An Assessment of a Naturalistic In-Home Training Protocol to Establish Joint Attention Responding with Children Diagnosed with Autism Spectrum Disorders

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An Assessment of a Naturalistic In-Home Training Protocol to Establish Joint Attention Responding with Children Diagnosed with Autism Spectrum Disorders

by

Heather Burris

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts Department of Child and Family Studies College of Behavioral and Community Sciences University of South Florida

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Keywords: Discrete trial training, autism, applied behavior analysis, pivotal response training, parent training

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Dedication

I dedicate this manuscript to my Mom. It was her continuous love and support that encouraged me to pursue and achieve my goals. It was a tremendous journey and I am grateful to have had her with me along the way.
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ABSTRACT

Children with autism have deficits in social interactions and verbal and nonverbal communication and engagement in rigid and repetitive activities and/or interests (ASA, 2008). A joint attention (JA) repertoire has been identified as a behavioral cusp for later social development and thus, JA deficits serve as an early indicator for diagnosis of autism spectrum disorder (Vismara & Lyons, 2007; Whalen & Schreibman, 2003). A JA repertoire consists of both responses to- and initiations for-bids for coordinated attention. Previous research has shown teaching strategies such as pivotal response and discrete trial training for joint attention skills to be effective (Vismara & Lyons, 2007; Whalen & Schreibman, 2003). The purpose of the current study was to evaluate a mixture of pivotal response and discrete trial training as an intervention method for training joint attention behaviors with children diagnosed with autism spectrum disorder in a home setting. In addition, this study evaluated the effects of interspersing targets during training and incorporated generalization probes to assess JA initiations in the form of shifting eye gaze and pointing. Lastly this study examined a parent training procedure to determine if it would promote maintenance after skill acquisition. Results show that all targets were acquired when taught simultaneously. The results show that 2 of the 3 participants made JA initiations during probes throughout intervention. Lastly, the results indicated that parent training did not help maintain JA responding for participant one.
Introduction

Autism is primarily characterized by an impairment in social interactions and both verbal and nonverbal communication (ASA, 2008). One of the earliest social impairments to be detected in children with autism is their deficit in joint attention (JA) skills, which is thought to serve as a foundation for all subsequent language and social development (Mundy, Sigman, & Kasari, 1990). It is possible to use this repertoire as a marker for potential social/language deficits that have yet to reveal themselves. Difficulties in joint attention skills may include lack of eye gaze to coordinate attention, inability to follow the attention of another person, and an inability to direct another’s attention to an object of interest (Wetherby et al, 2004).

Joint attention shares various definitions in the literature. Mundy, Sigman, and Kasari (1994) define JA as “the capacity of the young child to use gestures and eye contact to coordinate attention with another person in order to share the experience of an interesting object or event” while Dawson et al. (2002) add that JA occurs “between interactive social partners with respect to objects or events, or to share an awareness of the objects or events”. The constructs provided in these definitions have come from the developmental literature and may be difficult for a behavior analysis due to the imprecision of their definitions. For example, use of terms such as “awareness”, “interactive”, and “share”. In addition, Dube, MacDonald, Mansfield, Holcomb, and Ahern, (2004) indicate that the very term, “Joint Attention” is troublesome for a behavior analysis (for more on this see p. 198). Fortunately, a parsimonious definition is offered
by Whalen and Schreibman (2003) that includes a focus on the behavioral event. They describe JA as “the ability to coordinate attention between an object and a person in a social context” (Whalen & Schreibman, 2003).

Joint attention is broken into two distinct repertoires: a child can respond to joint attention (RJA) by following a person’s head or eye gaze, or by pointing/gesturing toward an object or event. The second repertoire involves initiating a bid for JA (IJA), such as eye contact and gestures with another person in order to coordinate attending to an object or event (Bono, Daley, & Sigman, 2004; Mundy & Thorp, 2007). These responses to- or solicitations for-social interaction have been labeled protodeclarative. A clear distinction is made between these bids, which function to solicit social interaction, and protoimperatives which are simply requests for aid in obtaining an object or event (Bruinsma, R.L. Koegel, & Koegel, 2004; Mundy & Thorp, 2007).

Joint attention develops between 6 and 18 months of age and is seen as an important milestone related to promoting language and social development. At 6 months of age babies begin to move eye gaze between a person and an object and soon after use gestures to share attention to something external to the social interaction. Coordinated gaze shift between a person and an interesting object or event in the environment is the earliest topography of joint attention (Tomasello, 1995). Coordinated attention is observed at approximately 13 months of age, thus setting up conditions that facilitate nonverbal communication (Bakeman & Adamson, 1984).

