	*Strongly Disagree*
I found the training appropriate for use with my child					
I understand how to use the CI technique to address the engagement goals of my child.					
I understand how to use CI at home during everyday activities.					
I will continue to use CI with my child at home during the day now that the training is over.					
I will share information about using CI with my child with other family members and/or service providers.					
The trainer presented the CI material in a way that I could easily understand.					
I enjoyed this training.					
My child enjoyed this training.					
My child showed improvement in social engagement.					
I would recommend this training to others.					

Please write any additional comments on the back

Thank you for your responses!

APPENDIX F

PARENT EXIT SURVEY FORM

Figure 11: Parent Exit Survey Form

1. **Please tell me about how you came to receive a diagnosis/risk of ASD for your child.**

2. **How different was it for you to learn the CI technique than other intervention strategies that you may have learned previously? What were the challenges?**

3. **How beneficial did you think it was to imitate your child?**

4. **Please tell me about the experience using only the imitation technique during the CI play sessions.**

5. **To what extent have you changed the way you interact with your child based on your experiences with CI?**

6. **Please tell me the hardest part about using the CI technique. The best part?**

7. **Have you found the use of the CI more or less stressful than other intervention techniques?**

APPENDIX G

EXAMPLE PARENT FIDELITY DATA COLLECTION FORM

Figure 12: Example Parent Fidelity Data Collection Form

Events for "A_122916_INT9_CI" observation

	time	subject	
1	00:00:07.242		CI
2	00:00:21.322		CI
3	00:00:33.606		CI
4	00:00:51.390		CI
5	00:00:53.692		CI
6	00:00:59.197		CI
7	00:01:25.321		CI
8	00:02:00.396		CI
9	00:02:12.704		CI
10	00:02:30.111		CI
11	00:03:02.154		CI
12	00:03:32.716		CI
13	00:03:36.818		CI
14	00:03:51.135		CI
15	00:04:06.252		CI
16	00:04:45.189		CI
17	00:05:13.083		CI
18	00:05:17.186		CI
19	00:05:23.061		CI
20	00:05:58.764		CI
21	00:06:30.794		CI
22	00:06:48.202		CI
23	00:07:44.170		CI
24	00:08:55.135		CI
25	00:08:56.917		CI

APPENDIX H

EXAMPLE DATA COLLECTION FORM FOR ENGAGEMENT

Figure 13: Example of Data Collection Form for Engagement

Case: ID_DATE			
SJE	PAR_091716_MOD1PS1-1.mp4	Movie	00:00:02.091,00:00:52.653
CJE	PAR_091716_MOD1PS1-1.mp4	Movie	00:00:52.653,00:01:31.857
SJE	PAR_091716_MOD1PS1-1.mp4	Movie	00:01:31.658,00:02:47.267
SJE	PAR_091716_MOD1PS1-1.mp4	Movie	00:02:46.266,00:03:56.259
CJE	PAR_091716_MOD1PS1-1.mp4	Movie	00:03:56.270,00:05:49.883
SJE	PAR_091716_MOD1PS1-1.mp4	Movie	00:05:49.883,00:06:51.278
CJE	PAR_091716_MOD1PS1-1.mp4	Movie	00:06:51.278,00:10:01.101

APPENDIX I

INTER-OBSERVER AGREEMENT ANALYSIS EXCEL FORM

Figure 14: Inter-Observer Agreement Analysis Excel Form

AJ23

	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
1	Instances	seconds	Sue	AMY	AGREEMENT							
2	1	0	SJE	SJE	1			agreed seconds	total seconds	percentage agreement	joint total seconds	
3	1	1	SJE	SJE	1		CJE	0	0	100%	0	
4	1	2	SJE	SJE	1		SJE	477	480	99%	959	
5	1	3	SJE	SJE	1		OE	0	0	100%	0	
6	1	4	SJE	SJE	1		UE	119	121	98%	243	
7	1	5	SJE	SJE	1		PE	0	0	100%	0	
8	1	6	SJE	SJE	1					sum	1202	
9	1	7	SJE	SJE	1							
10	1	8	SJE	SJE	1							
11	1	9	SJE	SJE	1							
12	1	10	SJE	SJE	1							
13	1	11	SJE	SJE	1							
14	1	12	SJE	SJE	1							
15	1	13	SJE	SJE	1							
16	1	14	SJE	SJE	1							
17	1	15	SJE	SJE	1							
18	1	16	SJE	SJE	1							
19	1	17	SJE	SJE	1							

APPENDIX J

CI FIDELITY OF INTERVENTION FORM

Figure 15: CI Fidelity of Intervention Form

CI Fidelity of Implementation Form

PARTICIPANT:
DATE:
CODER:

