

# Effects of coaching on the fidelity of parent implementation of reciprocal imitation training

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## Abstract

Imitation is an important early social communicative skill that is often impaired in young children with autism. Reciprocal imitation training is an easy-to-implement intervention that targets social imitation and can be taught to parents or other caregivers to implement at home and in the community. In this study, parents of children with autism were taught to implement reciprocal imitation training. The quality of parent fidelity of intervention implementation and rates of child spontaneous imitation were examined in three phases: baseline, post-didactic training, and after the introduction of 1:1 coaching. The results suggest that coaching improved parent fidelity with all parent participants, and this correlated to an increase in spontaneous imitation with some of the child participants.

## Keywords

autism, imitation, naturalistic developmental behavioral intervention, parent-implemented intervention, treatment fidelity

Imitation is a social communicative skill that is present from the very earliest moments in infant development (Meltzoff and Moore, 1977). In typical development, imitation is a pivotal skill, meaning that it is used to learn many other skills and reach developmental milestones. This is true for children with autism as well, including being an early predictor of communication development (Toth et al., 2006). Research on early imitation in autism suggests that for many young children, this important social communication skill is impaired (Ingersoll, 2008; Ingersoll and Meyer, 2011; Smith and Bryson, 1994; Young et al., 2011). Smith and Bryson (1994) found that children with autism showed impairments in imitation that involved both objects and movements.

Young children with autism respond differentially to different types of imitation tasks. Ingersoll (2008) assessed 31- to 62-month-old children with autism and typically developing children using a variety of spontaneous and elicited imitation tasks. Elicited imitation includes structured interactions with an adult, where the adult modeled an action for the child and then immediately instructed the child to do the same; a correct response involved the child doing the same thing the adult had modeled. Spontaneous imitation includes opportunities for the child to imitate a behavior the adult modeled after a period of time, during which the adult was imitating the actions of the child in

play, and no explicit instruction to imitate was given. Typically developing children demonstrated higher rates of imitation than the children with autism across all tasks. Interestingly, children with autism demonstrated higher rates of imitation during the elicited imitation tasks, and the children with autism showed lower rates of coordinated joint attention than their typical peers during all types of imitation activities. These findings suggest that this critically important social communicative skill presents unique challenges for young children with autism through not only the acquisition of the ability to imitate but also in the different contexts that may exert control over imitative behaviors.

Reciprocal imitation training (RIT) is a naturalistic developmental behavioral intervention (NDBI; Schreibman et al., 2015) that teaches generalized, spontaneous imitation to young children with autism through the use of applied behavior analysis (Cardon and Wilcox, 2011; Ingersoll, 2010; Ingersoll and Lalonde, 2010; Ingersoll

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and Schreibman, 2006). RIT targets imitation through the use of naturalistic behavioral strategies that incorporate following the child's lead in play (contingent imitation), modeling, prompting, and reinforcement to increase generalized spontaneous imitation (Ingersoll, 2010; Ingersoll and Schreibman, 2006). Ingersoll and Schreibman (2006) found that children with autism improved in generalized imitative ability and demonstrated measurable gains in joint attention, expressive language, and pretend play skills. In a randomized control trial of RIT, Ingersoll (2010) found that children in the treatment group (RIT) showed greater improvements post-intervention in both spontaneous and elicited imitation than the control group. RIT can target object imitation, which consists of imitating actions with objects, as well as gesture imitation, any physical acts that involve the body without the use of props (Ingersoll, 2010; Ingersoll and Lalonde, 2010). Ingersoll and Lalonde (2010) found that when gesture imitation was targeted, three of the four children involved in the study showed a marked increase in expressive language use. These findings highlight the significance of targeting imitation as an early skill that has collateral effects on other social communicative behaviors. RIT has undergone an independent replication in the research community (Cardon and Wilcox, 2011) and has also been piloted for adolescents with autism (Ingersoll et al., 2013), further demonstrating the potential value of RIT as an autism intervention. In addition, increased external replications for interventions such as RIT strengthen the evidence-base of support for such interventions, which is an intended aim of this study.

A relevant factor to consider as parent-mediated interventions continue to gain support in the literature is the importance of intervention fidelity (Billingsley et al., 1980; Wolery, 2011). Intervention fidelity emphasizes the importance of treatment procedures being implemented as designed (Billingsley et al., 1980; Wolery, 2011). Research shows that an individual's own perception of their ability to implement an intervention with fidelity differs from reality, such that teachers report higher levels of fidelity than independent recorders of the same behavior (Billingsley et al., 1980). Furthermore, high treatment fidelity is positively correlated with better outcomes (Wainer and Ingersoll, 2013). In planning for parent-mediated interventions, researchers and clinicians are faced with a problem of preparation and training, as many parents do not have prior experience in implementing autism-specific interventions. Wainer and Ingersoll (2013) suggest tracking intervention fidelity as a way to better understand and also bridge the gap between research and practice. Although passive, one-time training opportunities exist for parents, research on effective training suggests that the ability to perform skills targeted in training requires steps beyond presentation of information, including modeling and opportunities for practice and feedback (Reid et al., 2012). These findings

support the use of fidelity monitoring and individualized coaching in parent-mediated interventions for young children with autism as a way to improve treatment integrity and child outcomes.