In typically developing children, the emergence of joint attention skills is intertwined with the development of intentional communication (Bruinsma et al., 2004) as can be seen when children begin learning their first words during joint attention
interactions with objects and adults. For example, when a child is playing with a car, an adult might follow along with the child and say “car” when the child touches or picks up the car. This labeling of the car would serve as a prompt for the child to orient to both the object and the parent and would thus be considered a JA response on the part of the child (Vismara & Lyons, 2007).

Joint attention has become important to the autism community because a deficit in joint attention can be discovered before language emerges. Thus when a skills deficit is observed in JA ability, it is sensible to target it for remediation in an effort to impact future social and language ability. (Whalen & Schreibman, 2003).

**Behavior Analysis of Joint Attention**

Responses to joint attention can be described as discriminative control of the adult’s mand for the child’s attention and are possibly maintained by generalized reinforcers, such as social attention (Dube et al., 2004; Taylor & Hoch, 2008). Similarly, a child’s initiations of joint attention are viewed as mands for the adult’s attention toward an item or event in the environment. A history of adult-attending stimuli as a consequence for JA initiations often results in an increased probability of these behaviors. Dube et al. (2004) describes adult-attending stimuli as “visual indicators that the adult is aware of the interesting event, for example, the adult’s eyes are open and oriented toward it.” (p. 199). Over time the adult’s attending becomes a conditioned reinforcer because the child has a learning history that the adult will react to the event and that this reaction has been related to increased social reinforcement. The adult-attending stimuli not only function as conditioned reinforcers but also as discriminative stimuli, such that “an increased probability of other reinforcers relate to the adult’s behavior with respect to the
child and the interesting object or event.” (Dube et al., p. 199). The interesting object or event in an environment that includes an adult serves as an establishing operation. The value-altering effect of an interesting event increases the reinforcing effectiveness of adult-attending stimuli and the evocative effect increases the frequency of JA initiations that produce adult-attending stimuli as consequences.

Dube et al. stated that three possible operant classes of initiations for joint attention exist: 1) positive reinforcement when another individual participates in the event or engages with the item; 2) positive reinforcement in which another individual maximizes the reinforcing properties of an item or event; and 3) negative reinforcement by alleviating fear or distress about an item or event.

Methods for Training Joint Attention Skills

There are two methods for training joint attention skills; these include Pivotal response training (PRT) and Discrete trial training (DTT).

*Pivotal response training*. Behavioral procedures have been used over the years to train several skills for children and adults with varying behavior excesses and deficits. Pivotal response training (PRT) is an intervention method derived from the principles of ABA and expanded to incorporate child development and contextual fit (R.L. Koegel, Koegel, & McNerney, 2001). L.K. Koegel, Koegel, Harrower, and Carter (1999) discuss that PRT focuses on core deficits and excesses of autism that are considered pivotal areas. Early research suggested that targeting specific core areas may result in widespread effects across non-targeted behaviors (R.L. Koegel et al., 2001). From this, PRT has developed to focus on these core pivotal behaviors in an attempt to have a great affect in building a behavior repertoire.
The components of PRT that were used by Whalen & Schreibman:

*Pivotal Response Components*
1) Allowing the child to choose the activity
2) Using prompts that are appropriate to the task
3) Interspersing maintenance tasks with acquisition tasks
4) Taking turns with the child
5) Reinforcement is provided after the child’s response and differential reinforcement of alternative (DRA) behaviors was used for approximations
6) Prompted responses and unprompted correct responses was reinforced
7) Functional response-reinforcer relationships was used to ensure a naturalistic training scenario

*Discrete trial training.* Discrete trial training (DTT) is a widely used behavior analytic training procedure that is used to teach a variety of skills, such as communication, social interaction, and self-care, to children with autism (Smith, 2001). A discrete trial is a three term contingency that begins with a delivery of a discriminative stimulus, followed by a prompt (if necessary) that is faded over time, and then the correct response is followed by a consequence. If the child gives a correct response a reinforcer is immediately delivered, however, if the child gives an incorrect response a variety of procedures can be used, such as error correction, which involves providing prompting in order for the child to get the correct response and receive reinforcement. After a consequence has been provided the trial is complete and another trial will begin within 5-10 seconds (Smith, 2001).

