MOTHERS SCAFFOLDING PLAY IN CHILDREN

WITH AUTISM SPECTRUM DISORDERS

by

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ABSTRACT

Play allows children to appropriately engage with peers and others in their environment by using developmental and social skills. Many researchers have demonstrated that parents of children with typical development scaffold the development of children's play beginning at 12 months through the preschool years (Woolley & Tullos, 2008). However, some children have impairments in developing and using social skills, such as children with autism spectrum disorders (ASD). The current study was a single-subject design (n = 3; M_{age} = 26.5 months) that evaluated a social-communication intervention (i.e., Project ImPACT: Improving Parents As Communication Teachers) for toddlers with ASD. Mothers' scaffolding techniques (i.e., comments, requests, and prompts) were explored during mother-child play samples, in addition to children's social engagement in mothers' scaffolding techniques. Overall, results from Simulation Modeling Analysis (SMA) showed that mothers' scaffolding techniques and children's social engagement to these techniques increased. Additionally Reliable Change Index (RCI) revealed children's developmental/social/play skills improved from pre- to post- and pre- to post 2-intervention. Thus, early intervention, such as parent-mediated intervention, is an important component of children with ASD reaching their fullest potential.

Keywords: scaffolding, autism spectrum disorders, play, early intervention

DEDICATION

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LIST OF ABBREVIATIONS AND SYMBOLS

M_I	Mean of intervention: The sum of a set of measurements divided by the number of measurements during intervention
M_B	Mean of baseline: The sum of a set of measurements divided by the number of measurements during baseline
M	Mean: The sum of a set of measurements divided by the number of measurements in the set
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
κ	Cohen's κ: Value of interrater reliability
r	Pearson's *r*: Value of correlation
n	Sample size of group
SD	Standard deviation
**	*p* is less than .005
*	*p* is less than .05
†	*p* is less than .10
>	Greater than
%	Percentage
<	Less than
=	Equal to

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INTRODUCTION

Mothers Scaffolding Play in Children with Autism Spectrum Disorders

Play is an important component of children's development. Many researchers have demonstrated that parents of children with typical development (TD) scaffold the development of children's play beginning at 12 months through the preschool years (Woolley & Tullos, 2008). Play allows children to appropriately engage with peers and others in their environment by using developmental and social skills. For example, play provides opportunities to use social skills such as joint attention, eye contact, and response to name (Goldstein, English, Shafer, & Kaczmarek, 1997; Landa, Holman, & Garrett-Mayer, 2007). Additionally, play allows children to use language, engage in imitation, and use gestures (Ingersoll & Schreibman, 2006; Landa, Holman, & Garrett-Mayer, 2007). Play also involves the use of developmental skills including but not limited to fine/gross motor skills and receptive/expressive language.

However, some children have impairments in developing and using these skills. For example, children with autism spectrum disorders (ASD) are known to have language, communication, and social skill impairments (DSM-IV-TR; APA, 2000). These common deficits influence various aspects of children's daily lives with ASD, including their play skills. Social communication impairments interfere with children's ability to develop complex play skills and might make it more difficult for parents to engage in their play like parents of children with TD. In other words, children with ASD need extra assistance in developing complex play skills such as engaging in pretend play. Better guiding children's play could have a global effect on children's overall development because play and developmental skills are known to have a

reciprocal relationship (Stanley & Konstantareas, 2007). For example, language skills influence play, and play influences language skills. Although directionality of this relationship is undetermined, recent research suggests that pretend play and language are related such that pretend play precedes early language development (Lillard et al., 2012). For example, more complex play skills, like pretend play, require developmentally and socially appropriate skills to engage in such play behaviors.

To date, there is no research that specifically examines how parents scaffold pretend play development in children with ASD. It is possible that parents of children with ASD stop scaffolding play when they do not evoke a response from their children. However, children with ASD are still in need of parent involvement such as scaffolding play. This study examined how: 1) mothers scaffold play of toddlers with ASD, 2) toddlers with ASD socially engaged in mothers' scaffolding techniques, and 3) developmental, social, and play skills of toddlers with ASD changed from pre- to post-and pre- to post 2-intervention. Overall, this study aimed to highlight the importance of and need for parents to scaffold children's play. Additionally, this study highlighted the effects of Project ImPACT implementation on mothers' scaffolding techniques and children's skills changing from baseline to intervention. Thus in this introduction, the core components of this study are reviewed: autism spectrum disorder, scaffolding, and intervention for children with ASD.

Autism Spectrum Disorder (ASD)

Autism was originally noted in 1943 about 11 children with "infantile autism" who reflected abnormal characteristics (Kanner, 1943). Shortly thereafter, Hans Asperger documented a group of children who had common unusual features (1944). Both Kanner and Asperger speculated that these abnormalities were present from birth and that individuals were unable to

form normal affective relationships. Since these abnormalities were first mentioned, the characteristics and categorization of "autism" have evolved. Today autism, along with other similar disorders, is classified within the label "autism spectrum disorder" (ASD). Autism is known as a neuro-developmental disorder that affects 1 in 88 individuals (CDC, 2012). According to the DSM-IV-TR (2000), ASD is a collective term that includes the following: (1) autistic disorder, (2) Asperger disorder, and (3) Pervasive Developmental disorder- Not Otherwise Specified (PDD-NOS). Although debate exists about how these disorders differ, there are common features that underlie ASD, which are qualitative communication/social impairments in addition to the presence of restrictive and repetitive behaviors/interests.

As noted above, the first domain of ASD is impaired social interactions. This is evident in impaired usage of a variety of non-verbal behaviors such as: facial expressions, eye-to-eye gaze, body postures, and gestures that maintain social interaction. Individuals with ASD are often unable to develop peer relationships that are on target for their developmental level. Additionally, these individuals often lack emotional/social reciprocity and the ability to spontaneously seek engagements with other people such as sharing enjoyment, interests, or achievements.

The second domain of ASD is communication impairments. This refers to delayed (or total lack of) language development without compensated efforts such as gesture or mime. Individuals whose speech is in tact often have difficulty with initiating and/or maintaining conversation, and might use idiosyncratic language and/or stereotyped/repetitive language. Children with ASD also demonstrate communication impairments with their lack of or delayed make-believe and social imitative play.

The third domain of ASD is restrictive/repetitive behaviors and interests. This includes abnormal preoccupations with one (or multiple) stereotyped and restricted interests, which are abnormal in focus or intensity. Individuals with ASD are often rigidly fixated on specific, non-functional rituals and routines. Their behaviors frequently include motor mannerisms that are repetitive, stereotyped, and have persistent fixation on parts of objects.

Scaffolding

Lev Vygotsky, a Russian psychologist, was well known for the concept: zone of proximal development (ZPD), which refers to the gap between *actual* development and *potential* development (Vygotsky, 1962). Actual development is marked by an individual's development without the assistance of another whereas potential development is indicated by an individual's development when assisted by another. That is, when a more competent partner guides an individual's *actual* development, the individual is more likely to reach his/her *potential* developmental level.

Vygotsky also coined the phrase "scaffolding", which occurs when an individual is provided enough support to learn. Scaffolding can be applied to a variety of settings such as academics and goal setting. Considering scaffolding in the context of play, parents' involvement in children's *actual* developmental level could foster growth toward children's *potential* developmental level. Therefore, this project aimed to examine how mothers' scaffolding techniques used during children's play could bring children with ASD from their actual level to their potential level, considering skills of children with ASD are often delayed but still important for development.

Parent Scaffolding in Children's Play. Various terms are used to capture strategies that can aid children by improving their developing skills. For example, "prompting", "modeling",

and “reinforcement” are terms widely used in intervention literature. These techniques are known to provide assistance to children’s developing skills (Fava et al., 2011; Liber, Frea & Symon, 2008; Wetherby & Woods, 2006; Vismara et al., 2009). In the context of play, Valentino and colleagues (2011) recently used ‘scaffolding’ to describe mother-child play. Specifically, they considered maternal scaffolding as an umbrella term that captured the following: (1) “instruction/question” to guide the child’s attention, (2) “naming object” toward direction of child’s attention, (3) “position/reposition/demonstrate”, in which mothers used distal or proximal pointing (4) “move”, in which mothers used hand over hand prompting, and finally (5) limit-setting, in which mothers verbally or physically resisted acts/suggestions from child (Valentino, Cicchetti, Toth & Rogosch, 2011). These scaffolding techniques were adapted from Belsky, Goode, and Most’s (1980) original work examining play and social behaviors in preschoolers that were maltreated.

Furthermore, Woolley and Tullos (2008) suggested that parents of children who are typically developing begin to scaffold children’s play around 12 months old, in which these researchers also used scaffolding as an inclusive term. They highlighted 3 specific scaffolding techniques that parents often use in the context of play with children: (1) using comments (e.g., “I bet your doll is really hungry – she hasn’t eaten since breakfast”), (2) adding requests (e.g., “Why don’t you scramble an egg for your doll?’’), and (3) prompting (i.e., behaviors provided by the parent that increase the likelihood that the child will participate in the desired behavior). Woolley and Tullos (2008) stated that these types of scaffolding techniques serve two purposes to either *maintain* children’s play (e.g., if play is not complete, how parent continues with play scenario) or *enhance* children’s play (e.g., parent enriches what child does). For the aims of this study, Woolley and Tullos’ three scaffolding techniques (i.e., comments, requests, and prompts)

and the purposes (i.e., maintenance/enhancement) of these scaffolding techniques were further examined in the context of mothers playing with their children with ASD.

Play

Play is a rich term that is comprised of a variety of functions. For example, play could involve oral or tactile manipulation of objects, banging blocks together, rolling cars along the floor, rocking a baby doll to sleep, or acting as an animal at the zoo. These examples reveal the complexity of play by beginning with "indiscriminate actions" and progressing toward more advanced "fantasy play" (Lifter, 2000). In general, play typically follows a sequence that begins with functional play, progressing to pre-symbolic play, and advances to symbolic play.

A more complex type of play, pretend play and also known as imaginative play or symbolic play, occurs when an individual engages in an activity that is not really what it is represented as being (Singer & Singer, 1981). For example, when a child holds a TV remote up to his/her ear and babbles with the remote, s/he is pretending to talk on the "phone". Pretend play skills are indicators of typical development that emerge as early as 12 months in children who are developing expectedly. These advanced and complex play skills often develop significantly between 15 to 24 months (Greenspan, Prizant, & Wetherby, 2004; Woolley & Tullos, 2008) with expectation that participation in pretend play will be evident by a child's second birthday (Casby, 2003; Fenson, Kagan, Kearsley, & Zelazo, 1976; McCune, 1995).

On the other hand, the absence of pretend play skills in children often indicates atypical or delayed development such as autism spectrum disorder (DSM-IV-TR; APA, 2000). Research suggests that diagnostic features of ASD such as repetitive behaviors, can narrow children's abilities to develop more complex play behaviors (Wetherby & Morgan, 2007; Rutherford et al., 2007; Pierce, 2011). That is, children with ASD can become rigidly fixated on performing a

function on an object over and over (e.g., spin wheels on a car) rather than using the object functionally (e.g., roll the car on the table) or symbolically (e.g., getting a 'car wash'). Additionally, independent play in children with ASD has shown to be limited (Mundy, Sigman, Ungerer & Sherman, 1987) to the extent that children with ASD were once thought to have "impoverished" pretend play skills (Wing et al., 1977; Riguet et al., 1981; Ungerer & Sigman, 1981; Gould, 1986). With a more recent investigation of play skills in children with ASD, Pierce (2011) assessed exploratory, functional, and pretend play in young children with autism (n = 48; range = 18 – 24 months). This research found that children with autism engaged in more exploratory play in comparison to children who were typically developing, which participated in more complex play behaviors compared to children with ASD. Additionally, children with ASD participated in fewer pretend and functional play behaviors compared to children who were typically developing. Because children with ASD often display difficulty in spontaneously engaging in pretend play, it is essential to better facilitate and encourage these play behaviors in children when limitations are apparent.

The Influence of Play on Developmental and Social Skills

Developing pretend play skills is important because engaging in symbolic thoughts and activity can have developmental benefits. For example, research has shown that children who engage in pretend play displayed better inhibitory control skills and attention shift skills (Pierucci, O'Brien, McInnis, Gilpin, & Barker, under review). Furthermore, pretend play is important because it has been shown to enhance a variety of developmental and social skills including but not limited to: memory, attention, language, perspective-taking, self-control, narrative, and creativity (Bergen & Mauer, 2000; Elias & Berk, 2002; Lillard et al., 2012; Lindsey & Colwell, 2003; Ruff & Capozzoli, 2003).

In order for children to appropriately engage in pretend play, they must be able to identify what is real (i.e., reality) from what is not real (i.e., fantasy). Distinction between fantasy and reality generally emerges by the age of 3 in typically developing children (Morison & Gardner, 1978; Sharon & Woolley, 2004) with precursory pretend play behaviors evident earlier in childhood (Casby, 2003; Fenson, Kagan, Kearsley, & Zelazo, 1976; McCune, 1995). However, it is expected that children with ASD will be delayed in distinguishing fantasy from reality, unless assisted by a competent individual (e.g., peer or parent). In fact, according to the DSM-IV-TR (2000) criterion, individuals with ASD often lack make-believe or social imitative play for their appropriate developmental level.

Previously, children with autism were thought to have intact reality play skills and impoverished symbolic play skills (Wing et al., 1977; Riguet et al., 1981; Ungerer & Sigman, 1981; Gould, 1986); however, these studies did not use a consistent definition of pretend play. Baron-Cohen (1987) established a collective definition of pretend play, in which he stated that "pretend" play is distinct from "reality" play, because pretend play requires an individual to simultaneously know what the object is and what the object represents. According to Baron-Cohen, pretend play is comprised of 3 aspects: (1) using an object as if it was another object, (2) attributing properties to an object that it did not have, and/or (3) referring to an absent object as if it was present.

Baron-Cohen further explored these aspects of pretend play in children (n = 30; M = 6.5 years) with autism, Down syndrome, and typical development. Observations of children's pretend play were based on 15-minute videotaped play sessions, in which children's solitary spontaneous play was examined. More specifically, Baron-Cohen was interested in whether or not children with autism would show spontaneous pretend play. Results revealed that children

with autism produced the least amount of spontaneous pretend play compared to children with Down syndrome (DS) and typical development (TD), respectively. However, children with autism that did engage in pretend play had significantly higher nonverbal and verbal mental ages than children with autism that did not engage in pretend play. In other words, these results suggest that children with autism are capable of engaging in pretend play when accompanied by nonverbal and verbal language skills (although limited compared to children with TD or have DS). Additionally, Baron-Cohen noted that children with ASD did engage in some solitary play which leads to the speculation that if parents scaffold children's pretend play, children with ASD might begin to engage in pretend play more frequently. Additionally, these results indicate that children who engage in pretend play gain better developmental and social skills such as language, which is corroborated by the aforementioned reciprocal relationship (Stanley & Konstantareas, 2007).

Another study that examined pretend play in autism was conducted by Charman, Swettenham, Baron-Cohen, Cox, Baird, and Drew (1997). This study was unique by focusing on toddlers with autism, developmental delay, and typical development (n = 38; M = 20 months). Charman and colleagues examined the relationship between toddlers' empathy, pretend play, joint attention, and imitation skills. Results suggested that toddlers with autism and developmental delay engaged in functional play, with few participants engaging in spontaneous pretend play. Toddlers with developmental delays engaged in pretend play following prompting, although toddlers with autism did not engage in pretend play after being prompted; therefore, if parents were better trained in guiding children's play over time, then possibly children with autism would have engaged in pretend play as did the toddlers who were developmentally delayed. For example, research has revealed that providing specific pretend play training to

children with ASD can improve both pretend play skills and social interaction skills (Stahmer, 1995).

In a more recent study of pretend play and ASD, Stanley and Konstantareas (2007) examined the relationship of pretend play in children ages 21 to 26 months (n =101). The following domains were considered in relationship with children's pretend play: degree of autism symptomatology, nonverbal cognitive ability, receptive language, expressive language, and social development. They hypothesized that more advanced pretend play skills would be related to lower autism symptomatology, higher nonverbal cognitive ability and language ability, and better developed social skills. Results indicated that autism symptomatology was significantly related to pretend play. That is, the level of autistic symptoms significantly contributed to children's pretend play skills, in which children with fewer autistic symptoms displayed more pretend play skills. Findings also suggested that nonverbal cognitive ability and expressive language were both significant predictors of pretend play, which revealed that children with better nonverbal cognitive abilities and better expressive language skills displayed more pretend play skills. In summary, this research suggests that the relationship between symbolic play and cognitive/language skills is reciprocal, with development in one facilitating development in the other; therefore, this project assessed mothers' scaffolding techniques during children's play and children's developmental, social, and play skills.

In synchrony with past findings, another study conducted by Sigman and Ungerer (1984b) found that children with ASD displayed the least amount of pretend play compared to children with intellectual disabilities and/or no diagnosis (n = 47), which was also corroborated by Jarrold, Boucher, and Smith (1993). Jarrold et al. examined young children and found that many children with ASD had significant difficulty engaging in pretend play. However, when

children with ASD were prompted during play, they produced as many functional and pretend play behaviors as did children with TD (Lewis & Boucher, 1988). This finding suggests that through prompting and structured settings, children with ASD can be trained how to play and thereby are able to exhibit functional and pretend play behaviors with adequate assistance.