In 2007, Ingersoll and Gergans investigated the efficacy of parent-mediated RIT to promote generalized imitation in young children with autism. Parents involved in a more intensive coaching study reported both improvements in their child's imitation behaviors and overall feelings of satisfaction with the intervention, and noted that they would recommend the intervention to other parents of young children with autism (Ingersoll and Gergans, 2007). These findings carry special significance in light of recommendations that emphasize the importance of parent training and parent-mediated interventions for both the child and the parents (National Autism Center, 2009; National Research Council (NRC), 2001). Parent-mediated interventions can lead to meaningful outcomes including feelings of empowerment, increased levels of confidence, and decreased parental stress (Brookman-Frazee and Koegel, 2004). Brookman-Frazee and Koegel (2004) examined a parent-mediated intervention and found important changes in child behavior, including higher levels of engagement and responding during the treatment conditions. For these reasons, parent-mediated interventions are an important direction for research and the future of effective autism intervention, especially for young children.

In addition, due to an increase in diagnostic prevalence of autism and a shortage of service providers and other limiting factors (Centers for Disease Control and Prevention (CDC), 2018; Wainer and Ingersoll, 2015), further exploration of alternative approaches for teaching parents to act as interventionists is needed. Two studies have examined the use of such alternative methods to teach RIT to parents using a telehealth approach (Wainer and Ingersoll, 2013, 2015). Both studies addressed the need for increased access to training opportunities for parents via an Internet-based training program. Ingersoll and Gergans (2007) were able to demonstrate the importance of parent coaching through an intensive parent coaching study, while Wainer and Ingersoll (2013, 2015) sought to provide modified coaching opportunities in order to increase access for parents through alternative methods of training. The findings suggest that teaching opportunities for parents to learn to implement RIT can be accessed through alternative approaches or reduced contact with parents as compared to ongoing coaching.

The purpose of this study is to externally replicate and extend the literature on parent-mediated RIT as well as to investigate parental ability to implement the intervention with fidelity. The research questions are as follows: (a) Does individualized coaching influence parental ability to implement RIT with fidelity? (b) Does high fidelity coincide with increased child outcomes (spontaneous imitation)?

## Method

### Participants

Three child–parent dyads participated in this study. Parents volunteered based on interest in the study from a recruitment letter distributed in their child’s preschool program. All parents provided written consent to participate in the study prior to the beginning of the study. All children involved in this study were also enrolled in a research project for young children with autism that included participation in an inclusive preschool class and an extended day program that provided intensive behavioral program extended day program based on the principles of applied behavior analysis. The program also included a parent training component consisting of monthly home visits and a monthly parent education at the school. The content of the home visits was determined by parent priorities and requests. For example, if parents were concerned about meal time behaviors, the home visit was scheduled around a meal time, and addressing these behaviors was the topic of the visit. The parent education classes provided basic parenting information and were based on the *Steps to Independence* text (Baker et al., 2004). The parent training provided in this study was in addition to anything provided by the intervention program and focused specifically on the implementation of RIT. All of the children in the study had a diagnosis of autism spectrum disorder from either a licensed clinical psychologist or medical doctor, per state diagnostician requirements.

*Jean and Anna.* Jean was Anna’s mother; during the study, Jean was staying at home while her husband worked outside the home. Jean and her family had stable housing and adequate resources to participate in this study, including access to the Internet and a cell phone for communication with the first author (A.P.). Both Jean and Anna were Caucasian. Anna was 5 years and 5 months old at the time of the study and scored a standard score of 55 on the Peabody Picture Vocabulary Test (PPVT), 0.1 percentile with no age equivalence given. She was non-verbal and engaged in limited play with materials and people. When the clinician described the initial pre-baseline video to be collected, her mother reported that she didn’t “play with toys.” Anna had private applied behavior analysis (ABA) therapy most days per week from a local agency, and many therapists and teachers are involved in her care. Imitation was a goal that had been targeted with Anna previously, using an adult-directed, structured elicited approach with limited success.

*Kelly and David.* Kelly was David’s mother and a stay-at-home mom whose husband worked outside the home. Kelly had stable housing and sufficient resources to participate in the study including access to the Internet and a cell phone for communication with the A.P. Both Kelly

and David were Caucasian. David was 5 years old at the time of the study and scored a standard score of 56 on the PPVT, placing him in the 0.2 percentile with an age equivalence of 2 years and 3 months. David was verbal and communicated primarily through rote-memorized contextually appropriate phrases. He engaged in turn-taking play, but according to his mother, had difficulty sharing materials or allowing others to join him in play.