Low Fidelity 1	2	3	4	High Fidelity 5
Does not implement during session	Implements occasionally, but misses opportunities	Implements half of the times, but misses multiple opportunities	Implements more than half of the time, but misses some opportunities	Implements consistently throughout the session

BASELINE

Procedures	Score	Notes
1. Greets family warmly, asks about the well being of both the parent and the child.		
2. Provides a brief explanation of the videotape procedure, making clear that no conversation or remarks will be offered by the trainer during the videotaped play sample.		
3. Provides opportunity for parent to comfortably engage in the play sample (e.g., finishes tasks that needed to be done first, give child snack).		
8. Remains unobtrusive and non-distracting to the parent-child dyad during the videotaping session.		
9. Refrains from speaking to the parent during the videotaped play session.		
10. Refrains from offering any remarks or feedback about the videotaped session.		
11. Thanks parent for her time and schedules next meeting time.		
SCORING	ITEM TOTAL:	

Comments

PT SESSIONS

Procedures	Score	Notes
1.Greets family warmly, inquires about both parent and child well being.		
2. Provides a brief explanation of the session.		
3. Provides brief summary of information provided during previous session.		
8. Provides rationale for the use of CI clearly, incorporating printed training materials.		
9. Explains the key points of the CI procedure.		
10. Assesses the parent's understanding of the information.		
11. Invites comments, questions and concerns.		
12. Provides a demonstration of CI.		
13. Encourages the parent to practice CI with the child.		
14. Provides positive and corrective feedback to the parent regarding use of CI with child.		
SCORING	ITEM TOTAL:	

COMMENTS:

IS SESSIONS

Procedures	Score	Notes
1. Reviews video sample with parent.		
2. Maintains warm and open manner with parent during video review.		
3. Provides positive feedback first during feedback provision.		
8. Provides constructive feedback second at a rate appropriate for the parent (e.g., parent appears comfortable and relaxed).		
9. Uses reflective comments and questions to assess understanding and to facilitate problem solving.		
10. Invites comments, questions and concerns.		
11. Reviews CI log with parent, identifies what worked well and what was challenging.		
12. Encourages parent to practice CI in the context of any noted challenges when appropriate.		
13. Helps parent choose 2 routines for the coming week and highlights those routines on the parent CI log.		
14. Wraps up session with a clear summary of what went on during the session, and schedules the next meeting with parent.		
SCORING	ITEM TOTAL:	

COMMENTS:

MAINTENANCE SESSIONS

Procedures	Score	Notes
1. Videotapes play samples as described in Baseline procedures.		
12. Thanks parent and child for their participation		
SCORING	ITEM TOTAL:	

COMMENTS:

BIBLIOGRAPHY

Adamson, L. B., Bakeman, R., & Deckner, D. F. (2004). The development of symbol-infused joint engagement. *Child Development*, *75*(4), 1171–87. http://doi.org/10.1111/j.1467-8624.2004.00732.x

Adamson, L. B., Bakeman, R., Deckner, D. F., & Nelson, P. B. (2012). Rating parent-child interactions: joint engagement, communication dynamics, and shared topics in autism, Down syndrome, and typical development. *Journal of Autism and Developmental Disorders*, *42*(12), 2622–35. http://doi.org/10.1007/s10803-012-1520-1

Adamson, L. B., Bakeman, R., Deckner, D. F., & Nelson, P. B. (2014). From Interactions to Conversations: The Development of Joint Engagement During Early Childhood. *Child Development*, *85*(3), 941–955. http://doi.org/10.1111/cdev.12189

Adamson, L. B., Bakeman, R., Deckner, D. F., & Romski, M. (2008). Joint engagement and the emergence of language in children with autism and down syndrome. *Journal of Autism and Developmental Disorders*, *39*(1), 84–96. JOUR. http://doi.org/10.1007/s10803-008-0601-7

Adamson, L. B., Deckner, D. F., & Bakeman, R. (2010). Early interests and joint engagement in typical development, autism, and Down syndrome. *Journal of Autism and Developmental Disorders*, *40*(6), 665–676. http://doi.org/10.1007/s10803-009-0914-1

Adamson, L. B., McArthur, D., Markov, Y., Dunbar, B., & Bakeman, R. (2001). Autism and joint attention: Young children's responses to maternal bids. *Journal of Applied Developmental Psychology*, *22*(4), 439–453. http://doi.org/10.1016/S0193-3973(01)00089-2

Agnetta, B., & Rochat, P. (2004). Imitative Games by 9-, 14-, and 18-Month-Old Infants. *Infancy*, *6*(1), 1–36. http://doi.org/10.1207/s15327078in0601_1

APA. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. BOOK, American Psychiatric Pub.

