A PARENT-IMPLEMENTED INTERVENTION TO IMPROVE SPONTANEOUS IMITATION BY YOUNG CHILDREN WITH AUTISM

BY

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DISSERTATION

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Abstract

Imitation is a pivotal social-communicative skill, which is crucial for children's social and language development. Research has shown that young children with autism often have deficits in imitation skills. The purpose of this study was to examine the effects of a parent-implemented modified Reciprocal Imitation Training (RIT) on object and gestural imitation skills for children with autism. Two parents were trained and coached to use the modified RIT with their young children with autism in the home. The modified RIT was composed of reciprocity, object imitation, and gestural imitation strategies. A multiple baseline design across strategies was used to examine the parents' competence in learning and implementing the modified RIT. Results indicated that parents learned to use the intervention strategies, and children showed improvements in spontaneous imitation. Generalization effects for parents and children were examined in typical routines. Maintenance data were collected two weeks following the end of intervention.

To my grandfather, Talib Al Saqer, may his soul rest in peace.
For my parents, your early encouragement and guidance gave me a valuable head start.
For my sisters and brothers, thank you.

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Chapter 1

Introduction

Autism is a pervasive developmental disorder that is characterized by deficits in verbal and nonverbal communication, social interaction and reciprocity, and restricted pattern of interests and activities (APA, 1994). A large body of evidence has shown that children with autism have deficits in early social and communication skills such as imitation, joint attention, and play (Baron-Cohen, 1995; Charman et al., 2007; Kasari, Freeman, & Paparella, 2001). Deficits in early social and communication skills have been found to adversely affect the development of language and social reciprocity, and limit children's opportunities to learn from the surrounding environment and socially interact with others (Meltzoff & Moore, 1994; Mundy & Sigman, 1989).

Imitation, as an early social and communicative skill, was defined by Butterworth (1999) as a voluntary reproduction of a behavior following a model of that behavior by another individual. Garcia (1976) defined an imitative act as producing a behavior that matches the topography of another individual's behavior and follows it in time, where the imitative act is controlled by the preceding behavior. Imitation can also be defined based on topography: object, motor, or vocal (Rogers, Young, Cook, Giolzatti, & Ozonoff, 2008). More specifically, object imitation refers to actions that are performed on objects (Ingersoll & Schreibman, 2006), and includes actions that are either functional or not functional. Motor imitation is limited to body movements that do not involve objects and gestural imitation, gross motor imitation, and fine motor imitation. Finally, vocal imitation includes the imitation of any form of verbalization, including functional and non functional verbalizations.

There are three types of imitation in terms of proximity to the imitated behavior: immediate imitation, deferred imitation, and generalized imitation. Immediate imitation occurs when an individual reproduces the imitative act immediately after observing a model (Nadel & Pezé, 1993). Immediate imitation is the first form of imitation that is displayed by children, and has two purposes: learning and primary communication. Children learn through imitation by developing awareness about others and their surroundings, while primary communication conveys an intentional message but does not imply a prediction of the imitatee's behavior (Nadel, Guérini, Pezé, & Rivet, 1999).

Deferred imitation refers to the ability to imitate behavior that was observed at an earlier time (Rogers et al., 2008). This also is referred to as observational learning, when the goal is acquiring a skill (Nadel et al., 1999). Deferred imitation has cognitive and social functions. By recalling actions from memory and reproducing them in a specific situation, the child is building his/her memory and communicating with others without using language. In the same token, the child can demonstrate actions from the past through pantomime.

Finally, generalized imitation refers to a functional response class, where some imitative responses are maintained by reinforcing other imitative responses. Generalized imitation typically emerges without explicit training (Meltzoff & Moore, 1989). Infants has been found to demonstrate generalized imitation at the age of 10 months, and generalized vocal imitation between 9 and 12 months (Paulson, Kyparissos, Andreatos, Kymissis, Parns, 2002). Generalized imitation plays a critical role in the development of language, social communication, joint attention, and shared experiences (Brown, Peace, & Parsons, 2009).

In spite of the extensive research that has been conducted on imitation, little research exists to explain the development of imitation across time (Hepburn & Stone, 2006). However, researchers have studied the behavior of infants as they imitate tongue protrusion and opening and closing of the mouth a few weeks after birth (Meltzoff & Moore, 1992). The imitation of actions on object emerges between 6-9 months of age and continues to develop throughout the first 2 years of life (Meltzoff, 1988), while gestural imitation develops between the ages of 6-9 months (Meltzoff, 1988). Around the age of 12 months, infants imitate actions on objects and vocal tasks more than facial or social gestures (Heimann & Ullstadius, 1999). By age 17 months, meaningful actions are imitated more often than nonmeaningful actions, but the frequency of both meaningful and nonmeaningful actions becomes fairly balanced around 22 months of age (Killen & Uzgiris, 1981). Stone, Ousley, and Littleford (1997) reported that "infants up to 20 months old are more likely to imitate actions involving objects than actions involving body movements alone." Imitation continues to improve until it reaches its peak around age 30 months, and then a decline in spontaneous imitation of actions appears between 42-46 months as language emerges (Nadel, 2006).

Imitation serves several functions. First, the earliest forms of imitation serve as a means of communication. Infants use body movements, facial expressions, and vocalizations to connect and communicate with social partners (Rogers, Hepburn, Stackhouse, & Wehner, 2003). Imitation could be a way for a child to realize the relationship between self and others (McDuffie et al., 2007). Second, imitation serves as an instrument of learning, where children learn about people's actions, intentions, and the surrounding physical and social environment (Uzgiris, 1999). Third, imitation is

considered a precursor for development; where imitation plays a central role in developing language, play, and ideas (Smith & Bryson, 1994).

Deficits in imitation for children with autism were revealed through a series of studies reviewed by three research teams at different points in times (see Rogers & Pennington, 1991; Smith & Bryson, 1994; Williams, Whitens, & Singh, 2004). Although there is a body of literature on verbal imitation including echolalia (Smith & Bryson), the focus of this study is limited to object and gestural imitation. Researchers have shown that imitation deficits are apparent when children with autism are compared to typically developing children, and to children with other disabilities who are matched on mental age (Curcio & Piserchia, 1978; DeMyer et al., 1972; Hammes & Langdell, 1981; Heimann, Ullstadius, Dahlgren, & Gillberg, 1992; Ohta, 1987; Stone, Lemanek, Fishel, Fernandez, & Altemeier, 1990). Charman et al. (1997) found that problems with imitation can discriminate children with autism from typically developing children and children with other disabilities (i.e., intellectual disabilities) as early as age two.

Dawson, Meltzoff, Osterling, and Rinaldi (1998) reported that immediate and deferred imitation were delayed in preschoolers with autism. DeMyer et al. (1972), Heimann et al. (1992), and Stone et al. (1990) found that children with autism have difficulties imitating actions with objects, when pretend actions are involved. Other researchers found that children with autism are delayed in their use of symbolic actions with objects and in using pantomime (Curcio & Piserchia, 1978; DeMyer et al., 1972; Hammes & Langdell, 1981; Heimann et al., 1992; Stone et al., 1990). Delays by children with autism also were evident in gestural imitation (Curcio, 1978; Smith & Bryson, 1994; Stone et al., 1997), including non-symbolic gestures (Rogers, Bennetto, McEvoy, &

Pennington, 1996; Smith & Bryson, 1994) and meaningful gestures (Hammes & Langdell, 1981; Rogers, 1999).

Reciprocal Imitation Training (RIT) was developed to teach the social use of imitation during playful interactions between a child and an adult. The strategies that are incorporated in this intervention (i.e., reciprocity, model, prompt, praise) were drawn from other naturalistic interventions (i.e., pivotal response training, milieu teaching, incidental teaching) that were found to be effective in promoting learning (e.g., prompting, contingent reinforcement) and facilitating early social and communicative behaviors (e.g., language mapping, following the child's lead; Ingersoll, 2008a). RIT includes the use of contingent imitation as a crucial strategy in improving social responsiveness and intrinsic motivation. Research has shown that contingently imitating the child's action with objects, gestures, and vocalizations enhances social responsiveness (Dawson & Adams, 1984; Escalona, Field, Nadel, & Lundy, 2002). Ingersoll (2008a) explained that contingent imitation is an effective strategy in obtaining the child's attention and eliciting a social response. RIT also promotes generalization because of the nature of the play interactions and the response-reinforcer relationship. Two studies were found that focused on teaching object and gestural imitation to children with autism using RIT (Ingersoll, Lewis, & Kroman, 2007; Ingersoll & Schreibman, 2006). The researchers reported that RIT was effective in improving object and gestural imitation for children with autism. The studies, however, were conducted in clinical settings by trained therapists. Only one study was found that employed parents to teach imitation using RIT (Ingersoll & Gergans, 2007). The researchers indicated that parents were successful in learning and implementing RIT strategies in a clinical setting. Also, children made

improvements in their imitation skills, and positive outcomes were generalized to home settings.

Researchers have documented the significant role that parents can play in supporting children's communication and socialization skills (Koegel, 2000; McWilliam, 2000; Meadan, Ostrosky, Zaghlawan, & Yu, 2009; Rogers, 2000). Involving parents in their children's education has been a focus within early childhood special education research for years (Rogers, 1998), and research has shown that parents can learn to successfully use positive behavior support (Dunlap, Carr, Horner, Zarcone, & Schwartz 2008), milieu teaching strategies (Hemmeter & Kaiser, 1994), and pivotal response training (Koegel, Bimbela, & Schreibman, 1996). Research on parent training has shown that improving parent skills can lead to increased learning opportunities for children throughout the day (McWilliam, 2000). Additionally, parent training has been shown to result in increased parent confidence and decreased levels of stress, improvements in the quality of life for the family (Koegel), and increases in generalization and maintenance of skills (Meadan et al.).

Given the promising results of RIT in improving spontaneous imitation skills for young children with autism in natural settings and through naturally occurring interactions, the current study focuses on extending the literature on young children with autism by examining the effectiveness of parent-implemented modified RIT strategies to teach imitation skills to children with autism in the home. Specifically, the study addressed the following questions: (a) What is the impact of training and coaching on parents' use of modified RIT strategies in the home?, (b) How effective is a parent-implemented intervention in improving spontaneous object and gestural imitation for

children with autism?, and (c) Do parents and children generalize learned skills to a natural routine?

Chapter 2

Literature Review

This chapter presents a critical review of the empirical literature on parent - implemented interventions aimed at teaching imitative behaviors to children with autism. In order to identify intervention studies that included parents as the primary interventionists, a critical analysis of the empirical literature was conducted. The analysis focused on research that investigated the efficacy of parent-implemented interventions in teaching imitation to children with autism.

Literature Review Procedure

In order to minimize bias in study selection (Cooper, 1989), multiple methods were used to locate studies that met the selection criteria. First, a series of computer searches were conducted of the following databases: the Educational Resources Informational Clearinghouse (ERIC); PsychINFO; and Education full text. The computer search covered empirical articles published from 1990 through 2010 using different combinations of the following key words: autism, autism spectrum disorder, pervasive developmental disorder, father, mother, caregiver, parent training, parent intervention; imitation; motor imitation, object imitation, gestural imitation, early social skills, early communication skills, social communication skills, preschool, young children, preschool children, and children. Second, combinations of the same key words were used to identify relevant literature reviews. An ancestral search of reference lists from literature reviews and articles identified by the preceding process was conducted to identify additional studies. Finally, a manual review of relevant journals (i.e., *Journal of Autism and*

Developmental Disorders, *Journal of Early Intervention*, *Journal of Applied Behavior Analysis*, *Behavior Modification*, *Infant and Child Development*, *Child Development*, and *Child and Family Behavior Therapy*) from 1990 through 2010 was conducted.

Articles were selected for evaluation in this review if they met the following criteria: (a) At least one of the child participants had autism; (b) at least one child in the study was between the age of 2 and 5 years; (c) the study was an intervention-based investigation; (d) at least one of the target behaviors was imitation; (e) the intervention was implemented by parents; and (f) the study was published in a refereed journal. Three articles met the selection criteria (Ingersoll & Gergans, 2007; Ozonoff & Cathcart, 1998; Vismara, Colombi, & Rogers, 2009).

Results of Literature Review

Each of the three articles identified in the search process was analyzed with respect to the following methodological and outcome variables: (a) participant characteristics; (b) setting and materials; (c), experimental design; (d) parent training and behaviors; (e) child behaviors; (f) results; (g) reliability, generalization, and maintenance; and (h) fidelity and social validity. These variables serve as a guide to present the results of this review (see Tables 1 & 2).

Participant Characteristics. A total of 22 children participated in the three reviewed studies. Vismara et al. (2009) did not specify the gender of the children in their study. The majority of the participants in the other two studies were males (i.e., 11 males, 3 females). Across all studies, the age of children ranged from 24 to 72 months; all participants were diagnosed with autism. Language abilities prior to intervention were reported for children in two of the three studies (Ingersoll & Gergans, 2007; Vismara et

al., 2009). Further analysis revealed that two children were nonverbal, and nine children had significant language delays. Ethnicities of child participants were reported in two of the three studies (Ozonoff & Cathcart, 1998; Vismara et al.) with the majority of children being Caucasian. All child participants received early intervention services (Ingersoll & Gergans, 2007; Ozonoff & Cathcart; Vismara et al.).

Twenty-two parents participated in these three studies. In two studies the parent participants were referred to as families (Ozonoff & Cathcart, 1998; Vismara et al., 2009), while all parent participants in Ingersoll and Gergans' (2007) study were mothers. Two research teams provided socioeconomic information about the parents including educational level, marital status, and employment (Ingersoll & Gergans; Vismara et al.). Ingersoll and Gergans recruited their parent participants from the service providers in the area using flyers and word of mouth. Parent participants in the other two studies were recruited on a first-come-first serve basis. The parent trainer in Ingersoll and Gergans' study was a board certified behavior analyst. Trainers in the Vismara et al. study were the principal investigator, an educational psychologist and board certified behavior analyst, and a graduate student. Ozonoff and Cathcart employed graduate students in psychology to train the parents on the Treatment and Education of Autistic and Communication-Handicapped Children (TEACCH) model.

Setting and Materials. Two of the three studies were conducted in clinic settings (Ingersoll & Gergans, 2007; Vismara et al., 2009)**.** Ingersoll and Gergans implemented their intervention in a treatment room located in a college research laboratory. The room had a one-way mirror through which parent-child interaction was filmed. The researchers

supplied the dyads with two identical sets of toys (i.e., five to 10 pairs) during the intervention sessions. The families used their own toys during generalization sessions.

Vismara and her colleagues implemented their intervention in a large clinic playroom, which was equipped with a two-way mirror and appropriate furniture for both parents and children (e.g., table, chair, couch). Interactions were filmed using three video cameras, two of which were placed inside the playroom while the third one was located behind the two-way mirror. Ozonoff and Cathcart (1998) executed their study in two settings: clinic and home. Parent training occurred at the clinic, where the parents watched a therapist working with their children through a one-way mirror. Parents were then asked to practice the intervention at home during the weeks between training sessions.

Experimental Design. Two of the three studies employed a concurrent multiple baseline design to evaluate the effectiveness of the interventions (Ingersoll & Gergans, 2007; Vismara et al., 2009). Ingersoll and Gergans used a multiple-baseline design across participants and behaviors to assess the effectiveness of RIT in teaching children with autism spontaneous object and gestural imitation. The researchers in this study decided the length of the baselines (i.e., 2, 4, and 6) prior to implementing the intervention. Participants were randomly assigned to different baselines. The length of the intervention phase for all participants was 10 weeks.

Vismara et al. (2009) used a variation of the multiple baseline design, specifically a non-concurrent multiple baseline design. This research design was used to evaluate the effectiveness of the Early Start Denver Model (ESDM) in improving spontaneous functional verbal utterances, imitative behaviors, and child engagement. The researchers

believed that this design helped control for maturation and exposure to treatment settings, and allowed them to measure several behaviors concurrently. This design also was helpful in looking at individual differences and highlighting practical importance versus statistical significance. The intervention phase lasted 12 weeks, with the first two weeks devoted to administering a variety of standardized assessments.

Ozonoff and Cathcart (1998) used a pretest-posttest control group design. The researchers assigned the first 11 interested families to the experimental group, and the next 11 families to the control group. The two groups were matched on age, severity of autism, initial scores on the *Psychoeducational Profile-Revised* (PEP-R, Schopler, Reichler, Bashford, Lansing, & Marcus, 1990), and time interval between pre- and post testing. The experimental group received home-based program services (i.e., TEACCH) for approximately 10 weeks, while the control group received no home-based services. Both groups were tested over a 4-month period using the PEP-R (Schopler et al.). Pre- and post testing was conducted by a consistent group of graduate students for the experimental group, and by the researchers for the control group.

Parent Training and Behavior. While the three teams of researchers reported parent training data, only two research teams reported parent behavior data (Ingersoll & Gergans, 2007; Vismara et al., 2009). Parent training and parent behavior data from the three studies are described separately to highlight critical details on both variables.

Parent training. Parent training has been documented to be an effective and crucial component in early intervention services. The three studies that were reviewed used a format that Meadan et al. (2009) refer to as a *study within a study*. In this model, the researchers work closely with parents to teach and coach them on the targeted

intervention strategies ("study one"). In study two, the parents use the newly learned strategies to teach their children targeted behaviors. In a study within a study format, data are gathered on parent use of strategies as well as the impact of the strategies on child behavior. Parent training information across the three studies are presented next.