*Dan and Brooklyn.* Dan was Brooklyn’s father. Both Dan and his wife worked outside the home throughout the duration of the study. Dan and Brooklyn had stable housing during the study and adequate resources for the project, including access to the Internet and a cell phone for communication. Both Dan and Brooklyn were Caucasian. At the time of the study, Brooklyn was 4 years old and scored a standard score of 96 on the PPVT, 39th percentile and an age equivalence of 3 years and 10 months. Brooklyn was verbal, communicating in multi-word sentences to make requests for desired items or activities. According to his parents and observation, Brooklyn liked to lead in play and preferred to play according to his own play plan, rather than following the plan of others.

### Setting and materials

All intervention sessions with the caregiver–child dyads occurred in each of their homes in a location decided on by the parent. For most dyads, 1–2 settings were tried before a permanent setting for videotaping was decided upon by the parent; locations included the kitchen, living room, outside, and the child’s bedroom. Videos were recorded on either a cell phone or a small handheld video recorder provided to the family. Dan recorded via cell phone and uploaded videos to a password protected Internet sharing site, Kelly and Jean both borrowed handheld videos from the researcher and either left them in a safe location for the researcher to pick up or placed the camera in their child’s backpack for the researcher to collect from school. An introductory, 90-min group training was conducted at the participant’s early childhood center in a training room equipped with a computer, overhead projector, and speakers for watching and discussing video examples of the intervention.

Materials for the intervention included a small handheld video recorder as well as video recorders on parents’ cell phones, a laptop computer for the training and video coding, and a projector for the initial training, and parking reimbursement was provided for parents attending the training at the center. Intervention materials included duplicate sets of developmentally appropriate toys for the parent–child dyad to play with (10–20 sets recommended). A set of toys was defined as any duplicate or similar toy, examples used by participants included cars, slinkys, musical instruments, blocks, similar stuffed animals,

peg boards, and many other toys already in the family's home. These toys and materials were identified by parents during the didactic training and initial coaching sessions, with the support of the researcher, but were primarily items already owned by the family. One set of duplicate toys was given to each family for volunteering to participate in the study; these toys were of nominal value (less than US\$2 per item).

### *Independent variable*

Parents were provided with an initial 90-min didactic training on the model and asked to implement the intervention (RIT) five times per week for at least 20 min each day. During the coaching portion of intervention, feedback was given to parents during live coaching sessions that occurred one time per week, in the home. Both phases of the treatment are described below.

Parents began an RIT session by engaging their child in play using duplicate sets of toys. Parents imitated all child actions with toys. The parents also modeled simple language that was appropriate to the activity and expand upon on any language demonstrated by the child. Every 1–2 min, parents provided a model of a play action with the duplicate toy they were playing with and a verbal marker for the action. The model was relevant to the play and something that the child was likely to do. An example of this was, if the child was stretching a slinky apart, the parent might model shaking the slinky. An accompanying verbal marker might be, "Shake, shake, shake" or "whoa slinky!" The parent would then wait 10s before modeling the action again, modeling each action up to three times before physically prompting the child to imitate. Immediately after the child imitated or was prompted to imitate, the parent would provide behavior-specific verbal praise and then return to imitating the child and modeling language appropriate to the task.

*Group training.* After submitting a single pre-baseline video, all parents were invited to attend a 90-min training on the basics of the intervention. This training included a mixture of presentation styles, lecture, video, and opportunities for individual reflection and planning for intervention, all of which were based on the RIT manual. The training topics included linguistic mapping, contingent imitation, modeling, prompting, praising and pacing during sessions. All parents involved in the study were able to attend the 90-min training, including spouses and several non-participating parents who expressed interest, but did not end up participating due to time constraints. A training checklist was followed to ensure that all topics were covered and discussed as intended. The focus of this training was to teach parents how to implement RIT. Parents were given a copy of the RIT manual and the researcher led parents through a presentation that detailed how to set up for

RIT sessions, what materials to use and the steps to conducting RIT.

During the training the researcher explained each step of RIT and showed video examples of the intervention in use. Activity breaks were also included so that parents could spend time planning for practice in their home. Finally, parents were encouraged to share ideas and examples after activity breaks to promote increased understanding and examples. Prior to the start of this study, the researcher was trained by the developer of RIT, Brooke Ingersoll, as an RIT trainer for a State Attorney General's Office funded project, designed to provide free training workshops in autism screening and treatment throughout the state. The researchers training consisted of two full days of training delivered by the developer with opportunities for practice and feedback.