There are various components that contribute to children developing and using appropriate play skills. For example, Wolfberg (2009) suggested that children with autism, while having social support from their peers, could engage in representational and social play. In addition to peers providing support to foster play, parents are another source that can provide support during play. Gillett and LeBlanc (2007) found that parent training evoked improved play skills in children with ASD. This study replicated previous findings (Laski, Charlop, & Schreibman, 1988) using the National Language Paradigm (NLP). Specifically Gillett and LeBlanc taught parents of 3 children with autism how to implement the NLP, which involves equipping parents with techniques to enhance spontaneous speech acquisition and assist children with generalizing these skills. Parent implementation of the NLP with their children demonstrated efficacy by children having improved language skills (i.e., increased amounts of vocalizations shifting from imitative to spontaneous vocalizations) from pre- to post-intervention. Additionally, play skills were shown to improve (i.e., children using more appropriate play skills) from pre- to post-intervention. This corroborated previous research that showed children with autism are capable of developing pretend play behaviors, such that scaffolding play through parent implemented techniques could enhance children's play abilities and developmental/social skills. In conclusion, play of children with ASD is often limited, yet the level of impairment (e.g., severity of delay) in children's play is debatable; therefore, implementing a parent focused intervention for children with ASD could optimally improve

children's developmental, social, and play skills while also improving (i.e., increasing frequencies of) mothers' scaffolding techniques used during children's play.

Intervention in ASD

Research has revealed that early intervention for children with ASD leads to improved functioning and better long-term outcomes (National Research Council, 2001). The current recommendation of intervention services is 25 hours per week for young children with ASD (National Research Council, 2001). However, in the state of Alabama on average children with ASD receive 30 minutes of intervention services a week or less (Alabama Autism Collaborative Group, 2008). This great disparity suggests a dire need for children with ASD to receive intervention services from alternative resources, especially if not receiving an adequate amount of services from professionals. In other words, parents can play a significant role in implementing intervention, allowing children to meet the amount of recommended intervention services and reach optimal developmental outcomes.

There are various interventions that are implemented to treat children with ASD. Commonly, interventions focus on two approaches: (1) naturalistic behavioral interventions and (2) developmental, social-pragmatic interventions (DSP). The implementation of behavioral interventions started in the early 1960's, and one of the core principle of these types of interventions revolves around teaching skills through an "A, B, C" model (i.e., antecedent, behavior, and consequence). Another intervention approach, known as "developmental, social-pragmatic", started in the 1980's and was based on an infusion of Piaget's developmental approach with a social-pragmatic language acquisition model. Ingersoll (2010) expansively investigated the similarities and differences between these two intervention approaches and found a common thread that both naturalistic behavioral interventions and DSP interventions

focus on: teaching parents to increase social communication skills in children. Furthermore, recent findings suggest that social communicative interventions are most effective for young children with ASD because of children's responsiveness to this approach (Ingersoll, 2010).

Given there are multiple intervention models, it is important to consider effective interventions such as, ones that are empirically supported and have shown improvement from pre- to post-intervention. Effective interventions can occur in various settings such as in homes, classrooms, or clinics, suggesting that intervention is not limited to a therapy room. During a four-month intervention in a classroom setting, Sherratt (2002) examined the development of pretend play in children with ASD (n = 5; M = 5.5 years). This particular intervention was based on structure, affect, and repetition in order to promote pretend play. The intervention included 3 phases for both the child and teacher, which aimed to improve pretend play behaviors in children with ASD. Prior to intervention, none of the participants with ASD demonstrated any pretend play behaviors. At the conclusion of the intervention, all children with ASD were spontaneously exhibiting some pretend play behaviors. This finding suggests that effective interventions can develop and improve pretend play behaviors in children with ASD. Furthermore, there are multiple interventions that have shown to improve play, developmental, and social skills in children with ASD.

There are a variety of existing interventions that focus on increasing the complexity of children's play from simple (object) play to advanced (pretend) play (Goldstein & Cisar, 1992; Haring, 1985; Fox & Hanline, 1993; Kim, Lombardino, Rothman, & Vinson, 1989; Kok, Kong & Bernard-Opitz, 2002; Lifter, Sulzer-Azaroff, Anderson, & Cowdery, 1993; Stahmer, 1995; Thorp, Stahmer, & Schreibman, 1995). For example, Goldstein and Cisar aimed to increase interactions of children with autism during more complex play settings (i.e., sociodramatic play)

by teaching scripts to their peers and classmates (1992). It is important to note that delayed play skills in children with ASD often co-exist with other delays such as language and social skills (Lifter, Ellis, Cannon & Anderson, 2005). Thus, parents can serve as an ancillary source to optimally ameliorate delays in children with ASD. Therefore, this project implemented an intervention to improve parents as social communication teachers in the context of play, in order to better guide children with ASD to engage in more complex and functionally appropriate play.

A recent review examined 425 ASD intervention studies over the past 10 years, in which all studies had a common underlying goal: teaching children with autism how to play (Lang et al., 2009). Participants were toddlers to 8 years old and diagnosed with autism. Of the 425 studies, 15 satisfied the inclusion criterion, which required the studies to have: (1) experimental control, and (2) an operational definition of improvement in children's toy play as the dependent variable. Functional play interventions included methods such as video modeling, parent implementation of Natural Paradigm Language, structured work systems developed by TEACHH, and pairing a reinforcer with toy play. Pretend play interventions consisted of the following methods: (1) social stories, (2) video training/modeling, (3) reciprocal imitation training, (4) self-management, (5) correspondence training, (6) Milieu teaching, and (7) integrated play therapy. In general interventions that were assessed had 3 major components: (1) modeling, (2) prompting with contingent reinforcement, and (3) child-directed/naturalistic instruction. The 15 studies not only employed various play intervention methodologies, but they also had varying sample sizes that ranged from 1 to 21 participants ($M = 3$) (Lang, O'Reilly, Rispoli, Shogren, Machalicek, Sigafoos, & Regester, 2009).

Across these 15 studies, the type of play was categorized into two groups: functional play ($n = 5$ studies) and pretend play ($n = 10$ studies). Functional play is known as using an

object/activity for its intended purpose whereas pretend play occurs when an individual engages in an activity or with an object, for example, that is not really what it is represented as being (Lang et al., 2009; Singer & Singer, 1981). Within all functional play studies, results revealed a mean play behavior increase of 88% (range, 60% to 100%), suggesting that participants had improved functional play behaviors post-intervention compared to baseline performance. Additionally, within all pretend play studies, results revealed a mean play behavior increase of 86% (range, 27% to 100%). These findings suggested that there are multiple intervention methodologies which improve the complexity of play in children with ASD, and that these interventions can improve both functional and pretend play skills (Lang et al., 2009).

Given that these 15 studies varied by intervention methodologies, the methodologies that were shown to be most effective involved three common features: modeling, prompting, and contingent reinforcement. Because these components were shown to be the most effective, interventions focusing on parents scaffolding children's play using these techniques may be very successful in facilitating improved functional and pretend play behaviors. For example, Project ImPACT is a social-communication intervention for autism, in which parents are trained through interactive and directive techniques that allow parents to model, prompt, and reinforce children's behaviors (Ingersoll & Dvortcsak, 2009).

Parent-Mediated Intervention in ASD. Research has suggested that parent involvement in autism intervention is a vital component for children to reach their fullest potential (National Research Council, 2001); however within the existing literature, equipping parents to serve as key interventionists of children with autism is a growing work. In order to equip parents to serve as interventionists with their children, there are various limitations. For example, one type of intervention known as Pivotal Response Training (PRT; Koegel et al, 1999a; 1999b) takes

approximately 25 hours for parents to learn the techniques to appropriately implement PRT with their children. Therefore, many interventions require a great deal of time from parents in order for them to appropriately learn the intervention, so a heavy burden of responsibility is placed on the parents. Thus, parent-mediated interventions need to be designed to have reasonable training expectations. Another limitation of parent-mediated intervention is that solely attending sessions to learn an intervention model is not sufficient. In other words, parent attendance should be paired with *quality* intervention (Nix et al., 2009). That is, parents should be present at intervention sessions combined with delivering quality intervention techniques, whether from clinicians/parents, in order for children to display the best outcomes.

Vismara, Colombi, and Rogers (2009) recognized the importance of parent involvement for toddlers diagnosed with ASD. Vismara and colleagues provided an educational program to equip parents with naturalistic techniques infusing two types of established interventions: (1) Early Start Denver Model (ESDM; Rogers & Dawson, 2010) and (2) Pivotal Response Training (PRT; Koegel et al, 1999a; 1999b). Parents (n = 8) attended a brief 1-hour individualized weekly session over 12-weeks. During these sessions, parents were given strategies from the aforementioned interventions (ESDM and PRT) to use at home with their children with ASD. Strategies included, yet were not limited to, using verbal language, establishing a warm environment, turn taking, and rewarding children for desired behaviors. Results revealed that even minimal parent training (i.e., 1 hour/week) implementing techniques from ESDM and PRT were effective in improving children's developmental and social skills.

Another study that highlighted parent-mediated intervention in autism was conducted by Kasari and colleagues (2010). This study primarily focused on equipping parents to follow the interest of toddlers with autism (n = 38; M = 31 months) and examine how following children's

leads can influence their social communication development. The method employed during this intervention was a modified version of an existing joint attention intervention. Parents (n = 38) participated in 24 sessions during 8 weeks, in which they were taught a variety of skills such as: following their child's lead, imitating their child, maintaining eye contact, and engaging in their child's play. Overall this study suggested that short-term parent-mediated interventions in children with autism could improve children's social communication outcomes and play behaviors.

In an effort to meet the recommended 25 hours per week of intervention, Wetherby and Woods (2006) created an "Early Social Interaction" project (ESI) for young children with ASD. The ESI project used naturalistic teaching strategies in everyday routines in conjunction with the mandate of the Individuals with Disabilities Education Improvement Act (IDEIA) of 2004, Part C. Two groups of children involved in ESI were compared: (1) children who entered at 2 years old (n = 17; M_{age} = 18.2 months) and (2) children who entered ESI at 3 years old (n = 18; M_{age} = 30.7 months). At post-intervention assessment, children who entered the program at a younger age showed greater improvement across 11 of 13 social communication measures in comparison to the group of children who entered ESI at a later age. Further, the earlier entry age group showed better understanding of symbolic capacity from pre- to post-intervention assessment including "actions to others" and "inventory of actions", which could have extended implications for children engaging in pretend play if revealing better comprehension of these concepts. In summary, this study emphasized the important implications of parent involvement in teaching social communication to young children at onset of ASD diagnoses.

Furthermore, Fava and colleagues (2011) investigated the effectiveness of an early intensive behavioral intervention (EIBI) through a cross setting design including staff and parent-

mediated intervention (n = 12; M_{age} = 52 months), in comparison to an 'eclectic' intervention group (n = 10; M_{age} = 43.7 months). The methodology employed in the staff- and parent-mediated intervention included discrete trial teaching (DTT), incidental teaching (IT), and natural environment teaching (NET) in both a clinical setting (i.e., staff) and generalized to natural home environments (i.e., parents). In contrast, the eclectic intervention included a collection of methodologies primarily focusing on DTT and continuous reinforcement schedules. The goal of this study was to examine autism symptomatology, challenging and adaptive behaviors, and developmental skills such as language in both treatment groups. The treatment groups were on similar levels at intake and were reassessed 6 months after commencement of the interventions. Results revealed that children in the staff- and parent-mediated intervention group showed more improvement in the following domains: (1) autism symptomatology, (2) language skills, and (3) challenging behaviors in comparison to the eclectic intervention group. Both the intervention groups showed comparable changes in adaptive behavior skills. Overall, this study revealed the importance of early intervention, especially both staff- and parent involvement in early intervention models for young children with ASD, in order for children to better generalize skills across multiple settings (Fava, Strauss, Valeri, D'Elia, Arima, & Vicari, 2011).

Early intervention research involves a variety of methodological designs, in which a preferred design to investigate the efficacy of early intervention programs is through randomized controlled trials. Using this design, Roberts and colleagues (2011) examined the efficacy of two types of early intervention programs: (1) home-based and (2) centre-based with a parent program, in addition to a comparison group (i.e., waitlist group). Preschool aged children with ASD (n = 85; M_{age} = 42 months) were randomly assigned to one of the three aforementioned groups, in which both the home- and centre-based interventions included a transdisciplinary team

(i.e., teachers, occupational therapists, psychologists, and speech-language pathologists). The home-based intervention involved a 2-hour visit every other week over 40 weeks (i.e., maximum of 20 sessions) that focused on individualized plans for each child to enhance domains such as: (1) behavior, (2) communication, (3) social, (4) adaptive, (5) sensory processing, (6) motor, and (7) play skills. The centre-based intervention consisted of 2-hour weekly sessions over 40 consecutive weeks using a "manualised preschool program" with child playgroups. During these playgroups, therapists provided direct intervention services with children with a goal to enhance skills such as, social play and communication in preparation for integration in regular preschool settings. This manualised preschool program for children was combined with a parent program that occurred concurrently and involved parent support up to once a week. Topics that were of interest to parents were discussed, in which therapists also attended these meetings to provide support and offer advice on commonly reported parent concerns (e.g., behavior, communication, self-help, sensory, and academic issues). The control group in this study consisted of the waitlist group, which did not receive any systematic dissemination of intervention.

The following variables were assessed in each group pre- and post-intervention: (1) social, communication, and play skills in children, and (2) stress and quality of life in parents. When interpreting findings, it is important to note that children in the centre-based intervention received twice the amount of services delivered by interventionists compared to the home-based intervention group, not to mention the amount of time/services implemented by parents in both groups. Results regarding children's development revealed that children in the centre-based/parent program group improved significantly more than children in the home-based and waitlist group. In summary, this study suggested that more frequent implementation of intervention for children in combination with parent support/training is the most cost- and

developmentally effective outcome for children and their families, in comparison to alternative interventions such as home-based interventions in isolation (Roberts, Williams, Carter, Evans, Parmenter, Silove, Clark, & Warren, 2011).

In conclusion, parent involvement in autism intervention is a significant component for children to reach their fullest potential (National Research Council, 2001). As past research suggests, equipping parents with intervention techniques can facilitate appropriate skill development, assist with generalizing skills, and decrease autism symptomatology in children with ASD. Therefore, this study implemented a parent-focused intervention known as Project ImPACT (Ingersoll & Dvortcsak, 2009).

Project ImPACT Intervention. Ingersoll and Dvortcsak (2009) developed a social communicative intervention called *Improving Parents As Communication Teachers* (i.e., Project ImPACT). This intervention for children with ASD focused on four core skills to increase in children: (1) social engagement, (2) language, (3) social imitation, and (4) play. Parents were taught interactive- and direct teaching techniques to model in the clinic and implement in their natural environments (e.g., home) with their children with ASD. Interactive teaching techniques referred to parents following children's leads, creating opportunity for children to engage/communicate, waiting for children to engage/communicate, and responding to children's behavior by modeling a more complex response (e.g., scaffold). Direct teaching techniques also referred to parents following children's leads, creating opportunity for children to communicate, and waiting for children to communicate, in addition to prompting children, giving more supportive prompts (as needed), and reinforcing/explaining prompting. Preliminary research of parents implementing interactive- and direct teaching techniques has suggested that Project ImPACT leads to improvement in children's social engagement, language, social imitation, and

play in children with ASD (Ingersoll & Dvortcsak, 2009); however, prior to the current study there were no additional empirical findings reported to endorse that Project ImPACT leads to improved skills in children.

Purpose of the current study

When parents are involved in children's development and serve as interventionists, there are numerous benefits. Furthermore, when parents participate in children's play and guide them to engage in more complex play behaviors (i.e., pretend play), it can improve children's developmental and social skills such as improved language, increased speech and communication, and acquired perspective taking (Stanley & Konstantareas, 2007). Therefore, it is suggested that parents have an important role to engage in their children's play, because their facilitation helps develop children's social skills and communicative behaviors (Emde, 1989; Slade, 1987a; Slade, 1987b; Tamis-LeMonda et al., 2004).

There were three main goals in this project, which are further described below in relationship to the proposed hypotheses. The methodology employed in this project was an intervention to teach parents how to guide their children with ASD to play and develop social communication skills (i.e., Project ImPACT), as parent-mediated interventions have been shown to be effective (Fava et al., 2011; Ingersoll & Dvortcsak, 2009; Roberts et al., 2011; Vismara, Colombi, & Rogers, 2009; Wetherby & Woods, 2006).

Hypotheses

The first aim of this project was to establish how mothers using scaffolding techniques during children's play change from baseline through Project ImPACT intervention. The specific hypotheses are as follows:

1. Mothers' scaffolding techniques (i.e., comments, requests, and prompts) would improve (i.e., frequencies would increase) from baseline to intervention.
2. Mothers' *enhancing* purposes of scaffolding techniques would improve (i.e., frequencies would increase) from baseline to intervention.

The second aim of this project was to examine how children's social engagement in mothers' scaffolding techniques changes from baseline through Project ImPACT intervention. The specific hypothesis is as follows:

1. Children's social engagement (i.e., attention, nonverbal, and verbal skills) would improve (i.e., frequencies would increase) from baseline to intervention.

The third aim of this project was to examine how children's developmental, social, and play skills changed from pre- to post- and pre- to post 2-intervention. The specific hypotheses are as follows:

1. Children would demonstrate improved developmental, social, and play skills from pre- to post-intervention.
2. Children would demonstrate improved developmental, social, and play skills from pre- to post 2-intervention.

Study Implications

With the prevalence of ASD rising, more children will be diagnosed with autism this year than diabetes (1 in 500), AIDS (1 in 8,000), and cancer (1 in 25,000) combined. When children are diagnosed with ASD there is a need for immediate intervention; therefore, this study implemented a social communication intervention to equip parents of children who were recently diagnosed with ASD. Results have important implications such that involvement of parents in children's play aims to decrease children's autism symptomatology and improve children's

developmental, social, and play skills. Specifically, the quantity and quality of scaffolding techniques used by mothers would increase/improve from baseline to Project ImPACT intervention. Secondly, children would have increased social engagement from baseline to Project ImPACT intervention. Finally, children's developmental, social, and play skills would improve from baseline to Project ImPACT intervention. Overall, the outcomes of this study expand our understanding of the importance of parents: (1) serving as key interventionists (Roberts et al., 2011) and (2) scaffolding children's play (Woolley & Tullos, 2008).

METHODOLOGY

Participants

Three toddlers with ASD were recruited for this study from the University of Alabama's ASD Toddler Clinic. Ages of the toddlers ranged from 22.3 months to 29.8 months old at the start of the study (M_{age} = 26.5 months). Children were recruited after their diagnostic visits at the ASD Clinic and had minimal (i.e., not exceeding one hour a week of services through Early Intervention) to no intervention services prior to commencement of/throughout Project ImPACT. All children stayed home with their mothers (i.e., did not attend preschool/daycare), which were their primary caretakers.