Ingersoll and Gergans (2007) coached three mothers of children with autism to teach their children spontaneous object and gestural imitation. The mothers were recruited from service providers in the surrounding area. The first author, who worked as the parent trainer in this study, met the mothers individually for ten 30-40 minute sessions to educate them about the use of RIT. The parent trainer provided the three mothers with a manual explaining RIT. During each intervention session, the parent trainer introduced a group of intervention strategies to the mother, explained the rationale behind using these strategies, described the strategies and ways of using them at home, and answered the mother's questions about the strategies. Next, the mother watched the parent trainer model the intervention strategies with the child with autism for 5-10 minutes; the parent trainer described the strategies and the child's responses as she interacted with child. The parent trainer then asked the mother to practice the strategies with the child while she provided the mother with positive and corrective feedback.

The RIT intervention was composed of three phases designed to increase reciprocity and teach object and gestural imitation. In phase one, the mother learned to imitate her child's vocalizations, toy play, and gesture and body movements. The mother also was taught to use linguistic mapping, where she used simple language to describe her interactions with the child. In phase two, the parent trainer coached the mother on using the strategies of modeling, prompting, and reinforcement to teach object imitation.

The mother was asked to model an action with a toy related to the child's play combined with a verbal marker (up to a maximum of three times every minute). If the child spontaneously imitated the model, the mother praised the child and gave him/her access to the toy for a few seconds. If after three models the child did not respond to the mother, the adult was instructed to use least-to-most prompting (i.e., verbal, gesture, and physical) to help the child imitate the model. The child was then given access to the toy for a few seconds.

The researchers (Ingersoll & Gergans, 2007) terminated the intervention for two mothers after the completion of phase two without explaining the rationale for that decision. Only one mother proceeded into the third phase, where the mother used the same imitation training strategies (i.e., modeling, prompting, and reinforcement) in the same format to teach her child gestural imitation. In this phase the mother was directed to model a gesture related to the child's play. For example, if the child knocked down the block structure, the mother would make a surprised face (i.e., mouth and eyes wide open, hands open). The entire intervention lasted for 10 weeks.

In the study by Vismara et al. (2009), eight families of children with autism were involved in a 12-week parent education program to learn to use the *Early Start Denver Model* (ESDM) to improve their children's spontaneous functional verbal utterances and imitative behaviors, and increase child engagement. Two of the eight families withdrew from the study before completing the program (one for health reasons and the other family to join another intensive program). The ESDM incorporates strategies from both the Denver Model and Pivotal Response Training. The strategies are: (a) increasing the child's attention and motivation; (b) sensory social routines; (c) dyadic engagement; (d)

non-verbal communication; (e) imitation; (f) joint attention; (g) speech development; (h) antecedent–behavior–consequences relationship; (i) prompting, shaping, and fading techniques; and (j) functional assessment of behavior.

As part of the study, families attended an hour session every week in a clinic playroom. The first two sessions were spent conducting a parent interview related to short term goals for the children, administering the *Mullen Scales of Early Learning* (Mullen, 1995)*, ADOS* Module 1 (Schopler, Reichler, DeVellis, & Daly, 1980), and the ESDM curriculum checklist to assess the children's skills in different developmental domains. The other 10 sessions were devoted to coaching parents to use the ESDM strategies by introducing one strategy per week.

Each intervention session typically included one parent and a therapist, although occasionally other family members and professionals would participate. The format of each intervention session was the same: (a) reviewing with the participant's the progress from the previous week for 5-10 minutes; (b) videotaping a 10-minute parent-child interaction; (c) introducing and demonstrating the next strategy to the parent for 10-15 minutes; (d) practicing the new strategy with the child for 10-15 minutes by the parent; and (e) discussing possible opportunities to implement the strategies at home for 10 minutes. The therapist used reading materials, verbal discussion, and demonstration to introduce new strategies to each parent. While each parent practiced the new strategy with his/her child, the therapist coached the parent on how to use the strategy, modeled the strategy for the parent, and provided the parent with positive and corrective feedback. The activities targeted in the sessions were similar to those that are available during everyday routines at home, for example, playing with toys, meals, transitions, and

greetings. The parents were not instructed nor required to practice the strategies for a specific amount of time at home. The intervention was terminated once the tenth intervention session was completed.

Eleven families of children with autism were recruited and trained by Ozonoff and Cathcart (1998) to implement the TEACCH model at home. The researchers measured child outcomes in the experimental and control groups using the PEP-R (Schopler et al., 1990) and the *Childhood Autism Rating Scale* (CARS). The children were assessed on: communication patterns, imitation skills, preacademic and prevocational abilities, visual spatial tasks, work habits, attention, motivation, and interests. Parents observed the assessment process and they were briefed on their children's strengths and weaknesses. Based on the assessment results, each parent and therapist developed a treatment plan for the child to be implemented at home. The intervention lasted 10 weeks, during which time the parent attended weekly sessions at the clinic. Each session lasted for one hour, and two therapists were present with the child and the parent. One therapist worked with the child while demonstrating and modeling the teaching strategies for the parent. The other therapist was with the parent watching the therapist-child interaction behind a one-way mirror. The second therapist described what the other therapist was doing with the child, and provided the parent with emotional support. The therapists also provided the parents with written materials about the activities and methods that parents were to implement with the child at home. The parents were asked to use the newly learned strategies with the child during the following week for half an hour every day.

During training, the researchers emphasized the importance of teaching children with autism tasks that are more visual and rely on eye-hand integration and spatial and motor capabilities. They explained to parents that tasks with such characteristics are more enjoyable for children with autism and facilitate the teaching process. The therapists, in collaboration with the parents, developed an individual plan for each child. The plans focused on structured teaching, using more visuals to teach a variety of skills, having visual schedules to help the child during times of transition, and teaching preacademic and prevocational activities to help the child succeed in school. The therapists visited the children's homes at least one time to observe the parents use the strategies in natural environments, and they also visited the children's early childhood program one time to encourage the generalization of skills outside the home and clinic settings. The researchers did not describe how the therapists encouraged the generalization of skills in the children's early childhood program. The researchers faded their role in the treatment process as parents became more competent in implementing the strategies. Over time, the clinic sessions were conducted every 2-3 weeks instead of every week.

Parent behaviors. Intervention sessions in all three studies were videotaped for later coding. Intervention sessions in the study by Ingersoll and Gergans (2007) lasted for 10 minutes across all phases. The trainer left the room before the video recording started and the researchers coded parents' use of RIT strategies. From the videotapes, frequency data were collected on modeling, prompting, and reinforcement, and were reported as rate per minute. Contingent imitation and linguistic mapping were scored using 30s intervals.

Vismara et al. (2009) also videotaped samples of parent-child interactions as well as therapist-child interactions for later analysis and coding. The videotaped samples were 10 minutes in length across all study phases. During baseline sessions, samples of parent-child and therapist-child interactions were video recorded twice in each session (i.e., four samples) at the beginning and at the end of each session. Data were collected on the 10 ESDM strategies. Ozonoff and Cathcart (1998) did not gather data on parent behaviors. Their intervention lasted for 10 weeks, where families met with the therapists for an hour each week.

Child behaviors. The three studies included in this review focused on imitation as one of the target behaviors. Child behaviors were coded from videotaped sessions of parent-child interactions. Ingersoll and Gergans (2007) coded the spontaneous use of object and gestural imitation as frequency data, and these data were reported as rate per minute. Vismara et al. (2009) reported spontaneous functional verbal utterances and imitative behaviors. The spontaneous functional verbal utterances were defined as verbalizations initiated by the child, relevant to the interaction, and combined with body and facial orientation toward the adult and/or relevant stimulus materials. The verbalization had to contain a phonetically correct approximation of the word or word combination. Imitative behaviors included imitation of an action on objects, imitation of manual acts without objects, and imitation of vocalizations and words. The *Child Behavior Rating Scale* (CBRS) was used by Vismara et al. to evaluate child engagement (e.g., child attention and child initiation). Ozonoff and Cathcart (1998) did not describe imitation skills in detail, but they were measured using the PEP-R (Schopler et al., 1990).

Results. Two of the three studies included parent behavior data as dependent variables (Ingersoll & Gergans, 2007; Vismara et al., 2009), while all three studies reported changes in child behavior. A summary of the findings from the three targeted studies focuses first on parent behavior, and then on children behavior.

Parent behavior. Following participation in the RIT intervention, the three mothers in Ingersoll and Gergans' (2007) study increased their use of reciprocity strategies, contingent imitation, and linguistic mapping. For one of the mothers, the use of contingent imitation returned to baseline levels when object imitation was introduced. Another mother's linguistic mapping regressed during the object imitation phase. In terms of imitation training strategies (i.e., modeling, prompting, reinforcement), the three mothers showed significant increases in their use of these strategies when teaching their children object imitation. One mother displayed significant increases in her use of all three strategies, while the other two mothers showed significant increases in two strategies (i.e., modeling and reinforcement). Only one mother used the imitation training strategies to teach her child gestural imitation, resulting in significant increases in her child's gestural imitation.

Five out of six parents who completed the parent training in the Vismara et al. (2009) study reached mastery level in implementing the ESDM strategies. The five parents' mastery level was at or above the 85% criterion by the sixth intervention session. Ozonoff and Cathcart (1998) did not report parent data for their pre and post measures focused on child behaviors.

Child behavior. Ingersoll and Gergans (2007) found that improvements in the mothers' use of the training strategies positively impacted children's spontaneous display

of object imitation. Additionally, for one mother who taught her child gestural imitation, findings show that the child used gestural imitation more frequently as his mother increased her use of the training strategies. In the study by Vismara et al. (2009), the children increased their production of functional verbal utterances during interactions with both parents and therapists, and it was evident that changes in children's behavior were due to the parents' mastery of the ESDM strategies. Seven of the eight children showed consistent increases in their imitative behaviors with both parents and therapists. In addition, the children's attention and social initiations reached higher levels post-intervention during interactions with the parent and therapists. Ozonoff and Cathcart (1998) reported that children in the treatment group showed significant improvement compared to the control group, on the imitation subscale of the PEP-R (Schopler et al., 1990).

Reliability, Generalization, and Maintenance. Two of the three studies reported reliability, generalization, and maintenance data (Ingersoll & Gergans, 2007; Vismara et al. 2009). Ingersoll and Gergans collected reliability data on 25% of the observations. Vismara et al. (2009) calculated inter-rater agreement for 40% of the sessions across all children and adults, where reliability results on verbal utterances and imitative behaviors were above 85% for all behaviors. Cohen's Kappa results for child attention and initiations were .82 and .79, respectively during parent-child interactions and .77 and .78, respectively during therapist-child interactions.

Ingersoll and Gergans (2007) assessed the mothers' generalizations of the RIT strategies at home. Generalization and maintenance probes were video recorded twice during baseline, once at the end of intervention, and one month following the termination

of intervention. The 10-minute generalization probes took place at the children's homes, and the parents were asked to play with their children as they usually did. The three mothers generalized their use of the training strategies to the home settings. Two mothers continued to use the imitation training strategies at high levels one month after the intervention. All children generalized their use of object imitation to their homes and maintained those gains during follow-up. Only one child received training on gestural imitation; while he generalized those skills to the home setting, he did not maintain the gains during follow-up.

Vismara et al. (2009) conducted four 1-hour play sessions to assess generalization and maintenance of six dyads. The generalization sessions occurred two weeks, four weeks, two months, and three months post-intervention. Two 10-minute samples were collected for each of the four generalization sessions for later coding and analysis, one with the parent and the other with an unfamiliar therapist. During the first three generalization sessions, the therapists answered any questions posed by the parents and coached them on as-needed basis. During the fourth generalization session, the therapist re-administered the *Mullen Scale of Early learning (Mullen, 1995)* and the *ADOS* (Schopler et al., 1980) and collected the two 10-minute samples (with the parent and an unfamiliar therapist). Parents who completed the training program and met the fidelity criterion maintained the gains during follow-up sessions. Child gains in verbal utterances and imitative behaviors maintained throughout the three months of follow-up. Child behavior (i.e., attention and initiations) with the parents and therapists maintained higher levels compared to baseline levels. It is noteworthy to mention that during the three

month follow up, three of the six children were participating in another intense intervention (i.e., discreet trial training).

Fidelity and Social Validity. Fidelity measures are used to ensure that intervention procedures are implemented as planned (Gresham, MacMillan, Beebe-Frankenberger, & Bocian, 2000). Two of the three studies reported fidelity data (Ingersoll & Gergans, 2007; Vismara et al. 2009). Ingersoll and Gergans used a 30s interval system to code the mothers' use of contingent imitation and linguistic mapping. They also collected frequency data on the mothers' use of the imitation training strategies (i.e., modeling, promoting, reinforcement), and reported these data as a rate per minute. Vismara et al. used the *Early Start Denver Model Fidelity Scale* to evaluate 14 behaviors that were taught to parents during training. These data were collected from videotapes of parent-child interaction. The first and second authors served as the primary and reliability coders, and were trained on the scale by the third author. The coders used the *Early Start Denver Model Fidelity Scale* to independently code 25% of the videotapes. Agreement on items was assessed if the two scores fell within one point of each other. Reliability on parents' fidelity was calculated using Cohen's Kappa and yielded 85% interrater agreement.

Social validity refers to the social value of the target behaviors and the social acceptance of the procedures (Kazdin, 1982). Ingersoll and Gergans (2007) assessed social validity by utilizing a satisfaction survey to elicit the mothers' opinions about the intervention's effectiveness. The parent satisfaction survey included nine questions that focused on the mothers' use of the strategies, the impact of the intervention on the children's object and gestural imitation skills, child engagement and communication,

enjoyment in implementing the intervention, and plans to use the strategies in the future during regular routines. Results showed a positive impact of the intervention on children's imitation skills, engagement, and communication. The mothers also found the intervention easy to use and enjoyable.

Summary and Critique of Literature Review

Imitation is one of the earliest social communication behaviors that significantly impacts functional language, social reciprocity, and play behaviors in later years for children with autism (Dawson & Galpert, 1990; Field, Field, Sanders, & Nadel, 2001; Thurm, Lord, Lee, & Newschaffer, 2007; Toth, Munson, Meltzoff, & Dawson, 2006). Parent involvement in designing and executing successful interventions to teach imitation to children with autism positively impacts children's development and parents' competencies as primary caregivers (Ingersoll & Gergans, 2007; Vismara et al., 2009). Very few researchers have employed parents as primary interventionists to teach imitative behaviors to children with autism in natural environments. The dearth of literature indicates that the field of early childhood special education needs to encourage stronger partnerships between parents and professionals (McClannahan, Kantz, & McGee, 1982; McConachie & Diggle, 2007; Meadan et al., 2009).

A close examination of the parent training components in the targeted studies revealed that the research teams used various techniques to train parents on. Parent training strategies included: supplying parents with printed materials, modeling, inviting parents to practice the strategies with their children under the therapists' supervision, and providing parents with feedback. No fidelity measures were utilized to collect data about the training procedures regardless of whether the trainers were the researchers or

employed therapists, however, two of the three research teams provided fidelity data on the parents' implementation of these techniques (Ingersoll & Gergans, 2007; Vismara et al., 2009). Researchers are encouraged to collect, analyze, and report fidelity data on training as well as parent implementation of the procedures. According to Wolery (1994), these data can serve three functions. First, they assist us in monitoring the implementation of the procedures and avoiding implementation drift. Second, they provide documentation that experimental conditions were implemented as described. Finally, they improve the quality of recommendations for practitioners and other researchers.

Training parents in isolated and clinical settings contradicts the fundamental goal of early intervention in supporting children with autism in the natural environment (McWilliam, 2000; Sandall, Hemmeter, Smith, & McLean, 2005). Interventions described in the three reviewed studies were not implemented in natural environments, therefore future researchers are encouraged to examine whether behavior change for both parents and children would maintain longer if interventions were delivered in the home. For example, the only mother in one of the targeted studies who was willing to continue the RIT intervention to the final phase (i.e., gestural imitation) did not maintain her use of imitation training strategies nor did the child maintain gains during follow up (Ingersoll & Gergans, 2007). In Vismara et al. (2009), the generalization results were better, because three of the four follow up sessions were booster sessions.

There is consensus in the field that conducting interventions in natural environments is more effective for several reasons. First, the functionality of skills will be more robust, since the skills will be developed in natural environments, practiced with

familiar adults throughout regular routines in the child's environment, and more time and effort can be invested in generalizing the newly-developed skills to other natural settings and with significant others in the child's life. Second, examining interventions in natural environments encourages developmental interventionists, who are required to provide service to parent-child dyads at home, to adopt these practices. Third, many of the resources that are available at clinics or university research-based laboratories are not available in typical homes. For example, researchers may have access to a quiet environment, different sets of identical and novel materials, and more support from other therapists, but most parents do not have access to such resources at home. Therefore, it makes more sense to coach parents in their homes while using their materials, making it possible to encourage skill retention in the future. Finally, it is easier for parents to receive training at home, since this saves effort, time, and money. These family resources could be exhausted in traveling, employing babysitters (i.e., in the case of having siblings), and altering the family schedule to accommodate clinic sessions.