*Coaching.* After the group training, all parents were asked to start practicing RIT with their child for 20 min a day, 5 days per week, and submit two 10-min videos practicing RIT with their child each week. On average, participants submitted 13 videos for coding (Jean, 11 videos; Kelly 13 videos; Dan 16 videos). The videos were then coded for intervention fidelity. Parent coaching began for the first parent after a stable baseline trend was established. Coaching sessions were roughly 30–40 min in length and occurred once per week at a mutually agreed upon time. All coaching sessions were provided in the family's home. One coaching session per week was a pre-determined frequency for services. Two participant dyads received 6 weeks of parent coaching sessions, and one dyad (Jean and Anna) received one extra week of coaching based on a request for clarification on one aspect of RIT. For each coaching session, a coaching session plan was followed that included check-in, opportunities for practice and feedback, and planning for the next week. Communication during opportunities for practice and feedback consisted of praise, encouragement, and descriptive feedback and suggestions (corrective feedback) about RIT implementation with the child. The coach also kept a coaching log that included topics discussed and each participant's focus for the following week. Each session began with a check-in about how the intervention had gone the previous week, parents were able to ask questions about what had not gone well, and the researcher gave suggestions based on the video parents had submitted. The child was present for all coaching sessions. The check-in lasted roughly 5–8 min and then parents were asked to set up and conduct an RIT session as they would normally do. Parents practiced with the child while the researcher gave suggestions, praise, or comments roughly every 1–2 min. Verbal statements from the researcher ranged from very directive suggestions: for example, "Provide him with a new model, try tapping the stick since he was doing that earlier" to less directive comments such as, "See how much he looks at you when you imitate him!" On some occasions, the researcher would

model the intervention for the parent. This would occur when the researcher gave feedback on a particular aspect for RIT for two or more consecutive sessions and the parent's behavior had not yet changed. The researcher always asked for permission to model before jumping in and working with the child. This occurred once each with Jean and Dan, but did not occur with Kelly. Parent practice with the child typically lasted 15–20 min. After the practice period, the researcher would summarize 1–2 main points for the parent to focus on in the coming week. Usually, these were focused on components of RIT, but sometimes were more basic such as a reminder to practice the intervention several times during the week. Finally, the next session was scheduled for the following week, and the researcher verbally reminded the parent to submit their video.

### *Dependent measures*

In this study, the primary dependent variable was the parent fidelity of RIT implementation. The primary goal of the intervention was for parents to implement RIT with high fidelity multiple times a week, while examining the effects of a supportive training strategy (coaching). In order to measure intervention with fidelity, parents were expected to reach a combined treatment fidelity average of 80% or above for two consecutive video submissions. The purpose of the coaching was to help parents meet fidelity of implementation. Fidelity criteria were based on a rating scale from 1 (low fidelity) to 5 (highest fidelity) for six elements of RIT (linguistic mapping, contingent imitation, models, pace, prompts, and praise). An 80% score corresponded to a score of 4 on the 1-to-5 rating scale on the fidelity form. The purpose of converting to percentage was to display parent and child data on the same graph. Fidelity was rated using an RIT fidelity form developed and used in previous RIT studies (Ingersoll and Lalonde, 2010).

Child behaviors were also measured and coded for spontaneous imitation. Spontaneous imitation is a term used to describe generalized object or gesture imitation that is not controlled by a verbal directive to “copy me” or “do this.” Opportunities to respond were noted when the parent modeled a new action for the child to imitate that was different from what the child was already doing. Per the RIT protocol, the model was repeated up to three times before the parent was expected to prompt the child to imitate. Spontaneous imitation was recorded when the child independently imitated an action modeled by the parent.

### *Experimental design*

A multiple baseline design across participants was conducted to assess the efficacy of parent-implemented RIT and coaching on fidelity of implementation of RIT. Multiple baseline designs allow researchers to demonstrate

instructional control “when the target behavior is likely to be irreversible or when it is undesirable, impractical, or unethical to reverse conditions” (Cooper et al., 2007: 201).

### *Pre-baseline*

Rates of true baseline behavior were measured by asking parents to play with their child as they normally would, with duplicate sets of toys, consistent with previous research on RIT (Ingersoll and Gergans, 2007; Wainer and Ingersoll, 2013, 2015). For the purpose of this study, which was to evaluate the effects of parent coaching, this single data point phase was referred to as pre-baseline. Parents were asked to record play for 10 min and submit the video to the researcher to code for fidelity of RIT implementation. The purpose of coding for RIT implementation prior to parent knowledge of the intervention was twofold: to get a sense for how parents were already playing and interacting with their child at home and to strengthen the likelihood that parent fidelity increases were due to the training and or coaching alone. Due to time constraints with the end of the school year approaching, baseline conditions were limited to one pre-training data point.

### *Data collection*

Videos of parents implementing RIT with their child, in their own home, and with their own materials were coded to assess the fidelity of implementation and the amount of child imitation. Behaviors coded for parents included the six elements of RIT: contingent imitation, linguistic mapping, modeling, prompting, praise, and pacing; and the child's spontaneous imitation was coded for all videos. Contingent imitation and linguistic mapping were recorded using partial interval recording in 30-s intervals. All other behaviors (modeling, prompting, praise, pacing, and the child's spontaneous imitation) were recorded through event recording, once a model was delivered by the parent, an opportunity for each of the subsequent behaviors (spontaneous imitation, prompt, praise, etc.) occurred. Based on the event recording and partial interval scores, a fidelity score of 1 (low fidelity) to 5 (high fidelity) was assigned for each of the six fidelity areas (contingent imitation, linguistic mapping, model, pace, prompts, praise). Fidelity was reported as an overall percentage, with 80% or more for two consecutive days considered high treatment fidelity. For child behavior, spontaneous imitation was reported as a percentage, based on the number of occurrences per opportunities presented by the parent.