Important components of DTT:

*Discrete Trial Training*
1) Gaining the child’s attention prior to presenting the discriminative stimulus (when appropriate)
2) Training will be one-to-one (also used with PRT)
3) Training will consist of distinct and repeated trials during a session
4) Data collection will occur after each trial
Relevant Research on Joint Attention Training

A study conducted by Bono et al. (2004) examined the number and variety of interventions and subsequent language development in children with autism. The intervention methods used varied among participants and included the following: ABA/discrete trials, early intervention programs, socialization classes, music therapy, occupational therapy, sensory integration, social skills training, and speech language pathology. The three most frequent intervention methods in the sample of children were ABA, occupational therapy, and speech therapy. The average number of hours per week for intervention was 24, this also included school instruction time. Bono et al. (2004) found a correlation between joint attention skills and language development. They found the more frequently children engaged in initiations for joint attention, the greater gain in language ability was seen for those children. “Recent work demonstrates that when joint attention skills are the target of interventions, behavior modification procedures can increase these skills to the extent that even a naïve observer can notice a positive change in children’s behaviors,” (Bono et al., 2004, p. 504). A limitation discussed in Bono et al. is the design of the study, in that it was not designed to evaluate or compare the different interventions. Therefore, the efficacy of each type of intervention is not evaluated in this study.

Taylor and Hoch (2008) provide us with the opportunity to assess the “effects of prompting procedures and social reinforcement contingencies to each child with autism to engage in three components of joint attention: to shift their gaze between an object and an adult’s eyes, to vocally respond to bids for joint attention, and to initiate vocal bids for joint attention.” (p. 379). Four dependent measures were collected during probe
sessions which included: 1) the percentage of trials the child looked at the instructor’s point within 5 seconds; 2) the percentage of trials the child made an appropriate comment about the target item; 3) the percentage of trials the child looked back at the instructor after making a comment about the target item; and 4) the number of joint attention initiation bids made by the child. A multiple baseline across participants was used to assess the effects of the intervention on responses to and initiations of joint attention bids.

During baseline and probe sessions the environment was manipulated to include “visually enticing or unusually placed items,” (Taylor et al., 2008, p. 379). The researcher waited 1 minute for the participant to initiate a bid for joint attention, if the child made an initiation the researcher responded with an appropriate social comment and if the participant did not make an initiation then the researcher started a leisure activity with the child and began to make joint attention bids every 30 seconds. No additional prompts or reinforcement were provided during these sessions. During training responding to JA bids, the trainer initiated a joint attention bid and then used least-to-most prompting to prompt the child to look in the direction of the trainer’s point, to make a comment, and to look back at the instructor. During the initiating bids training, a prompt delay procedure was used to teach the children to initiate JA bids. The instructor walked the child close to a target item and waited 5 seconds to see if the child initiated a joint attention bid. If no bid was made, the instructor prompted the child using most-to-least physical and gestural prompts to point and used an echoic prompt to make a comment about the target item. One participant used an index card that had textual prompts and boxes to check off because she was not responding to the prompt delay after
3 days of training. Generalization was assessed during pre- and posttest probe sessions in and around the school where training took place.

For all participants in the study, responding to JA initiations increased to 100% within one to five probe sessions after beginning training. Initiating JA bids were rarely made during baseline and training for responding to JA bids. This indicates that training joint attention responding does not lead to collateral changes in initiating JA bids. One potential reason for this could be that any child initiations about items that were not considered important (outside of desired targets) were redirected and not scored. Perhaps this had a punishing affect on child’s initiations.

In an earlier study, Whalen and Schreibman (2003) utilized behavioral intervention procedures to specifically target joint attention behaviors to children with autism. They attempted to train JA responding and initiating with a combination of discrete trial and pivotal response training (PRT) methodologies in an analog setting. The components of PRT included: providing choices to influence child motivation, reinforcing attempts, using reinforcers related to the task, and interspersing maintenance tasks. It is unclear what specific components of discrete trial training were used during the study. A multiple baseline across participants design was implemented with data obtained during baseline, treatment, post-treatment, and at a three-month follow up.

Treatment consisted of two phases: 1) Response training and 2) Initiation training. The specific target behaviors included: 1) responding to showing, pointing, and gaze shifting of adults; 2) coordination of joint attention; and 3) pointing. All five children made gains in responding to joint attention and four of the 5 subjects (one participant did not complete the study) engaged in variable rates of joint attention initiations. However,
some of the initiations, such as coordinated gaze-shifting, did not maintain at follow-up. Whalen and Schreibman (2003) associate this with the fact that the parents received no training on how to maintain the skills their children had learned. In fact, the training setting (lab) may have contributed to the lack of generality of the children’s repertoire.

In a follow up study Whalen, Schreibman, and Ingersoll (2006) investigated whether training joint attention skills may lead to collateral increases in other social behaviors. The procedure, similar to the 2003 study, incorporated response training in the first phase, and initiation training in the second phase. The dependent variables in this study were social initiations, positive affect, play, empathetic response, imitation, and language, rather than the joint attention behaviors targeted during the two phases of training. Whalen et al. included language and play probes to establish context separate from the training sessions throughout baseline and treatment in order to assess the social changes.