Both single case research and group experimental designs are warranted to examine the effectiveness of parent-implemented interventions that target imitation. Employing single case research designs is vital to establish a functional relationship between the intervention and changes in target behaviors. Two of the targeted studies employed a non-concurrent multiple baseline design to examine the relationship between two different interventions (i.e., RIT, ESDM) and imitation. This design is flexible enough to permit researchers to recruit and work with families on different timelines. This flexibility allows researchers to start working with families as soon as they agree to participate, rather than having them wait until a sufficient number of families are

recruited. Also, single subject designs allow researchers to establish a functional relationship between the independent variables and changes in target behaviors, even though observations are not recorded concurrently. Moreover, conducting interventions with varying timelines can control for extraneous variables such as historical events.

In single subject designs, the baseline phase has descriptive and predictive functions for it should last long enough to inform the researcher about the participants' behavior characteristics (i.e., descriptive) and what the future pattern of behavior would be like in the absence of treatment (i.e., predictive). In addition, stable baseline data help researchers make inferences about the treatment. Ingersoll and Gergans (2007) predetermined the length of baselines and assigned dyads randomly to each of the three baselines. Watson and Workman (1981) described this method as a non-concurrent multiple baseline design. Given the rationale of having a baseline phase, predetermining the length of baselines does not serve the functions described above.

Vismara et al. (2009) used the first two sessions in their study to obtain baseline data. These data revealed low levels of parent and child behaviors, but the short phase failed to meet the predictability function. Future researchers need to pay close attention to the logic and rationale behind having different experimental phases and ensure that their procedures align with the purposes.

Additionally, the RIT and ESDM showed considerable potential in teaching children with autism to imitate. Replications are needed with additional subjects, and by different research teams. Generalization data, given the small sample sizes, is limited; therefore, researchers are encouraged to design large scale experimental and comparative studies to examine the effectiveness of these intervention programs. One of the reviewed

studies used an experimental group design (Ozonoff & Cathcart, 1999), but the results should be interpreted cautiously for several reasons. First, the researchers did not report data on procedural fidelity, reliability, generalization, or social validity. Second, the same graduate students tested the experimental group before and after intervention allowing for testing error. Third, the researchers did not provide enough details about the TEACCH-home based model to make it possible for other researchers to replicate the study. Finally, the lack of randomization in assigning subjects to experimental groups makes the results questionable.

Only one of the three reviewed studies assessed the social significance of the intervention; they used a parent satisfaction survey (Ingersoll & Gergans, 2007). According to Wolf (1978), social validity should be established for goals, procedures, and outcomes. Researchers can investigate social validity using social comparison or subjective evaluation (Kazdin, 1982). Social comparison is established by comparing the child's behaviors to typically developing children before and after intervention, Subjective evaluation entails inviting significant others and/or experts (e.g., parents, therapists) to evaluate the social significance of goals and procedures. The goal of using different interventions to teach imitation is to achieve meaningful changes in children's social and communication skills. Thus, researchers are encouraged to utilize social validity methods to evaluate the significance of research outcomes against social criteria.

Planning for generalization is crucial to enable children to function in their natural environments. Two of the reviewed studies assessed generalization, one across settings and stimuli (i.e., home and toys) and the other across people (i.e., unfamiliar therapist). Researchers assess generalization in contrived or natural environments to examine the

effectiveness of an intervention across novel stimuli, people, or settings. Positive generalization results would indicate that the intervention is effective to enable children who have the same characteristics to generalize targeted skills across novel stimuli, settings, and people. One of the primary goals of generalization, however, is to expand the children's opportunities to use newly learned skills in different settings, with a variety of stimuli, and with significant people in the children's life. Therefore, if the ultimate goal of an intervention study is to support children in natural environments, then it is important to plan and assess generalization in natural environments. Assessing generalization in natural environments could serve three goals: (a) supporting the child participant in generalizing the newly learned skills to novel stimuli, settings, and people, (b) enabling researchers to draw inferences and propose recommendations to the larger population, and (c) gathering generalization and maintenance data will inform practitioners about whether intervention gains could last for an extended period of time supported by natural consequences, or if there is a need for ongoing support. Learning this information would be helpful in planning intervention programs for children and determining the support needed by parents and therapists over time.

In summary, involving parents as the primary interventionists for children with autism is increasingly attracting support in the field of early childhood special education (National Research Council, 2001). While the three reviewed studies demonstrated positive results based on collaboration between parents and researchers, there is a need for more research to develop additional parent-implemented interventions that focus on improving the imitation skills of children with autism. Research efforts also should focus on replicating promising interventions that have already produced positive outcomes.

Assessing the fidelity of procedures for training parents should be given more attention in future research. Data such as these could help professionals as they design interventions to use with parents during home visits. Parents need to understand the real progress that results from their daily work with their children, and not just during therapy sessions. Fidelity data could provide more information about training strategies that support parent competence in learning and using evidence-based strategies.

Studying intervention effectiveness in natural environments encourages researchers to consider the barriers that face early interventionists, and think of ways to facilitate the collaborative work between early interventionists and parents of young children. Consequently, the research outcomes might be more easily accepted by practitioners, and increase their adoption of successful strategies to support children's development of imitation skills. Overall, when there is positive evidence regarding the implementation of intervention programs in natural environments by parents, this increases the social significance of these programs and consequently heightens the probability of their use by both families and professionals. The current study extends the literature on parent-implemented interventions in natural settings with a focus on imitation skill development by young children with autism.

Chapter 3

Methodology

The parent-child dyads were recruited from the Urbana-Champaign area. All participants had to meet the following criteria: (a) the child has a primary diagnosis of autism as identified by a pediatrician or psychologist, (b) the child's age range is between two and five years old, (c) the child has no significant vision, hearing, or physical problems, (d) the primary language spoken in the home is English, (e) the parents agree to participate in the study for approximately four months, (f) the parents agree to participate in at least two intervention sessions every week, (g) the parents allow videotaping of all parent-child sessions, and (h) the parents agree to conduct generalization sessions during a regular routine of their choosing in the home.

The researcher contacted and discussed the study with four directors of early childhood and early intervention programs in Urbana and Champaign. He individually met with the four directors and explained the research rationale, goals, and potential benefits. Directors were provided with both hard copy and electronic flyers, and they were encouraged to share the flyers and study information with teachers, developmental therapists, families, and other professionals (see Appendix A). The researcher also electronically sent flyers to several local early childhood, early intervention, and parent support group list-servs such as Developmental Services Center, Head Start of Champaign County, CU Autism Network, and The Autism Program. Moreover, the researcher attended two parent support groups, used word-of-mouth, posted flyers in local community settings and on virtual communities such as Facebook in an effort to recruit participants. Interested families were encouraged to contact the researcher via

electronic mail or phone to indicate their desire to participate. The researcher contacted all families who called or e-mailed to verify they met the criteria for inclusion in the study (see Appendix B). The researcher's goal was to recruit four families for this study. During eight months of recruitment efforts, 30 families contacted the researcher through phone and electronic mail. The researcher individually met 10 of the 30 families, who met the initial selection criteria and only two families qualified and agreed to participate in this study.

During the individual meetings between the researcher and the families, the researcher assessed potential target children's imitative behaviors using the *Motor Imitation Scale* (*MIS*, Stone et al., 1997). The *MIS* is used to assess the imitation skills of children. The scale consists of 16 single-step motor imitation items. The scale measures imitation skills in four domains: object imitation, body movement, meaningful actions, and non–meaningful actions. The total score on the *MIS* ranges from 0 – 32, based on the child's score on each item. Stone et al. assessed interobserver agreement for 20% of the *MIS* videotapes using Cohen's kappa, which yielded .80 interobserver agreement. Internal consistency was calculated for the total *MIS* score and for the four domain scores. The standardized alpha coefficient for the total *MIS* was .87, and for the domains it ranged from .57 to .88. The total *MIS* test-retest reliability score was .80 (Stone et al.).

A dyad qualified for participation in the study if the child exhibited low rates of imitative behaviors on the *MIS* and the parent signed the consent letter (see Appendix C). During the initial home visit, the researcher shared with the parents additional information about the study such as: their time commitment, videotaping procedures, potential benefits, incentives, and parent level of involvement. He also answered the

parents' questions and addressed any concerns they had about the study. The researcher also discussed with the parents about the following: (a) the designated parent who would work with the researcher throughout the study phases, (b) the intervention schedule and setting, (c) the intervention materials that would be used during the parent-child interactions, and (d) the routine that would serve as the generalization context.

Participants

Two parent-child dyads completed all phases of the study. It was required that one parent from each family consistently work with the researcher throughout the study. Table 3 provides a summary of demographic information on each parent and child participant.

Jason. Jason was 37 months old at the onset of this study. He lived with his parents and two older stepbrothers, one of whom had autism. A local physician with expertise in the assessment of autism spectrum disorder diagnosed Jason with autism and apraxia at the age of 35 months old. Jason's hearing, vision, and gross motor skills were typical. His social and language age based on *The Child Development Inventory* was less than 12 months. Jason's total score on *The Childhood Autism Rating Scale* (CARS) was 31.5, which falls in the mild to moderate range of autism. Based on the MIS, Jason did not show any object or gestural imitation. Jason demonstrated few sounds, and he relied mainly on pushing things away or crying to make his needs known. He signed "more," and his parents were teaching him to communicate using The Picture Exchange Communication System. At the beginning of the study, Jason was receiving developmental therapy and private speech therapy once a week. He started receiving private behavioral therapy three times a week at the time his family joined the study.

During the course of the study, Jason was enrolled in an early childhood program part-time. Jason's father, Ron, agreed to be the primary interventionist for Jason. The father had earned a bachelor's degree in engineering, but stayed at home with Jason and his brothers. Ron usually attended all of Jason's therapy sessions, but he was not involved in any other parent training or support group during the time he participated in this study.

Daniel. Daniel was 60 months old when he joined the study. He lived with his adoptive parents and six siblings, which included two of his biological siblings who also have disabilities. A local physician with expertise in autism diagnosed Daniel with autism. Daniel's hearing, vision, and motor skills were all within normal range. Daniel was a very active child who mouthed almost anything he touched. Due to his hyperactivity, it was difficult to administer a formal speech evaluation, however Daniel's receptive language was significantly below his age level. He used no vocalizations consistently and he did not use a formal communication system to express his needs at the start of the study. Daniel scored 48 on the CARS, which put him in the severe range of autism. Based on the mother's responses on *The Vineland Adaptive Behavior Scales*, Daniel received low scores on all domains. He scored an 8 on the *Autism Diagnostic Observation Schedules*, which put him in the autism range. Based on the MIS, Daniel did not demonstrate any object or gestural imitation. At the start of the study, Daniel was enrolled in an inclusive kindergarten, where he received speech therapy 40 minutes per week. He also received 20 minutes of occupational therapy each week at school. Daniel started receiving private behavioral therapy (10 hours every week) by the time this study started. Daniel received respite care through the local developmental services center, and he attended a Sunday school at a local church, where a special educator taught his class.

Daniel's mother, Marcy, agreed to be his primary interventionist. The mother had earned a bachelor's degree in physical therapy, but stayed at home with Daniel and his siblings. She was responsible for coordinating all services for Daniel, and she attended all his therapy sessions. She was not involved in any other parent training or support group during the course of this study.

Settings

This study was conducted in two home settings. All baseline and intervention sessions took place in an area selected jointly by the parents and the researcher. For Jason, all baseline and interventions sessions took place in his bedroom. The bedroom was approximately 3 m x 3 m and carpeted. It contained a child-sized bed, wooden shelves, changing table, walk in closet, child sized table and a chair, and appropriate play materials. The researcher set his video camera in the bedroom corner to capture all the space inside the room no matter where the dyad was located during play interactions. The parent and the researcher agreed on the dates for sessions on a weekly basis. Only the parent, child, and the researcher were present in this area during baseline and intervention sessions.

Daniel's baseline and intervention sessions took place in the family's living room. The living room was located in the middle of the house, and it was approximately 6 m x 5 m. The living room contained two sofas, a fireplace, piano, coffee table, and a box of play materials. Daniel and his mother typically played in the middle of the room on the floor. The video camera was set close to the fireplace to capture the entire scene in the middle of the room. The researcher and the parent arranged the study schedule jointly on a weekly basis. The parent, child, and the researcher were typically the only ones present

during all baseline and intervention sessions, although occasionally other members of the family would sit in the same area or pass through the room during sessions. A babysitter came to the home to take care of the other children when the parent and the child were working with the researcher. This babysitter was a graduate student in early childhood special education at the University of Illinois.

A digital video camera (Sony Bloggie™ Camera CM5) was utilized and operated by the researcher to capture parent-child interactions. Baseline sessions lasted for 10 minutes, while intervention sessions lasted for 30 minutes. All baseline and intervention sessions were videotaped for later coding. At the beginning of each baseline and intervention session, the researcher mounted the digital camera on a tripod in a strategic corner of the room to capture parent-child interaction. The researcher did not react or respond verbally or nonverbally to the child to avoid encouraging the child to look at or communicate with him during videotaping. Rather, the researcher focused his attention on viewing the ongoing interaction through the camera LCD screen. The researcher also informed the parents that he would not communicate with them while videotaping parent-child interactions.

Generalization sessions were conducted during a typical home routine, which was selected jointly by the researcher and the parent. Initially, the researcher and each parent discussed the daily routines of the family with their child, and together they decided on a convenient routine that could serve as a generalization setting. Generalization sessions for Jason were conducted during mealtime in the kitchen area. Jason was placed in a high chair with a tray, located beside the kitchen counter. Daniel and his mother conducted their generalization sessions during their individual playtime, which took place in the

same area that was used to videotape baseline and intervention sessions. Generalization routine lasted 10 minutes. The parents or members of their family operated the video camera during generalization sessions, and the researcher was not present. The researcher provided the family with a tripod and video camera of the same make and model that he used during baseline and intervention sessions. The researcher taught the parents how to operate the camera.

Materials

The parents interacted with their children using play materials that were classified in the following seven sets: (a) nesting and stacking toys, (b) blocks, (c) balls, (d) musical toys, (e) dolls and stuffed animals, (f) pretend food, and (g) vehicles and people. During the initial home visits prior to baseline, the parents were asked to choose their children's favorite toy sets, and provide a list of toys that they felt belonged to that set. Parents were encouraged to choose toys that their children enjoyed playing with, and toys that had more than one function (e.g., use a cup as a drum, a hat, to pour an imaginary drink). The parents also were encouraged to choose toys that were interesting but not overly consuming, so children would interact with the parents without being completely absorbed by the toys. The researcher helped the parents create a list of toys by providing examples of toys in each toy set. The researcher provided the play materials to the parents during all baseline and intervention sessions. The play materials always consisted of 10 pairs of toys drawn from the list that was created by the parents. The 10 pairs could each be categorized into one of the 7 sets listed above (See Table 4 for Daniel and Jason's toy sets)

During generalization sessions the parents used materials from their homes as they interacted with their children. Jason's father used kitchen utensils during mealtime such as spoons, forks, plates, and cups. Daniel's mother used toys that were available in her home to interact with her child during generalization sessions. The researcher brainstormed with Daniel's and Jason's parents about possible materials that could be used during the generalization sessions, and different ideas for using those materials. The parents were not required to have duplicate sets of the materials, but rather they were encouraged to take turns with the children using the same materials.

Experimental Design and Conditions

A multiple-baseline design across parent-implemented strategies (Horner & Baer, 1978) was employed to evaluate the effects of modified RIT on improving the spontaneous object and gestural imitation of two children with autism. This study included two experimental conditions for each of the dyads: (a) baseline and (b) modified RIT. Parent-child interaction sessions lasted for 10 minutes across all experimental conditions, and they were all videotaped. Although the participants moved through the experimental conditions in the same order, the time of entry into the study was different. Following baseline observations, training on RIT strategies was introduced once baseline data were stable. Additionally, to evaluate if the parents used the strategies with their children during a typical routine, a multiple-probe technique (Horner & Baer) was employed to collect intermittent generalization data throughout the study.

Baseline. The researcher provided the parents with two identical sets of materials (n = 10 toys per set). The parents were asked to interact with their children as they usually did for 10 minutes. The researcher did not provide any guidance to the parents on

how they should use the play materials. The baseline sessions occurred at least twice a week, and baseline lasted until a trend in the data was established.

Modified reciprocal imitation training. RIT is a naturalistic approach to teaching object and gestural imitation to young children with autism (Ingersoll, 2008b). Researchers have shown that implementing RIT leads to significant increases in social communication skills, language, and pretend play (Ingersoll, Lewis, & Kroman, 2007; Ingersoll & Schreibman, 2006). RIT was designed to be implemented by parents in a playful and game-like format using a variety of materials. The training is composed of a group of evidence-based strategies that can be used during regular routines (i.e., modeling, prompting, praising). The RIT training consisted of several components: (a) imitating the child, (b) describing on-going play interactions with the child, (c) teaching object imitation, (d) expanding the child's play skills, (e) teaching gestural imitation, and (f) teaching object and gestural imitation during daily routines. For the purpose of this study, the researcher modified the original RIT training protocol in two ways: (a) by decreasing the number of object and gestural imitation models to two models and (b) by reducing the wait time between models to 3s from 10s, and therefore, the intervention is referred to as modified RIT (see Appendix D). These modifications were introduced based on research findings in the areas of time delay and milieu teaching (Kaiser, Yoder, & Keetz, 1992; Liber, Frea, & Symon, 2008). During interactions, dyads used the same play materials that were used during baseline. Modified RIT sessions were conducted between two to three times each week with both dyads immediately following the completion of baseline. In the following sections the parent training components of modified RIT are described.