Bakeman, R., & Adamson, L. B. (1984). Coordinating attention to people and objects in mother-infant and peer-infant interaction. *Child Development*, *55*(4), 1278–1289. http://doi.org/10.2307/1129997

Baranek, G. T., Watson, L. R., Turner-Brown, L., Field, S. H., Crais, E. R., Wakeford, L., …

Reznick, J. S. (2015). Preliminary Efficacy of Adapted Responsive Teaching for Infants at Risk of Autism Spectrum Disorder in a Community Sample. *Autism Research and Treatment*, *2015*, 1–16. http://doi.org/10.1155/2015/386951

Beaudoin, A. J., Sébire, G., & Couture, M. (2014). Parent training interventions for toddlers with autism spectrum disorder. *Autism Research and Treatment*, *2014*, 839890. http://doi.org/10.1155/2014/839890

Berger, N. I., & Ingersoll, B. (2009). A Further Investigation of Goal-Directed Intention Understanding in Young Children with Autism Spectrum Disorders, (2014), 3204–3214. http://doi.org/10.1007/s10803-014-2181-z

Brian, J. a, Bryson, S. E., & Zwaigenbaum, L. (2015). Autism spectrum disorder in infancy. *Current Opinion in Neurology*, *28*(2), 117–123. http://doi.org/10.1097/WCO.0000000000000182

Bruner, J. (1978). From communication to language: a psychological perspective. *The Social Context of Language*, *3*(3), 255–287.

Carpenter, M., Uebel, J., & Tomasello, M. (2013). Being mimicked increases prosocial behavior in 18-month-old infants. *Child Development*, *84*(5), 1511–1518. http://doi.org/10.1111/cdev.12083

Carter, A. S., Messinger, D. S., Stone, W. L., Celimli, S., Nahmias, A. S., & Yoder, P. (2011). A randomized controlled trial of Hanen's "More Than Words" in toddlers with early autism symptoms. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *52*(7), 741–752. http://doi.org/10.1111/j.1469-7610.2011.02395.x

CDC. (2014). *Prevalence of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2010*. Retrieved from http://www.cdc.gov/mmwr/pdf/ss/ss6302.pdf

Chao, R. K. (2000). The parenting of immigrant Chinese and European American mothers: Relations between parenting styles, socialization goals, and parental practices. *Journal of Applied Developmental Psychology*, *21*(2), 233–248. JOUR.

Choe, D. E., Sameroff, A. J., & McDonough, S. C. (2013). Infant functional regulatory problems and gender moderate bidirectional effects between externalizing behavior and maternal depressive symptoms. *Infant Behavior & Development*, *36*(3), 307–318. http://doi.org/10.1016/j.infbeh.2013.02.004

Clifford, S., & Dissanayake, C. (2009). Dyadic and triadic behaviours in infancy as precursors to later social responsiveness in young children with autistic disorder. *Journal of Autism and Developmental Disorders*, *39*(10), 1369–80. JOUR. http://doi.org/10.1007/s10803-009-0748-x

Dawson, G., & Adams, A. (1984). Imitation and social responsiveness in autistic children. *Journal of Abnormal Child Psychology*, *12*(2), 209–226. JOUR.

Dawson, G., & Galpert, L. (1990). Mothers' use of imitative play for facilitating social responsiveness and toy play in young autistic children. *Development and Psychopathology*, *2*(15), 1–162. JOUR.

Escalona, a, Field, T., Nadel, J., & Lundy, B. (2002). Brief report: imitation effects on children with autism. *J Autism Dev Disord*, *32*(2), 141–144. http://doi.org/10.1023/A:1014896707002

Ezell, S. (2012). Imitation Effects on Joint Attention Behaviors of Children with Autism. *Psychology*, *3*(9), 681–685. http://doi.org/10.4236/psych.2012.39103

Feldman, R. (2007). Infant Biological Foundations Synchrony and Developmental Outcomes. *Current Directions in Psychological Science*, *16*(6), 340–345. http://doi.org/10.1111/j.1467-8721.2007.00532.x

Fenson, L. (2007). *MacArthur-Bates Communicative Development Inventories: user's guide and technical manual*. BOOK, Paul H. Brookes Publishing Company.

Field, T., Field, T., Sanders, C., & Nadel, J. (2001). Children with autism display more social behaviors after repeated imitation sessions. *Autism*, *5*(3), 317–323. JOUR.