Participants were selected based upon satisfying the established inclusion criterion: (1) diagnosed with ASD from the UA ASD Toddler Clinic, (2) having moderate autism symptoms (i.e., not severe symptoms as measured by the Childhood Autism Rating Scale - Second Edition from the diagnostic evaluation), (3) having/had minimal or no intervention services (i.e., measured using family demographic questionnaire/ASD clinic evaluation form), and (4) having basic level of play skills (i.e., "Take-apart Combinations"). Specifically, all children at least had the ability to take apart combinations, such that they could take out pieces of a puzzle, as measured by Lifter's DPA (2000). This ensured that children had fundamental play abilities (Lifter, 2000; Stanley & Konstantareas, 2007). See Appendix B for Lifter's play levels that were used to assess children's play skills during mother-child play samples. Additionally, refer to Table 1 for detailed demographic profiles of each participant. In addition to recruitment of toddlers with ASD, mothers (n = 3) were also recruited for the study. Fathers (n = 3) also

participated with the mothers in the intervention. See Table 2 for attendance of mothers and fathers from baseline, intervention, and the short-term follow up sessions.

Design

This study employed an A-B intervention design. That is, children and their parents participated in baseline sessions (i.e., "A"; $n = 5$ sessions) then proceeded with intervention sessions (i.e., "B"; $n = 12$ sessions). All three participants started baseline simultaneously. This prevented staggered starts of the intervention and allowed for parents to collectively attend group sessions that were lead by the primary experimenter. In summary, baseline consisted of 5 sessions (e.g., introductions of families/completion of baseline measures) and the intervention consisted of 12 sessions (e.g., group parent meetings learning/implementing Project ImPACT) with all participants completing a short-term follow up that was individually conducted with each participant 2 months post-intervention (i.e., post 2). Overall the purpose of using an A-B design was to demonstrate how behavior changed according to implementing an intervention (Kazdin, 2011). In other words, the A-B design examined changes in frequencies of scaffolding techniques used by mothers and changes in children's social engagement to mothers' scaffolding techniques.

Materials

During each play sample, a set of duplicated toys was present in the clinic therapy rooms to facilitate various levels of play between mother and child as suggested by Lifter (2000): lacing beads/blocks, stuffed animal, baby doll, nesting cups, picnic basket (plates and food), Mr. Potato Head, animated pop up toy, and a noise making fire truck. A hand-held video camera was used to record and document the 10-minute mother-child play samples. Mothers completed a battery of questionnaires. Refer to the measures below in the Pre-, Post-, Post 2-intervention section.

Additionally, clinicians and trained experimenters implemented two assessments: (1) MSEL: Mullen Scales of Early Learning and (2) CARS2 – ST: Childhood Autism Rating Scales- Second Edition pre-, post- and post 2-intervention. Finally, *Teaching Social Communication to Children with Autism: A Practitioner's Guide to Parent Training* and *A Manual for Parents* were used to implement the intervention (i.e., Project ImPACT).

Pre-, Post-, and Post 2-Intervention Measures

Mullen Scales of Early Learning (MSEL). The MSEL (Mullen, 1995) is a standardized test that assesses five areas of children's developmental skills: (1) gross motor, (2) visual reception, (3) fine motor, (4) receptive language, and (5) expressive language. This instrument has a maximum of 159 items that are cumulatively used as a screening or diagnostic tool, which takes approximately 15 to 60 minutes to administer. However, because older children generally perform at ceiling on gross motor skills, the clinician/experimenter solely administered the remaining four developmental areas on the MSEL: (1) visual reception, (2) fine motor, (3) receptive language, and (4) expressive language. Children's developmental levels were determined for each of the 4 areas according to the items successfully completed by the child within each developmental domain. Next children's raw scores and age equivalents were calculated. The experimenter administered the MSEL to assess children's developmental skills pre-, post-, and post 2-intervention.

Childhood Autism Rating Scale- Second Edition (CARS2 – ST). The CARS2 – ST (Schopler, Reichler, & Rochen-Renner, 2010) is a 15-item measure that is based on direct observation. This measure in isolation is not a diagnostic tool; however, this measure is useful in a broader assessment to capture classifications of autism symptomatology. Specifically, the CARS2 - ST assesses the following items: (1) relating to people, (2) imitation, (3) emotional

response, (4) body use, (5) object use, (6) adaptation to change, (7) visual response, (8) listening response, (9) taste, smell, and touch response and use, (10) fear or nervousness, (11) verbal communication, (12) nonverbal communication, (13) activity level, (14) level and consistency of intellectual response, and (15) general impressions. Each item is rated on a continuum from 1 to 4, with 1 representing typical skills and 4 representing atypical skills. These ratings were based on the clinician's/experimenter's observations. The total score reflects the symptom level of ASD, in which symptomatology of ASD was classified in three categories: (1) minimal, (2) mild to moderate, or (3) severe, as outlined by the CARS2 – ST scoring process. The clinician/experimenter completed the CARS2 – ST based on observations during the mother-child play samples pre-, post-, and post 2-intervention to measure the severity of ASD symptoms.

Adaptive Behavior Assessment System – Second Edition (ABAS – II). The ABAS – II (Harrison & Oakland, 2003) is a parent questionnaire, which is designed to examine important behaviors of an individual that are performed in a variety of settings such as home and school. This measure assesses the following skill areas: (1) communication, (2) community use, (3) functional pre-academics, (4) home living, (5) health and safety, (6) leisure, (7) self-care, (8) self-direction, (9) social, and (10) motor. Each item is rated from 0 to 3, with 0 representing that the child is not able to perform the skill to 3 representing that the child (almost) always performs the skill. Collectively there are 242 items from all 10 skill areas with higher scores reflecting more optimal performance/capabilities in these skill areas. Mothers completed this questionnaire pre-, post-, and post 2-intervention.

Childhood Routines Inventory (CRI). The CRI (Evans et al., 1997) is a 19-item questionnaire, which measures children's routines. In general, these items address whether an

individual has particular habits (e.g., bed time routine) or strong preferences (e.g., particular foods). Each item is rated from 1 (i.e., not at all/never) to 5 (i.e., very much/always), in which higher total scores indicate more ASD qualities. Mothers completed this questionnaire pre-, post-, and post 2-intervention.

Repetitive Behavior Stereotype- Revised (RBS-R). The RBS-R (Bodfish et al., 1999) is a 43-item questionnaire that examines restricted, repetitive behaviors in individuals, which is a diagnostic domain of autism. There are 6-subscales within this measure that assess the following: (1) stereotyped, (2) self-injurious, (3) compulsive, (4) ritualistic, (5) sameness, and (6) restricted behaviors. Responses indicated whether the behavior was present and if present the severity of the problem behavior. Each item within these subscales was rated on a continuum from 0 (i.e., behavior does not occur) to 3 (i.e., behavior occurs and is a severe problem), with higher scores on this measure being less preferred such that individuals have more restrictive and repetitive behaviors. Mothers completed this questionnaire pre-, post, and post 2-intervention.

Social-Communication Checklist. This checklist (Ingersoll & Dvortcsak, 2009) assesses children's behaviors within the following 6 domains: (1) social engagement, (2) form of expressive language, (3) function of expressive language, (4) understanding/following directions, (5) social imitation, and (6) play. Mothers indicated whether their children engaged in these behaviors according to the following 4 responses: (1) usually, (2) sometimes/not consistently, (3) rarely/not yet, or (4) not observed. Collectively, there are 47 items across the 6 domains that measured children's social communication skills. Lower scores on this measure are preferred and reflect that children 'usually' display the assessed skills/behaviors as observed and reported by mothers. Mothers completed the social communication checklist pre-, post-, and post 2-intervention.

Baseline/Intervention Measures

Demographic Questionnaire. Mothers completed a self-report questionnaire during the first baseline session that assessed family demographics. Questions on this demographic form included, but were not limited to, relationship to the child, age of caregiver, annual family income, relationship status (e.g., single, married), highest level of education completed by the caregiver, caregiver's occupation, number of children in the family, and the amount of individuals living in the household.

Child History Form. Mothers completed this 16-item form about her child that assessed his/her history (Ingersoll & Dvortcsak, 2009). Questions included, but were not limited to, what the child's primary language is, who the child spends the most time with, how the child communicates, what the child's preferred activities are, what types of intervention services the child has received (if any), and if the child has any medical conditions. Mothers completed the child history form during baseline.

Daily Activity Schedule. This schedule assesses 10 daily routines of children such as mealtime, fine motor play, songs/social games, and bathing (Ingersoll & Dvortcsak, 2009). For each routine, mothers provided the time of day when the activity generally occurred, length of time the child engaged in the activity, and a brief description of the routine. Mothers also indicated whether their children enjoyed, tolerated, or resisted the activities. The purpose of this schedule was to better understand each child's daily living to construct appropriate goals for the intervention (See Goal Development Form). Mothers completed the daily activity schedule during baseline.

Goal Development Form. This form focused on the four core components of Project ImPACT, which are social engagement, language, social imitation, and play (Ingersoll &

Dvortcsak, 2009). Within each of these components mothers identified, with help of the experimenter, their children's current skills and suggested measurable goals to increase children's current skills. The purpose of this form was to identify specific, realistic goals and methods in order to meet these goals with their children during the span of the intervention. Mothers completed the goal development form, with assistance from the primary experimenter, during baseline.

Treatment Fidelity/Adherence. Treatment fidelity is an important component to ensure that the experimenter adhered to the intervention. This was measured by a set of items provided in the Project ImPACT manual that was designed to identify procedures that were (not) observed during parent group sessions. Items such as, 1) providing explanation of the session, 2) pointing out common themes among parents' comments, and 3) using the provided intervention material to explain the rationale/key points for each treatment technique, assessed the experimenter's adherence to Project ImPACT. The primary experimenter rater herself after each session to document adherence to the intervention. When necessary, the videotaped group sessions were also reviewed by the experimenter to rate compliance to the aforementioned items.

Mother Play Report. Mothers individually completed a self-report questionnaire at the start of each group session that assessed children's play activity and mothers' involvement in their children's play. The purpose of the play report was to examine how mothers playing with their children vary across time, if at all, and examine how mothers' involvement during children's play influences children's developmental, social, and play skills. The complete mother play report (i.e., including the open-ended responses) was administered pre-, post-, and post 2-intervention. An abbreviated version of the mother play report was administered during all other sessions. The abbreviated version included the first 6 items and final item on the mother play

report. In other words, mothers did not complete the open-ended responses during each session. In summary, mothers completed the entire full-length play report 3 times whereas mothers completed the abbreviated play report (i.e., including quantitatively rated items, excluding open-ended responses) during the remaining sessions (n = 15). See Appendix A for the complete mother play report.

Mother-Child Play Samples. During each of the 5 baseline sessions, 12 intervention sessions, and 1 short-term follow up session, mothers and children with ASD participated in 10-minute play samples in individual therapy rooms at the UA ASD Clinic. Each mother and child was provided with a consistent set of duplicate toys and play samples were videotaped. See Materials. During baseline, mothers were told to play as they generally do in their home environments. Once the intervention started, mothers were encouraged to use the techniques learned during the group sessions during Project ImPACT. In total, each mother and child had 18 recorded play samples from the start to end of intervention. Observational data were extracted from the mother-child play samples. For example, videos were reviewed and children's level of play was observationally assessed using Lifter's play sequence and definitions. See Appendix B. Children's autism symptomatology was also assessed from the play samples using the CARS2 - ST. Additionally, mothers' scaffolding techniques (i.e., frequencies and purposes) were coded during children's play. Also, children's social engagement in mothers' scaffolding techniques were observed and coded.

Project ImPACT Intervention. "Improving Parents As Communication Teachers" is a social communication intervention that was implemented with three children with ASD and their parents (Ingersoll & Dvortcsak, 2009). This intervention focuses on increasing four core skills in children: (1) social engagement, (2) language, (3) social imitation, and (4) play. Parents of

children with ASD participated in 17 baseline/intervention group sessions during a 9-week period, in which the experimenter provided interactive and direct teaching techniques that mothers practiced during the mother-child play samples, received coaching, and that parents also implemented with their children at home. Interactive teaching techniques were taught during the first half of the intervention sessions as a way of increasing parent's responsiveness to the child's behavior and social reciprocity. Direct teaching techniques (e.g., naturalistic behavioral techniques) were taught during the second half of the intervention sessions as a way of teaching social imitation, language, and play skills. During the final session of the intervention, parents were taught to use both interactive and direct teaching techniques simultaneously. Additionally, parents and children attended a short-term follow up 2 months after the conclusion of Project ImPACT to assess mothers' scaffolding techniques, children's social engagement and overall skill level. In total, families participated in 18 sessions (i.e., 5 baseline sessions, 12 intervention sessions, and 1 short-term follow up session).

Project ImPACT Interventionists. Interventionists assisted the primary experimenter for the duration of the project, in which interventionists consisted of 6 undergraduate research assistants recruited from the University of Alabama. Prior experience of interventionists varied; however all had experience with children with developmental delays/disorders to some capacity. Additionally, interventionists were trained by the primary experimenter prior to start of intervention on Project ImPACT methodologies. Collectively, training the interventionists prior to the start of the project totaled 15 hours, in which training was delivered in both group and individual sessions.

Prior to each session during the project, interventionists and the primary experimenter met to revisit the specific techniques from previous Project ImPACT training. Specifically, the

experimenter discussed the main points that the interventionists should work on with the children at the beginning of each session, which parents also learned simultaneously during the group sessions. Additionally, interventionists were given coaching (i.e., supervision) as a group with the other interventionists involved in the project at the conclusion of each session. During this time, the primary experimenter received feedback from the interventionists, highlighted adherence to the treatment, and mentioned techniques that interventionists could use specifically for each child. Interventionists were also provided with individual, private feedback from the primary experimenter in relation to the specific child she was working with during session. The primary role of interventionists was to provide one-on-one therapy for the children while parents attended the group sessions for Project ImPACT. Interventionists' responsibilities included, but were not limited to implementing specific techniques from Project ImPACT.

Procedure

Before the start of the study, parents of each participant voluntarily signed consent for themselves and their children to participate. Additionally, children assented to participate. Because children with ASD often have language delays, non-verbal cues were sufficient as assent (e.g., not resisting or showing signs of distress, or taking the investigator's hand, smiling, gesturing toward the room, etc.). For all sessions, each child was paired with two consistent interventionists that were with the children in the therapy room, while parents attended the group sessions in a conference room. Interventionists cared for the children during the baseline sessions without implementing intervention techniques during the first 5 sessions in order to prevent convoluted data (i.e., withholding direct administration of intervention techniques during baseline sessions). Thereafter, interventionists implemented the techniques that parents learned during each group session, in order to provide intervention services for the children while parents

attended the group sessions to learn Project ImPACT techniques. Below describes the baseline and intervention sessions in more detail. Also refer to Appendix C for timeline of the project.

Baseline Sessions. Baseline consisted of 5 sessions. During the first baseline session, mothers completed the following battery of questionnaires: (1) demographic questionnaire, (2) mother play report, (3) child history form, and (4) Social-Communication Checklist. Because mothers/clinicians had recently completed the: (1) ABAS – II , (2) CRI, (3) RSB-R, and (4) MSEL during the child's diagnostic evaluation at the UA ASD Toddler Clinic, mothers consented to transferring their responses from these measures. Diagnostic evaluations occurred within 5 weeks of start of the project, and mothers reported that their children's current skills reflected what was reported at time of diagnostic evaluation. Additionally during each baseline session, mothers participated in an individual 10-minute play sample with their child.

During the second week of baseline, the experimenter completed the 'overview of the program' with the parents. During the third week of baseline, the experimenter completed how to 'set up your home for success', and mothers completed the goal development form and daily activity schedule (Ingersoll & Dvortcsak, 2010). These 2 sections of Project ImPACT (i.e., overview of program/set up your home for success) were covered prior to the start of the intervention sessions to ensure that parents and their homes were prepared before they started learning the interactive and direct teaching techniques. Overall, the 5 baseline sessions occurred within a 3-week period. See Appendix C for timeline of the project.

Project ImPACT Intervention Sessions. Once the 5 baseline sessions were completed, the intervention sessions started by implementing techniques from Project ImPACT. All parents (n = 6) of the 3 toddlers attended the group intervention sessions. During these group sessions, the primary experimenter taught parents techniques/skills from Project ImPACT to implement

with their children at home in their natural environments. At the first intervention session, the experimenter distributed *A Manual for Parents* from Project ImPACT to each of the families, which included the following guidelines about and homework sheets on 15 techniques that parents learned throughout the intervention (Ingersoll & Dvortcsak, 2009). Overall, parents and children attended two sessions each week totaling a 9-week project.

At the start of each group parent session, mothers individually completed the mother play report. At the conclusion of each group parent session, mother and child participated in individually recorded play samples for 10 minutes in the clinic therapy rooms. At the end of each play sample, the experimenter joined the mother and child in the session room to discuss how Project ImPACT techniques were (not) used and how the child responded to these techniques. This approach models the 'coaching' segment of Project ImPACT, which allows the experimenter to further discuss how parents can practically use these developmental/social techniques during play with their children outside of a clinical setting.

Additionally, each technique that parents learned about during the group sessions had an accompanied homework sheet in the parent manual that parents received at the start of intervention. The homework sheets provided the key points of each of the sessions and further described how parents could reasonably infuse these techniques in their daily routines with their children. Homework sheets were discussed at the start of following group parent sessions in order to reminisce on techniques that were effective with their children, to provide feedback (i.e., coaching), and to foster group support from other parents and the experimenter.