Results of the study suggest that the two phase training procedure produced increases in social initiations for all four participants and the initiations observed post training were at comparable levels of typically developing children. All participants showed increases in positive affect, empathetic responses, and spontaneous language. Although Whalen et al. (2006) showed increases in language, play, and social behaviors, the exact components necessary for these changes are unidentifiable from their research. In addition, many of the collateral behaviors did not maintain from post-treatment to follow-up. This lack of maintenance identifies a need to go beyond acquisition in analog settings with trainers as the primary change agent. It is sensible to conclude that deficits
in both generalization and maintenance may be impacted by incorporating the parents in training of these skills and to implement the training in familiar settings.

Rocha, Schreibman, and Stahmer (2007) furthered joint attention training research by examining a parent-implemented intervention program that targeted joint attention responding. The investigators examined the following questions: a) Can parents, with children with autism, be taught to implement joint attention training in a clinical setting? b) What effect will the parents’ implementation of the joint attention intervention have on the child’s responding and initiating during assessments? c) Will the parent’s new skill-set generalize to the home? d) Will changes in both the parent and the child maintain over time?, and e) Will the parents be satisfied with their participation and their child’s progress? (Rocha et al., 2007).

Parents received training in the PRT and DTT teaching methods utilized in Whalen and Schreibman (2003) to teach their child to respond to joint attention bids. The DTT components used by Rocha et al. (2007) included using complete trials (discriminative stimulus, response and consequence), teaching the parent to provide a specific instruction, distinguishing between appropriate and inappropriate responses, and providing consequences following a child’s response. The PRT components included the use of child choice and motivating toys.

At the beginning of each training phase (5 total phases as seen in Whalen & Schreibman, 2003; Loveland & Landry, 1986) 20 minutes of didactic teaching took place to describe the specific techniques to be used and the type of joint attention that would be introduced during that phase. A discussion of the benefits of parent training, the importance of joint attention skills, examples of social games, and how the parents can
create a better joint attention environment in the home took place during this time. Handouts were provided for the parents and an opportunity to ask questions was provided. The parents were also asked to give good and bad examples of the use of the procedures. Once procedures were clear to the parents, the techniques were modeled by the trainer with the child for about 10 minutes. After observing the skills, the parent implemented the procedures while the trainer provided prompting for each procedure. If a bid for joint attention was not given once every 2 minutes, the trainer prompted the parent to provide a bid. During subsequent sessions prompting was faded to providing examples and explanations every 2 minutes, then 5 minutes, and then only when the parents made a mistake in implementing the procedures. All 3 participants received at least 17 hours of intervention over 6 weeks and the child-parent dyads progressed through the phases as the child mastered each phase.

Video was scored during the middle 10 minutes of a 20 minute session for the following child behaviors: 1) coordinated joint attention; 2) joint attention initiations; and 3) joint attention responding. Generalization probes were conducted during baseline and intervention in the child’s home once a week for 10 minutes. Parents were instructed to use the procedures they were learning but no specific instruction was given on how to do this specifically in the home. Rocha et al. (2007) found that the parents effectively implemented the joint attention training with their children as observed by their child’s increase in responses during training and generalization sessions. The findings from this study contributed to the research on JA by expanding joint attention training implementation to parents. The Unstructured Joint Attention Assessment showed that all participants responded to a higher percentage of joint attention initiations after
intervention and all children showed an increase in initiation of coordinated joint attention across phases, however initiations were not specifically targeted in this study. The design of the study does not allow for specification on how initiations developed. All parents were encouraged to implement their new skill set in the home, however, no additional instruction was given on how to do so and as a result none of the parents maintained an increase in joint attention initiation bids during follow-up at home (Rocha et al., 2007). This finding establishes a need to conduct a parent training within the home to ensure that the parent is able to exhibit joint attention bids in their natural environment.

The previous studies identify the need to examine the developmental relationship between joint attention responding and initiations, specifically looking at how targeting one type of joint attention (responding) might generalize to the other type (initiating) without explicit training. By examining the training procedures for joint attention skills it may be possible to discover more efficient and effective methods for training responding and initiating. It is also important for researchers to look at the development of responding to joint attention and how that affects the acquisition of other, non-targeted social behaviors.