Field, T., Guy, L., & Umbel, V. (1985). Infants' Responses to Mothers' Imitative Behaviors. *Infant Mental Health Journal*, *6*(1), 40–44. JOUR. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,uid&db=aph&AN=12033403&scope=site

Field, T., Sanders, C., & Nadel, J. (2001). Children with autism display more social behaviors after repeated imitation sessions. *Autism : The International Journal of Research and Practice*, *5*(3), 317–323. http://doi.org/10.1177/1362361301005003008

Freeman, S., & Kasari, C. (2013). Parent-child interactions in autism: Characteristics of play. *Autism : The International Journal of Research and Practice*, (February). http://doi.org/10.1177/1362361312469269

Gazdag, G., & Warren, S. F. (2000). Effects of Adult Contingent Imitation on Development of Young Children's Vocal Imitation. *Journal of Early Intervention*, *23*(1), 24–35. http://doi.org/10.1177/10538151000230010701

Greenspan, S. I., & Wieder, S. (1999). A Functional Developmental Approach to Autism Spectrum Disorders. *The Journal of The Association for Persons with Severe Handicaps*, *24*(3), 147–161. http://doi.org/10.2511/rpsd.24.3.147

Gulsrud, A. C., Hellemann, G., Shire, S., & Kasari, C. (2015). Isolating active ingredients in a parent-mediated social communication intervention for toddlers with autism spectrum disorder. *Journal of Child Psychology and Psychiatry*, n/a-n/a. http://doi.org/10.1111/jcpp.12481

Haebig, E., McDuffie, A., & Ellis Weismer, S. (2013). Brief Report: Parent Verbal

Responsiveness and Language Development in Toddlers on the Autism Spectrum. *Journal of Autism and Developmental Disorders*. http://doi.org/10.1007/s10803-013-1763-5

Haebig, E., McDuffie, A., & Weismer, S. E. (2013). The contribution of two categories of parent verbal responsiveness to later language for toddlers and preschoolers on the autism spectrum. *American Journal of Speech-Language Pathology*, *22*(1), 57–70. http://doi.org/10.1044/1058-0360(2012/11-0004)

Heimann, H., Laberg, K. E., & Nordoen, B. (2006). Imitative Interaction Increases Social Interest and Elicited Imitation in Non-Verbal Children with Autism. *Infant and Child Development*, *15*, 297–309. http://doi.org/10.1002/icd.

Hensen, M., & Barlow, D. H. (1984). Single case experimental designs. GEN, Pergamon, New York.

Hirsh, J. L., Stockwell, F., & Walker, D. (2014). The Effects of Contingent Caregiver Imitation of Infant Vocalizations: a Comparison of Multiple Caregivers. *Journal of Applied Behavior Analysis*, *30*(2014), 20–28. http://doi.org/10.1007/s40616-014-0008-9

Hobson, R. P. (1993). The emotional origins of social understanding. *Philosophical Psychology*, *6*(3), 227. JOUR. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,uid&db=aph&AN=9606244291&scope=site

Hoff, E., Core, C., Place, S., Rumiche, R., Señor, M., & Parra, M. (2012). Dual language exposure and early bilingual development. *Journal of Child Language*, *39*(1), 1–27. http://doi.org/10.1017/S0305000910000759

Ingersoll, B. (2008). The Social Role of Imitation in Autism: Implications for the Treatment of Imitation Deficits. *Infants and Young Chuildren*, *21*(2), 107–119.

Ingersoll, B., Lewis, E., & Kroman, E. (2007). Teaching the imitation and spontaneous use of descriptive gestures in young children with autism using a naturalistic behavioral intervention. *Journal of Autism and Developmental Disorders*, *37*(8), 1446–1456. http://doi.org/10.1007/s10803-006-0221-z

Ingersoll, B. R., & Dvortcsak, A. (2010). *Teaching Social Communication to Children with Autism*. Guilford Press, New York, NY.

Ingersoll, B., & Schreibman, L. (2006). Teaching reciprocal imitation skills to young children with autism using a naturalistic behavioral approach: Effects on language, pretend play, and joint attention. *Journal of Autism and Developmental Disorders*, *36*(4), 487–505. http://doi.org/10.1007/s10803-006-0089-y

Ingersoll, B., & Wainer, A. (2013). Initial efficacy of project ImPACT: A parent-mediated social communication intervention for young children with ASD. *Journal of Autism and Developmental Disorders*, *43*(12), 2943–2952. http://doi.org/10.1007/s10803-013-1840-9

Jones, W., & Klin, A. (2013). Social engagement in the first two years of life in autism spectrum disorders. In *Development and brain systems in autism.* (pp. 123–147). CHAP, Psychology Press, New York, NY. Retrieved from http://pitt.idm.oclc.org/login?url=http://search.proquest.com/docview/1519514117?accountid=14709