During week 1 of intervention, the experimenter taught 3 techniques to parents. First parents learned to "follow your child's lead" during session 1. This session emphasized the importance of letting the child choose his/her own activity while remaining face to face with the

child in order to engage in his/her play. Following your child's lead involves commenting on the child's play and waiting for the child to communicate and engage with the parent. Commenting on children's play, as taught during "follow your child's lead", is one scaffolding technique that was specifically assessed during mother-child play samples. Parents were encouraged to be sensitive yet persistent with their children while maintaining control of the situation. Second parents learned, "imitate your child" and "animation" during session 2. During the second session, parents learned to specifically imitate children's play with their toys, vocalizations, and body movements/gestures. It was recommended that parents only imitate behaviors that were appropriate (e.g., not throw tantrums). Additionally during the second session, parents learned another technique known as "animation". Animation consists of using the following tactics such as being excited about the child's selected activity and exaggerating gestures, vocal quality, and facial expressions. Parents were encouraged to use attention-getting devices and to wait with anticipation for their children to respond.

During week 2 of intervention, 4 techniques were taught to parents during sessions 3 and 4. Parents learned "modeling and expanding language" during session 3. That is, parents were encouraged to give meaning to their children's actions and adjust their language (e.g., speak slowly, stress important words). Additionally, parents were taught to model their language around their children's interest and expand on their children's language. During session 4 parents learned 2 techniques, "playful obstruction and "balanced turns". Playful obstruction involved parents being taught to playfully interrupt children's activity in order to provide more opportunity for communication and engagement between parents and children. Playful obstruction allowed for parents to implement scaffolding techniques. Another technique that parents learned was balanced turns, which involved parents taking short turns with their children.

That is, parents initiated play with their children such as using (an) object(s), in which they waited for their children to communicate his/her own turn, and then the object(s) was (were) returned back to their children.

During week 3 of intervention, the experimenter taught one technique to parents (i.e., communicative temptations), which concluded the interactive teaching techniques of Project ImPACT. The experimenter introduced the direct teaching techniques during sessions 5 and 6. Session 5 consisted of parents learning one technique known as "communicative temptations". Specifically, the experimenter taught parents how to set up communication by using a temptation for the child (e.g., placing a toy in sight, but out of reach). During session 6, parents reviewed the interactive techniques (i.e., prior 5 intervention sessions) by highlighting the important components/techniques they found most useful and then introduced the direct techniques (i.e., the remaining 6 sessions of intervention). Therefore at the conclusion of week 3 of intervention, parents completed the first half of Project ImPACT known as interactive teaching techniques.

During week 4 of intervention, the experimenter taught two techniques to parents during session 7 and 8. Session 7 consisted of parents learning how to teach their children "expressive language". Specifically, the experimenter taught parents how to give prompts (i.e., physical, gesture), present choices to children, ask direct questions, and use time delays (e.g., wait time for children's response). Giving prompts, as taught during "expressive language", is one of the specific scaffolding techniques that was assessed during mother-child play samples. During session 8, parents learned how to teach their children "receptive language". That is, parents were encouraged to give clear directions (e.g., direct commands) and help their child respond (e.g., verbal instruction).

During week 5 of intervention, the experimenter taught two techniques to parents during sessions 9 and 10. Session 9 consisted of parents learning to "teach social imitation" to their children. For example, parents learned to model skills (e.g., gestures) that they wanted their children to learn. Once parents modeled the skill, they described the action, waited for their children's responses, prompted an initiation if necessary, and finally gave reinforcement. During session 10, parents were taught how to teach their child to play. Specifically, parents modeled play and embedded verbal instruction and questions, and then waited for their children to respond. Enhancing play, as taught during session 10, was one of the purposes of scaffolding that was assessed during mother-child play samples.

During week 6 of intervention, parents reviewed the direct teaching techniques and condensed all of the content that the parents learned throughout the intervention during sessions 11 and 12. At the final intervention session, mothers completed the following battery of questionnaires: (1) mother play report, (2) ABAS – II , (3) CRI, (4) RBS-R, and (5) Social-Communication Checklist. Trained experimenters completed the MSEL and the CARS2 - ST in order to assess children's developmental level and autism symptomatology. At the conclusion of week 9 of intervention, parents completed the interactive and direct teaching techniques from Project ImPACT.

A short-term follow up was individually conducted with each participant two months after completion of Project ImPACT. During these sessions, mothers completed the battery of measures that were also completed at the start and end of intervention (i.e., (1) mother play report, (2) ABAS – II , (3) CRI, (4) RBS-R, and (5) Social-Communication Checklist). Additionally, trained experimenters completed the MSEL and CARS2 - ST to assess children's developmental level and autism symptomatology. The primary experimenter also discussed other

intervention options that the families could pursue in order for each child to continue to receive services (e.g., Mitchell's Place) once the intervention concluded. See section "Other Intervention Services Participants Received" for more details about alternative resources children received intervention.

Coding

Videotaped mother-child play samples occurred during baseline sessions (n = 5), intervention sessions (n = 12), and the short-term follow up session (n = 1) for each participant. Thus, each toddler had a total of 18 mother-child play samples from these aforementioned sessions with the exception that one participant missed an intervention session (i.e., 15th session), in which this participant had a total of 17 mother-child play samples. Mother-child play samples occurred in individual therapy rooms at the UA ASD Clinic.

From each videotaped mother-child play sample conducted after the group parent sessions, mothers' scaffolding techniques and children's social engagement skills were coded. The primary experimenter was the main coder of scaffolding techniques and social engagement. A second coder was trained by first examining/coding other similar mother-child play samples recorded from clients at the UA ASD Toddler Clinic in order to establish fidelity with the main coder (Wetherby & Woods, 2006). The coders established interrater reliability (Cohen's κ) indentifying mothers' scaffolding techniques and children's social engagement during mother-child play samples. See Preliminary Analyses for interrater reliability on identifying these techniques/skills and Table 3. Once trained (i.e., coders met a reasonable Kappa, κ =.74 with 86% agreement), the mother-child play samples from baseline and intervention sessions were coded by the second coder blind to the sessions.

Although scaffolding techniques (i.e., comments, requests, prompts) that were observed and coded were not specific tools taught during the group parent sessions, there is much overlap

in scaffolding techniques that were coded and the methods that parents learned from Project ImPACT (Ingersoll & Dvortcsak, 2009; Woolley & Tullos, 2008). For example, "comments" were a scaffolding technique proposed by Woolley and Tullos (2008) and during the "Follow your child's lead" session of Project ImPACT, "comment on child's play" was suggested. Thus, scaffolding techniques were embedded throughout the Project ImPACT material. The following describes each of the scaffolding techniques and social engagement skills that were coded from mother-child play samples. See Appendix D for the detailed codebook.

Mother Scaffolding Techniques. Mothers' scaffolding techniques while playing with their children were observed and coded. Mother's scaffolding in children's play were measured as defined by Woolley and Tullos (2008). Specifically, coders looked for three scaffolding techniques: (1) comments (e.g., "I bet your doll is really hungry – she hasn't eaten since breakfast"), (2) requests (e.g., "Why don't you scramble an egg for your doll?''), and (3) prompts (e.g., visual - showing a toy; physical - using child's hand to help perform an action). More specifically comments included mothers adding in direct commands and statements. Requests included questions that mothers added in during children's play. Prompts consisted of behaviors or verbal/visual cues provided by the mother that increased the likelihood that the child would participate in the desired behavior. In summary, the primary scaffolding techniques that were observed were comments, requests, and prompts.

Secondly, Woolley and Tullos (2008) suggested that scaffolding techniques employed by mothers could either *maintain* play (e.g., turn-taking) or *enhance* play (e.g., enrich what child does, upping the ante). Therefore, the purpose of using these primary scaffolding techniques was also coded by identifying if mothers' scaffolding techniques maintained or enhanced children's play. The purpose (i.e., maintenance or enhancement) of these scaffolding techniques also aligns well with the term scaffolding because the definition of scaffolding involves bringing one from

his/her *actual* level (e.g., maintain) to *potential* level (e.g., enhance). In addition to identifying mothers' scaffolding techniques, it was also coded if children were socially engaged in mothers' scaffolding techniques. See Appendix D for the detailed codebook including mother's scaffolding techniques, which was also adapted from Valentino and colleagues (Valentino, Cicchetti, Toth, & Rogosch, 2011).

Child Social Engagement Skills. Children's social engagement skills in mothers' scaffolding techniques used during mother-child play samples were also coded. This is an important aspect because mothers could use various scaffolding techniques at high frequencies at the expense that their children are not engaged. Thus, it was essential to observe children's social engagement in relationship to mothers using scaffolding techniques. Kasari and colleagues (2006) categorized children's social engagement in the context of a randomized intervention examining joint attention and symbolic play through: 1) attention, 2) nonverbal communication, and 3) verbal communication. Additionally, Ingersoll and Dvortcsak (2009) corroborated these types of social engagement evident in children.

Children's social engagement was determined by children: 1) paying attention, 2) using nonverbal communication, 3) using verbal communication, or 4) not being engaged, in response to mothers using comments, requests, and/or prompts. Specifically, attention was defined as the child directing his/her awareness (e.g., eye gaze; head turn; orients body) toward the mother and/or activity. Nonverbal communication included instances such as the child gesturing with his/her hands or body to gain the mother's attention or the child pointing and/or showing proximally (near) or distally (away). Verbal communication included instances such as the child using words, utterances with intention, or verbal instruction to guide mother's attention. Verbal communication also included the child laughing and/or noisily protesting. The purpose of

children's social engagement (i.e., functional or nonfunctional) was also coded. In other words, it was noted if children's social engagement was functional (e.g., appropriate – eat with plate) or nonfunctional (e.g., inappropriate – spin plate). See Appendix D for detailed codebook including children's social engagement, which was also adapted from Belsky and colleagues (Belsky, Goode, & Most, 1980).

Interrater Reliability

Interrater reliability between two coders was calculated using Cohen's Kappa, κ. Specifically, Cohen's κ was used because it assesses agreement between two coders and is known to be a more conservative test (Siegel & Castellan, 1988) given that it corrects for expected chance agreement among coders. Again, the primary experimenter served as the first coder while the second coder was blind to the experimenter's coding and the participant's session number. The two coders agreed overall on the scaffolding techniques of the mothers 86% of the time (κ = .74) and agreed overall on the social engagement of the children 86% of the time (κ = .74). In regard to each of the scaffolding techniques, the two coders agreed on "comments" made by mothers 91% of the time (κ = .83) "requests" made by mothers 71% of the time (κ = .48), and "prompts" made by mothers 95% of the time (κ = .91) In regard to each of children's social engagement, the two coders agreed on children's "attention" 75% of the time (κ = .49), "nonverbal communication" 81% of the time (κ = .65), "verbal communication" 90% of the time (κ = .81), and "no engagement" 100% of the time (κ =1.0). The experimenter's codes were used in subsequent data analyses. See Table 3.

RESULTS

The primary purpose of this study was to examine mothers' scaffolding techniques during baseline and intervention. The second purpose was to examine children's social engagement to mothers' scaffolding techniques during baseline and intervention. Finally, children's developmental, social, and play skills, in addition to autism symptomatology, were evaluated from pre- to post- and pre- to post 2-intervention assessments. Below are the analyses that examined each of these components.

Primary Analyses

The primary purpose of the study was to examine changes throughout baseline and intervention play samples of mothers' scaffolding techniques during children's play. Mothers' scaffolding techniques were examined by: (1) frequencies of each scaffolding technique (i.e., comments, requests, and prompts) that were measured observationally and hand-coded from mother-child play samples, and (2) mothers' reports of involvement in children's play, as measured by mothers' responses on the mother play report from each group parent session. The second purpose was to examine changes in children's social engagement to mothers' scaffolding throughout baseline and intervention. Children's social engagement (i.e., attention, nonverbal, and verbal skills) in response to mothers' scaffolding techniques were also measured observationally and hand-coded from mother-child play samples.

Previous research suggested that 10 to 18 observations (e.g., mother-child play samples), with a minimum of 5 observations per phase, provide enough power for time series analysis (Borckardt et al., 2008; Smith, Handler, & Nash, 2010). In total, there were 18 observations for

each participant: 5 baseline observations, 12 intervention observations, and 1 short-term follow up intervention observation, with the exception of one participant missing an intervention observation. Thus, there was a sufficient amount of observations (i.e., mother-child play samples) per phase (i.e., baseline and intervention) to conduct the following time series analyses. The following analyses include baseline and intervention sessions' data (i.e., 5 baseline and 12 intervention), which excluded the short-term follow up session because it occurred 2 months post-intervention.

Simulation Modeling Analyses (SMA)

Time series level change and slope vector analyses were employed using a statistical method known as Simulation Modeling Analysis (SMA; Borckardt, 2006). SMA is known to be a reliable method of analyzing data with short streams (i.e., $n < 30$ per phase). In other words, within each phase (i.e., baseline and intervention) there should be no more than 30 time points (i.e., mother-child play samples and mothers' play reports). These observational data collected through mother-child play samples and mothers' play reports meet this assumption (Borckardt et al., 2008; Smith, Handler, & Nash, 2010).

Additionally, SMA is often used with case-based data; therefore, these analyses were appropriate given this study's sample size, $n = 3$ (Gray, 2010). SMA takes into account autocorrelation (i.e., non-independence of sequential observations); therefore, the default model (i.e., "lag-1 autoregressive") was selected to prevent increasing type-one error given the small sample size and to provide the most conservative approach with these analyses. Because of the suggested minimum amount of simulations, these analyses were set to run 5,000 simulations (Borckardt, 2006). Additionally, Pearson's *r* is the default statistic and recommended approach for SMA; thus, Pearson's *r* was selected and reported to indicate the correlations between the

level change (i.e., mean of baseline phase to mean of intervention phase) of: 1) mothers' scaffolding techniques/purposes and 2) types/purposes of children's social engagement. Additionally, Pearson's *r* was reported to indicate the correlations between baseline and intervention time points against an a priori slope vector. Specifically, the slope vector that was selected aligned with expected behaviors during baseline and intervention. This particular slope vector remained stable during baseline (i.e., "0") and increased linearly during intervention (i.e., "1, 2, 3,…12"). In other words, it was expected that mothers' scaffolding techniques and children's social engagement would remain stable during baseline and would change during intervention sessions, as influenced by Project ImPACT. Thus, the observed frequencies from each time point during baseline and intervention were correlated with this slope vector to identify if there was a relationship between stable observations during baseline and increased/decreased behaviors during intervention. Although not causal, significant correlations could indicate effects from the intervention compared to baseline when intervention techniques were not implemented.

SMA was conducted using Version 9.9.28 for MacOSX to compare behaviors (i.e., scaffolding and social engagement) that occurred during different time points (i.e., baseline and intervention sessions). Significantly correlated level-change and slope-vector analyses suggested that mothers' scaffolding frequencies and children's social engagement that were observed were related to the hypothesized improvements. Specifically, SMA examined the following behaviors of the mothers: (1) scaffolding techniques and frequencies of each technique (i.e., counts obtained from hand coded calculations of trained coders) during mother-child play samples, and (2) mothers involvement in children's play (i.e., Likert-type items rated from 0 to 3 on the mother play report) obtained during 17 sessions. Additionally, SMA examined changes in children's social engagement to mothers' scaffolding techniques (i.e., counts obtained from hand coded calculations of trained coders) from mother-child play samples. See Figure 1 for Example

SMA figure of baseline and intervention frequencies. Overall, SMA examined if there were significant changes in mothers' scaffolding techniques/frequencies and children's social engagement throughout 17 mother-child play samples from the start of the project (i.e., baseline) through completion of the intervention. The following highlights the significant changes for each participant in level change and/or slope vector from baseline compared to level change and/or slope vector from intervention.

Participant 1: Mother-Child Play Samples. The first scaffolding technique that was analyzed from mother-child play samples was the mother using "comments" (i.e., counts obtained from each mother-child play sample). Comments from mother that were used to *maintain* child's play did not significantly change from baseline (M_B = 102.4) to intervention (M_I = 152; r = .54, p > .10). However, comments used to *enhance* the child's play significantly improved from baseline (M_B = 3.60) to intervention (M_I = 56.25) according to level change (r = .902, p < .001) with moderate improvement indicated by slope vector (r = .760, p = .066). Child's overall social engagement to mother's comments significantly improved from baseline (M_B = 62.40) to intervention (M_I = 185.0) according to level change (r = .879, p = .004). Child's overall social disengagement to mother's comments showed moderate improvement from baseline (M_B = 44.6) to intervention (M_I = 16.75) according to level change (r = -.674, p = .097). In reference to the child's social engagement, the child's attention to mother's comments improved from baseline (M_B = 55.20) to intervention (M_I = 179.33) according to level change (r = .875, p = .003), indicating the child engaged in mother's comments more during intervention play samples. The child's nonverbal engagement in mother's comments did not show significant improvement from baseline (M_B = 33.4) to intervention (M_I = 35.75; r = .058, p > .10). Additionally, the child's verbal engagement in mother's comments did not show significant improvement from baseline (M_B = 3.6) to intervention (M_I = 6.75; r = .267, p > .10). Finally in

regard to comments as a scaffolding technique, the purpose of the child's social engagement to mother's comments was significantly more functional during intervention (M_I = 182.83) compared to baseline (M_B = 62.40), r = .862, p = .018, according to level change. That is, the child's social engagement (i.e., attention, nonverbal, and verbal communication) to the mother's comments was more functionally appropriate in comparison to social engagement observed during baseline. See Table 4 and Figure 2 for SMA results for participant 1.