Parent training. At the beginning of each experimental condition of the modified RIT training, the researcher scheduled an individual training session with each parent for 30 minutes. During these individual sessions, the researcher went through the modified RIT handouts (see Appendix D). The researcher explained the rationale for using modified RIT and the strategies involved in the modified RIT intervention. Parents were encouraged to ask questions about the intervention. All individual training sessions were audiotaped to assess fidelity.

Additionally, the researcher reviewed the strategies with the parents, and coached them on how to use the strategies at the beginning of each intervention session across all experimental conditions. The researcher clarified what strategies parents should use during the session, explained the rationale behind the strategies, modeled the use of the strategies with the child, and described the child's responses to the strategies. After modeling the strategies for the parent, the parent was asked to practice the strategies with the child. The researcher provided coaching and feedback to the parent as he/she practiced the strategies. The review and coaching sessions were faded as the parents progressed in using the strategies. All review and coaching sessions were videotaped; they lasted between 15-20 minutes in addition to the 10 minutes videotaped interaction. The following section includes a description of the three components of the modified RIT.

Reciprocity. At the onset of this experimental condition, the researcher met each parent individually for approximately 30 minutes and provided details about the reciprocity strategies. The session was conducted at the family's home during a convenient time for the family. During the training, the researcher went through a handout with the parents as he described the reciprocity strategies, the rationale, the

significance of learning these strategies, and the implications of using these strategies to teach spontaneous imitation skills to young children with autism (see Appendix D). The researcher showed the parents sample video clips of correct and incorrect use of the strategies. The researcher answered all questions or concerns expressed by the parents. The parents were asked to read the handout on their own and contact the researcher with any additional questions or concerns.

The reciprocity strategies included imitating the child's play with toys, using gestures and body movement, and making vocalizations. For example, if the child hugged a baby doll, clapped his hands, or said "baby," the parent would hug a baby doll, clap his or her hands, and say "baby." The reciprocity strategies also included descriptive language strategies, which were composed of simple language (i.e., using language that is slightly above the child's current language level), slow speech (i.e., giving the child time to process the language and respond), repetition (i.e., using the same words or phrases again and again), stressing specific words (i.e., pausing before important words to help children recognize these words), and language expansion (i.e., adding more information to the child's language). Both reciprocity strategies (i.e., contingent imitation and descriptive language) were introduced to the parents at the same time. The reciprocity strategies have been shown to improve reciprocal interaction between parents and children by increasing shared attention and social interaction, promoting spontaneous language and vocalizations, increasing children's repertoire of play ideas, and teaching children that imitation is a back and forth interaction (Ingersoll, 2008b).

During the review and coaching sessions in this phase, the researcher reminded the parents of the targeted strategies, provided a detailed explanation of the strategies,

and answered any questions the parents had about the strategies. The researcher then modeled the strategies with the child for 5-10 minutes, described his use of strategies, and explained the child's responses. The researcher gave the parents an opportunity to practice the targeted strategies with their children, while he provided coaching and feedback. Parents were encouraged to ask questions throughout the training. Following this review and coaching portion of the session, the researcher videotaped the parent–child interaction for 10 minutes. Typically, the review and coaching session lasted 15-20 minutes.

Object Imitation. Following the reciprocity strategies, imitation skills were introduced to the parents using the same training format that was used to introduce the reciprocity strategies. This format included individual training at the beginning of the experimental condition and at the beginning of each intervention session throughout the condition. Object imitation strategies included: (a) modeling an action using identical toys (e.g., if the child was playing with a train toy, the parent would model how the train moves on the track), (b) providing a verbal label with the action (e.g., the parent would roll a ball and say "roll," "boing," "bounce"), (c) providing verbal and physical prompts, and (d) praising the child when she or he imitated the parent's model. The parent modeled an action on an identical toy that the child was interested in, and then waited three seconds to give the child an opportunity to respond. When the child spontaneously imitated the parent's model, the parent praised the child, played with the child using that toy for few seconds, and modeled another action. If the child did not spontaneously imitate the action after the first model, the parent provided a second model of the same action using the same verbal label. The parent then waited for three seconds. If the child

spontaneously imitated the action, the parent provided praise and played with the child using that toy. If the child did not spontaneously respond by imitating the action, the parent asked the child to imitate the action by saying "you do it." If the child did not respond to the verbal prompt after three seconds, then the parent physically helped the child imitate the action and he/she praised the child. Praise was either vague (e.g., good job, hug) or was in the form of descriptive feedback (e.g., "you rolled the car") while the parent showed excitement on his/her face (i.e., smiling). A laminated handout that parents could place on the floor beside them was provided as a visual prompt to help the parent recall the sequence of the strategies (i.e., model, prompt, praise) and the wait time. This, laminated handout was faded over time as the parents mastered the use of object imitation strategies. The parents also were instructed to positively end the trial if the child lost interest in the toy (e.g., "You don't want to play with the drum anymore so I will put it away."). The parents were asked to continue using the reciprocity strategies that they learned, when they were not providing any action on object models to the child. The parents were encouraged to follow their child's lead, and model simple actions that consisted of one step.

Gestural Imitation. In this condition, the parents used the same strategies (i.e., model, prompt, praise) that were used in the previous condition to teach their children gestural imitation. The parents were instructed to model a gesture that was related to what the child was doing. For example, if the child was putting a doll to sleep, the parent might model a "yawning" gesture by yawning and stretching his/her arms in the air. If the child was not playing with a toy, then the parents were taught to model an action with a toy and a related gesture (e.g., the parent might hit the drum, and model putting his hands on his

ears indicate the sound is “loud”). The parents were instructed to continue describing their play actions during the gestural imitation condition. Parents also were instructed to model gestures that their children could physically do, and gestures that they could physically guide their children to do. The researcher and parents focused on modeling gestures that used the upper part of the body. This made it easier for parents to physically prompt their children to imitate the models, when necessary. The researcher discussed possible gestures related to the play materials that parents could model during parent-child interactions. A visual prompt also was provided to help the parents recall the sequence of the strategies (i.e., model, prompt, praise) and the wait time; it was faded as the parents mastered the use of gestural imitation strategies.

Generalization probes and maintenance. Generalization probes were conducted three times during baseline, once at the end of reciprocity and object imitation conditions, and twice at the end of gestural imitation condition. Maintenance data also were gathered two weeks following the termination of gestural imitation condition. Generalization and maintenance probes were conducted during a naturally occurring routine that the researcher and parents agreed to at the onset of the study. All generalization probes lasted 10-minutes. During maintenance and generalization probes, the parents were instructed to interact with their children as they usually would. The parents and other family members operated the video camera during these sessions.

Measurement

Parent and child data were gathered across all baseline, intervention, generalization, and maintenance sessions. Children's imitation skills were assessed in two ways: spontaneous object and gestural imitation. Parents' data were gathered on their use of the following strategies: reciprocity, object imitation, and gestural imitation. All data were graphed and visually inspected.

Imitation skills Two dependent variables were measured to assess children's responses to the modified RIT: (a) percentage of opportunities of spontaneous object imitation, and (b) percentage of opportunities of spontaneous gestural imitation.

Spontaneous object imitation. Object imitation occurred when the parent modeled an action with an object and the child imitated the action within three seconds of the model without physical guidance, a verbal command, or a gestural prompt. For example, the parent might tap the table with a spoon and the child might then tap the table with a spoon.

Spontaneous gestural imitation. Gestural imitation occurred when the parent modeled a gesture and the child imitated the gesture within three seconds of the model without physical guidance, a verbal command, or a gestural prompt. Gestures included actions (e.g., both palms pushing out from the body to mean "pushing"), descriptions (e.g., hand rubbing the stomach to mean "I am hungry"), pantomime (e.g., arms out as if flying to mean "it is a plane"), affection (e.g., hands hiding the eyes to mean "I am scared"), or conventional gestures (e.g., waving good-bye to someone).

Parent strategy use. The parents' use of the strategies was measured across all sessions to ensure consistency of implementation. Data were gathered on reciprocity

strategies: (a) the percentage of intervals of contingent imitation strategies implemented by parents, (b) the percentage of intervals of descriptive language strategies implemented by parents, and (c) the percentage of correct episodes of object and gestural imitation strategies. Reciprocity strategies consisted of: contingent imitation of the child's action with toys, gesture/body movements, and verbalizations. Descriptive language strategies included: simple language, slow speech, repetition, stressing specific words, and expansion. Imitation training strategies consisted of: (a) modeling (i.e., the parent modeled an action with a toy related to the child's play) (b) prompting (i.e., the parent provided a verbal command or physical guidance to the child to complete an action if the child did not spontaneously imitate the model), and (c) praising the child after he/she completed the task successfully.

Observation and Recording Procedures

All baseline, intervention, and generalization sessions were videotaped, coded, and analyzed by the researcher. The researcher set up the play materials in the intervention room selected by each parent, and then asked the parent and child to come into the setting. At the end of each session, the parent and child left the room, and the researcher gathered the play materials and the video equipment, and left the setting. The researcher transferred the video clips from the video camera to a secure computer, and coded all data from the video clips using paper and pencil.

The researcher utilized a 30s partial interval time sampling system to code reciprocity strategies (i.e., contingent imitation and descriptive language). The computer clock was utilized to prompt the observers every 30s to record the occurrence/ nonoccurrence of reciprocity strategies during each interval (Kazdin, 1982). Object and

gestural imitation strategies were recorded as correct or incorrect episodes with the time of the episode noted. Children's spontaneous object and gestural imitation were recorded as they occurred within episodes. The researcher watched the videotapes twice. The first time he coded the interval data (i.e., the reciprocity strategies), and the second time he coded all episodic data (i.e., object and gestural imitation strategies). All data were recorded by hand on a data sheet developed by the researcher (see Appendix F for sample data form).

Measures assessed across all baseline, intervention, generalization and maintenance sessions included two dependent variables: (a) percentage of opportunities of spontaneous object imitation by children, and (b) percentage of opportunities of spontaneous gestural imitation by children. Independent variables included: (a) percentage of intervals during which reciprocity strategies were used by parents and (b) percentage of correct episodes of object and gestural imitation strategies by parents. the same measures were coded during generalization and maintenance using paper and pencil.

Observers and Observer Training

A graduate student in early childhood special education served as the reliability observer. Prior to baseline data collection, the researcher and the reliability observer read and discussed the definitions for the dependent and independent measures. They became familiar with the observational and recording procedures. The observers practiced coding data by watching 15 five-minute segments of play interactions for dyads who did not participate in this study. They also practiced coding data by watching five-minute video segments of Ron and Jason, however, these video segments were not included as

reliability data. Observer training continued until the observers reached 80% agreement across all measures for three consecutive practice sessions.

A comparison of the coded data sheets for reciprocity was made on an interval-by-interval basis, and for object and gestural imitation the comparison was made on an episode-by-episode basis matched using the digital time on the videotape. Comparison of child data was made on a point-by-point basis and matched using the digital time on the videotape. An agreement was scored for parent use of reciprocity strategies when both observers recorded the occurrence or nonoccurrence of the strategy during the same interval. An agreement was scored for parent use of object and gestural imitation strategies, when both observers recorded the same episode within a 5s window. An agreement was scored for child spontaneous imitation, when both observers recorded the occurrence/nonoccurrence of the child's behavior within a 5s window as it was matched using the digital time on the videotape.

Interobserver Reliability

To assess interobserver reliability, the reliability observer independently coded 25% of the experimental data. The reliability clips were randomly selected across phases for the two dyads. Interobserver reliability was calculated for parent use of contingent imitation by dividing the total number of intervals, which included agreements on occurrence and nonoccurrence, by the total number of agreements plus disagreements, multiplied by 100%. Interobserver reliability was calculated for parent use of descriptive language by dividing the total number of intervals, which only included agreements on occurrence, by the total number of agreements plus disagreements, multiplied by 100%. Interobserver reliability was calculated for parent use of object and gestural imitation by

dividing the total number of agreements on episodes by the total number of agreements plus disagreements multiplied by 100%. Interobserver reliability was calculated for child spontaneous imitation by dividing the total number of agreements on occurrence by the total number of agreements plus disagreements multiplied by 100%.

For Ron, interobserver agreement on his correct use of contingent imitation averaged 80% (range = 40% to 95%) and for his correct use of descriptive language interobserver agreement averaged 80% (range = 50% to 95%). Interobserver agreement on Ron's correct episodes of object and gestural imitation averaged 67% (range = 0% to 94%). For the episodes of object and gestural imitation on which the reliability observers agreed, interobserver agreement on Ron's use of object imitation averaged 84% (range = 67% to 100%), and reliability for gestural imitation averaged 85% (range = 69% to 100%). Interobserver agreement on Jason's spontaneous object imitation averaged 88% (range = 50% to 100%), and reliability on Jason's correct use of spontaneous gestural imitation the averaged 92% (range = 83% to 100%).

For Marcy, interobserver agreement on her correct use of contingent imitation averaged 86% (range = 70% to 100%), and interobserver agreement for her correct use of descriptive language averaged 88% (range = 73% to 100%). Interobserver agreement on Marcy's correct episodes of object and gestural imitation averaged 66% (range = 0% to 100%). For the episodes of object and gestural imitation on which the reliability observers agreed, interobserver agreement on Marcy's use of object imitation averaged 82% (range = 71% to 100%), and reliability on gestural imitation strategies averaged 100%. Interobserver agreement on Daniel's spontaneous object imitation averaged 97% (range = 86% to 100%); there were no occurrences of spontaneous gestural imitation.

Procedural Reliability

Procedural reliability was monitored during the individual parent training and review and coaching sessions. Procedural reliability checklists were developed for the individual parent training and review and coaching sessions to insure implementation fidelity (see Appendix E). To assess procedural fidelity, a graduate student in early childhood special education conducted fidelity checks on all individual parent training sessions and 25% of the review and coaching sessions in each experimental condition.

Chapter 4

Results

Data were gathered to answer the following questions: (a) What is the impact of training and coaching on parents' use of modified RIT strategies in the home?, (b) How effective is a parent-implemented intervention in improving spontaneous object and gestural imitation for children with autism?, and (c) Do parents and children generalize learned skills to a natural routine? Data were visually inspected, and decisions about changing conditions were made based on three criteria: mean, level, and the trend of data (Kazdin, 1982).

Green Family

Parent behavior. Data were gathered on the following behaviors: reciprocity, object imitation, and gestural imitation strategies. Data on Ron Green, the father, and Jason Green, his 3 year old son with autism, are presented in the following sections.

Reciprocity strategies. Figure 1 displays the percentage of intervals in which Ron correctly used reciprocity strategies. During baseline, his correct use of contingent imitation averaged 40% (range = 10% to 75%). Training on the two reciprocity strategies substantially increased Ron's imitation of Jason's play with objects, gestures, and verbalizations. During the six sessions following training, Ron's correct use of contingent imitation averaged 90% (range = 80% to 100%). Ron's correct use of descriptive language during baseline averaged 65% (range = 50% to 80%), and during the six sessions immediately following training, his correct use of descriptive language averaged 79% (range = 55% to 95%).

Imitation training. Ron's percentage of correct episodes using object imitation is presented in the middle leg of Figure 1. During baseline, Ron displayed some variability in using object imitation across sessions. His correct use of object imitation averaged 22% (range = 0% to 100%). As a result of training on object imitation strategies, Ron increased his correct use of object imitation to an average of 65% (range = 38% to 100%) during the six object imitation sessions following training. While Ron never used gestural imitation in baseline (see third leg of Figure 1), he demonstrated an immediate, stable, and substantial increase in using gestural imitation, when he was taught the gestural imitation strategies. His correct use of gestural imitation averaged 79% (range = 70% to 89%) during the gestural imitation training condition.

With the introduction of object imitation, Ron's correct use of contingent imitation and descriptive language declined to 63% (range = 35% to 75%) and 73% (range = 55% to 85%), respectively. Also with the introduction of gestural imitation (last 4 data points), Ron's correct use of contingent imitation dropped below baseline levels and averaged 34% (range = 25% to 40%). However, Ron's correct use of descriptive language when gestural imitation was introduced averaged 89% (range = 85% to 95%). In addition, with the introduction of gestural imitation (last 4 data points) Ron's correct use of object imitation declined to an average of 44% (range = 0% to 75%).

Generalization. Figure 2 shows the percentage of intervals for Ron's correct use of reciprocity strategies during mealtime. During baseline generalization probes, Ron demonstrated a declining slope in using contingent imitation and descriptive language. His correct use of contingent imitation averaged 18% (range = 5% to 40%). Following training on reciprocity strategies, Ron's correct use of contingent imitation averaged

90%. During baseline generalization probes, Ron's correct use of descriptive language averaged 65% (range = 50% to 80%), and it remained at the same level following the training on the reciprocity strategies.

Figure 2 also shows Ron's percentage of correct episodes using object and gestural imitation during mealtime. Prior to the intervention, Ron's correct use of object imitation averaged 41% (ranged from 0% to 67%). Following the training on object imitation, Ron's correct use of object imitation during the generalization probe rose to 65%. Ron did not use gestural imitation during the first few generalization probes, but once gestural imitation training occurred, Ron's correct use of gestural imitation averaged 80% (range = 71% to 88%).

During the one generalization probe that followed training on object imitation, Ron's correct use of contingent imitation was 25% and his correct use of descriptive language rose slightly to 85%. Following training on gestural imitation, Ron's correct use of contingent imitation averaged 78% (range = 75% to 80%). Ron's correct use of descriptive language during the generalization probes that immediately followed gestural imitation training averaged 93% (range = 90% to 95%).