Kasari, C. (2015). Update on behavioral interventions for autism and developmental disabilities. *Current Opinion in Neurology*, *28*(2), 124–129. http://doi.org/10.1097/WCO.0000000000000185

Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *47*(6), 611–620. http://doi.org/10.1111/j.1469-7610.2005.01567.x

Kasari, C., Gulsrud, A. C., Wong, C., Kwon, S., & Locke, J. (2010). Randomized controlled caregiver mediated joint engagement intervention for toddlers with autism. *Journal of Autism and Developmental Disorders*, *40*(9), 1045–56. JOUR. http://doi.org/10.1007/s10803-010-0955-5

Kasari, C., Gulsrud, A., Paparella, T., Hellemann, G., & Berry, K. (2015). Randomized Comparative Efficacy Study of Parent-Mediated Interventions for Toddlers With Autism. *Journal of Consulting and Clinical Psychology*, 554–563. JOUR. http://doi.org/http://dx.doi.org/10.1037/a0039080

Kasari, C., Paparella, T., Freeman, S., & Jahromi, L. B. (2008). Language outcome in autism: Randomized comparison of joint attention and play interventions. *Journal of Consulting and Clinical Psychology*. JOUR DESCRIPTORS - *Attention; *Autism Spectrum Disorders; *Childhood Play Behavior; *Language Development; Mother Child Relations PMID - 18229990, Kasari, Connie: UCLA, 3132 Moore Hall, Los Angeles, CA, US, 90095, kasari@gseis.ucla.edu: American Psychological Association. http://doi.org/10.1037/0022-006X.76.1.125

Kasari, C., Siller, M., Huynh, L. N., Shih, W., Swanson, M., Hellemann, G. S., & Sugar, C. a. (2014). Randomized controlled trial of parental responsiveness intervention for toddlers at high risk for autism. *Infant Behavior and Development*, *37*(4), 711–721. http://doi.org/10.1016/j.infbeh.2014.08.007

Katagiri, M., Inada, N., & Kamio, Y. (2010). Mirroring effect in 2-and 3-year-olds with autism spectrum disorder. *Research in Autism Spectrum Disorders*, *4*(3), 474–478. JOUR.

Koegel, L. K., Vernon, T. W., Koegel, R. L., Koegel, B. L., & Paullin, A. W. (2012). Improving social engagement and initiations between children with autism spectrum disorder and their peers in inclusive settings. *Journal of Positive Behavior Interventions*, *14*(4), 220–227. JOUR. http://doi.org/http://dx.doi.org/10.1177/1098300712437042

Koegel, R. L., Koegel, L. K., Vernon, T. W., & Brookman-Frazee, L. I. (2010). Empirically supported pivotal response treatment for children with autism spectrum disorders. In

Evidence-based psychotherapies for children and adolescents (2nd ed.). (pp. 327–344). CHAP, Guilford Press, New York, NY. Retrieved from http://pitt.idm.oclc.org/login?url=http://search.proquest.com/docview/760213476?accountid=14709

Kratochwill, T. R., Hitchcock, J. H., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2012). Single-Case Intervention Research Design Standards. *Remedial and Special Education*. http://doi.org/10.1177/0741932512452794

Lakin, J. L., Jefferis, V. E., Cheng, C. M., & Chartrand, T. L. (2003). The Chameleon Effect as Social Glue: Evidence for the Evolutionary Significance of Unconscious Mimicry. *Journal of Nonverbal Behavior*, *27*(3), 145–162. http://doi.org/DOI: 10.1023/A:1025389814290

Landry, S. H., Smith, K. E., & Swank, P. R. (2006). Responsive parenting: establishing early foundations for social, communication, and independent problem-solving skills. *Developmental Psychology*, *42*(4), 627–642. http://doi.org/10.1037/0012-1649.42.4.627

Landry, S. H., Smith, K. E., Swank, P. R., Zucker, T., Crawford, A. D., & Solari, E. F. (2012). The effects of a responsive parenting intervention on parent–child interactions during shared book reading. *Developmental Psychology*, *48*(4), 969–986. http://doi.org/10.1037/a0026400

Lieberman-Betz, R. G. (2014). A Systematic Review of Fidelity of Implementation in Parent-Mediated Early Communication Intervention. *Topics in Early Childhood Special Education*, *35*(1), 15–27. http://doi.org/10.1177/0271121414557282

Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*. JOUR DESCRIPTORS - *Autism; *Behavior Modification; *Cognitive Ability; *Educational Placement; Followup Studies PMID - 3571656, US: American Psychological Association. http://doi.org/10.1037/0022-006X.55.1.3