The second scaffolding technique, "request", was examined from mother-child play samples. Requests from the mother that were used to *maintain* the child's play significantly decreased from baseline (M_B = 49.4) to intervention (M_I = 16.5), r = -.925, p < .001, according to level change. That is mother's requests that *maintained* the child's play decreased whereas mother's requests that *enhanced* the child's play increased from baseline (M_B = 14.0) to intervention (M_I = 18.25) although not statistically significant (r = .346, p > .10). The child's overall social engagement in mother's requests decreased from baseline (M_B = 41.8) to intervention (M_I = 29.0) with marginal significance according to slope vector (r = -.643, p = .064). The child's social disengagement significantly decreased from baseline (M_B = 21.6) to intervention (M_I = 4.58) accordingly to level change, r = -.702, p = .041. Specifically, the child's attention decreased from baseline (M_B = 37.6) to intervention (M_I = 27.25) according to slope vector, r = -.628, p = .043. Additionally, the child's nonverbal social engagement decreased from baseline (M_B = 28.8) to intervention (M_I = 11.58) with marginally significant level change, r = -.603, p = .083. Although decreased, there were no significant changes from baseline (M_B = 1.8) to intervention (M_I = 1.75) in the child's verbal engagement to mother's requests (r = -.011, p > .10). Finally in regard to requests as a scaffolding technique, the functional purpose of the child's social engagement to mother's requests marginally decreased from baseline (M_B = 41.8) to

intervention (M_I = 28.75), according to slope vector, r = -.604, p = .057. That is, the child's social engagement (i.e., attention, nonverbal, and verbal communication) to the mother's requests was marginally less functionally appropriate in comparison to social engagement observed during baseline. See Table 4 and Figure 2.

The final scaffolding technique, "prompts", was observed during mother-child play samples. Prompts from the mother that were used to *maintain* the child's play marginally increased from baseline (M_B = 6.2) to intervention (M_I = 16.333), according to level change, r = .549, p = .059. Additionally, prompts from the mother that were used to *enhance* the child's play significantly increased from baseline (M_B = 3.8) to intervention (M_I = 25.333), according to level change, r = .775, p = .014. Overall child's social engagement to mother's prompts increased from baseline (M_B = 8.8) to intervention (M_I = 38.583), according to level change, r = .797, p = .018. The child's overall social disengagement increased from baseline (M_B = 1.2) to intervention (M_I = 3.167), although not significant according to level change, r = .408, p > .10. In regard to the child's social engagement, specifically the child's attention to mother's prompts marginally increased from baseline (M_B = 8.2) to intervention (M_I = 38.5), according to level change, r = .758, p = .024. The child's nonverbal engagement (M_B = 3.4; M_I = 12.0) and verbal engagement (M_B = 0; M_I = 1.5) to mother's requests increased from baseline to intervention although not statistically significant (r = .512, p > .10; r = .452, p > .10, respectively). Lastly in regard to prompts as a scaffolding technique, the purpose of the child's social engagement to mother's prompts was significantly more functional during intervention (M_I = 39.167) compared to baseline (M_B = 9.0), according to level change, r = .79, p = .013. That is, the child's use of social engagement (i.e., attention, nonverbal, and verbal communication) to mother's prompts was

more functionally appropriate in comparison to the child's social engagement observed during baseline. See Table 4 and Figure 2.

Participant 1: Mother Play Reports. The child's play behaviors and mother's involvement in the child's play was also measured through responses from the mother on the "mother play report". See Appendix A. Results revealed that mother reported the child engaging in play with others more often from baseline (M_B = 1; "on occasion") to intervention (M_I = 1.917; "often"), according to level change, r = .936, p < .001. Additionally, mother reported the child engaging in more pretend play from baseline (M_B = 1; "on occasion") to intervention (M_I = 1.958; "often"), according to level change, r = .967, p < .001. The mother also reported engaging in pretend play more with her child from baseline (M_B = 1.2; "on occasion") to intervention (M_I = 1.958; "often"), according to level change, r = .815, p = .022. The mother indicated that her child's play interests shifted from reality-based play during baseline (M_B = 1.2; "strongly interested in reality") to more fantasy-oriented play during intervention (M_I = 2.615; "sometimes interested in fantasy, but mostly interested in reality") according to level change, r = .815, p = .02. Finally, there was a significant change in the amount of hours that mother engaged in play with her child from baseline to intervention, according to level change (r = -.452, p = .047) and slope vector (r = -.586, p = .007), suggesting that mother spent less time playing with her child outside of the clinic during intervention compared to time spent playing with her child outside of the clinic during baseline.

Participant 2: Missed Session. Participant 2 was absent from one session during this study (i.e., 15th session). Thus, no mother-child play sample was collected. However, the mother was contacted via phone to complete the mother-play report and the father attended the parent group session in order to receive the Project ImPACT material. As recommended and evident in

clinical trials, the observational data from the play sample prior to this participant's missed session were carried over for analytical purposes (i.e., "last observation carried forward"; Jarrett & Ollendick, 2012; Streiner, 2002). In other words, data from session 14 were duplicated for session 15, which the participant was absent. Therefore, the following SMA analyses were conducted accordingly.

Participant 2: Mother-Child Play Samples. The first scaffolding technique that was assessed from mother-child play samples was the mother using "comments". Comments from the mother that were used to *maintain* the child's play significantly increased from baseline (M_B = 52) to intervention (M_I = 67.833) according to slope vector, r = .847, p = .012. The mother's use of comments that *enhanced* the child's play also significantly increased from baseline (M_B = 9.2) to intervention (M_I = 63.833) according to level change, r = .878, p = .003. See Table 5 and Figure 3 for SMA results for participant 2.

The child's overall social engagement to the mother's comments significantly improved from baseline (M_B = 50.6) to intervention (M_I = 125.083) according to level change, r = .868, p = .004, and slope vector, r = .871, p = .018. This was also corroborated by the child's overall social disengagement to mother's comments significantly decreasing from baseline (M_B = 10.8) to intervention (M_I = 2) according to level change, r = -.807, p < .001. Specifically, the child's attention to mother's comments improved from baseline (M_B = 35) to intervention (M_I = 125.417) according to level change, r = .907, p = .002, and slope vector, r = .852, p = .03, in which the child engaged in the mother's comments more during intervention play samples in comparison to baseline. Additionally, the child's social engagement in nonverbal communication significantly increased from baseline (M_B = 9) to intervention (M_I = 37.833) according to level change, r = .796, p = .005. Also, the child's social engagement in verbal communication

increased from baseline (M_B = 16.4) to intervention (M_I = 28) according to level change, r = .536, p = .043. Finally in regard to comments as a scaffolding technique, the purpose of the child's social engagement to mother's comments was significantly more functional during intervention (M_I = 124.667) compared to baseline (M_B = 50.4), according to level change, r = .869, p = .004, and slope vector, r = .876, p = .016. That is, the child's use of social engagement (i.e., attention, nonverbal, and verbal communication) to the mother's comments was more functionally appropriate as observed during intervention compared to observations during baseline. However, the child's nonfunctional social engagements to mother's comments marginally increased from baseline (M_B = .2) to intervention (M_I = .917), according to slope vector, r = .663, p = .051. See Table 5 and Figure 3.

The second scaffolding technique, "request", was observed from mother-child play samples. Requests that *maintained* the child's play marginally decreased from baseline (M_B = 17.0) to intervention (M_I = 7.917), according to level change, r = -.645, p = .068. However, requests that *enhanced* the child's play significantly increased from baseline (M_B = 3) to intervention (M_I = 20.333), according to level change, r = .873, p < .001. The child's overall social engagement to mother's requests significantly improved from baseline (M_B = 11) to intervention (M_I = 26.333) according to level change, r = .709, p = .004. This was also corroborated by child's overall social disengagement to mother's requests significantly decreasing from baseline (M_B = 9.4) to intervention (M_I = .75) according to level change, r = -.933, p < .001. Specifically, the child's attention to mother's requests improved from baseline (M_B = 7.2) to intervention (M_I = 27.083) according to level change, r = .796, p = .002, indicating the child engaged in mother's comments more during intervention play samples

compared to baseline. Child's social engagement in nonverbal communication also significantly increased from baseline (M_B = 1.4) to intervention (M_I = 16.083) according to level change, r = .834, p = .001. There were no significant changes from baseline (M_B = 4.8) to intervention (M_I = 7.917) in the child's verbal engagement to mother's comments (r = .277, p > .10). Finally in regard to comments as a scaffolding technique, the purpose of the child's social engagement to mother's comments was significantly more functional during intervention (M_I = 27.25) compared to baseline (M_B = 11.0), according to level change, r = .753, p = .003. That is, the child's use of social engagement (i.e., attention, nonverbal, and verbal communication) to mother's comments was more functionally appropriate during intervention in comparison to the child's social engagement observed during baseline. See Table 5 and Figure 3.

The final scaffolding technique that was assessed from mother-child play samples was the mother using "prompts". Prompts from mother that were used to *maintain* the child's play significantly decreased from baseline (M_B = 42.6) to intervention (M_I = 22.25) according to level change, r = -.770, p = .01, and slope vector, r = -.701, p = .045. However, the mother's use of prompts that *enhanced* the child's play significantly increased from baseline (M_B = 14.4) to intervention (M_I = 47.167), according to level change, r = .856, p = .004. The child's overall social engagement to mother's prompts marginally improved from baseline (M_B = 43.2) to intervention (M_I = 64.667), according to level change, r = .558, p = .064. This was corroborated by the child's social disengagement decreasing from baseline (M_B = 11.8) to intervention (M_I = 1), according to level change, r = -.769, p = .001, and marginally according to slope vector, r = -.458, p = .082. Specifically, the child's attention to mother's prompts improved from baseline (M_B = 31.6) to intervention (M_I = 64.917) according to level change, r = .741, p = .017, in which the child engaged in mother's prompts more during intervention play samples compared to

baseline. Additionally, the child's nonverbal communication in response to mother's prompts also increased from baseline (M_B = 6.6) to intervention (M_I = 25.167) according to level change, r = .786, p = .005. The child's verbal communication in response to mother's prompts decreased from baseline (M_B = 18.2) to intervention (M_I = 12.833) according to slope vector, r = -.591, p = .023. Finally in regard to prompts as a scaffolding technique, the purpose of the child's social engagement to mother's prompts was marginally more functional during intervention (M_I = 66.583) compared to baseline (M_B = 43), according to level change, r = .595, p = .057. That is, the child's use of social engagement (i.e., attention, nonverbal, and verbal communication) to mother's prompts was marginally more functionally appropriate during intervention in comparison to the child's social engagement observed during baseline. See Table 5 and Figure 3.

Participant 2: Mother Play Reports. According to mother's reports, there were no significant changes from baseline to intervention in the child's play behaviors and mother's involvement in child's play as measured by the "mother play report".

Participant 3: Mother-Child Play Samples. The first scaffolding technique that was assessed was "comments". There were no significant changes from baseline (M_B = 84) to intervention (M_I = 76.5) in mother's use of *maintaining* comments (r = -.212, p > .10; level change), and there were no significant changes from baseline (M_B = 44.6) to intervention (M_I = 63.333) in mother's use of *enhancing* comments (r = .384, p > .10; level change). However, the child's overall social engagement in mother's comments marginally increased from baseline (M_B = 72.2) to intervention (M_I = 133.667), according to level change, r = .718, p = .055. This was also corroborated by the child's overall social disengagement decreasing from baseline (M_B = 57.2) to intervention (M_I = 4.25), according to level change, r = -.955, p < .001. Specifically, the child's attention increased from baseline (M_B = 66.6) to intervention (M_I = 132.083), according

to level change, $r = .745$, $p = .037$. There were no significant changes from baseline ($M_B = 26.2$) to intervention ($M_I = 33.083$) in the child's nonverbal engagement to mother's comments ($r = .192$, $p > .10$; level change). Additionally, there were no significant changes from baseline ($M_B = 11.4$) to intervention ($M_I = 21$) in the child's verbal engagement to mother's comments ($r = .34$, $p > .10$; level change). Finally in regard to comments as a scaffolding technique, the purpose of the child's social engagement to mother's comments was significantly more functional during intervention ($M_I = 133.75$) compared to baseline ($M_B = 70.0$), $r = .728$, $p = .049$, according to level change. This was corroborated by the child's nonfunctional use of social engagement decreasing from baseline ($M_B = 1.6$) to intervention ($M_I = 0$), $r = -.746$, $p = .009$, according to level change. That is, the child's use of social engagement (i.e., attention, nonverbal, and verbal communication) to mother's comments was more functionally appropriate during intervention in comparison to the child's social engagement observed during baseline - with no observation of nonfunctional social engagement during intervention play samples. See Table 6 and Figure 4 for SMA results for participant 3.

The second scaffolding technique, "request", was observed from mother-child play samples. Requests that *maintained* the child's play significantly decreased from baseline ($M_B = 59.8$) to intervention ($M_I = 26.917$), according to level change, $r = -.788$, $p = .008$, with marginal significance according to slope vector, $r = -.857$, $p = .001$. However, requests that *enhanced* the child's play increased from baseline ($M_B = 31.6$) to intervention ($M_I = 42.5$), although not significantly according to level change, $r = .449$, $p > .10$. The child's overall social engagement to mother's requests increased from baseline ($M_B = 46.6$) to intervention ($M_I = 66.417$) but did not show significant improvement according to level change, $r = .542$, $p > .10$. However, the child's overall social disengagement to mother's requests significantly decreased from baseline

(M_B = 45.0) to intervention (M_I = 2.5) according to level change, r = -.954, p < .001. Specifically, the child's attention did not show significant improvement from baseline (M_B = 42.0) to intervention (M_I = 66.25) according to level change, r = .626, p > .10. Additionally, the child's nonverbal communication in response to mother's requests did not show significant improvement from baseline (M_B = 17.6) to intervention (M_I = 27.833) according to level change, r = .506, p > .10. However, the child's verbal communication in response to the mother's requests significantly increased from baseline (M_B = 9.2) to intervention (M_I = 14.75) according to slope vector, r = .513, p = .017. Finally in regard to requests as a scaffolding technique, the purpose of the child's social engagement to mother's requests was significantly more functional during intervention (M_I = 63.167) compared to baseline (M_B = 45.2), according to level change, r = .497, p = .033. That is, the child's use of social engagement (i.e., attention, nonverbal, and verbal communication) to mother's requests was more functionally appropriate during intervention in comparison to the child's social engagement observed during baseline. See Table 6 and Figure 4.

The final scaffolding technique that was assessed from mother-child play samples was the mother using "prompts". Prompts from the mother that were used to *maintain* the child's play significantly increased from baseline (M_B = 18.2) to intervention (M_I = 33.083) according to level change, r = .719, p = .013, and marginally significant according to slope vector, r = .554, p = .098. Additionally, the mother's use of prompts that *enhanced* the child's play increased from baseline (M_B = 32) to intervention (M_I = 52.25) although not significant according to level change, r = .548, p > .10. The child's overall social engagement in mother's prompts increased from baseline (M_B = 29.6) to intervention (M_I = 82.083) according to level change, r = .834, p = .008, while the child's overall social disengagement in mother's prompts decreased from

baseline (M_B = 20.6) to intervention (M_I = 2.333) according to level change, r = -.953, p < .001. Specifically, the child's attention to mother's prompts increased from baseline (M_B = 29) to intervention (M_I = 81.917), according to level change, r = .835, p = .006. Additionally, the child's nonverbal communication in response to mother's prompts increased from baseline (M_B = 7.8) to intervention (M_I = 28.333), according to level change, r = .758, p = .021. The child's verbal engagement to mother's prompts increased from baseline (M_B = 4.2) to intervention (M_I = 16.667) but did not show significant improvement according to level change, r = .632, p > .10. Finally in regard to prompts as a scaffolding technique, the purpose of the child's social engagement to mother's prompts was significantly more functional during intervention (M_I = 81.833) compared to baseline (M_B = 29.2), according to level change, r = .824, p = .011. This was corroborated by the child's social engagement being significantly less nonfunctional during intervention (M_I = 0) compared to baseline (M_B = .4), according to level change, r = -.566, p = .011. That is, the child's use of social engagement (i.e., attention, nonverbal, and verbal communication) to mother's requests was more functionally appropriate during intervention in comparison to social engagement observed during baseline – with no nonfunctional responses to prompts observed during the intervention play samples. See Table 6 and Figure 4.

Participant 3: Mother Play Reports. The child's play behaviors and mother's involvement in child's play was also measured through responses from the mother on the "mother play report". See Appendix A. Results revealed that the child engaged in play by itself less during intervention (M_I = 3: "always") compared to baseline (M_B = 2.417: "often"), with moderate significance according to slope vector, r = -.717, p = .07. Additionally, the child engaged in pretend play from "never" during baseline (M_B = 0) to "on occasion" intervention (M_I = .154), with moderate significance, r = .447, p = .07, according to slope vector.

Secondary Analyses

The third aim of this project was to examine changes in children's developmental, social, and play skills from pre- to post- and pre- to post 2-intervention. In order to assess if there were significant changes across these time points, scores from the following measures were used to evaluate children's skills: (1) Mullen Scales of Early Learning (MSEL: assessing developmental skills), (2) Social Communication Checklist (SCC: assessing developmental, social, and play skills), (3) Childhood Routines Inventory (CRI: assessing social skills through routines), (4) Repetitive Behavior Stereotype – Revised (RBS – R: assessing social skills through repetitive/stereotyped behaviors), (5) Adaptive Behavior Assessment System – Second Edition (ABAS – II : assessing social skills across various settings), (6) Childhood Autism Rating Scale – Second Edition (CARS2 – ST : assessing autism symptomatology), and (7) Developmental Play Assessment (DPA: assessing children's play skills). Reliable change index (RCI; Jacobson & Truax, 1991) was used to examine clinically significant changes from pre- to post- and pre- to post 2-intervention in children's skills/behaviors for the measures that had reported psychometrics (i.e., test-retest reliabilities and *M*s/*SD*s from normative samples).

Reliable Change Index

The statistical analysis known as reliable change index (RCI) assesses whether a change in an individual's score (e.g., pre- compared to post-intervention score) is significant based on how reliable the measure is (Jacobson & Truax, 1991). In this procedure, a standard score, known as the Reliable Change Index, is calculated and represents the change in a participant's score on a measure (i.e., from pre- to post-intervention and pre- to post 2-intervention). This indicated if a participant has improved and/or recovered from pre-intervention. Recovery is used as a consistent term with Reliable Change Index analyses; however, recovery is not relative to a

skill deficit or recovery from ASD diagnosis. Mathematically, RCI is the difference of the participant's scores divided by the standard error of the difference for the measure being used (i.e., (Time 2 score – Time 1 score) / Standard Error).