The purpose of the current study was to examine: 1) the effects of working on all JA responding targets each session as opposed to sequentially; 2) effects of training JA responding in-home as opposed to clinic settings; 3) the effects of specific training on JA responding and how that will facilitate the emission of non-targeted JA initiations, and 4) the effects of maintenance of JA skills when parents receive a short training session at the end of treatment.
Method

Participants, Setting, & Materials

Three children with an autism diagnosis between the ages of 2 and 3 years old were selected for this study. The children all received an independent diagnosis of autism by a psychologist or physician using the Autism Diagnostic Observation Schedule (ADOS) and the Autism Diagnostic Interview (ADI) prior to starting the study. All children in the study were recruited from the Silver Child Development Center at the University of South Florida. An initial interview was conducted with each family prior to being asked to participate. During this interview the first author gathered the following information from the parents: types and frequency of therapies, identification of problem behaviors, communication level, and the child’s ability to sit for 10-15 minutes at a table. Acceptance into the study required that the child be between the ages of 24 and 48 months, have an autism diagnosis from a psychologist or physician, have little to no problem behaviors, and have the ability to sit for 10-15 minutes at a table. During this initial interview the researcher also played with the child in order to assess if the child had the skills that were going to be targeted in the study, several trials of the 6 targets were presented and the researcher observed the child’s responses.

Participant 1, Dakota, was a 42 month old, non-verbal girl who had little to no problem behaviors. Prior to beginning the study she was receiving pivotal response training with a psychologist, however, these services were temporarily put on hold during the study. During the study she received no services and was not attending school. In
her initial interview she had good eye contact and was responding to her name (target 4) with the trainer, although she had this skill she was not responding to the other targets and therefore qualified for the study.

Participant 2, Riley, was a 30 month old, non-verbal boy who had little to no problem behaviors. During the study Riley was receiving the follow therapies: applied behavior analysis for 10 hours per week, speech therapy for 2 hours per week, occupational therapy for 1 hour per week, physical therapy for 1 hour per week, and feeding therapy for 1 hour per week. Prior to starting the study, the therapists were informed of the study and requested to not work on responding to name and other joint attention programs. During Riley’s initial interview he did not demonstrate any of the 6 targets and presented as a good participant for the study.

Participant 3, Connor, was a 41 month old boy with limited verbalizations who had little to no problem behaviors. During the study Connor was receiving applied behavior analysis therapy for 6 hours per week. He attended school 5 days a week and received group speech therapy with 3 other kids for 1.5 hours per week. Prior to starting the study the behavior analyst was informed of the study and requested to not work on responding to name and other joint attention programs. During Connor’s initial interview, he had good eye contact and was responding to his name (target 4); however, he was not responding to any of the other targets and therefore was still included in the study.

The study was conducted in the homes of the participants/guardians. Baseline, treatment, and follow-up sessions took place in each of the participant’s bedrooms. The bedroom included a small table with a chair for the child, baskets with high preference
toys, stimuli that are typically present in the room, and a video camera (during a majority of the sessions).

The following materials were used in this study: Sony “Handycam” digital video camera recorder, pen, tragus tripod, three ring notebooks, plastic bins, joint attention data sheets for child behavior and for trainer behavior, Sony USB flash drives, and an assortment of high preference toys (varying for each participant).

*Target Behaviors*

Targets 1-3 are considered prerequisite skills for responding to joint attention bids and are thought to increase responding to JA, however, because it is unclear in the literature whether they serve as prerequisites all of the targets were trained simultaneously. Targets 4-6 are responses to joint attention bids. The definitions of the target behaviors are as follows:

1. **Target 1-Response to hand on object:** While the child was playing with one toy, the trainer placed the child’s hand on a different toy. A correct response included taking the toy within 5 seconds and manipulating the newly presented toy for at least five seconds.

2. **Target 2-Response to object being tapped:** The trainer tapped a newly presented toy while the child was engaged with another toy (same protocol as target 1). A correct response included taking the toy within 5 seconds and manipulating the newly presented toy for at least five seconds.

3. **Target 3-Response to showing of object:** The trainer showed the child a new toy while the child was engaged in another activity (same protocol as target 1.
and 2). A correct response included taking the toy within 5 seconds and manipulating the newly presented toy for at least five seconds.

4. Target 4-Eye contact: The trainer said the child’s name one time and simultaneously presented an object near her eyes and then faded to nose until not object was necessary to establish eye contact with the child. Making eye contact within 5 seconds was scored as a correct response.

5. Target 5-Following a point: When the child was engaged with an object, the trainer established eye contact with the child by following the steps in target 4 (saying the child’s name and holding up an object near eyes or nose—fading to not at all). Following the establishment of eye contact, the trainer turned her head and pointed to another object in the room. The goal was for the child to turn his or her head in the same direction as the trainer. A correct response included the child looking at the trainer and then shifting his or her gaze to the object specified by the trainer.

6. Target 6-Following a gaze: Target 6 looks similar to target 5. The trainer shifted her gaze, rather than point. The same topography of response was scored.