Mahoney, G. K. (2013). The Effects of Mother's Style of Interaction on Children's Engagement: Implications for Using Responsive Interventions with Parents. *Topics in Early Childhood Special Education*, *33*(3), 133–143. http://doi.org/10.1177/0271121413484972

Mahoney, G., Kim, J. M., & Lin, C. (2007). Pivotal behavior model of development learning. *Infants & Young Children: An Interdisciplinary Journal of Special Care Practices*, *20*(4), 311–325. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=2009684792&site=ehost-live

Mahoney, G., & Perales, F. (2003). Using Relationship-Focused Intervention to Enhance the Social Emotional Functioning of Young Children with Autism Spectrum Disorders. *Topics in Early Childhood Special Education*, *23*(2), 74–86. http://doi.org/10.1177/02711214030230020301

Mahoney, G., & Perales, F. (2005). Relationship-focused early intervention with children with

pervasive developmental disorders and other disabilities: A comparative study. *Journal of Developmental & Behavioral Pediatrics*, *26*(2), 77–85. JOUR.

Masur, E. F., & Olson, J. (2008). Mothers' and infants' responses to their partners' spontaneous action and vocal/verbal imitation. *Infant Behavior and Development*, *31*(4), 704–715. http://doi.org/10.1016/j.infbeh.2008.04.005

McConachie, H., & Oono, I. (2013). Cochrane in context: Parent-mediated early intervention for young children with autism spectrum disorders (ASD). *Evidence-Based Child Health*, *8*(6), 2483–2485. http://doi.org/http://dx.doi.org/10.1002/ebch.1954

McDuffie, A., & Yoder, P. (2010). Types of parent verbal responsiveness that predict language in young children with autism spectrum disorder. *Journal of Speech, Language, and Hearing Research : JSLHR*, *53*(4), 1026–1039. http://doi.org/10.1044/1092-4388(2009/09-0023)

McManus, B. M., Carle, A. C., & Rapport, M. J. (2012). Classifying infants and toddlers with developmental vulnerability: who is most likely to receive early intervention? *Child: Care, Health and Development*, 1–10. http://doi.org/10.1111/cch.12013

Meadan, H., Ostrosky, M. M., Zaghlawan, H. Y., & Yu, S. (2009). Promoting the Social and Communicative Behavior of Young Children With Autism Spectrum Disorders: A Review of Parent-Implemented Intervention Studies. *Topics in Early Childhood Special Education*, *29*(2), 90–104. http://doi.org/10.1177/0271121409337950

Meltzoff, A. N. (2007). The "Like Me" Framework for Recognizing and Becoming an Intentional Agent. *Acta Psychologica*, *124*(1), 26–43.

Mundy, P., & Crowson, M. (1997). Joint attention and early social communication: implications for research on intervention with autism. *Journal of Autism and Developmental Disorders*, *27*(6), 653–76. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9455727

Mundy, P., & Newell, L. (2007). Attention , Joint Attention , and Social Cognition. *Current Directions in Psychological Science*, *16*(5), 269–275. http://doi.org/10.1111/j.1467-8721.2007.00518.x

Mundy, P., Sullivan, L., & Mastergeorge, A. M. (2009). A parallel and distributed-processing model of joint attention, social cognition and autism. *Autism Research : Official Journal of the International Society for Autism Research*, *2*(1), 2–21. http://doi.org/10.1002/aur.61

Nadel, J., Croué, S., Mattlinger, M.-J., Canet, P., Hudelot, C., Lecuyer, C., & Martini, M. (2000). Do children with autism have expectancies about the social behaviour of unfamiliar people? A pilot study using the still face paradigm. *Autism*, *4*(2), 133–145. JOUR.

Nadel, J., & Dumas, G. (2014). The Interacting Body : Intra- and Interindividual Processes During Imitation. *Journal of Cognitive Education and Psychology*, *13*(2), 163–176. http://doi.org/doi.org/10.1891/1945-8959.13.2.163

National Research Council. (2001). Educating children with autism. BOOK.

Nichols, K. E., Fox, N., Mundy, P., & Nichols, K.; Fox, N.; Mundy, P. (2005). Joint Attention, Self-Recognition, and Neurocognitive Function in Toddlers. *Infancy*, *7*(1), 35–51. JOUR. http://doi.org/10.1207/s15327078in0701_4

Oono, I. P., Honey, E. J., McConachie, H., Oono Inalegwu, P., Honey Emma, J., & McConachie, H. (2013). Parent-mediated early intervention for young children with autism spectrum disorders (ASD). *The Cochrane Database of Systematic Reviews*, *4*, CD009774. http://doi.org/10.1002/14651858.CD009774.pub2