In order to calculate the RCI for each measure (MSEL, ABAS – II , CRI, CARS2 – ST, and RBS – R), psychometrics were obtained from past literature (i.e., test-retest reliabilities and normative sample *M*s/*SD*s). They are as follows: MSEL (test-retest = .70; visual reception: M = 26.7, SD = 3.1, fine motor: M = 26.4, SD = 2.3, expressive language: M = 23, SD = 3.8, receptive language: M = 24.8, SD = 3.4; Mullen, 1995), ABAS – II (test-retest = .90; M = 100, SD = 15; Harrison & Oakland, 2003), CRI (test-retest = .86; M = 114.74, SD = 16.31; Jordan, 2003), CARS2 – ST (test-retest = .64; M = 35.3, SD = 6.9; Schopler, Reichler, & Renner, 2010), and RBS – R (test-rest = .71; M = 40.7, SD = 9.3; Bodfish, Symons, & Lewis, 1999). Next means and standard deviations of this sample (n = 3) were calculated using scores from pre-intervention for each individual measure. Normative sample *M*s and *SD*s were used from past literature, when reported, to account for the smaller sample size of this study. Thus, this sample's *M*s and *SD*s (or normative samples' *M*s and *SD*s when reported) and previously reported test-retest reliabilities were used to calculate the RCIs. Overall, RCI helped identify if there was clinically significant change in the participants' developmental, social, and play skills, in addition to their autism symptomatology.

Unreported Psychometrics. Because the Developmental Play Assessment (DPA; Lifter, 2000) and Social Communication Checklist (SCC; Ingersoll & Dvortcsak, 2009) did not report needed psychometrics (i.e., test-retest reliabilities and/or normative sample *M*s and *SD*s), the following method was used. Similarly to RCI, means and standard deviations were calculated for pre-intervention scores on each measure in order to determine clinically significant change (i.e.,

improvement/recovery) at post- and post 2-intervention. Individual scores for each participant from post- and post 2-intervention were individually compared with means of children's pre-intervention scores on the DPA and SCC to indicate improvement in their developmental, social, and play skills. This method differs from RCI because it did not factor in test-retest reliabilities and normative samples' means/standard deviations in relationship to participants' improvements and recoveries. Again, recovery is used as a consistent term with Reliable Change Index analyses; however, recovery is not relative to a skill deficit or recovery from ASD diagnosis. Therefore, following highlights improvements and recovery children's developmental, social, and play skills using RCI.

Participant 1. Overall, there was improvement in developmental, social, and play skills according to RCI for participant 1. Specifically regarding developmental skills, receptive language as measured by MSEL improved and recovered from pre- to post- and pre- to post 2-intervention. As measured by mother report on SCC, the *form* of expressive language improved from pre- to post 2-intervention and the *function* of expressive language skills improved from pre- to post 2-intervention. Participant 1's social skills, including the ability to follow directions, improved from pre- to post- and pre- to post 2-intervention according to the SCC. This child's imitation skills also improved on the SCC from pre- to post- and pre- to post 2-intervention. Additionally, social skills improved and recovered from pre- to post-intervention and improved from pre- to post 2-intervention according to the ABAS – II. Finally, play skills as measured by the Developmental Play Assessment improved from pre- (3 = "Takes-Apart Combinations") to post- (5 = "General Combinations") and post 2-intervention (6 = "Pretend Self"). See Appendix B for levels of the DPA. Improvement in play skills was also corroborated by play measured on the SCC, which improved from pre- to post 2-intervention. See Table 7 for

improvement/recovery from pre- to post-intervention and Table 8 for improvement/recovery from pre- to post 2-intervention using RCI.

Participant 2. Overall, there was improvement in developmental, social, and play skills according to RCI for participant 2. Specifically regarding developmental skills, visual reception skills on the Mullen Scales of Early Learning significantly improved and recovered from pre- to post-intervention and fine motor skills improved from pre- to post-intervention. Participant 2's expressive language improved from pre- to post- and pre- to post 2-intervention as measured by the MSEL. As reported by mother on the SCC, the *form* of expressive language skills improved from pre- to post-intervention and pre- to post 2-intervention. Lastly regarding the child's developmental skills, there was improvement and recovery from pre- to post- and pre- to post 2-intervention with receptive language skills. In regard to social skills, this child's imitation skills as measured by the SCC improved from pre- to post-intervention and pre- to post 2-intervention. Additionally, social skills improved from pre- to post-intervention and improved from pre- to post 2-intervention according to the ABAS – II. Finally, play skills as measured by the Developmental Play Assessment improved from pre- (3 = "Takes-Apart Combinations") to post- (6 = "Pretend Self") and pre- to post 2-intervention (6 = "Pretend Self"). See Appendix B for levels of the DPA. Improvement in play skills was also corroborated by the SCC, in which the child showed improved play skills from pre- to post- and pre- to post 2-intervention. There was also improvement in the child's autism symptomatology as measured by the CARS2 – ST from pre- to post 2-intervention. See Table 7 for improvement/recovery from pre- to post-intervention and Table 8 for improvement/recovery from pre- to post 2-intervention using RCI.

Participant 3. Overall, there was improvement in developmental, social, and play skills

according to RCI for participant 3. Specifically regarding developmental skills, as measured by the MSEL visual reception improved and recovered from pre- to post-intervention and remained improved from pre- to post 2-intervention. Participant 3's receptive language improved and recovered from pre- to post-intervention and pre- to post 2-intervention as measured on the MSEL. Additionally, the child's receptive language improved from pre- to post-intervention, and fine motor skills improved from pre- to post- and pre- to post 2-intervention. The *form* of expressive language skills as measured by the SCC improved from pre- to post-intervention and pre- to post 2-intervention. The *function* of expressive language skills as measured by the SCC improved from pre- to post-intervention and pre- to post 2-intervention. The child's social skills improved and recovered from pre- to post 2-intervention as measured by the ABAS – II. Finally, play skills as measured by the Developmental Play Assessment improved from pre- (6 = "Pretend Self") to post- (8 = "Child-as-Agent") and pre- to post 2-intervention (8 = "Child-as-Agent"). Thus from pre- to post-intervention, play skills improved and remained stable at post 2-intervention. See Appendix B for levels of the DPA. Additionally, play skills as measured by the SCC improved from pre- to post-intervention. Finally, the child's autism symptomatology improved and recovered from pre- to post- and pre- to post 2-intervention. Again, recovery is used as a consistent term with RCI analyses but is not claiming recovery relative to ASD diagnosis. See Table 7 for improvement/recovery from pre- to post-intervention and Table 8 for improvement/recovery from pre- to post 2-intervention using RCI.

Overall for all 3 participants, there were no significant changes in children's repetitive and stereotyped behaviors as reported by mothers on the RBS – R and no significant changes as reported by the mothers on the CRI.

Treatment Fidelity/Adherence

Throughout all 17 sessions (not including the individual short-term follow up sessions), there was 95.47% overall adherence to the treatment with 96.55% treatment adherence for the intervention sessions (i.e., excluding baseline). The 3.45% discrepancy of adhering to the intervention was primarily due to not completing one item, which was showing sample video clips for parents to watch during the group sessions. When there were time constraints, parents were polled by the primary experimenter to gage interest/need from the parents to watch the video play samples provided in the intervention manual. Only when parents felt adequately equipped without viewing the videos were the video clips not viewed. Otherwise, the primary experimenter appropriately adhered to all other items on the checklist.

Other Intervention Services Participants Received

Mothers were asked to report the amounts (i.e., hours) and types of intervention services (e.g., speech therapy) that the children received prior to commencement of Project ImPACT, in conjunction with Project ImPACT, and up to the short-term follow up session. The following highlights services that each participant received.

Participant 1. At the start of the project and throughout the intervention, this child received services through Early Childhood Intervention. Specifically, this child had a maximum of 4 hours of speech therapy from pre- to post-intervention.

Participant 2. At the start of the project and throughout the intervention, this toddler did not receive any alternative services than what was provided through Project ImPACT.

Participant 3. At the start of the project and throughout the intervention, this child received services through Early Childhood Intervention. Specifically, this child had a maximum of 4 hours of speech therapy from pre- to post-intervention.

DISCUSSION

The first aim of this project was to examine changes in mothers' scaffolding techniques used during children's play from baseline through intervention (i.e., implementation of Project ImPACT). Secondly, this project examined children's social engagement to mothers' scaffolding techniques from baseline through intervention (i.e., implementation of Project ImPACT). Third this project explored children's overall developmental, social, and play skills from pre- to post- and pre- to post 2-intervention. In general, as evident in the results, mothers' scaffolding techniques increased (i.e., frequencies), children's social engagement increased, and children's overall developmental, social, and play skills improved from: 1) pre- to post- and 2) pre- to post-2 intervention. There were various improvements specific to each participant; thus, the following further describes these improvements with each participant in relationship to the proposed hypotheses.

Regarding the first aim, mothers' scaffolding techniques (i.e., comments, requests, and prompts) increased from baseline to Project ImPACT intervention sessions. In other words, mothers quantity (i.e., frequencies) of scaffolding techniques increased during children's play from baseline to intervention. Specifically, mother 1 increased use of maintaining and enhancing comments, enhancing requests, and maintaining and enhancing prompts from baseline to intervention. Additionally, mother 2 used more maintaining and enhancing comments and enhancing requests and prompts during her child's play from baseline to intervention. Finally, mother 3 significantly increased her use of enhancing comments and requests, and maintaining

and enhancing prompts from baseline to intervention. Thus the hypotheses for the first aim, examining mothers' scaffolding techniques and purposes of these techniques, were confirmed.

The second aim of this project was to examine children's social engagement in mothers' scaffolding techniques. Given that in general mothers' quantities of scaffolding techniques (i.e., frequencies) increased from baseline to intervention, it provided more opportunities for children to be engaged with mothers in play during intervention compared to baseline. In addition to more opportunities provided by mothers, children also socially engaged more often in mothers' scaffolding techniques from baseline to intervention. Thus the hypothesis for the second aim, examining children's social engagement, was confirmed.

Specifically, participant 1 increased in overall social engagement to mother's comments and requests from baseline to intervention. Participant 1's attention to mother's comments and prompts increased. Additionally, participant 2 increased in overall social engagement to mother's scaffolding techniques. Participant 2's attention and nonverbal skills increased to mother's comments, requests and prompts from baseline to intervention. Additionally, verbal engagement in mother's comments increased from baseline to intervention. Finally, participant 3 increased in overall social engagement to mother's comments and prompts. Participant 3's attention to mother's comments and requests increased, in addition to nonverbal engagement in mother's prompts.

A final aim of this project was to examine how children's overall developmental, social, and play skills changed from pre- to post-intervention and pre- to post 2-intervention. It is important to note that delayed play skills in children with ASD often co-exist with other delays such as language and social skills (Lifter, Ellis, Cannon, & Anderson, 2005). However, in general, children exhibited more advanced developmental, social, and play skills from pre- to

post-intervention and pre- to post 2-intervention. See Tables 7 and 8 for specific improvements during these time points, in which these improvements were captured from multiple informants: mothers' reports and/or experimenter observations and assessments. Mothers' increased usage of scaffolding techniques during child's play was also present with children's developmental, social, and play skills becoming more complex after implementation of Project ImPACT. This is not a causal explanation; however, Project ImPACT seems to be an effective intervention by: 1) increasing mothers' scaffolding techniques, 2) increasing children's social engagement to mothers' scaffolding techniques, and 3) improving children's developmental, social, and play skills.

Woolley and Tullos (2008) suggested that scaffolding techniques employed by mothers could either *maintain* play (e.g., turn-taking) or *enhance* play (e.g., enriching what child does, upping the ante). The purpose (i.e., maintenance or enhancement) of these scaffolding techniques also aligns well with the term scaffolding because the definition of scaffolding involves bringing one from his/her *actual* level (e.g., maintain) to *potential* level (e.g., enhance). Maintaining play could be a method that mothers use rather than enhancing play, which can be more effortful. Thus mothers could potentially rely on more comfortable techniques (i.e., maintaining children's play), rather than making greater effort to enhance children's play. While this cannot be directly assumed with these data, future research could further probe maintenance and enhancement of children's play. Overall, these data show that in the presence of *maintaining* scaffolding techniques decreasing, *enhancing* scaffolding techniques increase.

An interesting finding is that in the presence of some mothers using more *enhancing* scaffolding techniques, *maintaining* scaffolding techniques decreased. In other words when the mother's scaffolding techniques served an enhancing purpose, she used fewer scaffolding

techniques that solely maintained the child's play. For example, mother 1 used significantly less *maintaining* requests from baseline to intervention. Additionally, mother 2 used fewer requests and prompts that *maintained* her child's play from baseline to intervention and instead used more requests and prompts that *enhanced* her child's play from baseline to intervention. Finally, mother 3 used fewer *maintaining* comments and requests and instead used more comments and requests that *enhanced* her child's play from baseline to intervention. Thus it seems more beneficial to use scaffolding techniques that can indeed *enhance* a child's play rather than solely maintain the child's play.

Although Project ImPACT did not directly focus on increasing mothers' scaffolding techniques, these data showed increased use of scaffolding techniques (i.e., frequencies) from baseline to intervention sessions. Thus, the techniques that were taught to parents from Project ImPACT did increase the specific scaffolding techniques indentified by Woolley and Tullos (i.e., comments, requests, and prompts; 2008). Each parent group session had a particular focus on skill(s) to teach from Project ImPACT, which mothers implemented with their children during mother-child play samples. In other words, there were certain techniques that were taught from Project ImPACT (e.g., modeling language), which could explain higher frequencies of mothers' scaffolding techniques (e.g., comments) during intervention in comparison to baseline used during children's play. That is, Project ImPACT did not specifically train mothers on Woolley and Tullos' (2008) scaffolding techniques; instead, it focused on the techniques that were outlined in the Project ImPACT practitioner manual. See Appendix C for techniques taught from Project ImPACT during intervention sessions. Therefore, this study was exploratory in nature such that one could expect mothers' scaffolding quantities and qualities to increase/improve from baseline to intervention sessions through implementation of Project ImPACT.

This study uniquely contributed to past research because it includes an intervention that is based upon parent involvement. For example, a meta-analysis on single-subject designs examining evidence-based practices for young children with autism only mentioned four studies that included parent involvement suggesting that parent involvement is not a primary component of single-subject designs (Odom et al., 2003). This current study involved mother scaffolding as a primary focus because current recommendations advocate that children with ASD receive 25 hours of intervention per week. This often goes unfulfilled because of both the lack of intervention services and the huge financial and time burden placed on families. Thus, parent involvement in ASD intervention is vital (National Research Council, 2001). Additionally, this was one of the first empirical studies that implemented Project ImPACT as the primary part of its methodology. This study was also exclusive in its contributions to existing literature because it examined mothers' scaffolding techniques (Woolley & Tullos, 2008) that are evident with parents and children's play of children who are typically developing. Uniquely, this study encompasses multiple scaffolding techniques as an umbrella term, rather than focusing solely on one tactic, which parents often use (e.g., point; Valentino, Cicchetti, Toth, & Rogosch, 2011).

There are various strengths within this study with two specifically highlighted, which are: 1) multiple informants and 2) a homogeneous sample. First, there were multiple methods of data collection: 1) observational, 2) mother report, and 3) experimenter reports. In other words, mothers' scaffolding techniques and children's skills were assessed through a variety of informants. Thus a more variable profile was obtained for each mother and child. Given that this was an exploratory study that examined the use of scaffolding techniques that mothers use during children's play, there is a vast amount of data. Therefore, the findings are individually interpreted for each participant, rather than providing generalizations. Additionally, the sample

was homogeneous, which was reflected in children's scores matching during pre-intervention assessments on measures for inclusion criteria (i.e., MSEL, CARS2 – ST). However, this was also a weakness such that this homogenous sample might not be able to adequately generalize the heterogeneity that is often present in the ASD population (Roberts et al., 2011).

This study also involved various limitations. First, by focusing on a homogeneous group (i.e., scores matching relatively well on MSEL and CARS2 – ST), it limited the ability to generalize to the population of young children with autism. However, it was with purposeful intent to recruit a set of toddlers with similar skills at the start of intervention in order to have smaller standard deviations for analytical purposes and also have comparable experiences from parents during the group parent sessions. Thus, future studies could recruit a larger heterogeneous sample. Another limitation was not assessing generalization. In other words, this study did not include probes that could assess if children's skills transcend the clinic. For example, Fava et al. (2011) used generalization probes to examine if children's improved skills were evident across settings (e.g., at the clinic and in natural environments). That is, generalization probes can be used to assess if skills are used beyond where they are first learned. Fava and colleagues conducted monthly assessments of children's skills in the clinic using generalization probes, in which the overall purpose was to assess if children were maintaining targeted skills (2011). However, the only generalization probe that occurred during this current study was through informal discussion among the parents and the experimenter during group parent sessions throughout the intervention.

An additional limitation in this study was the lack of control group because it did not allow for comparison of other toddlers with ASD (e.g., to be able to generalize these findings from this ASD sample to the ASD population) or to be able to highlight intervention effects in

isolation from developmental maturation (McGee, Morrier, & Daly, 1999; as cited in Wetherby & Woods, 2006). In other words, one could expect developmental skills to improve with time, which would allude to natural developmental maturation. Especially when not involved in early intervention, it is possible that children with ASD are more at risk for regression of skills rather than following the expected developmental maturation. At the conclusion of Project ImPACT children were receiving very limited amounts of early intervention that would put them at risk for regression of skills. However, parents were trained as therapists such that when children were not receiving direct services from interventionists in the clinical setting, children were still receiving a form of intervention.

For ethical purposes when children were recruited for this study, they remained involved in other services they were already receiving at time of recruitment. In other words, two of the children were already involved with local Early Childhood Intervention (ECI) agencies receiving speech therapy. Thus, these two children continued with these services throughout the duration of this study. Although minimal amounts of intervention were delivered through ECI (i.e., maximum of 2 hours a month, as reported by mothers), these services could still have influenced children's progression and improvements that were evident at the conclusion of Project ImPACT. Thus, Project ImPACT was not the sole contributor to children's improvements as is expected from past literature and similar early intervention studies. However, this study corroborates that mothers can effectively learn techniques that can better facilitate children's development (Vismara, Colombi, & Rogers, 2009).