*Interobserver Agreement*

Interobserver agreement was scored by two trained research assistants by independently viewing videoed sessions. For targets 1-3 the observers needed to agree with the first author on whether or not the child was engaged with a toy, whether or not the child manipulated the newly presented toy for approximately 5 seconds and then whether or not the trials were scored as correct. For target 4 the observers needed to
agree whether or not the child made eye contact and whether or not the trial was scored as correct. For targets 5 and 6 the observers needed to agree on whether or not the child was engaged with a toy, made eye contact, turned head in direction of point or eye gaze, and whether or not the trial was correct. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

Social Validity

The parents in the study were asked to fill out a pre-intervention and post-intervention survey to assess the percentage of time they feel their child: 1) makes eye contact while playing; 2) initiates social interaction using eye contact while playing; 3) responds to social initiations using eye contact while playing; 4) initiates social interactions using verbalizations while playing; and 5) responds to social interactions using verbalizations while playing. See Appendix A. All of the questions were explained and questions were answered prior to the parents filling it out to ensure there was no confusion on the survey. Participant 3’s parents did not complete their pre-intervention survey and therefore a post-intervention survey was not administered.

The parents also filled out a parent questionnaire prior to starting training. The following questions were asked: 1) do you feel this training is important to your child; 2) would you like to be involved in your child’s training; 3) how important do you feel it is to be involved in your child’s training; 4) how many minutes per day is it possible for you to work with your child; and 5) how many days per week is it possible for you to work with your child. The parents were given a follow up questionnaire after their child completed the study, the following questions were asked: 1) do you feel that your child
benefitted from this training; 2) do you feel that you benefitted from receiving training; 3) approximately how much time did you spend a day working on joint attention with your child; 4) approximately how many days per week did you spend working on joint attention with your child; 5) would you want your child to participate in future studies, similar to this one; and 6) how do you feel about having a researcher in your home. At the bottom of the questionnaire was a spot for the parents to insert additional comments and thoughts about the study. See Appendix B.

Fidelity of Implementation

Fidelity of implementation was scored by reviewing video and scoring the trainer’s behavior for a percentage of the sessions. This measure assessed correct execution of joint attention bids by the researcher and correct application of contingencies following the child’s response. See Appendix C for an example of the data sheet.

Design

A concurrent multiple probe across two participants was utilized. A nonconcurrent replication was used for the third participant. A baseline probe was used to save time overall, and to avoid extensive baseline sessions for the children. Session data was collected during baseline, response training intervention, and at follow up. See Appendix D for example of data sheet used. Baselines were staggered across participants in order to control for extraneous variables, maturation, and exposure to the treatment. Dakota was in baseline for 6 sessions or 20 days. She was in intervention for 24 sessions or 60 days. Riley was in baseline for 70 days and had 14 probe sessions during that time. He was in intervention for 24 sessions which was 68 days. Connor was in baseline for 6
sessions, lasting 14 days. He had 13 intervention sessions which was 42 days. Initiation probes took place at the end of every session to evaluate whether or not the child would point or shift eye gaze with the trainer without any previous training. Dakota’s follow up took place 2 months after the completion of intervention, due to a family situation which prevented her from receiving follow up at the one month marker. Riley’s follow up sessions took place 1 month after the completion of intervention and Connor’s follow up sessions are expected to take place approximately 1 month after intervention.

Procedure

Preference assessment. A multiple stimulus-without replacement, preference assessment (MSWO) (DeLeon & Iwata, 1996) was conducted with all participants. The procedures for the MSWO followed protocol as described in Carr, Nicolson, and Higbee (2000). At the beginning of each preference assessment session the investigator placed a linear array of eight stimuli on the table in front of the participant. The eight stimuli included in the array were picked using parents’ suggestions and the trainers’ knowledge of what may serve a reinforcing function (visual display, sound, etc). The children were asked “What do you want to play with?” All participants picked a stimulus with the first instruction. After the stimulus was selected, the child was allowed access to the item for 10-s and then it was removed from the array. Any attempt to select more than one stimulus at a time was blocked and the initial verbal instruction was repeated.

Following the selection of a stimulus, the remaining stimuli were repositioned in a quasi-randomized manner. This process continued until all stimuli were selected and was conducted a total of three times during the session. The child’s choices were ranked from first picked which was recorded as a 1 (highest) to last pick which was recorded as an 8.
(lowest). Overall ranking of stimuli was computed from the aggregate of the three rankings. For instance, if a bear was chosen 1st, 3rd, and 2nd, the average of these scores was 2. If, during the same assessment a car was chosen 3rd, 1st, and 1st, the average of these rankings was 1.66. Thus, the car would be ranked as most preferred (1st) and the bear would be ranked second. The stimuli were considered high preference if ranked in the top five and were utilized during training. The preference assessments were conducted before the first baseline session. An additional MSWO was conducted for Riley and Connor, due to decreases in data which suggested that the stimuli were no longer exhibiting reinforcing properties. The toys were placed in a basket and the children did not have access to the stimuli outside of training sessions with a researcher.