Patterson, S. Y., Elder, L., Gulsrud, A., & Kasari, C. (2013). The association between parental interaction style and children's joint engagement in families with toddlers with autism. *Autism : The International Journal of Research and Practice*, *18*(5), 511–518. http://doi.org/10.1177/1362361313483595

Pedersen, D., & Shonkoff, J. P. (2010). Translating the science of early childhood development into policy and practice. In *Nurturing children and families: Building on the legacy of T. Berry Brazleton.* (pp. 332–340). CHAP, Wiley-Blackwell. Retrieved from http://pitt.idm.oclc.org/login?url=http://search.proquest.com/docview/896406452?accountid=14709

Pelaez, M., Virues-Ortega, J., & Gewirtz, J. L. (2011). Reinforcement of Vocalizations Through Contingent Vocal Imitation. *Journal of Applied Behavior Analysis*, *44*(1), 33–40. http://doi.org/10.1901/jaba.2011.44-33

Ruble, L., McDuffie, a., King, a. S., & Lorenz, D. (2008). Caregiver Responsiveness and Social Interaction Behaviors of Young Children With Autism. *Topics in Early Childhood Special Education*, *28*, 158–170. http://doi.org/10.1177/0271121408323009

Sanefuji, W., & Ohgami, H. (2011). Imitative behaviors facilitate communicative gaze in children with autism. *Infant Mental Health Journal*, *32*(1), 134–142. JOUR. http://doi.org/10.1002/imhj.20287

Sanefuji, W., & Ohgami, H. (2013). "Being-Imitated" Strategy at Home-Based Intervention for Young Children with Autism. *Infant Mental Health Journal*, *34*(1), 72–79. JOUR.

Schertz, H. H., & Odom, S. L. (2007). Promoting joint attention in toddlers with autism: a parent-mediated developmental model. *Journal of Autism and Developmental Disorders*, *37*(8), 1562–75. JOUR. http://doi.org/10.1007/s10803-006-0290-z

Schertz, H. H., Odom, S. L., Baggett, K. M., & Sideris, J. H. (2013). Effects of Joint Attention Mediated Learning for toddlers with autism spectrum disorders: An initial randomized controlled study. *Early Childhood Research Quarterly*, *28*(2), 249–258. http://doi.org/10.1016/j.ecresq.2012.06.006

Schopler, E., Van Bourgondien, M. E., Wellman, G. J., & Love, S. R. (2010). The Childhood Autism Rating Scale: 2nd Edition. *Western Psychological Services, Los Angeles, CA*, b15.

JOUR.

Schreibman, L., Dawson, G., Stahmer, A. C., Landa, R., Rogers, S. J., McGee, G. G., … Halladay, A. (2015). Naturalistic Developmental Behavioral Interventions: Empirically Validated Treatments for Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*. http://doi.org/10.1007/s10803-015-2407-8

Schultz, T. R., Schmidt, C. T., & Stichter, J. P. (2011). A Review of Parent Education Programs for Parents of Children With Autism Spectrum Disorders. *Focus on Autism and Other Developmental Disabilities*, *26*(2), 96–104. http://doi.org/10.1177/1088357610397346

Shire, S. Y., Gulsrud, A., & Kasari, C. (2016). Increasing Responsive Parent–Child Interactions and Joint Engagement: Comparing the Influence of Parent-Mediated Intervention and Parent Psychoeducation. *Journal of Autism and Developmental Disorders*. http://doi.org/10.1007/s10803-016-2702-z

Shonkoff, J. P. (2010). Building a new biodevelopmental framework to guide the future of early childhood policy. *Child Development*, *81*(1), 357–67. http://doi.org/10.1111/j.1467-8624.2009.01399.x

Siller, M., Hutman, T., & Sigman, M. (2013). A Parent-Mediated Intervention to Increase Responsive Parental Behaviors and Child Communication in Children with ASD : A Randomized Clinical Trial. *Journal of Autism and Developmental Disorders*, *43*(3), 540–555. http://doi.org/10.1007/s10803-012-1584-y

Siller, M., & Sigman, M. (2008). Modeling longitudinal change in the language abilities of children with autism: Parent behaviors and child characteristics as predictors of change. *Developmental Psychology*, *44*(6), 1691–1704. JOUR. Retrieved from http://pitt.idm.oclc.org/login?url=http://search.proquest.com/docview/614488497?accountid=14709

Siller, M., Swanson, M., Gerber, A., Hutman, T., & Sigman, M. (2014). A Parent-Mediated Intervention That Targets Responsive Parental Behaviors Increases Attachment Behaviors in Children with ASD: Results from a Randomized Clinical Trial. *Journal of Autism and Developmental Disorders*, *44*(7), 1720–1732. http://doi.org/10.1007/s10803-014-2049-2