### *Inter-observer agreement*

A.P. was the primary coder for all submitted videos. Two observers were trained in reliably coding RIT fidelity and child behavior for inter-observer agreement. Reliability

coders were not aware of the purpose of the study or the treatment conditions of the videos they were coding. Inter-observer agreement data collection was conducted for 22% of randomly selected video submissions across participants and conditions of the study. Inter-observer agreement was measured by reviewing opportunity by opportunity recordings of each dimension of the data. This was calculated by number of overall agreements divided by the total number of agreements plus disagreements and then multiplied by 100 to determine total inter-observer agreement. Inter-observer agreement for parent fidelity was 99% and child spontaneous imitation was 95%. Total overall inter-observer agreement was 97%.

### Social validity

A survey of parent reaction to this intervention was conducted prior to the initial parent training and after the conclusion of coaching sessions. Questions were presented in a multiple-choice format. Surveys were given to parents to determine comfort with conducting interventions in the home, amount of time working on specific goals at home, and other related topics prior to the start and after the completion of the study. The post-survey included additional questions about parent satisfaction with the intervention and any progress noted in their child.

## Results

Results for parent behavior and child behavior are summarized in Figure 1.

### Parent behavior

*Jean.* In pre-baseline, Jean earned an RIT fidelity score of 37%, indicating that she was naturally doing some elements of the RIT protocol. After initial training, Jean's average post-training baseline fidelity score was 40%, slightly higher than before didactic training, but demonstrated that she was still not implementing RIT with fidelity. Once coaching began, Jean's fidelity score increased to immediately and dramatically to 72% and 77% for her first two sessions post-coaching. Jean's scores went above 80% in the third session and remained above 80% for the rest of the sessions, with an average coaching fidelity score of 85%.

*Kelly.* Prior to the initial training, Kelly submitted a 10-min pre-baseline video of herself playing with her son, David. The pre-baseline video was scored for RIT fidelity and was given a score of 30%. After the initial 90-min training, Kelly's six post-training baseline fidelity scores increased dramatically to an average of 77%, with one video scored as 83%. Once coaching began, Kelly immediately met fidelity, with an average fidelity score of 89% for all coaching sessions.

*Dan.* When Dan's pre-baseline video was coded, it demonstrated that Dan was implementing RIT with a fidelity of 34%. Dan had nine post-training baseline sessions before coaching began. The average fidelity for these nine sessions was 60%. Dan had six coaching sessions. After the initial coaching session, Dan's fidelity jumped to 80%, with an average fidelity score of 88% across all six videos submitted during the coaching phase.

### Child behavior

*Anna.* During the single pre-baseline video and during the post-training baseline phase, Anna did not engage in any spontaneous imitation. Once coaching began, Anna's spontaneous imitation increased immediately and dramatically to an average of 50% spontaneous imitation, with an average of 48% across the coaching sessions.

*David.* During the single pre-baseline video, David engaged in spontaneous imitation on 0% of opportunities. During the post-training baseline phase, David's spontaneous imitation increased to an average of 76% of opportunities across the six sessions in this phase. This was consistent with his mother's drastic response to the initial training. During the coaching phase, David's spontaneous imitation was 80% of opportunities across the six sessions from the coaching phase.

*Brooklyn.* Brooklyn's spontaneous imitation in the single pre-baseline video was 0% responding. During the post-training baseline phase, Brooklyn's imitation was variable, and average spontaneous imitation was 32%. After parent coaching began, Brooklyn's imitation improved consistently, with average spontaneous imitation occurred on 58% of presented opportunities.

### Effect size

Percentage of non-overlapping data (PND) was calculated for all of the dependent variables. PND was calculated from pre-baseline to baseline phase and again from baseline to coaching, in order to assess how effective didactic training was and to assess the effects of coaching on fidelity. PND was not reported between pre-baseline and baseline due to the limitation of the single pre-baseline data point. From baseline to coaching, Kelly's PND was 83% while both Dan and Jean's PND was 100%. The average PND for all parent fidelity from baseline to coaching was 94% (range of 83%–100%).

PND was also calculated for child behaviors from baseline to coaching. From baseline to coaching, David's PND was 16%, Brooklyn's was 50%, and Anna's was 100%. The average PND for child spontaneous imitation from baseline to coaching was 55% (range of 16%–100%).