Following training on the reciprocity and gestural imitation strategies, Ron never used object imitation during the generalization probes. When object imitation was introduced, Ron's correct use of gestural imitation rose to 100% for one session.

Maintenance data also are presented in Figure 2. Ron's correct use of contingent imitation and descriptive language were 35% and 95% of the episodes, respectively. Ron did not use object imitation during the maintenance probe, but his correct use of gestural imitation was 77% of episodes.

Child behavior. Jason's data included spontaneous object and gestural imitation. These data are described in the following sections, and displayed in Figures 3 and 4.

Object imitation. Jason's percentages of opportunities of spontaneous object imitation are graphically displayed in Figure 3. During baseline, Jason displayed considerable variability across sessions (M = 23%, range = 0% to 57%). Following training on reciprocity strategies, Jason's spontaneous object imitation averaged 21% (range = 0% to 100%). As Jason's father learned object imitation strategies, Jason's spontaneous object imitation was somewhat less variable and declined to an average of 12% (range = 0% to 27%). Following gestural imitation training, Jason's spontaneous object imitation was more stable (M = 19%, range = 0% to 25%).

During the mealtime generalization session, Jason displayed a stable decline in spontaneous object imitation during baseline probes as seen in Figure 4. Spontaneous object imitation averaged 35% (range = 0% to 73%). Jason rarely engaged in spontaneous object imitation throughout the generalization probes (only 12% of the opportunities during the gestural imitation condition).

Gestural imitation. As seen in Figure 3, Jason did not engage in any spontaneous gestural imitation until his father was taught gestural imitation strategies. At that time, Jason marginally increased his spontaneous gestural imitation to an average of 8% of the opportunities (range = 0% to 11%).

During mealtime generalization probes, Jason never engaged in gestural imitation until his father was taught object imitation. During this generalization probe, Jason engaged in spontaneous gestural imitation 50% of the opportunities. Following Ron's training on gestural imitation, Jason's spontaneous gestural imitation averaged 37% of

the opportunities (range = 33% to 41%). In maintenance, spontaneous gestural imitation was observed during 41% of the opportunities.

Davis Family

Parent behavior. Data were gathered on the following behaviors: reciprocity, object imitation, and gestural imitation strategies. Data on Marcy Davis, the mother, and Daniel Davis, her 5 year old son with autism, are presented in the following sections.

Reciprocity strategies. Figure 5 displays the percentage of intervals in which Marcy correctly used reciprocity strategies. During baseline, her correct use of contingent imitation averaged 31% (range = 20% to 55%). Immediately following training on the two reciprocity strategies Marcy substantially increased her imitation of Daniel's gestures, verbalizations, and his play with objects. During the three sessions following training, Marcy's correct use of contingent imitation averaged 98% (range = 95% to 100%). Marcy's correct use of descriptive language during baseline averaged 61% (range = 35% to 70%), and during the three sessions immediately following training, her correct use of descriptive language averaged 90%.

Imitation training. Marcy's percentage of correct episodes using object imitation is presented in the middle leg of Figure 5. During baseline, Marcy rarely used object imitation. Her correct use of object imitation averaged 5% (range = 0% to 20%). As a result of training on object imitation strategies, Marcy substantially increased her correct use of object imitation to an average of 55% (range = 31% to 94%) during the following four sessions. While Marcy never used gestural imitation in baseline, she demonstrated an immediate but small increase in using gestural imitation, when she was trained on

gestural imitation strategies. Her correct use of gestural imitation averaged 42% (range = 29% - 67%) during the gestural imitation training.

With the introduction of object imitation, Marcy's correct use of contingent imitation and descriptive language declined to 49% (range = 30% to 65%) and 68% (range = 50% to 85%), respectively. Also with the introduction of gestural imitation, her correct use of contingent imitation dropped to baseline levels, and averaged 29% (range = 20% to 35%). However, Marcy's correct use of descriptive language continued to remain above baseline levels when gestural imitation was introduced (*M* = 83%, range = 70% to 95%). Finally, Marcy's correct use of object imitation declined to an average of 24% (range = 12% to 36%) when gestural imitation was introduced.

Generalization. Figure 6 shows the percentage of intervals for Marcy's correct use of reciprocity strategies during generalization playtime. Marcy demonstrated variable use of contingent imitation and descriptive language during baseline probes. Her correct use of contingent imitation averaged 27% (range = 15% to 50%). During the one generalization probe following training on the reciprocity strategies, Marcy's correct use of contingent imitation was 70%. During baseline generalization probes, Marcy's correct use of descriptive language averaged 60% (range = 50% to 70%), and it increased to an average of 95% following the training on the reciprocity strategies.

Figure 6 also shows Marcy's percentage of correct episodes using object and gestural imitation during generalization playtime probes. Prior to intervention, Marcy's correct use of object imitation averaged 5% (ranged from 0% to 10%). Marcy's correct use of object imitation rose to 50% immediately following the training on object imitation. Marcy never used gestural imitation in the generalization setting until she was

taught gestural imitation strategies, and then her correct use of gestural imitation averaged 42% (range = 33% to 50%).

During the one generalization probe that followed training on object imitation, Marcy's correct use of contingent imitation was 50%. Following training on gestural imitation, Marcy's correct use of contingent imitation averaged 55% (range = 25% to 85%). Marcy's correct use of descriptive language declined to 80% during the generalization probe that followed object imitation training. Immediately following training on gestural imitation, Marcy's correct use of descriptive language averaged 90% (range = 85% to 95%). Following training on the reciprocity strategies, her correct use of object imitation was 16% during the one generalization probe. Marcy's correct use of object imitation declined to 29% (range = 25% to 33%) as gestural imitation was introduced.

Maintenance data also are presented in Figure 6. Marcy's correct use of contingent imitation and descriptive language during maintenance were 55% and 95% of episodes, respectively. Marcy's correct use of object imitation was 67% of episodes, and her correct use of gestural imitation was 67% of maintenance episodes.

Child behavior. Daniel's data included spontaneous object and gestural imitation. The data are described in the following sections, and displayed in Figures 7 and 8.

Object imitation. Daniel's percentages of opportunities of spontaneous object imitation are graphically displayed in Figure 7. During baseline, Daniel demonstrated a declining slope across sessions (M = 21%, range = 5% to 40%). When Daniel's mother was taught reciprocity strategies, Daniel did not engage in any spontaneous object

imitation. As expected, as Marcy, his mother, learned object imitation strategies, Daniel's spontaneous object imitation increased (*M* = 44%, range = 14% to 69%). When gestural imitation strategies were introduced to Marcy, Daniel's spontaneous object imitation increased slightly (*M* = 51%, range = 29% to 83%).

During the baseline generalization sessions, Daniel displayed a stable decline in spontaneous object imitation (see Figure 8). Spontaneous object imitation averaged 19% (range = 8% to 30%). Daniel's spontaneous object imitation increased to 32% and 58% of opportunities following training on reciprocity strategies and object imitation, respectively. During the generalization probes that followed training on gestural imitation, Daniel's spontaneous object imitation averaged 24% of opportunities (range = 10% to 38%). During the maintenance probe, Daniel's spontaneous object imitation was 30% of opportunities.

Gestural imitation. As seen in Figure 7, Daniel did not engage in any spontaneous gestural imitation until the end of the study. As Marcy, the mother, learned gestural imitation strategies, Daniel marginally increased his spontaneous gestural imitation (*M* = 2%, range = 0% to 8%). During the generalization playtime probes, Daniel never engaged in gestural imitation.

Social Validity

At the end of the study, a graduate student who was naïve to the purpose of the study interviewed both parents to assess the social validity of the modified RIT intervention in increasing children's spontaneous imitation skills. Each interview lasted approximately 30 minutes and was conducted after the last generalization probe. The interviewer asked each parent questions related to (a) their learning and use of the

strategies, (b) changes in their child's social engagement, communication, and play with objects, (c) changes in their child's object and gestural imitation, (d) parents' use of the strategies outside the intervention sessions, and (e) any other feedback or concerns the parents had about the intervention (see Appendix G for specific questions). All interviews were audiotaped and transcribed by another graduate student.

Both parents reported that prior to intervention most of their play interactions with their children lacked reciprocity and following the children's lead. However, they also reported that the intervention did not result in dramatic changes in their interactions with their children. Marcy, however, stated that the intervention made her more aware of the need to provide her child with enough time to process and respond to her play bids. Both parents stated that it was not difficult to learn the strategies. Marcy pointed out that at times it was difficult to follow the sequence of strategies (i.e., model, prompt, praise), while Ron stated that he usually referred to the handout between the videotaped interactions to strengthen his understanding of the strategies. Both parent participants expressed an interest in maintaining their use of the strategies even if it was not in the exact sequence they learned in the study.

Although the parents attempted to use the strategies with their children a few times during the day, they did not see any significant improvements in their children's imitation skills. Marcy explained that her child's play skills were severely delayed, which resulted in limited opportunities to engage in sustained play with him. Neither Ron nor Marcy was able to identify any changes in their children's social engagement as a result of participating in this intervention study. Ron explained that Jason started applied behavior analysis therapy and was enrolled in a preschool program around the same time

he started participating in this study. Therefore, Ron could not determine if the minimal changes in Jason's social engagement and communication were attributed to the modified RIT intervention, the other programs, or a combination of all variables. Marcy did not notice any positive changes in Daniel's communication that she would attribute to participating in the study.

Additionally, both parents reported that they did not observe significant changes in their child's interactions with play materials as a result of the object imitation training. Marcy noted that she could now identify more opportunities where she could follow Daniel's lead during a play interaction and become engaged with him around a play material that interested him. Neither parent participant noticed any changes in their child's gestural imitation. Marcy, nevertheless, emphasized the difficulty she experienced moving to the gestural imitation phase when Daniel was not yet ready to imitate gestures.

Finally, both parents stated that they would recommend this intervention to other parents. Marcy said that the intervention enlightened her about the importance of imitation skills in facilitating a young child's communication development. She explained that the intervention broke down the targeted strategies in a way that made it simple for parents to learn and use. Ron believed that learning the strategies increased his knowledge about these strategies and helped him interact with Jason more positively. He also stated that his success in implementing the strategies increased his confidence in using them.

Chapter 5

Discussion

Reciprocal Imitation Training is a naturalistic intervention that was designed to improve nonverbal social-communication skills such as imitation and joint attention for young children with autism during play interactions (Ingersoll, 2008b). Imitation, a pivotal early social-communication skill, impacts the development of social and language skills for young children (Smith & Bryson, 1994). However, researchers have found that most young children with autism lack imitation skills (Ledford & Wolery, 2011; Smith & Bryson; Williams, Whitens, & Singh, 2004). Ingersoll and colleagues conducted a series of studies to assess the effectiveness of RIT in improving imitation skills for young children with autism (e.g., Ingersoll, Lewis, & Kroman, 2007; Ingersoll & Schreibman, 2006), but only one of these studies employed parents as early interventionists to teach imitation skills to their children (Ingersoll & Gergans, 2007).

The current study is a replication of Ingersoll and Gergans' research (2007), where parents were trained to use RIT in a clinical setting to teach spontaneous imitations skills to their young children with autism spontaneous imitations skills. Specifically, the current study contributes to the literature by providing evidence that parents of children with autism are capable of learning and implementing evidence based strategies that target spontaneous imitation skills for young children with autism. This study also extends the literature around RIT by conducting the intervention in the families' home. Finally, by using a "study within a study" framework (Meadan et al., 2009), this study adds evidence to the literature by examining the effectiveness of RIT in improving early social-communication skills for young children with autism (Ingersoll, 2008a).

The purpose of this study was to investigate three questions. The first question focused on examining the impact of teaching and coaching on parents' use of RIT strategies in the home. The results suggest that two parents, Ron and Marcy, were able to learn and implement the modified RIT strategies including reciprocity, object imitation, and gestural imitation. The second question addressed the effectiveness of a parent-implemented intervention on the spontaneous imitation skills of young children with autism. Results suggest that the modified RIT intervention produced minimal improvements in Jason and Daniel's spontaneous object and gestural imitation skills. The last question focused on evaluating the generalization effects of the intervention in a typical home routine. Results suggest that Ron showed modest generalization of the reciprocity and gestural imitation strategies, but his use of object imitation did not successfully generalize across contexts except for the Phase II probe. Ron maintained his use of only reciprocity and gestural imitation. Marcy, however, demonstrated a modest level of strategy use during generalization and maintenance probes. Jason generalized and maintained his use of spontaneous gestural imitation, whereas Daniel generalized and maintained his use of spontaneous object imitation.

The findings from this study support those from previous research studies that were conducted with parents in clinical settings (Ingersoll & Gergans, 2007; Ozonoff & Cathcart, 1998; Vismara et al., 2009). As seen in Figures 1 and 5, the current study shows that parents were able to implement the modified RIT strategies at a modest level in their homes. Data revealed that parents increased their implementation of the modified RIT strategies, with the exception of descriptive language, from a low level at baseline to

moderate and high levels post intervention. Both parents used descriptive language at moderate levels in baseline and increased their use of this strategy following training.

It is impressive that both parents continued to use the modified RIT strategies during typical home routines. Both parents were able to use all modified RIT strategies at modest levels, except Ron who stopped using object imitation strategies during mealtime once he learned the gestural imitation strategies. Around the time when training gestural imitation was completed, Ron's son started signing the word "eat" as a way to request food. It could be argued that Ron wanted to boost and maintain Jason's use of this gesture; therefore he increased his use of gestural imitation strategies with Jason during Phase III and the maintenance probes. Jason's data clearly support this argument, for he spontaneously imitated more gestures during Phase III and maintenance. Parents' generalization and maintenance data in this study are consistent with research conducted by Ingersoll and Gergans (2007) and Vismara et al. (2009). Ingersoll and Gergans reported that three parents in their study were able to generalize their use of RIT strategies to the home. The parents included in their study did maintain their use of object imitation during the follow-up. One of the parents maintained use of object imitation at lower rates comparing to intervention levels, and another parent did not maintain her use of gestural imitation at follow-up. Vismara et al. also reported that children's imitative behaviors remained at positive levels at follow up.

Both child participants in this study had a diagnosis of autism. Research has consistently shown that one of the key characteristics of autism is that children with this diagnosis have difficulty imitating actions on objects and gestures (Rogers & Pennington, 1991). Data from the current study, as seen in Figures 4 and 7, indicate that there were

minimal improvements in children's spontaneous imitation as a result of the modified RIT intervention. This finding contradicts a previous study on RIT, which indicated that children increased their spontaneous object imitation skills (Ingersoll & Gergans, 2007). Ingersoll and Gergans also reported that one child, whose mother was trained to use gestural imitation, made substantial increases in spontaneous gestural imitation. This inconsistency in outcomes may be the result of modifications that were made to the original training protocol. In this study the number of object and gestural models were decreased from three to two models. Also, the delay between models was lowered from 10s to 3s. Many children with autism have difficulty processing visual and/or auditory cues and need more time to process them and decide upon a response (National Research Council, 2001). Therefore, providing a short waiting time might not have given them enough time to process the parents' actions on objects or gestures. In the same vein, providing three models could have provided the parents with more opportunities to practices the strategies with their children, and could have provided the children with more opportunities to learn spontaneously imitation.

Finally, the intervention phases were changed based on parents' progress in learning and implementing the targeted strategies, not on children's improvements on spontaneous imitation. In the current study, there were no pre-determined criteria established for parents to achieve in each intervention phase, and therefore parents may have not become fluent in using the strategies before the next strategy was introduced. Thus, it could be argued that neither parents nor children had enough practice using any newly learned strategy to result in considerable improvements in children's spontaneous imitation.

Limitations

While the findings from the current study are somewhat promising, it is important to discuss several limitations to this study. First, the small number of participants poses a concern as to whether this study provides enough replications to support the validity of the results. Previous research that utilized single subject design methodology involved more than two families (Ingersoll & Gergans, 2007; Vismara et al., 2009). While the results indicate positive changes in parents' use of the strategies, a larger sample could provide stronger evidence on the effectiveness of the intervention.

Second, the parents selected the routines that were to be used as a context for generalization and maintenance probes. Marcy was only able to identify playtime as an appropriate context to use for the generalization and maintenance probes. She explained to the researcher that Daniel needed extensive support during other routines such as mealtime and bedtime; therefore she felt that she probably would not be able to use the RIT strategies with him during such routines. She also shared that different family members and care providers took turns working with Daniel during those routines. Therefore, it would have been a burden to change the family schedule to accommodate these routines as generalization or maintenance settings. Using a different routine (other than a second play routine) would have provided more robust evidence on generalization effects for Marcy and Daniel, and the replication of generalization effects across two families.

The intervention also was limited by the research design. There was not sufficient time for the parents to practice the new strategies and improve mastery before changing phases. When mastering new strategies, the learner typically advances through a

predictable series of learning stages. At the start, a learner is usually hesitant and uncertain as he or she tries to use the target strategies. Through practice and by providing coaching and feedback, the learner becomes more fluent, accurate, and confident in using the strategies. It is beneficial to consider the learning phases (i.e., acquisition, fluency, generalization, and adaptation) when designing training programs for parents (Haring, Lovitt, Eaton, & Hansen, 1978).