Slaughter, V., & Ong, S. Sen. (2014). Social Behaviors Increase More When Children With ASD Are Imitated by Their Mother vs. an Unfamiliar Adult. *Autism Research*, *7*(5), 582–589. http://doi.org/10.1002/aur.1392

Solomon, R., Van Egeren, L. A., Mahoney, G., Quon Huber, M. S., & Zimmerman, P. (2014). PLAY Project Home Consultation intervention program for young children with autism spectrum disorders: a randomized controlled trial. *Journal of Developmental and Behavioral Pediatrics : JDBP*, *35*(8), 475–85. http://doi.org/10.1097/DBP.0000000000000096

Stahmer, A. C., & Pellecchia, M. (2015). Moving towards a more ecologically valid model of parent-implemented interventions in autism. *Autism*, *19*(3), 259–261.

http://doi.org/10.1177/1362361314566739

Tiegerman, E., & Primavera, L. H. (1984). Imitating the autistic child: facilitating communicative gaze behavior. *Journal of Autism and Developmental Disorders*, *14*(1), 27–38. http://doi.org/10.1007/BF02408553

Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: the origins of cultural cognition. *The Behavioral and Brain Sciences*, *28*(5), 675-691-735. http://doi.org/10.1017/S0140525X05000129

Trevarthen, C. (1979). Communication and cooperation in early infancy: A description of primary intersubjectivity. *Before Speech: The Beginning of Interpersonal Communication*, 321–347. JOUR.

Trevarthen, C. (2005). First things first: infants make good use of the sympathetic rhythm of imitation, without reason or language. *Journal of Child Psychotherapy*, *31*(1), 91–113. http://doi.org/10.1080/00754170500079651

Trevarthen, C. (2011). The Generation of Human Meaning: How Shared Experience Grows in Infancy. In A. Seeman (Ed.), *Joint Attention: New Developments in Psychology, Philosophy of MInd, and Neuroscience* (pp. 73–113). Cambridge, Massachussetts: The MIT Press. http://doi.org/2011021048

Trevarthen, C., & Aitken, K. J. (2001). Infant Intersubjectivity : Research , Theory , and Clinical Applications. *Journal of Child Psychology and Psychiatry*, *42*(1), 3–48.

Tronick, E., Als, H., Adamson, L., Wise, S., & Brazelton, T. B. (1978). The infant's response to entrapment between contradictory messages in face-to-face interaction. *Journal of the American Academy of Child Psychiatry*, *17*(1), 1–13. JOUR.

Tronick, E. Z. (1989). Emotions and emotional communication in infants. *The American Psychologist*, *44*(2), 112–9. http://doi.org/10.1037/0003-066X.44.2.112

van Baaren, R., Janssen, L., Chartrand, T. L., & Dijksterhuis, A. (2009). Where is the love? The social aspects of mimicry. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, *364*(1528), 2381–2389. http://doi.org/10.1098/rstb.2009.0057

Vismara, L. A., & Lyons, G. L. (2007). Using Perseverative Interests to Elicit Joint Attention Behaviors in Young Children With Autism: Theoretical and Clinical Implications for Understanding Motivation. *Journal of Positive Behavior Interventions*, *9*(4), 214–228. http://doi.org/10.1177/10983007070090040401

Volkmar, F. R., Lord, C., Bailey, A., Schultz, R. T., & Klin, A. (2004). Autism and pervasive developmental disorders. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *45*(1), 135–70. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/14959806

Vygotsky, L. S. (1980). *Mind in society: The development of higher psychological processes*. BOOK, Harvard university press.

Vygotsky, L. S. (1997). *The Collected Works of LS Vygotsky: Problems of the theory and history of psychology* (Vol. 3). BOOK, Springer Science & Business Media.

Wallace, K. S., & Rogers, S. J. (2010). Intervening in infancy: implications for autism spectrum disorders. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *51*(12), 1300–20. http://doi.org/10.1111/j.1469-7610.2010.02308.x

Webb, S. J., Jones, E. J. H., Kelly, J., & Dawson, G. (2014). The motivation for very early intervention for infants at high risk for autism spectrum disorders. *International Journal of Speech-Language Pathology*, *16*(1), 36–42. http://doi.org/10.3109/17549507.2013.861018

Zwaigenbaum, L., Bryson, S., Lord, C., Rogers, S., Carter, A., Carver, L., … Yirmiya, N. (2009). Clinical assessment and management of toddlers with suspected autism spectrum disorder: insights from studies of high-risk infants. *Pediatrics*, *123*(5), 1383–1391. http://doi.org/10.1542/peds.2008-1606