Although there were multiple methods in which data were obtained (e.g., mother, child, experimenter), there are also other existing measures that could have been used to assess children's skills. For example, The Leiter International Performance Scales – Revised (Roid &

Miller, 1997; Tsatsanis et al., 2003) is used for individuals having a mental age of 2 years or higher. The Leiter does not require receptive or expressive language skills. Another measure used to assess both intellectual and academic skills is the Differential Abilities Scales (DAS; Elliott, 1990), which is administered to individuals with a chronological and/or mental age of 2.5 years to 17 years. Although the DAS is favored and allows for repeat administrations, it was not implemented in this study because of the participants being younger than 2.5 years old. The Bayley Scales of Infant Development – II and the Mullen Scales of Early Learning are often administered to children at-risk for ASD. The MSEL is generally preferred to the Bayley given that the MSEL has more distinct developmental domains, which separately assess verbal and nonverbal skills whereas the Bayley has one score that comprises children's communication, memory, and problem solving skills (Ozonoff, Goodlin-Jones, & Solomon, 2005). Although the MSEL has fewer years of research compared to the Bayley, the MSEL provides more detailed information (i.e., scores) for each developmental domain (Ozonoff, Goodlin-Jones, & Solomon, 2005). Thus, the MSEL was selected to assess children's developmental skills. It is possible that children's true developmental skills (i.e., what they are capable of) were not reflected in their raw scores on the MSEL. In other words, this standardized test presents issues such that children with ASD require less time to complete the measure (compared to age matched peers) because of spending more time in off-task behaviors (Akshoomoff, 2007). Additionally, the MSEL was administered from pre-, post-, to post 2-intervention, which is not common practice (e.g., start of intervention to end of intervention was approximately 2 months, with a short-term follow up 2 months after the end of intervention).

It is necessary to recognize the importance of individualized treatment plans in the context of intervention. In other words, this study developed individual goals (i.e., treatment

plans) for each toddler. That is, what works well for one child with ASD might not be the most effective for another child with ASD. For example, a child with many repetitive behaviors may interrupt the ability for one effective intervention to actually work well with that child. Additionally, there are factors such as time, energy, and finances that influence which treatment a parent will select for their child (Miller et al., 2012). Finally, when selecting an intervention for a child with autism it should be developed with caution, such that empirically based interventions should be implemented (e.g., not sensory integration therapy for autism spectrum disorders; Lang et al., 2012).

Past research has examined mothers' language as an influencing factor in children's social engagement, such as expressive language. For example, Walton and colleagues examined non-demanding versus demanding language use of mothers in relationship to children's expressive language (Walton, Sherwood, & Ingersoll, 2012). They found that mothers of children with ASD versus TD used less demanding language quite possibly because children with ASD provided fewer social engagement cues like attentional orientation toward mothers. Thus these past findings relate to this study's findings because mothers possibly used fewer scaffolding techniques just as they used fewer demanding phrases. This could also be related to children with ASD not being as socially engaged as children with TD. Similarly, parenting styles/culture may differ and contribute to the interactive or lack of interactive play between parents and children (Bornstein & Putnick, 2012).

Future research could explore these scaffolding techniques further with typically developing populations. Perhaps mothers of children with ASD do not scaffold play as often compared to parents of children with TD because children with ASD generally have social and communication deficits (e.g., language, joint attention, gestures, and imitation), which might

prevent as much parent interaction. In other words, mothers' scaffolding techniques did increase from pre- to post-intervention focusing on children with ASD, which could also be explored in other atypical populations. Additionally, future research could implement this intervention in a natural environment, rather than a clinical setting, and would allow parents to learn effective techniques through a cost-efficient method.

In summary, ASD has become a propagating concern as the prevalence continues to rise. Parents of children with ASD often report concerns prior to their child's second birthday, in which social and developmental delays are generally present by 12 to 18 months of age (Wetherby et al., 2008). However, the median age of autism diagnosis in the state of Alabama is approximately 4.5 years. Thus, this study supports the importance of intervening early and highlights the importance of parental involvement in children's development. Overall, the outcomes of this study expand our understanding of the importance of parents: (1) serving as key interventionists (Roberts et al., 2011) and (2) being involved in children's play through scaffolding (Woolley & Tullos, 2008). Although these data were specific to each participant/mother, with sensitive interpretation, these data suggest that Project ImPACT is an effective intervention in improving mother's scaffolding techniques during children's play and children's social engagement to mothers' scaffolding techniques.

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Appendix A

Mother Play Report

Please answer the following questions according to these responses:

0 = not at all 1 = on occasion (sometimes) 2 = often 3 = always

How often does your child engage in play by his/herself?	0	1	2	3
How often does your child engage in play with others?	0	1	2	3
How often does your child engage in play with you?	0	1	2	3
How often do you engage in play with your child?	0	1	2	3
How often does your child engage in pretend play?	0	1	2	3
How often do you engage in pretend play with your child?	0	1	2	3

What type(s) of toys are of interest to your child?

_____

_____

What type(s) of activities are of interest to your child?

_____

_____

Please explain things you do/say during play with your child:

_____

_____

_____

Any other comments you would like to make about your child's play and your play with your child:_____

_____

_____

How would you rate your child's level of fantasy and pretend play? (i.e., Does your child do a lot of pretending, have great interest in fantastical beings, watch television programs and read books that are fantasy oriented?)

1__ child strongly interested in reality (e.g., plays sports/rule based games)

2__ sometimes child is interested in fantasy, but mostly interested in reality

3__ child equally interested in fantastical and reality play/media

4__ child is mostly interested in fantasy, but sometimes interested in reality

5__child is strongly interested in fantasy (e.g., often engages in pretense, enjoys fantastical books, etc.)

Appendix B

Sequence/Definitions of Play Categories for Developmental Play Assessment
(DPA; Lifter, 2000)

1 Indiscriminate Actions: All objects are treated alike (e.g., all objects are mouthed)

2a Discriminative Actions: Differentiates among objects, preserving their physical or conventional on Single Objects characteristics (e.g., rolls round beads, squeezes stuffed animal)

2b Takes-Apart Combinations: Separates configurations of objects (e.g., takes all pieces out of puzzle)

3a Presentation Combinations: Recreates combinations of objects according to their presentation configuration (e.g., puts puzzle pieces into puzzle; nests nesting cups)

3b General Combinations: Creates combinations of objects that result in simple, nonspecific configurations such as container/contained relations (e.g., puts beads and puzzle pieces in cup)

3c Pretend Self: Relates objects to self, indicating a pretend quality to the action (e.g., brings empty cup to mouth to drink)

4 Specific Combinations: Preserves unique physical characteristics of objects in the configuration (Physical Attributes) (e.g., stacks nesting cups; strings beads)

5a Child-as-Agent: Extends familiar actions to doll figures, with the child as agent of the activity (e.g., extends cup to dolls mouth)

5b Specific Combinations: Preserves unique conventional characteristics of object in the (Conventional Attributes) configuration (e.g., places cup on saucer; places string of beads on self)

6a Single-Scheme Sequences: Extends same familiar action to two or more figures (e.g., extends cup tobaby doll, to stuffed lamb, to interactant)

6b Substitutions: Uses one object to stand in place for another (e.g., puts bowl on head for hat)

7a Doll-as-Agent: Moves doll figures as if they are capable of action (e.g., moves figure to load blocks into a truck; puts mirror into doll's hand to see itself)

7b Multischeme Sequence: Extends different actions to same figure (e.g., feeds doll with spoon, wipes it with a cloth, then puts it to bed)

8a Sociodramatic Play: Adopts various familiar roles in play theme (e.g., plays house, assigning the various roles)

8b Thematic Fantasy Play: Adopts roles of fantasy characters (e.g., plays "Superman" or "Wonderwoman," assigning the various roles)

Appendix C

Project ImPACT Timeline

Week #	Phase & Session #	Measures	Technique taught to parents from Project ImPACT
1	Baseline 1	Experimenter: MSEL, CARS2 - ST Mother: Demographic questionnaire, child history form, Play Report, ABAS – II , CRI, RBS-R, Social-Communication Checklist & mother-child play sample	
2	Baseline 2	Mother: Play Report, & mother-child play sample	Overview of program
	Baseline 3	Mother: Goal Development form, Daily Activity Schedule, Play Report, & mother-child play sample	
3	Baseline 4	Mother: Play Report & mother-child play sample	Set up your home for success
	Baseline 5	Mother: Play Report & mother-child play sample	
4	Intervention 1	Mother: Play Report & mother-child play sample	Follow your child's lead
	Intervention 2	Mother: Play Report & mother-child play sample	Imitate your child & animation
5	Intervention 3	Mother: Play Report & mother-child play sample	Modeling & expanding language
	Intervention 4	Mother: Play Report & mother-child play sample	Playful obstruction & balanced turns
6	Intervention 5	Mother: Play Report & mother-child play sample	Communicative temptations
	Intervention 6	Mother: Play Report & mother-child play sample	Review above interactive techniques & introduce direct teaching techniques below
7	Intervention 7	Mother: Play Report & mother-child play sample	Expressive language
	Intervention 8	Mother: Play Report & mother-child play sample	Receptive language
8	Intervention 9	Mother: Play Report & mother-child play sample	Social imitation
	Intervention 10	Mother: Play Report & mother-child play sample	Play
9	Intervention 11	Mother: Play Report & mother-child play sample	Review above direct techniques & putting it all together
	Intervention 12	Experimenter: MSEL, CARS2 - ST Mother: Play Report, ABAS – II , CRI, RBS-R, Social-Communication Checklist, & mother-child play sample	
18	2 month short-term follow up session	Experimenter: MSEL, CARS2 - ST Mother: Play Report, ABAS – II , CRI, RBS-R, Social-Communication Checklist, & mother-child play sample	

Appendix D

MOTHER SCAFFOLDING AND CHILD SOCIAL ENGAGEMENT CODEBOOK

The purpose of this coding protocol is to capture the role of mother involvement (i.e., scaffolding) during children's play and children's responses (i.e., engagement) to mothers scaffolding. Mother involvement is divided into 3 primary scaffolding techniques and 2 secondary techniques. In other words, mother scaffolding is first identified through making 1) comments, 2) requests, or 3) prompting and then determined if these primary techniques either 1) maintain or 2) enhance the child's play. Additionally, children's social engagement is measured to determine if the child is engaged with the mother during these scaffolding techniques. Children's social engagement is divided into 3 categories: 1) attention, 2) nonverbal, and 3) verbal. Both mother scaffolding and children's social engagement are defined below.

Mother Scaffolding (Woolley & Tullos, 2008):

PRIMARY SCAFFOLDING TECHNIQUES

1. **Comments: Non-literal comments-** (e.g., "I bet your doll is really hungry – she hasn't eaten since breakfast.")
    - "Direct" command
    - Comment on child's play – giving commands (Project ImPACT – Follow your child's lead)
        i. Examples: "Look", " (Child's name), look", "(Child's name)"
2. **Requests: Add requests to their non-literal comments** (e.g., "Why don't you scramble an egg for your doll?'')
    - Questions
    - Mother adds a request to what the child is doing in the play scenario
3. **Prompting** (i.e., behaviors provided by parent that increase the likelihood that child will participate in desired behavior)
    - Physical prompt – mother physically guides the child's body movement to help him/her follow the direction or respond to the question. (e.g., "get the truck", take his/her hand, bring child to the truck, and help child pick up truck) (Project ImPACT – Teaching your child Receptive Language)

- Visual prompt – mother shows child what she wants him/her to do. (e.g., mother holds up block and says, 'on top', while putting the block on top herself) (Project ImPACT – Teaching your child Receptive Language)

4. **Unclear/Other**

PURPOSE OF SCAFFOLDING TECHNIQUES

1. **Maintenance of play**: if play is not complete, does parent/child continue with play scenario?
    - Turn-taking
    - Imitate what child does – playing with same toy, gestures and body movements, vocalizations (Project ImPACT – Imitate your child)
2. **Enhancing play** (i.e., enriching what child does-child says, 'roar', parent brings out dinosaurs and says, 'roar')
    - Upping the ante
    - When child is not doing behavior/sound/activity and mom initiates it
    - When child is doing a 'basic' level of activity and mom adds in 'advanced' level
        i. Examples: Silly situations – mother does something the 'wrong' way and looks expectantly at the child (e.g., puts shoe on head) (Project ImPACT – Communicative Temptations)
5. **Unclear/Other**

<u>Child Social Engagement (Kasari et al., 2006):</u>

1. **No engagement**
2. **Attention**:
    - Child directs attention (e.g., eye gaze; head turn; orients body) toward mother, activity, or both
    - Child monitors or glances at mother to acknowledge her presence, or to seek reassurance or to share his/her pleasure in play (Adapted from "Maternal Stimulation and Infant Exploratory Competence: Cross-Sectional, Correlational, and Experimental Analysis)
3. **Nonverbal Communication**:
    - Child gestures with hands or body to gain mother's attention
    - Child points either proximally (near) or distally (away)

- Child taps something with his/her finger or gives object to mother to obtain mother's attention (Adapted from "Maternal Stimulation and Infant Exploratory Competence: Cross-Sectional, Correlational, and Experimental Analysis)
- Child shows mother how to do something or something works (Adapted from "Maternal Stimulation and Infant Exploratory Competence: Cross-Sectional, Correlational, and Experimental Analysis)
- Child physically initiates interactions to guide maternal attention (Adapted from "Maternal Stimulation and Infant Exploratory Competence: Cross-Sectional, Correlational, and Experimental Analysis)
- Child shows resistance/protest (e.g., swats at mother) or does not tolerate the activity (e.g., turns away abruptly from activity)
- Child shows positive affect (e.g., gives parent hug, laughs at activity)

4. **Verbal Communication**:
    - Child uses words, utterances with intention, or verbal instruction to guide mother's attention (Adapted from "Maternal Stimulation and Infant Exploratory Competence: Cross-Sectional, Correlational, and Experimental Analysis)
    - Includes laughing/giggles and noisy protesting
5. **Unclear/Other**

Table 1

Demographic Information for Sample (n = 3)

Participant 1	
Age of Mother	36
Education Level	Partial College
Income of Mother	Not working
Marital Status	Married
Number of Children in Family	3
Number of Individuals in Household	5
Occupation	Nurse's Assistant, Insurance and Customer Service with Durable Medical Equipment Company
Participant 2	
Age of Mother	26
Education Level	2-year college or associate's degree
Income of Mother	$10,000 - $14,999
Marital Status	Married
Number of Children in Family	2
Number of Individuals in Household	4
Occupation	Cosmetologist
Participant 3	
Age of Mother	28
Education Level	4-year college or bachelor's degree
Income of Mother	$20,000 - $24,999
Marital Status	Married
Number of Children in Family	2
Number of Individuals in Household	4
Occupation	Office Clerk

Table 2

Project ImPACT Parent Group Session Attendance of Mothers and Fathers

Session #	Participant 1	Participant 2	Participant 3
Baseline			
1	M & F	M & F	M & F
2	M & F	M & F	M & F
3	M & F	M & F	M & F
4	M & F	M & F	M & F
5	M & F	M & F	M & F
Intervention			
6	M & F	M & F	M
7	M & F	M & F	M & F
8	M & F	M & F	M & F
9	M & F	M & F	M & F
10	M & F	M & F	M & F
11	M & F	M & F	M
12	M & F	M & F	M & F
13	M & F	M & F	M & F
14	M	M & F	M
15	M	F*	M
16	M & F	M & F	M
17	M & F	M & F	M & F
Short-term follow up			
18	M & F	M & F	M & F

Note. M = Mother; F = Father. *Participant 2's father only attended session 15 because mother and child were both ill. Mother was contacted via phone to complete the mother play report and there was no mother-child play sample recorded during session 15.

Table 3

Interrater Reliability of Mother's Scaffolding Techniques and Children's Social Engagement. Using Cohen's Kappa (κ) and Percentage of Agreement

	Cohen's Kappa (κ)	**% of Agreement**
Mothers' Scaffolding Techniques		
Comments	.83	91%
Requests	.48	71%
Prompts	.91	95%
Overall	.74	86%
Children's Social Engagement		
Attention	.49	75%
Nonverbal Communication	.65	81%
Verbal Communication	.81	90%
No Engagement	1.0	100%
Overall	.74	86%

Note. The primary experimenter served as the first coder while the second coder was blind to the experimenter's coding and the participant's session number.

Table 4

Participant 1: Pearson's r of Level Changes and Slope Vectors from Simulation Modeling Analysis Examining Mother's Scaffolding Techniques and Child's Social Engagement to Scaffolding Techniques

	Level Change	Slope Vector
Mother's Comments		
Maintain	.540	.589
Enhance	.902**	.760†
Child's Social Engagement		
Overall	.879**	.748
Disengagement	-.674†	-.195
Attention	.875**	.666
Nonverbal	.058	.296
Verbal	-.707†	.657
Functional	.862*	.755
Nonfunctional	.512	.653†
Mother's Requests		
Maintain	-.925**	-.664
Enhance	.346	-.043
Child's Social Engagement		
Overall	-.538	-.643†
Disengagement	-.702*	-.420
Attention	-.439	-.628*
Nonverbal	-.603†	-.414
Verbal	-.011	-.267
Functional	-.503	-.604†
Nonfunctional	.161	.025
Mother's Prompts		
Maintain	.549†	-.072
Enhance	.775*	.471
Child's Social Engagement		
Overall	.797*	.236
Disengagement	.408	-.362
Attention	.758*	.697
Nonverbal	.512†	.191
Verbal	.452	.248
Functional	.790*	.238
Nonfunctional	.208	.071

Note. † $p < .10$, *$p < .05$, **$p < .005$. Level change reflects Pearson's r of M_B and M_I, and slope vector reflects Pearson's r of frequencies from each time point during baseline and intervention in comparison to a slope that remained constant during baseline (i.e., "0") and increased linearly during intervention (i.e., 1, 2, 3,…12). Overall, these results include baseline ($n = 5$) and intervention ($n = 12$) sessions, thus, excluding the short-term follow up session that occurred 2 months post-intervention.