This study was conducted over an 8- to 11-week period, which is similar to the time period that was described in previous studies (Ingersoll & Gergans, 2007; Ozonoff & Cathcart, 1998; Vismara et al., 2009). While it was assumed that parents would find these strategies beneficial and practice them outside the intervention sessions, no data were collected to describe the parents' use of strategies at times other than intervention and generalization.

Implications for Future Research

Several suggestions can be made when conducting home based parent-implemented intervention research in the future. First, both parent participants were stay-at-home parents, and they were responsible for taking care of more than one child with a disability in their families. In addition to regular household chores, both parents were responsible for scheduling and attending other therapies, communicating with therapists, and attending individual planning meetings for their children with disabilities. Engaging in a research study in addition to these other responsibilities meant more work for Ron and Mary. An area of future research might be investigating the effects of learning and implementing imitation strategies on parents' stress level, and feelings of confidence and competence.

Although the parents did increase their use of the targeted strategies in every phase, the results show that the parents could have benefited from more coaching to use the strategies to enhance their play interactions with their children. When each new phase was introduced, parents' usually decreased their correct use of previously learned strategies. This pattern was replicated across both families. One suggestion that might be employed in future research is to refine and improve the coaching component included in the modified RIT intervention. A successful coaching approach builds on parents' current skills and knowledge, refines them, and encourages self-reflection to promote competence and mastery of new strategies (Dunst, Herter, & Shields, 2000). In addition, successful coaching increases parents' competence by explaining relationships between new and existing knowledge and supports them in embedding the newly learned strategies in their home schedule and routines (Fenichel & Eggbeer, 1990). In a successful coaching model, the coach is responsible for creating a supportive environment where both the parent and coach can brainstorm solution to address challenging situations. The ultimate goal of coaching is to build parental competence and confidence so they acquire and maintain new strategies, and so they are able to adapt them to new settings and situations (Gallacher, 1997).

Another suggestion for future research is to reduce the number of intervention phases to two phases instead of three. An intervention design that includes two phases would include a reciprocity phase to support parent-child interaction and social responsiveness, and a second phase focused on either object or gestural imitation based on each child's developmental progression. When designing the intervention it also would be beneficial to consider the four learning stages that Haring et al. (1978)

suggested to increase parent's acquisition, fluency, generalization, and adaptation of the targeted strategies. Future research should also consider training parents and children to a mastery criterion, which guide changes in intervention phases. Including mastery criteria for both parents and children would help parents see the magnitude of improvements in their use of imitation strategies, and consequently changes in their child's imitation skills. Consequently, these future research ideas would improve the social validity of a modified RIT intervention.

Although the children in this study made minimal gains in their spontaneous imitation skills, it is unknown if this effect can be attributed to the modified RIT strategies. As noted, due to the severity in which the children were impacted by autism, both child participants were involved in intensive therapeutic programs. As the current study got underway, Jason started receiving behavioral therapy and he entered a half-day preschool program. Daniel, on the otherhand, was receiving multiple services that included behavioral therapy and attending an inclusive kindergarten. Future research is warranted to include demographic measures that consider the effects of such variables on children's spontaneous imitation skills. Additionally, Ron and Marcy were stay-at-home parents, who were involved in their children's therapy and engaged in frequent communication with the therapists. Researchers might want to include measures to assess parents' learning during these interactions for it is possible that the parents were combining the knowledge gained from multiple professionals to improve their interactions with their children during the course of the study.

Another issue for future research involves exploring the social validity of the modified RIT intervention. Interviews were conducted with the parents after concluding

the intervention to elicit their perceptions about the learning and implementation process of the intervention. Given the importance of teaching imitation skills to children with autism, a robust method to evaluate the social validity of the intervention (e.g., subjective evaluation or social comparison; Kazdin 1982) would increase researchers' confidence in using this intervention.

Conclusion

This study demonstrates that teaching and coaching parents to use a modified RIT intervention was effective in helping them learn to use strategies to support the spontaneous imitation skills to their young children with autism. Results show that two parents were able to learn reciprocity, object imitation, and gestural imitation and implement these strategies in home settings with high fidelity. The intervention, which lasted an average of 10 weeks, resulted in minimal improvements in children's spontaneous imitations skills. More research is warranted to examine the modified RIT intervention with a larger sample of children and for a longer period of time to better understand the effectiveness of the targeted strategies in improving the spontaneous imitation skills of young children with autism.

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Appendix A

Sample Recruitment Flyer

Are you a parent of a young child with autism?

Does your child know how to imitate?

Is your child between the ages of 2-5? If you push a toy car, does he/she imitate you? If you wave goodbye, does he/she imitate you?

Are you interested in learning strategies to teach your child how to imitate? We are seeking parents who are interested in participating in a study that will last approximately 15 weeks. Parents will learn strategies to teach their children imitation skills and support positive parent-child interactions.

If you are interested, please contact Hasan Zaghlawan at the University of Illinois at Urbana-Champaign @ 333-0260 or 721-3651 or zaghlawa@illinois.edu to ask questions and for more information regarding this project.

Appendix B

Screening Questions for Potential Participants

1. What is your child's date of birth?
2. Tell me about your child's favorite toys or things to do?
3. Can you describe some of the positive interactions you had with your child in the past week? What were the settings when these occurred, and what made these positive for you?
4. Are you willing to participate in a short assessment to evaluate your child's imitation skills?
5. Are you willing to attend an hour long training session at a place and time that is convenient for you?
6. Will you give consent for me to videotape you and your child throughout the study? The videos will be used for data collection.
7. Are you willing to participate in this study for 15 weeks?
8. What is your child's diagnosis?

Appendix C

Consent Letter

Department of Special Education, 288 Education Building,
1310 S. Sixth St., Champaign, IL 61820 217-333-0260

Dear Parent,

My name is Hasan Zaghlawan, and I am a graduate student in the College of Education at the University of Illinois. My advisor, Professor Michaelene Ostrosky, and I would like to invite you and your child to participate in a research project focusing on teaching imitation skills to young children with autism. Imitation is a non-verbal social communication skill that emerges early in development. Young children with autism are often slow to learn imitation skills. Research has shown that learning imitation skills can impact the development of language, play, and joint attention. Thus, teaching young children with autism imitation skills may assist in the development of broader social and communication skills. This project will require your involvement in a one hour training session, half an hour interview at the end of the study, and two training sessions per week in your home. The weekly training sessions will include you and your child. The expected duration of this study is 15 weeks. All sessions will be videotaped, and the interview will be audio taped.

Your participation with your child in this project is completely voluntary; you are free to withdraw your permission for you and your child's participation at any time and for any reason without penalty. The videotapes and all other information that are obtained during this research project will be kept strictly secure and will not become a part of other projects or records. The videotapes and audiotapes will be kept in a locked file cabinet and will be accessible only to us and our research assistants. The results of this study may be used for journal articles and conference presentations. Should you or your child need additional support, we will provide additional information about resources in the community. We anticipate almost no risk to you and your child beyond those that exist in your everyday activities at home. We anticipate that the results of this research will improve parent education.

In the space at the bottom of this letter, please indicate whether you want to participate with your child in this project. Also please note if you give permission for video recording and audio taping. If you have any questions about this research project, please feel free to contact us by mail, e-mail, or telephone. The second copy of the form is yours to keep.

Sincerely,

Hasan Zaghlawan
zaghlawa@illinois.edu

Michaelene Ostrosky, Professor
ostrosky@illinois.edu

For any questions about your rights as research participant please contact the BER at 217-333 3023 or the Institutional Review Board at 217-333-2670.

Research Participation Consent
I give permission for my child _____ and me _____ to participate in the research project described above.
I give permission for **video recording** for the purposes of data collection _____
I give permission for interview **audio taping** for the purposes of data collection _____

Date _____ Parent's Signature _____

Appendix D

Modified Reciprocal Imitation Training

Parent Handout

Imitate Your Child

The basis of Reciprocal Imitation Training (RIT) relies on imitating all of your child's gestures, vocalizations, and actions with toys. Imitating your child's play promotes your child's focus on the interaction, and improves your child's social skills, and increases the number of different play ideas your child has. Imitating your child's speech or sounds encourages your child to use his or her language and vocalizations more during everyday play interactions. Imitating your child also lays the groundwork for teaching mutual imitation because your child learns that imitation is a back and forth interaction. For this reason, it is important to imitate most of your child's actions, even unusual play, body movements, or vocalizations. By doing this, you tell your child that you are interested in how he or she likes to play. You will have the opportunity to teach your child more appropriate play, gestures, and language when it is your child's turn to imitate you! Children who know how to imitate can learn many things from the world around them. The following strategies will make imitating your child most effective.

Be face to face

Make sure that you are always in your child's line of sight so that he or she can easily make eye contact with you and see what you are doing. Sit so that you are face to face with your child, so that he or she can make eye contact easily. If your child has a hard time sitting, you will need to move around to stay face to face with your child.

Imitate play with toys

Imitate what your child is doing with the toys he or she chooses to play with. For example, if your child is rolling a car back and forth on the ground, you would roll another car back and forth. If your child is spinning the wheels of a car, you would spin the wheels of another car as well. You will be like a mirror reflecting back to your child the behaviors that sh/she displays. *Remember; don't become frustrated if your child chooses to play with toys or other objects in an unusual way.*

Imitate gestures and body movements

Imitate your child's gestures and body movements. This will also help your child realize that you are imitating him or her and that his or her behavior is meaningful and can influence how you act. Imitating gestures and body movements is especially helpful when your child is not engaged with a toy. For example, if your child is jumping, follow the same path purposefully, while trying to remain face to face. Children often find this behavior quite funny and really enjoy interacting this way.

Imitate vocalizations

For children who are preverbal or just starting to talk, it is important to imitate their child's vocalizations and words. With a verbal child, it is recommended that you only

imitate language that is appropriate to the context of the play. Again, when using this technique it is important to be visible and animated.

Be animated
Exaggerate your imitations of your child's gestures, facial expressions, and vocal quality to draw attention to the fact that you are imitating him or her. While imitating your child, you can vary your imitations slightly to keep them interesting. For example, if your child drops a toy on the ground without paying attention to it, you can bounce your toy on the ground in an exaggerated way. Also, you can pause with an expectant look in the middle of imitating your child to encourage your child to initiate for you to continue the game. Use words like "Uh Oh", "Oh No", "Ready, set, go", sound effects and gasping to let your child know you have something to share.

Only imitate appropriate behavior
Imitating your child will typically increase the behavior that is being imitated. Therefore, when imitating your child, it is important to decide which behaviors to imitate. For children who exhibit little to no appropriate play, try to imitate every appropriate action or vocalization. This could include: throwing a ball, looking in the mirror, babbling etc. Do not imitate behaviors that you do not want to be repeated (i.e., throwing toys down on the ground) or behaviors that are dangerous or aggressive such as hitting or breaking toys. If your child uses behaviors you do not want to see increase you can "imitate" that behavior while shaping it into something more appropriate. For example, if your child is mouthing an object, you can pretend to eat a similar object, or if your child is flapping his or her hands to show excitement you could "imitate" the excitement but express it by clapping your hands. For children who engage in a lot of appropriate play, try to imitate only the appropriate behaviors.

Control the situation
While you want to imitate your child, it is equally important to be consistent with rules and consequences. Do not allow behaviors that could destroy property or injure the child or another. Remember that you are in control of the situation and therefore determine which behaviors are acceptable. If your child engages in an unacceptable behavior, you should make it clear to your child that this behavior is NOT OK and remove the toys or objects that are causing a problem.

Describe Your Play

Describe what you and your child are doing to highlight the fact that you are both doing the same thing. This is an opportunity to give meaning to your child's play when it is not yet meaningful. For example, if your child (and you!) are lining up cars, you can give it a purpose by saying "We parked the cars". If your child (and you!) are just holding a block in your hands, you can say "We're hiding blocks." Describing your play should look somewhat like a running commentary or a sports announcer; however, be sure to pause to give your child an opportunity to respond.
Another reason for describing your play is to help your child understand language and use new language. Many children with special needs have difficulty understanding spoken language because it moves so quickly. By changing the way you speak to your child, you can help him or her understand what you say. The following strategies will help make describing your play most effective.

Simplify your language
Use simple words or sentences to help your child understand what you say. Use simple language that is slightly more complex than your child's language. For example, if your child is not using words, use single words; if he or she uses single words, use 2-3 word phrases. it is appropriate to simplify your language by leaving out higher level parts of language (e.g., "Feed baby" instead of "You are feeding the baby").

Speak slowly
Slow down your rate of speech. The slower you speak, the more your child will be able to pick out the important words and meaning. Although you want to provide a running commentary, make sure to give your child a chance to respond. Pause between comments to give your child time to process the information you provide to him/her.

Stress important words
Children often have a hard time recognizing important words in sentences. You can help your child gain "meaning" by pausing before important words and stressing them ("We have a…BUNNY").

Be repetitive
Use the same language over and over. You can use the same phrase repetitively ("Down it goes. Down it goes") or you can repeat specific important words ("Car is rolling. Roll, roll. Rolling fast").

Expand your child's language
Expand your child's language by imitating your child's speech and then *adding a little* more information. By adding more words, you revise and complete your child's speech *without direct correction*. For example, if your child says "buh", you could say "ball". If your child says "train" you could say "yellow train". If your child says "I push car", you could say "I am pushing the car".

Teach Object Imitation

To teach imitation, you will begin going back and forth between imitating your child, and providing opportunities for your child to imitate you. The goal is to get into a back and forth "social game" where you and your child take turns imitating each other. Don't worry if you did most of the imitation at the beginning. In order to help your child learn to imitate, you can use physically guide him or her and provide praise once he/she has imitated you. The following strategies will make teaching imitation most effective.

Model actions with the same toy
In order to increase your child's ability to pay attention to your actions and be motivated to imitate, you should model an action with the same toy your child is already playing with. Every minute (on average), model an action with the duplicate toy. Make sure that your child is attending to you (making eye contact or watching your actions) when you model actions. Imitating your child should help increase attention, but you may also call your child's name, or block his or her play to get his or her attention if necessary. Also, it is important that your child knows this is something he or she should imitate, so make sure the action is "big" so that your child notices it. For example, bounce a sizable ball, let it bounces few times to capture your child's attention, and be excited about the action that is taking place. An incorrect example will be to roll small ball in a direction that is invisible to your child, and without showing any excited facial expression about the action. If your child is not engaged with a toy, try to get him or her interested in a toy or model an action with the last toy with which your child was playing.

Use a verbal label with the action
When you model the action, you want your child to pay attention and imitate you. However, you want your child to learn to imitate you spontaneously, rather than on command. Therefore, rather than telling your child to imitate (e.g., "Do this.") or telling your child what to do (e.g., "Give the baby a drink"), you should use a "verbal label" to describe what you are doing (e.g., I am feeding my baby). This way your child will learn to imitate when you model an action and talk about it, rather than only when you tell him or her to do so. Verbal labels should be short, at or slightly above your child's language level, be said clearly and stressed, and describe the action without giving a command. For example, when modeling rolling a ball, make sure your child is watching you, roll the ball with an exaggerated gesture, and say "Roll". To help your child imitate in many contexts, vary what you say (i.e., say "bounce" one time and "boing" another when modeling the same action at different times). If your child has a difficult time paying attention to what you are doing, you can say his or her name to get his attention first; but try to avoid doing this every time or your child might learn to imitate only often you say his or her name.

Model actions your child is likely to imitate
You will want to begin by modeling actions that your child is naturally inclined to want to imitate. This includes actions that your child already performs on his or her own (familiar actions) as well as actions that are at or slightly above your child's developmental level. If you model actions that are too advanced, your child is less likely

to understand the action and imitate. To decide good actions to model, watch what your child does with toys on his or her own and model similar actions. If your child likes to explore toys by banging, throwing appropriately, and dropping them, model these types of actions as well as nesting one object in another, putting objects in containers, lining, stacking, or ordering toys in certain ways. If your child uses most common toys appropriately, such as pushing cars, putting people in cars, and throwing and catching balls, model these types of actions as well as some basic pretend actions. *Remember, the actions you model do not have to be "appropriate" it is ok to imitate nonfunctional behaviors such as stacking; the goal is to increase your child's motivation to imitate your behavior!*

Model the action up to two times and then prompt

Give your child several opportunities to imitate the action spontaneously. Model the action with a verbal label and wait 3 seconds for your child to imitate (count in your head 1001, 1002, 1003). If your child does not imitate spontaneously after 3 seconds, model the same action again with the same verbal label. If your child does not imitate after the second model, then tell your child "You do it" if he or she responds to verbal instructions; otherwise physically guide your child to imitate you. Only do these steps if the child is still interested in interacting with you.

Praise your child for imitating

As soon as your child imitates you, provide him or her with verbal praise and physical affection if your child enjoys this. Praise should be more intense if your child imitates you spontaneously than if you need to physically guide your child to imitate. It is more important for your child to match your actions in general, than to perform a specific action exactly, so be sure to praise any attempt at imitation even if it is not perfect. After your child has imitated your action or gesture, let your child play with the toys, as he or she likes for the next minute.

Teach Gestural Imitation

Gestural imitation is taught using the same strategies as object imitation; however, instead of modeling an action with a toy, you will model a gesture that is directly related to the toy with which your child is playing. For example, if your child is spinning the wheels of the car, you might model a spinning gesture (e.g., spinning finger in circle) while saying "spin, spin". Like object imitation, you should pair the modeled gesture with a related verbal label ("Spin"). Make sure to model gestures that that you can physically guide your child to complete if he or she does not imitate spontaneously.