During the preference assessment the trainer worked on building rapport with the child. The trainer used this opportunity to pair herself with the preferred items in order to establish them as a conditioned reinforcer. Building rapport was important in order to ensure that the trainer’s attention serves as reinforcement for the child.

_Baseline_. Baseline measures took place approximately three times a week (with the exception of the participants being sick or going out of town in which 1 or 2 sessions occurred), with each session lasting 15 minutes. Upon arrival at the child’s house, the researcher asked the child “Are you ready to play?”. The child was then directed to the table and given toys to play with while the trainer set up the stimuli and video camera and then the session began. The child sat on one side of the table and the therapist sat on the opposite side. Next to the trainer was a basket with the toys identified as highly preferred during the MSWO. The child was assessed on the six target behaviors listed previously.
The trainer provided five opportunities for the child to respond to each of the 6 targets resulting in 30 trial presentations during all sessions. These targets were randomly dispersed throughout the session; no more than 2 trails of the same target were conducted consecutively. If an error occurred, the trainer marked the trial as incorrect and presented the next trial. The child’s response was scored as correct or incorrect, however, no consequence was provided for correct, incorrect, or no response. Prior to presenting the discriminative stimulus for targets 5 and 6, the researcher gained the child’s attention by saying his or her name with a stimulus near her eyes to gain the child’s attention (this was later faded out) and then turned and pointed or shifted eye gaze to an item to the left or right of the child. An example of target 1 looked as follows: the child was already playing with a toy and then the trainer placed the child’s hand on a different toy than the child was currently engaged with (discriminative stimulus) and waited to see if the child started to manipulate the new toy within 5 seconds. The child was given 5 seconds to emit a target response (such as engaging with the toy or making eye contact). Inclusion in this study required that the participants did not have an average above 40% correct for all responses during baseline. Once baseline was stable for the Dakota, response training was implemented. Riley continued in baseline until desirable changes in level and trend were observed for the first child. Because Connor’s baseline was nonconcurrent he started independent of Dakota and Riley.

**Response training.** Intervention consisted of Response Training of 15-20 minute sessions, in which the participants were taught to respond to protodeclarative joint attention bids from a researcher trained in both DTT and PRT methodologies. Response training involved teaching the child to respond appropriately to joint attention bids
provided by the researcher. For example, when attempting to evoke a JA response from the child (orienting, engaging the item), the trainer may have put the child’s hand on a toy; the appropriate response was for the child to engage with the newly presented toy for at least 5 seconds.

A trial started with the delivery of the discriminative stimulus (SD) and an opportunity for the child to respond. During the first session for all participants the first 3 trials were presented and an initial prompt was provided followed by praise for engaging in the desired response. When the child responded correctly (manipulated or engaged with an object for at least 5 seconds, gave eye contact to trainer, shifted gaze in direction of trainer’s point or eye gaze) the trainer provided a variety of social positive statements for approximately 5 seconds. If the child did not emit the desired response within 5 seconds, a correction procedure was implemented, using a least-to-most prompting hierarchy. The trainer provided a gestural prompt, such as modeling the appropriate response, blocking another stimulus, and/or pointing, and then a physical prompt, such as physically moving the child’s face to orient to an item. Following a correction procedure a statement such as “thank you or good job” was provided to the child with less inflection than when the skill was demonstrated independent of error correction. Implementation with Dakota varied from the above procedure slightly, in that every time error correction was used for a target, the following trial for that target was started with a prompt. Starting with a prompt resulted in limiting the number of opportunities she had to respond correctly (this will be discussed further in the discussion section). Following each trial (prompted or unprompted) an intertrial interval of 5-10 seconds elapsed prior to the start of the next trial. During this time the trainer recorded the child’s response as correct or
incorrect. The targets were randomly dispersed throughout the session; thus, all five opportunities for one target were not given in sequence and no more than 2 consecutive trials for a target were given. Mastery criteria for all targets were met when each child got 80% for three consecutive sessions. After a skill was mastered, it was continued throughout until all targets were mastered and all prompts were faded. Training sessions were video recorded in order for scoring and interobserver agreement to be calculated later.