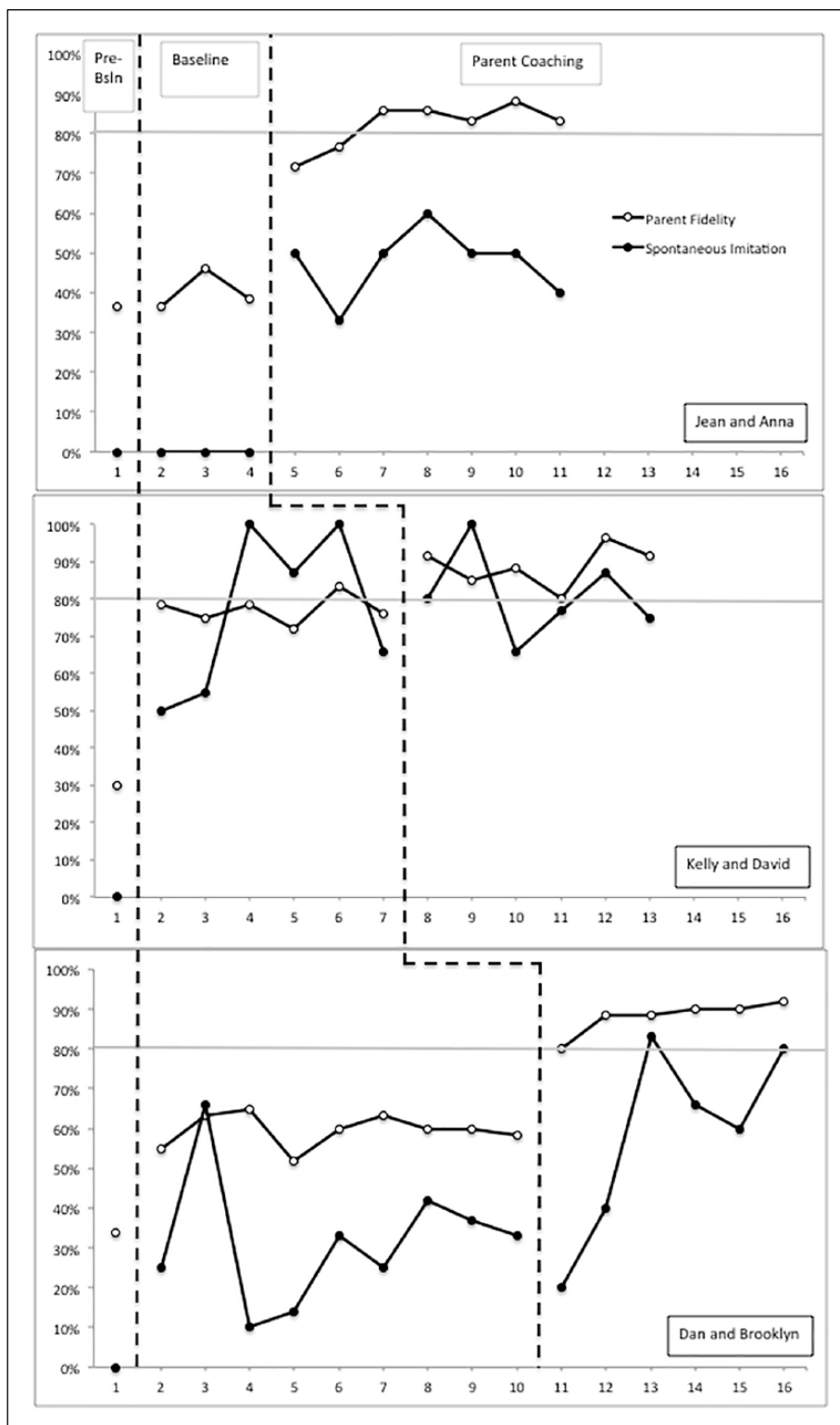


Figure 1. Parent and child response to RIT intervention.

PND guidelines suggest that the coaching intervention should be considered “very effective” (>90%; Scruggs and Mastropieri, 1998). PND guidelines for child outcomes indicate “questionable effectiveness” (50%–70%;

Scruggs and Mastropieri, 1998), although a wide range of differences was seen in this data set. Worth noting was that the lowest overall effect size from baseline to coaching was David at 16%, this was similar to his mother, Kelly.

**Table 1.** Social validity results.

Survey item	Pre-survey responses	Post-survey responses
How easy to you find implementing autism-specific interventions at home? (1— <i>not satisfied</i> , 5— <i>very satisfied</i> )	2 (Jean) 3 (Dan) 1 (Kelly)	5 (Jean) 3 (Dan) 2 (Kelly)
Where do you feel most comfortable implementing interventions with your child?	Meal times (Dan) Play times (Dan, Kelly, Jean) 1:1 format (Jean)	1:1 format (Dan, Kelly, Jean)
What are some barriers to implementing interventions at home?	Unsure of what to do (Dan and Kelly) I don't have time (Dan) I am exhausted (Jean)	Unsure of what to do (Kelly) Lack of self-discipline (Dan) I am exhausted (Jean)
How satisfied are you with current home interventions?	Not satisfied at all (David and Kelly) Somewhat satisfied (Jean)	Very satisfied (David and Jean) Somewhat satisfied (Kelly)
Please rate your overall satisfaction with RIT (1— <i>not satisfied</i> , 5— <i>very satisfied</i> )	N/A	Jean (5) Dan (4) Kelly (3)

RIT: reciprocal imitation training.