The gestures that you model can include conventional gestures (i.e., waving bye - bye, blowing a kiss, nodding yes or no), joint attention gestures that involve an object (pointing to express interest, giving, showing), descriptive gestures (holding arms out for "big," fingers close together for "small"), and pantomime gestures (pantomiming "drinking"). If your child is not playing with a toy, you can model an action with an object and then a related gesture. When doing this, only prompt your child to imitate the gesture. For example, you can pretend touch a cup and then pull your fingers right away to gesture "hot", or you can pretend you are calming a baby that is in your arms, and put your finger on your lip to gesture "shhh!." You can also model gross motor movements such as jumping, turning around, and falling down. However, make sure that these are actions that you can physically guide your child to imitate!

Gesture Ideas

Easier gestures are those that are more commonly used and require less fine motor skills. Again, it often helps to brainstorm different gestures you can model when you are not playing with your child so you have some ideas in your head to use. Below are some examples of gestures that can be modeled during different types of play.

	Gestures	Words	Toys
Actions	spinning finger in circles	It's spinning/ it spins	spinning top
	palm face down, moving up and down as if bouncing a ball	It's bouncing	bouncing ball
	fling arms up and out	It crashed	toy car/ train crashes
	both palms pushing out from body	She's pushing	miniature doll pushing stroller
	hand move quickly down through air as if on a slide	It's a slide/ He went down (the slide)	miniature slide and toy
Attributes	finger tips open and close	It's sticky	sticky ball
	hands moving up and out as if putting a necklace on the child	She put the necklace on	doll and necklace
	hands moving apart, either horizontally or vertically	It's so big/ It's so tall	large toy
	hand rubbing stomach	Yummy food	doll/ bear and pretend food
	jerking action with hand	It's hot/ sharp	toy w/ imagined attributes of hot or sharp (toy scissors, toy stove)
Pantomime	arms out as if flying	it's a plane/ it's flying/ it flies	airplane
	bent arms moving forwards and backwards at sides as if train wheels	chugga-chugga	train
	open up close palms	it's a book/ let's read	book
	strumming a guitar/ banging drum/ playing recorder	she's playing the guitar/ drum/ Recorder	toy guitar' drum/ recorder and doll
	open and close wiggling fingers	it's going to get you	creepy-crawly toy
v e	fists rubbing eyes	she's hurt	miniature person who fell
	hands pressed together by face as if sleeping	baby's tired	baby and blanket

	hands on hips	I'm angry	a toy that it would make sense to be angry with!
	hands hiding eyes	that's scary	a scary toy
	arms wrapped around self	they're friends	two toys that can hug
Conventional	finger to lip	shhhh! baby's sleeping	baby and blanket
	wagging finger as if scolding	no-no, naughty shark (in response to shark biting)	toy shark w/ open mouth
	shoulder shrug with open palms up	where is it	any toy
	clap hands	good job	any toy
	cup hand around ear	what's that noise?/ hear that?	noise-making toy

Appendix E

Fidelity Checklist

Individual Training – Reciprocity

Item	Yes	No
Introduce the reciprocity strategies (i.e., contingent imitation & descriptive language)		
Explain the reciprocity strategies		
Share with the parent video clips as examples of the correct use of strategies		
Answer the parent's questions		

Individual Training – Object Imitation

Item	Yes	No
Introduce the strategies (i.e., model, prompt, & praise)		
Explain object imitation strategies		
Share with the parent video clips as examples of the correct use of strategies		
Brainstorm with the parent different types of actions that they can perform on objects		
Answer the parent's questions		

Individual Training – Gestural Imitation

Item	Yes	No
Introduce the strategies (i.e., model, prompt, & praise)		
Explain gestural imitation strategies		
Brainstorm with the parent different types of gestures that they can teach the child – researcher provide examples of gestures		
Answer the parent's questions		

Review and Coaching Session
Reciprocity

Item	Yes	No
Introduce the reciprocity strategies to the parent		
Explain the strategies to the parent		
Answer the parent's questions about strategies		
Model strategies with the child for 5 minutes		
Describe the use of strategies and the child's responses to the parent		
Ask the parent to practice the strategies with the child		
Provide coaching and feedback		

Review and Coaching Session
Object Imitation

Item	Yes	No
Introduce the object imitation strategies to the parent		
Explain the strategies to the parent		
Answer the parent's questions about strategies		
Model strategies with the child for 5 minutes		
Describe the use of strategies and the child's responses to the parent		
Ask the parent to practice the strategies with the child		
Provide coaching and feedback		

Review and Coaching Session
Gestural Imitation

Item	Yes	No
Introduce the gestural imitation strategies to the parent		
Explain the strategies to the parent		
Answer the parent's questions about strategies		
Model strategies with the child for 5 minutes		
Describe the use of strategies and the child's responses to the parent		
Ask the parent to practice the strategies with the child		
Provide coaching and feedback		

Appendix F

Sample Data Form

Date: __________________ Observer: __________________ Parent: ___________________

Parent			Child	
30 sec	60 sec	Episode	OIM	GIM
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		
OM GM VM PL LO SS RP EX	OM GM VM PL LO SS RP EX	M1 M2 Vp Pp R+/C M1 M2 Vp Pp R+/C		

Appendix G

Parent Interview Questions

1. Describe your typical play interactions with your child. Have there been any changes since beginning this study? If so, what changed and to what do you contribute those changes?
2. How easy or difficult was it to learn and use the intervention ideas (i.e., reciprocity, object imitation, gestural imitation)?
3. How often, if at all, do you use the strategies with your child during daily routines?
4. How successful have you been in using the strategies during these daily routines?
5. Do you plan to continue to use the strategies with your child now that the study is over?
6. Have you noticed any changes in your child's social engagement? Please describe.
7. Have you noticed any changes in your child's communication? Please describe.
8. Have you noticed any changes in your child's object play? Please describe.
9. What changes, if any, have you noticed in your child's object imitation?
10. What changes, if any, have you noticed in your child's gesture imitation?
11. Would you recommend this intervention to other parents? Why or why not?

Appendix H

Tables and Figures

Table H1

Description of the Reviewed Studies

Authors, Date	Purpose / Research Methodology	Setting	Participants		Methods		Results
			Children with ASD	Parents	IV	DV	
Ingersoll & Gergans (2007)	To assess the effectiveness of parent-implemented Reciprocal Imitation Training (RIT) with young children with ASD -Single-subject, multiple-baseline design conducted across participants and across behaviors	Treatment room and research laboratory	2 M/ 1 F Age: 31 to 42 months old	3 mothers	Parent training: -Mothers were taught to use RIT twice a week for 10 weeks in a clinic setting (manual, modeling, and practice with feedback) Parents as trainers: -Mothers used RIT strategies with their children	Parent Behavior: -Mothers' use of RIT strategies (modeling, prompting and reinforcement) Child Behavior: -Spontaneous object and/or gesture imitation	Parent Behavior: - All the mothers showed increases in their correct implementation of the imitation training procedure. The mothers generalized their use of the imitation training procedure to their home. Child behavior: - All children increased their use of spontaneous imitation. They maintained and generalized their imitation skills to their home.

(continued)

Table H1 (continued)

Authors, Date	Purpose / Research Methodology	Setting	Participants		Methods		Results
			Children with ASD	Parents	IV	DV	
Ozonoff & Cathcart (1998)	To evaluate the effectiveness of a TEACCH-based home intervention model for young children with autism -Pretest/ posttest with a control group	Clinic and home	9 M/ 2 F Age: 2 to 6 years old	11 families	**Parent training:** Parents met weekly with two therapists in the clinic for an hour. One therapist modeled strategies to parent, and the other explained the strategies in detail to the parents **Parents as trainers:** Parents used the strategies with their children during the week, for 30 minutes per day for 10 weeks	**Parent behavior:** No data on parent use of the strategies were collected. **Child Behavior:** Imitation, perception, fine and gross motor skills, eye-hand coordination, and verbal and nonverbal conceptual ability as measured on The PEP-R	**Parent Behavior:** No data were reported **Child behavior:** Improvements in the cognitive and developmental skills of young children with autism

(continued)

Table H1 (continued)

Authors, Date	Purpose / Research Methodology	Setting	Participants		Methods		Results
			Children with ASD	Parents	IV	DV	
Vismara, Colombi, & Rogers (2009)	- To assess the parents' acquisition of the ESDM teaching procedures - to assess changes in the childrens' social and communicative behaviors -Non-concurrent multiple-baseline design	Clinic playroom	8 children Age: 2-3 years old	8 families	**Parent training:** - Parents were taught to use ESDM strategies for 1 hr/week over 12 weeks in a clinic setting (manual, modeling, practice with feedback, coaching) **Parents as trainers:** -Mothers used ESDM strategies with their children	**Parent Behavior:** -Parents' use of ESDM strategies **Child Behavior:** -Spontaneous functional verbal utterances -Imitative behaviors -child engagement	**Parent Behavior:** - All the parents showed high levels of correct implementation of the ESDM. Parents maintained the gains at follow–up **Child Behavior:** - All children increased their production of functional verbal responses, and 7 of the children demonstrated increases in their use of imitative behaviors - Children demonstrated increases in attention and initiations

Table H2

Description of Reliability, Generalization, Social Validity and Fidelity in the Reviewed Studies

Authors, Date	Reliability	Generalization and Maintenance	Social Validity	Fidelity
Ingersoll & Gergans (2007)	Inter-rater reliability (Cohen's Kappa ranged .64-.99)	- Children's behaviors were assessed twice at home during baseline and at the end of treatment. -Follow-up data were collected 1-month after treatment	Parent satisfaction survey was given to the parents at the end of the study asking them to rate their level of agreement with positive statements about the program. All statements were rated with an agreement level of 6.3 or higher on a 7.0 scale	-Parents as trainers: Data were collected on parents' use of the targeted teaching strategies
Ozonoff & Cathcart (1998)	Not reported	Not reported	Not reported	Not reported
Vismara, Colombi, & Rogers (2009)	Inter-rater reliability (85% for spontaneous verbal utterances, and 93% for imitative behaviors)	- Four 1 hour maintenance and generalization sessions. The first 2 sessions were scheduled 2 weeks apart, and the second 2 sessions were 1 month apart. - During the first 3 sessions, therapists provided coaching to parents	Not reported	-Parents as trainers: Data were collected on parents' use of the targeted teaching strategies

Table H3

Participants' Demographics

Child (Name[a])	Parent	Ethnicity	Child's Gender	Child's age (month[b])	Parent Education Level
Jason	Ron	Caucasian	Male	36	B.A.
Daniel	Marcy	Asian	Male	62	B.A.

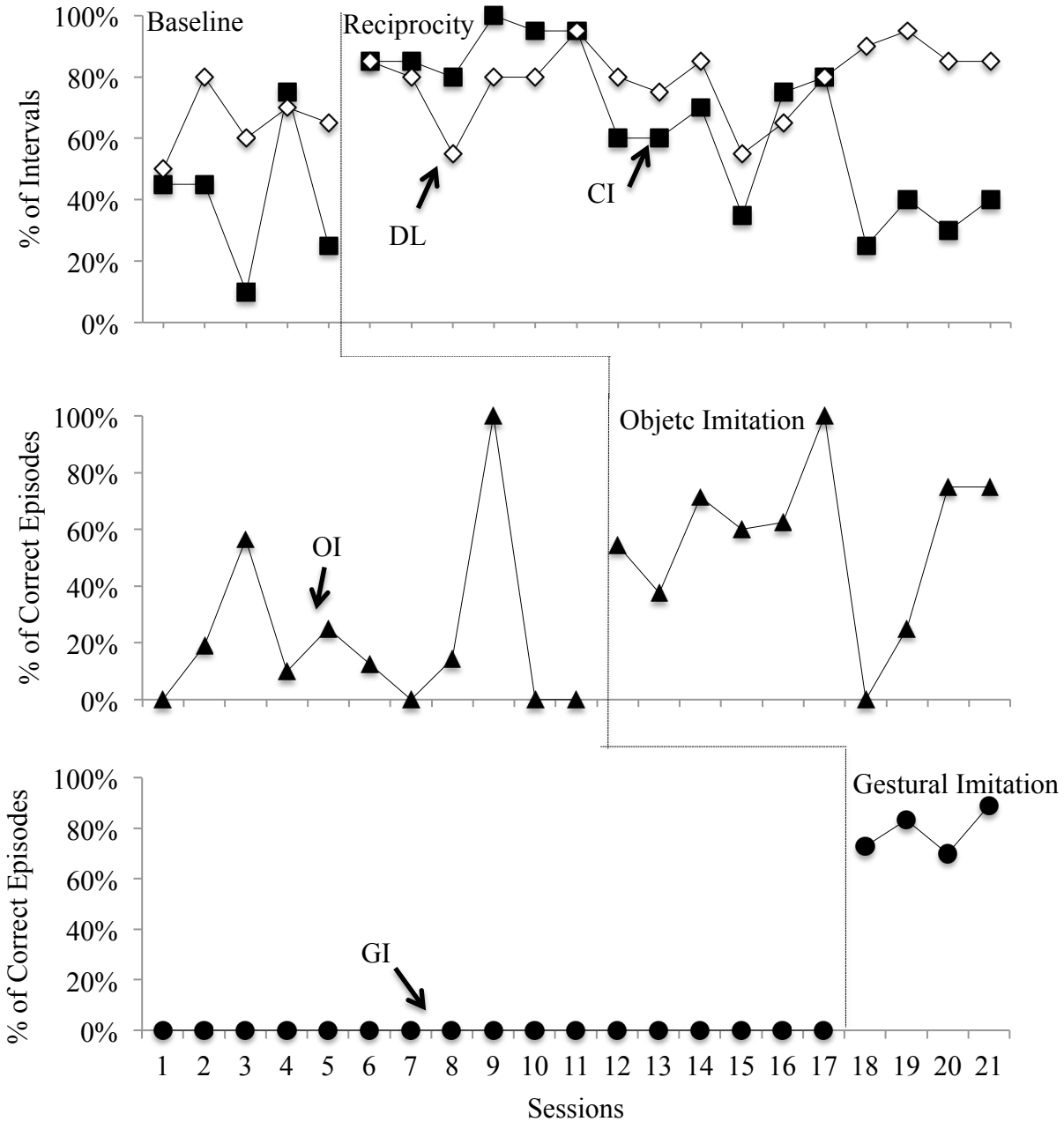
[a]Pseudo names were assigned to children to ensure anonymity. [b]Age at the beginning of the study.

Table H4

Daniel and Jason's Toy Sets

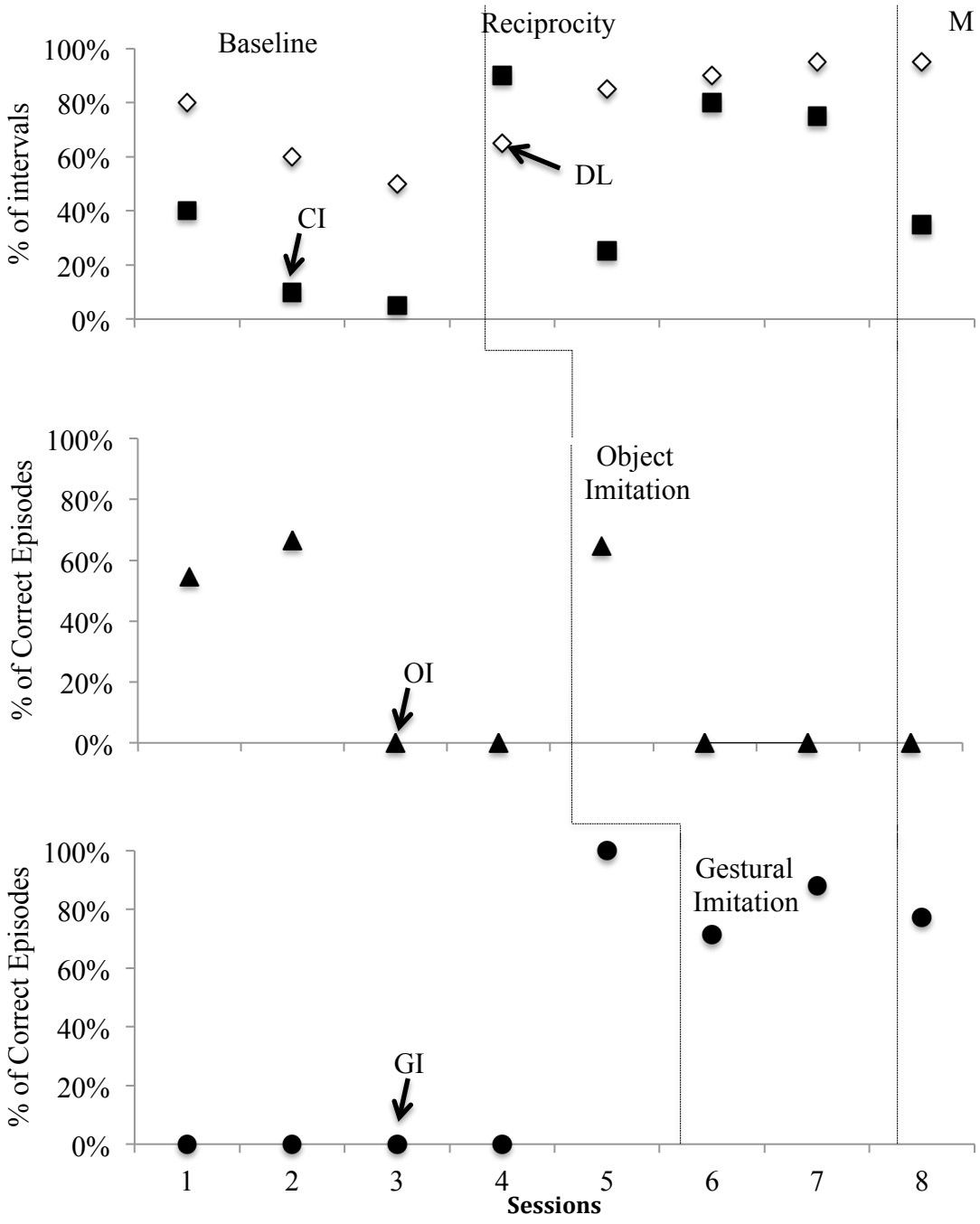
Toy Material
Nesting and stacking toys
Blocks
Balls
Musical toys
Dolls and stuffed animals
Pretend food
Vehicles and people