Table 5

Participant 2: Pearson's r of Level Changes and Slope Vectors from Simulation Modeling Analysis Examining Mother's Scaffolding Techniques and Child's Social Engagement to Scaffolding Techniques

	Level Change	Slope Vector
Mother's Comments		
Maintain	.372	-.847*
Enhance	.878**	.669
Child's Social Engagement		
Overall	.868**	.871*
Disengagement	-.807**	-.394
Attention	.907**	.852*
Nonverbal	.796**	.565
Verbal	.536*	.276
Functional	.869**	.876*
Nonfunctional	.278	.663†
Mother's Requests		
Maintain	-.645†	-.579
Enhance	.873**	.547
Child's Social Engagement		
Overall	.709**	.387
Disengagement	-.933**	-.547
Attention	.796**	.400
Nonverbal	.834**	.399
Verbal	.277	-.272
Functional	.753**	.376
Nonfunctional	.161	-.387†
Mother's Prompts		
Maintain	-.770*	-.701*
Enhance	.856**	.637
Child's Social Engagement		
Overall	.558†	.325
Disengagement	-.769**	-.458†
Attention	.741*	.400
Nonverbal	.786**	.414
Verbal	-.273	-.591*
Functional	.595†	.296
Nonfunctional	-.165	.080

Note. † $p < .10$, *$p < .05$, **$p < .005$. Level change reflects Pearson's r of M_B and M_I, and slope vector reflects Pearson's r of frequencies from each time point during baseline and intervention in comparison to a slope that remained constant during baseline (i.e., "0") and increased linearly during intervention (i.e., 1, 2, 3,…12). Overall, these results include baseline ($n = 5$) and intervention ($n = 12$) sessions, thus, excluding the short-term follow up session that occurred 2 months post-intervention.

Table 6

Participant 3: Pearson's r of Level Changes and Slope Vectors from Simulation Modeling Analysis Examining Mother's Scaffolding Techniques and Child's Social Engagement to Scaffolding Techniques

	Level Change	Slope Vector
Mother's Comments		
Maintain	-.212	-.045
Enhance	.384	-.431
Child's Social Engagement		
Overall	.718†	.617
Disengagement	-.955**	-.693
Attention	.745*	.622
Nonverbal	.192	-.069
Verbal	.340	.380
Functional	.728*	.629
Nonfunctional	-.746*	-.533
Mother's Requests		
Maintain	-.788*	-.676†
Enhance	.449	-.040
Child's Social Engagement		
Overall	.542	-.008
Disengagement	-.954**	-.669
Attention	.626	.067
Nonverbal	.506	.155
Verbal	.341	.513*
Functional	.497*	.099
Nonfunctional	-.387	-.277
Mother's Prompts		
Maintain	.719*	.554†
Enhance	.548	.083
Child's Social Engagement		
Overall	.834*	.422
Disengagement	-.953**	-.736
Attention	.835*	.419
Nonverbal	.758*	.434
Verbal	.632	.646
Functional	.824*	.409
Nonfunctional	-.566*	-.404†

Note. † $p < .10$, *$p < .05$, **$p < .005$. Level change reflects Pearson's r of M_B and M_I, and slope vector reflects Pearson's r of frequencies from each time point during baseline and intervention in comparison to a slope that remained constant during baseline (i.e., "0") and increased linearly during intervention (i.e., 1, 2, 3,…12). Overall, these results include baseline ($n = 5$) and intervention ($n = 12$) sessions, thus, excluding the short-term follow up session that occurred 2 months post-intervention.

Table 7

Reliable Change Index Percentages of Participants from Pre- to Post-Intervention Indicating Improvement and Recovery of Children's Developmental, Social, and Play Skills

Measure	Pre-intervention *M (SD)*	Post-intervention *M (SD)*	Improved	Recovered
Developmental Skills				
MSEL: Vis Reception	20.00 (2.65)	23.67 (6.66)	67%	67%
MSEL: Fine Motor	17.33 (3.79)	20.66 (2.31)	67%	0%
MSEL: Exp Language	10.00 (3.51)	12.67 (2.52)	33%	0%
MSEL: Rec Language	10.33 (1.15)	15.00 (1.73)	100%	100%
SCC: Exp Lang Form	14.67 (2.31)	17.00 (3.46)	67%	0%
SCC: Exp Lang Function	4.00 (4.58)	5.33 (5.03)	33%	0%
Social Skills				
SCC: Directions	3.00 (1.00)	4.00 (1.00)	33%	0%
SCC: Imitation	4.00 (0)	4.67 (1.53)	67%	0%
ABAS – II	1.19 (0.11)	1.34 (0.12)	67%	33%
CRI	33.67 (10.97)	47.00 (14.00)	0%	0%
RBS-R	21.33 (19.55)	20.00 (15.62)	0%	0%
Play Skills				
DPA	4.00 (1.73)	6.33 (1.53)	100%	0%
SCC	13.67 (0.58)	15.00 (1.00)	100%	0%
Autism Symptomatology				
CARS2 - ST	31.28 (3.96)	30.83 (3.79)	33%	33%

Note. The percentages of recovery are also included in improvement percentages. Thus if a participant recovered, s/he also improved. Recovery represents 'recovery' in terms of the statistical definition of Reliable Change Index, not relative to autism recovery. DPA and SCC did not have reported psychometrics (i.e., test-retest reliabilities and normative *M*s/*SD*s); therefore, these values were not used when calculating improvement and recovery percentages.

Table 8

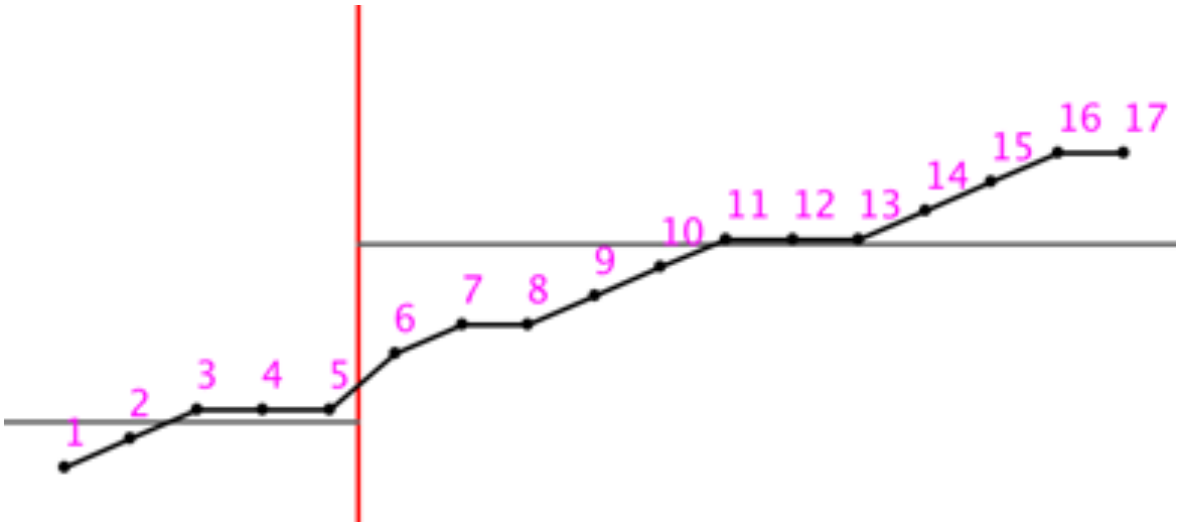
Reliable Change Index Percentages of Participants from Pre- to Post 2-Intervention Indicating Improvement and Recovery of Children's Developmental, Social, and Play Skills

Measure	Pre-intervention *M (SD)*	Post 2-intervention *M (SD)*	Improved	Recovered
Developmental Skills				
MSEL: Vis Reception	20.00 (2.65)	19.67 (3.79)	33%	0%
MSEL: Fine Motor	17.33 (3.79)	21.33 (1.53)	33%	0%
MSEL: Exp Language	10.00 (3.51)	14.33 (2.08)	67%	0%
MSEL: Rec Language	10.33 (1.15)	15.67 (1.53)	100%	100%
SCC: Exp Lang Form	14.67 (2.31)	22.00 (0)	100%	33%
SCC: Exp Lang Function	4.00 (4.58)	8.00 (2.65)	67%	33%
Social Skills				
SCC: Directions	3.00 (1.00)	4.00 (1.00)	33%	0%
SCC: Imitation	4.00 (0)	6.00 (1.73)	67%	0%
ABAS – II	1.19 (0.11)	1.44 (0.08)	67%	33%
CRI	33.67 (10.97)	40.67 (15.50)	0%	0%
RBS-R	21.33 (19.55)	18.33 (14.22)	0%	0%
Play Skills				
DPA	4.00 (1.73)	6.67 (1.15)	100%	0%
SCC	13.67 (0.58)	16.67 (1.15)	67%	0%
Autism Symptomatology				
CARS2 - ST	31.28 (3.96)	28.67 (3.69)	67%	33%

Note. The percentages of recovery are also included in improvement percentages. Thus if a participant recovered, s/he also improved. Recovery represents 'recovery' in terms of the statistical definition of Reliable Change Index, not relative to autism recovery. DPA and SCC did not have reported psychometrics (i.e., test-retest reliabilities and normative *M*s/*SD*s); therefore, these values were not used when calculating improvement and recovery percentages.

Figure 1

Example Simulation Modeling Analysis Graph



Note. The first 5 time points indicate frequencies from the baseline phase. The remaining 12 time points (i.e., sessions 6 through 17) indicate frequencies from the intervention phase. The vertical line separates baseline (n = 5 times points) and intervention (n = 12 time points) phases. The horizontal lines extending through each phase are representative of the phases' means (i.e., M_B = left horizontal line and M_I = right horizontal line).

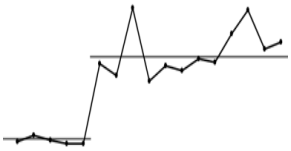
Figure 2

Participant 1: Level Change and Slope Vectors from Simulation Modeling Analysis Examining Mother's Scaffolding Techniques and Child's Social Engagement to Scaffolding Techniques

Maintaining Comments

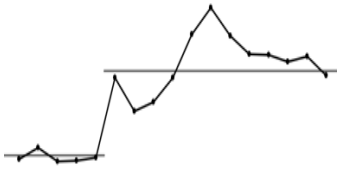
M_B = 102.4; M_I = 152

Enhancing Comments



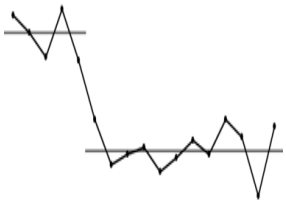
M_B = 3.6; M_I = 56.25

Child's Overall Social Engagement



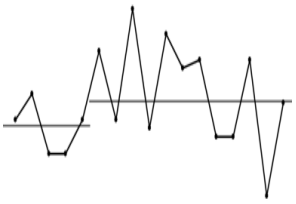
M_B = 62.4; M_I = 185

Maintaining Requests



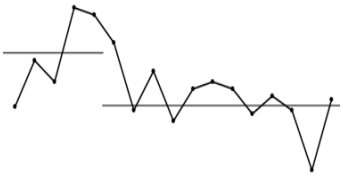
M_B = 49.4; M_I = 16.5

Enhancing Requests



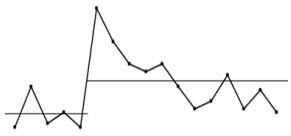
M_B = 14; M_I = 18.25

Child's Overall Social Engagement



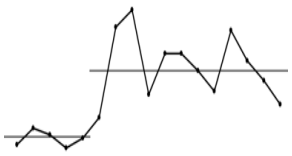
M_B = 41.8; M_I = 29

Maintaining Prompts



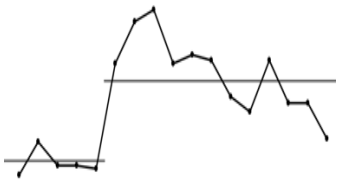
M_B = 6.2; M_I = 16.33

Enhancing Prompts



M_B = 3.8; M_I = 25.33

Child's Overall Social Engagement

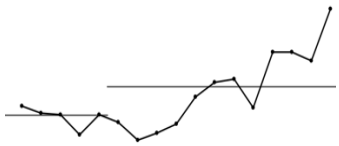


M_B = 8.8; M_I = 38.58

Figure 3

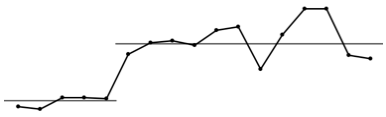
Participant 2: Level Change and Slope Vectors from Simulation Modeling Analysis Examining Mother's Scaffolding Techniques and Child's Social Engagement to Scaffolding Techniques

Maintaining Comments



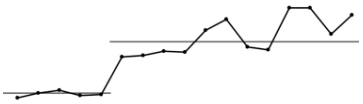
$M_B = 52$; $M_I = 67.83$

Enhancing Comments



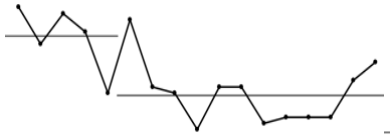
$M_B = 9.2$; $M_I = 63.83$

Child's Overall Social Engagement



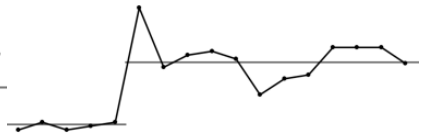
$M_B = 50.6$; $M_I = 125.08$

Maintaining Requests



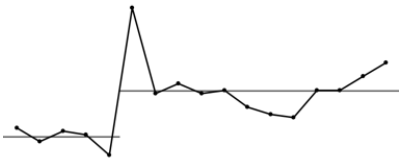
$M_B = 17$; $M_I = 7.92$

Enhancing Requests



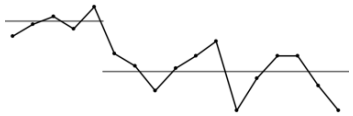
$M_B = 3$; $M_I = 20.33$

Child's Overall Social Engagement



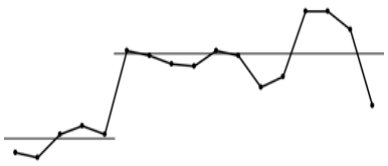
$M_B = 11$; $M_I = 26.33$

Maintaining Prompts



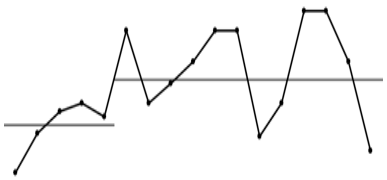
$M_B = 42.6$; $M_I = 22.25$

Enhancing Prompts



$M_B = 14.4$; $M_I = 47.17$

Child's Overall Social Engagement

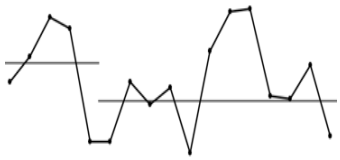


$M_B = 43.2$; $M_I = 64.67$

Figure 4

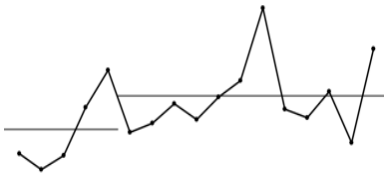
Participant 3: Level Change and Slope Vectors from Simulation Modeling Analysis Examining Mother's Scaffolding Techniques and Child's Social Engagement to Scaffolding Techniques

Maintaining Comments



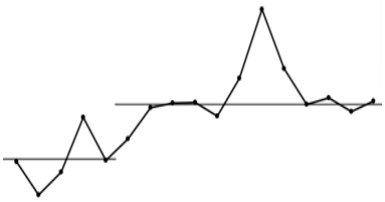
$M_B = 84$; $M_I = 76.5$

Enhancing Comments



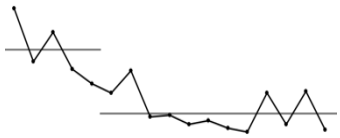
$M_B = 44.6$; $M_I = 63.33$

Child's Overall Social Engagement



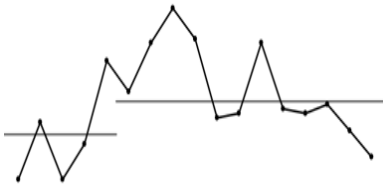
$M_B = 72.2$; $M_I = 133.67$

Maintaining Requests



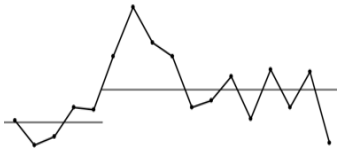
$M_B = 59.8$; $M_I = 26.92$

Enhancing Requests



$M_B = 31.6$; $M_I = 42.5$

Child's Overall Social Engagement

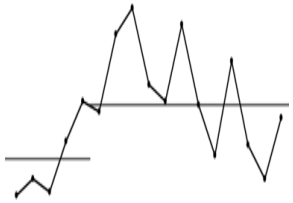


$M_B = 46.6$; $M_I = 66.42$

Maintaining Prompts

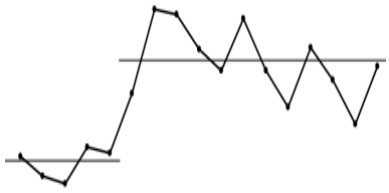
$M_B = 18.2$; $M_I = 33.08$

Enhancing Prompts



$M_B = 32$; $M_I = 52.25$

Child's Overall Social Engagement



$M_B = 29.6$; $M_I = 82.08$

Vita

Jillian Michelle Pierucci was born in Houston, Texas on April 9, 1987, the daughter of Joseph M. Pierucci and Jennifer L. Pierucci. After completing high school at Humble High School in 2005, she entered The University of Texas at Austin. In May 2009, she received the degree of Bachelor of Arts in Psychology. In August 2009, she entered The Graduate School at The University of Alabama, and received her Masters of Arts in May 2011.

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