For David and Kelly, the greatest PND effect size was noted between pre-baseline and baseline, rather than between baseline and coaching. The PND between pre-baseline and baseline was 100% for each of them, suggesting the training alone to be “very effective” for these participants.

### Social validity

On the social validity survey, parents reported overall feelings of satisfaction with the intervention; these results are summarized in Table 1. The average pre- and post-scores for parents' feelings of comfort with implementing interventions remained the same from pre to post (3.33 on a scale of 1 to 5). One parent, Jean, reported an overall increase in ease of implementing interventions at home from a “2” on the pre-survey to a “5” on the post-survey. In the pre-survey, parents described comfort implementing interventions at home in a variety of settings (meals, play, and 1:1 work settings), and the post-survey indicated that all parents felt most comfortable implementing interventions in a 1:1 format with their child. When asked about barriers to implementation in the pre-survey, two parents reported that they were unsure of what to do during intervention time at home, and others reported they have no time or were exhausted. During the post-survey, only one parent reported uncertainty about what to do, while others stated fatigue or lack of discipline and schedules. Of the three parents involved in the study, two reported on the pre-survey that they were “not satisfied at all” (David and Kelly) with current home interventions, while one marked “somewhat satisfied” (Jean). On the post-survey, two parents (David and Jean) reported feeling “very satisfied” with current home interventions, while Kelly reported feeling “somewhat satisfied.” All parents reported an increase in satisfaction with home interventions after the study.

On a scale of 1 (not at all satisfied) to 5 (very satisfied), the parents reported an average of “4” for overall satisfaction with RIT on the post-survey. Anecdotally, all three parents noted on the post-survey increases in their child's imitation, joint attention, and pretend play, with one parent noting that the child also improved in “expanding play to other interests.” Some parent comments on the intervention included, “I felt that RIT is a good intervention. However, the amount of time involved was overwhelming ...” (Kelly). Jean said RIT was, “Very helpful and I will definitely continue to use RIT as the main way I play and interact with my daughter.”

### Discussion

The results of this study demonstrate that with appropriate training and coaching, parents of children with autism can implement RIT with fidelity and that with consistent access to RIT, children with autism improve in the area of spontaneous imitation. The results indicate that each parent was able to meet fidelity of the intervention, but only after individualized coaching, this is consistent with existing literature on training and coaching (Fettig et al., 2015). Similarly, child participants in the study increased in their ability to spontaneously imitate during play, but only after their parents were implementing at least some components of the RIT intervention with consistency.

Although all parents were able to meet fidelity, the path to fidelity was different for every participant. One parent, Kelly, was fairly close to meeting fidelity after the initial 90-min training. This suggests that some parents may benefit simply from parent education nights or didactic trainings and workshops. As Kelly bubbled just below the fidelity line, her son was making progress, with only a very slight increase in spontaneous imitation from baseline to the coaching phase.



Although Dan and Jean also participated in the didactic training, it did not have the same effect on their behavior. Dan began to use some RIT components, and this change did result in an increase in spontaneous imitation for Brooklyn, there was a noted increase in trend line once the coaching phase began and an overall increase in spontaneous imitation from baseline to the coaching phase. Anna did not demonstrate any spontaneous imitation during the baseline phase and only began to spontaneously imitate when her mother's fidelity of implementation increased. These responses to the didactic training raise interesting questions. First, they reinforce the extant knowledge that that didactic instruction is not enough to teach many or most adults complex behavioral interventions (Fettig et al., 2015). Since all the three of these participants responding so differently to the training, it also suggests that we need to be able to individualize coaching packages. Clearly, the three adult participants required different intensities of coaching. Worth noting is the small number of coaching sessions that were needed in order for all parents to achieve fidelity. This indicates a need for more research to determine the optimal number of parent coaching sessions and/or combined learning opportunities that consist of group training and individualized coaching, and also, the possibility of some parents benefiting from short-term services for focused interventions such as RIT.

At pre-baseline, all parents were at the same level in their ability to implement RIT with fidelity; on their own, they were demonstrating some components of the intervention, but were far below the fidelity cut-off. Similarly, at pre-baseline, none of the child participants demonstrated spontaneous imitation. From here, we saw three different patterns of responders emerge for our three participant dyads. Kelly demonstrated near-fidelity of RIT immediately after the didactic training, with major initial changes in David's spontaneous imitation seen at this time. In terms of coaching, Kelly's behavior, and that of her son David, was impacted by a ceiling effect, which limited the response due to relatively high rates of responding in baseline. However, this limited response to coaching is likely due to a ceiling effect as Kelly and David had already shown larger changes in behavior after the didactic training. Dan and Brooklyn demonstrated some change from pre-baseline to baseline, but Dan did not meet fidelity until coaching was introduced, suggesting a moderate responding pattern from coaching. Finally, Jean and Anna demonstrated a low response to the didactic training (baseline) and high response to coaching.