Figure H1. Ron's Use of Reciprocity and Imitation Training Strategies



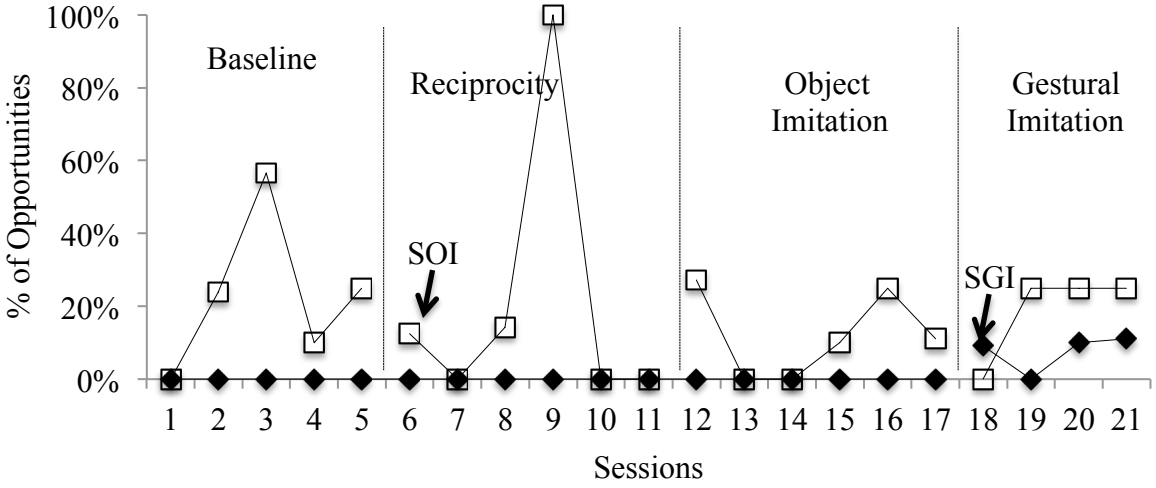
Note. DL = Descriptive Language; CI = Contingent Imitation; OI = Object Imitation; GI = Gestural Imitation

Figure H2. Ron's Generalized Use of Reciprocity and Imitation Training Strategies



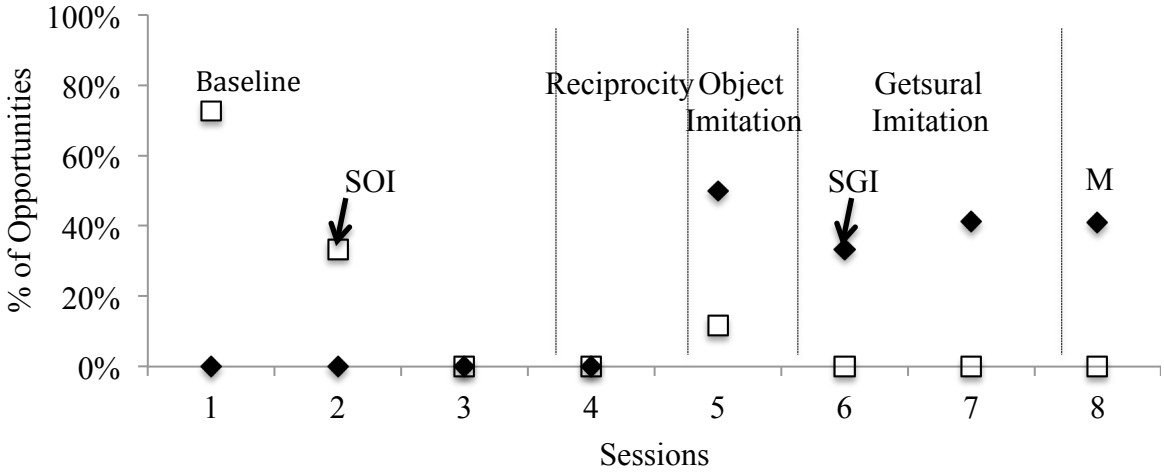
Note. DL = Descriptive Language; CI = Contingent Imitation; OI = Object Imitation; GI = gestural Imitation; M = Maintenance

Figure H3. Jason's Use of Spontaneous Imitation



Note. SOI = Spontaneous Object Imitation; SGI = Spontaneous Gestural Imitation

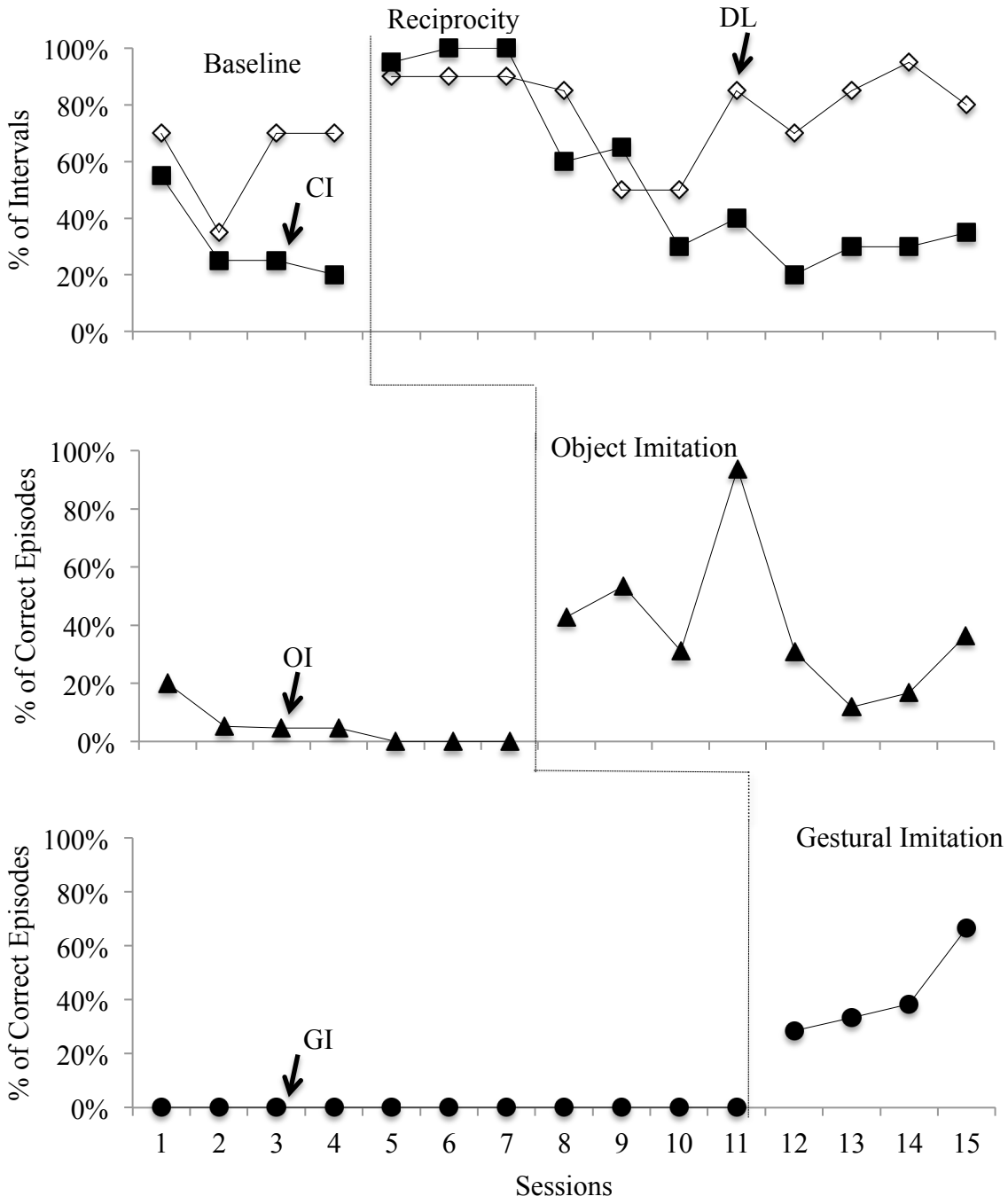
Figure H4. Jason's Generalized Use of Spontaneous Imitation



Note. SOI = Spontaneous Object Imitation; SGI = Spontaneous Gestural Imitation;

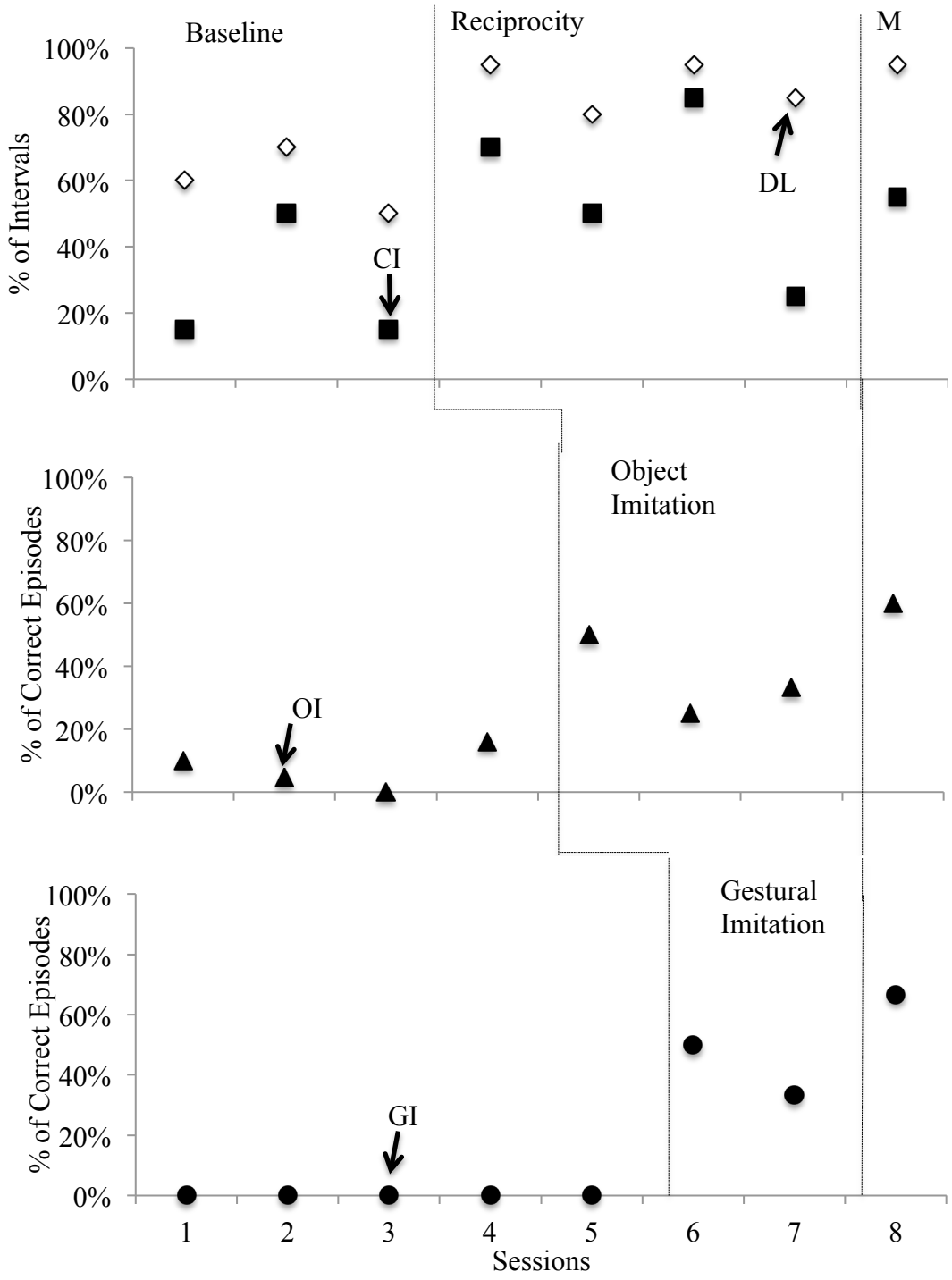
M = Maintenance

Figure H5. Marcy's Use of Reciprocity and Imitation Training Strategies



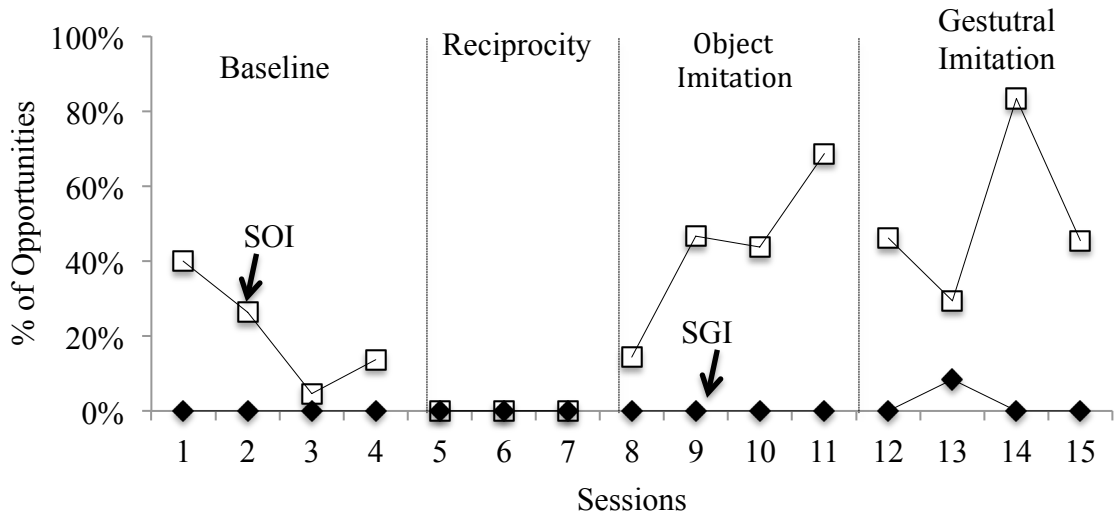
Note. DL = Descriptive Language; CI = Contingent Imitation; OI = Object Imitation; GI = Gestural Imitation

Figure H6. Marcy's Generalized Use of Reciprocity and Imitation Training Strategies



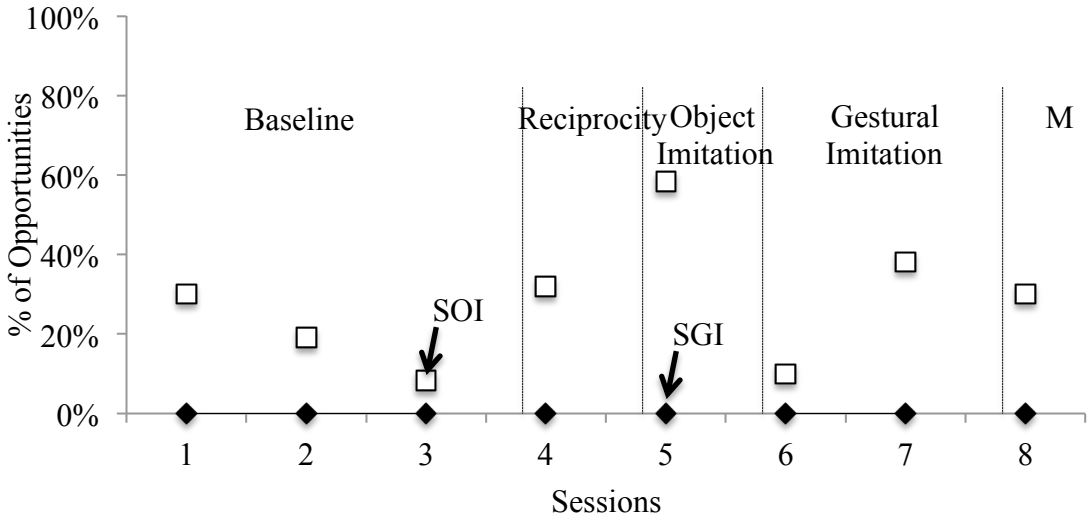
Note. DL = Descriptive Language; CI = Contingent Imitation; OI = Object Imitation; GI = gestural Imitation; M = Maintenance

Figure H7. Daniel's Use of Spontaneous Imitation



Note. SOI = Spontaneous Object Imitation; SGI = Spontaneous Gestural Imitation

Figure H8. Daniel's Generalized Use of Spontaneous Imitation



Note. SOI = Spontaneous Object Imitation; SGI = Spontaneous Gestural Imitation;

M = Maintenance