One concern that arises from these three different response patterns is the perpetuation of the use of didactic training for parent education. In this case, only one parent demonstrated high effect from the training alone, although her performance was still not meeting treatment fidelity from the didactic training. Only one parent demonstrated significant benefit from the didactic training, whereas all

parents' PND results suggest coaching to be "highly effective" to "effective." This supports previous research on the importance of individualized and supportive coaching for more effective parent education.

This study had several limitations. First, follow-up data were not collected due to the limited length of the study and availability of participants after coaching concluded. Another limitation is the demographic of participants. All participants were already enrolled in a high-quality intensive instruction program that included parent coaching and high-quality preschool services. Parent participants were well-resourced and highly motivated to participate and lived in a community with easy access to the research institution, which made participation easier. Future research similar to Wainer and Ingersoll's (2013, 2015) telehealth work should look to find ways to reach underserved communities and populations. Third, the single pre-baseline data point limits the interpretation of the findings from pre-baseline to baseline. Additional pre-baseline data points would strengthen the argument that some of the dyads benefited directly from the group training. Another limitation was around the coaching fidelity. The lead researcher completed a fidelity checklist after each session based on the coaching protocol, but no independent fidelity measurements of the coaching were conducted. Finally, PND was a difficult and potentially limited outcome for measuring David and Kelly's response to the intervention due to the marked increase in Kelly's use of RIT strategies after the initial training. It appeared that David's behavior was more likely mediated by Kelly's behavior and the difference in behavior was noted most dramatically from pre-baseline to baseline.

These findings support the use of coaching for parents delivering interventions in home-based settings with their children with autism. Also of significance is the importance of treatment fidelity in improving child outcomes, although the possibility exists that scores that are merely close to fidelity may be enough to increase outcomes, even without meeting fidelity standards, as demonstrated with Kelly and David.

Dan and Brooklyn's behavior also suggest that we may need to rethink what fidelity means. Although Dan did not implement the RIT intervention with fidelity during baseline, Brooklyn's rate of spontaneous imitation increased immediately and dramatically after the didactic training. This might suggest we want to re-examine what fidelity means. Brooklyn's imitative behavior increased even more when Dan met fidelity, but it may be important as our field moves toward training more people, including parents and paraprofessionals to consider stages of procedural fidelity. Could we even consider defining procedural fidelity in a functional manner? That is, if the target behavior changes only when the intervention is provided, then we have achieved functional fidelity.

Some of the comments from the social validity assessment require further discussion. Parent reports of exhaustion were mentioned in the pre- and post-social validity survey as barriers when it came to “working” with their child or implementing interventions at home. One possible benefit of RIT is the low-intensity of implementation and the play-based nature of the intervention. In this intervention, parents are taught more effective and meaningful ways to play and interact with their child than they may have been doing prior to the study. Viewing RIT as an approach to organizing and structuring play and interaction time with their child might help to ameliorate some of the stressors at home when it comes to parental pressure to “work” with their child with autism. These reports of exhaustion and stress, however, must be taken seriously, especially when many interventions, especially in early childhood continue to place extraordinary demands on parents. All of these parents were from two parent families whose basic needs were being met. If these families are stressed and exhausted, those feelings may be experienced exponentially in families with more difficult life experiences. As researchers and interventionists, we must continue to consider all of the factors facing families with children with disabilities as we consider and advocate for increased and sometimes required parent participation in intervention. If the goal of intervention is to increase the quality of life for all family members (e.g. Carr et al., 2002), we must involve families in a meaningful way to determine what role(s) they want to and can play in the ongoing intervention for their children with disabilities.

Future research in this area would be beneficial in a few areas. As autism diagnoses continue to rise (CDC, 2018), continued focus on ways to provide alternative methods for teaching parents to serve as interventionists for their child, particularly in underserved communities, is imperative (Wainer and Ingersoll, 2013, 2015). This study provided preliminary findings to suggest that a group training and limited duration individualized parent coaching sessions successfully led to increased spontaneous imitation for young children, as well as positive parent reports of the intervention. In addition, analysis of the strategies separately would help provide more information about how the difficulty or complexity of a strategy might impact parent fidelity. This type of information could assist practitioners by providing guidance for matching teaching method to complexity of strategies being targeted. Of course, individual performance would continue to be a marker for success, but general recommendations that evaluate the complexity of strategies could assist in streamlining parent coaching supports, which could result in better use of resources.

This study supports the existing bodies of literature on RIT, parent-implemented interventions, and treatment fidelity concerning young children with autism spectrum disorders. This study also demonstrates the importance of

fidelity when it comes to parent-implemented interventions as well as the need for the support of a coach or provider in ensuring treatment integrity.


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