Initiation Probes

Initiation probes were conducted at the end of every second session throughout the training period and at follow up. The trainer placed an attention grabbing and/or obscure object out of reach from the child (Taylor & Hoch, 2008). An example of a stimulus that was used is a Phlat ball, which is pressed down into a flat disc and after 5-10 seconds pops open into a ball. The trainer pretended to collect data and watched to see if the child made any joint attention initiations, such as looking at the trainer and then pointing to the stimulus or looking at the stimulus and then at the trainer. If the child did initiate joint attention the trainer provided verbal praise and a statement about the stimulus, for example, “Nice job Sue, that is a neat toy!” If 30 seconds passed and the child did not make an initiation then the stimulus was removed and the session was ended. In the event that a child engaged in a JA initiation during response training (outside of the initiation probes), the trainer provided social positive attention in an attempt to make this response more probable in the future while not explicitly targeting/training initiations. It was noted in the daily notes if initiations occurred during the session.
Follow up

Follow up measures were collected 2 months after completing response training for Dakota and were collected 1 month after completing response training for Riley. Connor’s follow up data have yet to be collected but will be collected approximately 1 month after the completion of his training. Follow up adhered to the same protocol as baseline. Three, 15 minutes sessions were conducted at follow up using the same stimuli that was used during baseline/intervention.

Parent Training

The parents of Dakota and Connor received parent training within 1 week of their child completing intervention. Riley’s parents received parent training after their child completed follow up, in order to assess whether or not the parent training had any affect on maintenance of the responding to joint attention skills. The training took place in-home after the completion of responding to joint attention training. The training sessions lasted between 1.5 and 2 hours and followed behavior skills training (BST) protocol. Behavior skills training consisted of giving instructions, modeling the desired behavior, having the parent rehearse the skills with the trainer and with their child, and providing feedback to the parent.

Training began with providing details to the parents about responding to joint attention, including why it is important and what it looks like. The parents were given definitions on the targeted responses (targets 1-6 above). Next the trainer modeled how the parent should initiate joint attention in order to get the desired responding from their child. The primary researcher modeled the targets with the parent playing the role of the therapist and the trainer playing the role of the child. The child’s preferred toys were
used as the stimuli during the modeling and rehearsal phases. The researcher modeled target 1, then the parent rehearsed target 1, and the trainer provided feedback. This process was completed for all 6 targets. After completing all 6 targets the parents went through all targets with their child and the trainer provided feedback and answered any questions that the parents had.
Results

Mean of Sessions

The use of PRT and DTT to train responding to joint attention skills proved to be effective for all 6 targets across all 3 participants. The averages of all 6 targets for each session were calculated in order to determine the average for a session and the overall progress for all of the targets. For example, if the participant responded correctly on 20% of opportunities for target 1, 40% for target 2, 20% for target 3, 60% for target 4, 0% for target 5 and 0% for target 6, these percentages were added together (totaling 140) and then divided by 6 resulting in a score of 23.3% for the session. During baseline Dakota had a mean of 28.7% for all targets (see Figure 1). Her mean during intervention was 68.5% and her mean during follow up fell to levels similar to baseline with a mean of 24.4%. Riley’s mean during baseline was 26.7% and his mean increased to 76.9% during intervention. His follow up mean was 16.6% (see Figure 1). Connor’s mean during baseline was consistent with Dakota and Riley with 29.4%, only slightly higher than Dakota. His mean during intervention was also consistent with the other two participants with 73.8% (see Figure 1). No follow up data is available for Connor at this time.
Figure 1. Average of all six targets per session for Dakota, Riley, and Connor.

BL=Baseline, RT (A)= Response training with stringent criteria, and RT= Response training as described in the procedure section.
Participant 1

Data for Dakota showed that she was able to acquire all six targets by the conclusion of the intervention. During baseline target 1 displayed a downward trend. At the start of intervention target 1 was at 0% (see Figure 2). Targets 2 and 3 leveled out at 40% prior to the start of intervention. Target 4 was on an upward trend during baseline, as this was a skill that was already in Dakota’s repertoire prior to starting the study (see Figure 3). During baseline targets 5 and 6 stayed at 0% for all six sessions. The procedure protocol required initial prompting for the first three trials for all targets. The stringent procedure resulted in low percentages of independent-correct responding during the first session for all participants. No initial prompting was conducted for target 4 because this was a skill that Dakota was exhibiting during baseline, however, a drop in the data occurs during session 9 (3rd intervention session) from 80% to 20%. It is not clear why Dakota responded poorly during this session. Dakota mastered targets 1 and 2 after 12 intervention sessions. She mastered targets 3 and 4 after 7 sessions. Targets 5 and 6 took much longer for Dakota to master. She mastered target 5 after 19 sessions and target 6 after 21 sessions (see Figure 3).

A second phase line was put in for Dakota due to a slight procedure change. The change is referred to as response training A in the graphs. The data displayed a drop to 60% during session 21 for target 2 and during session 22 for target 3. The data for target 5 were variable, between 60% and 20% and target 6 was leveled at 0%. The drops and variability in the data were determined to be a result of the restrictiveness of the procedure. The procedure required that after an error occurred, the trainer immediately provided a prompt with the presentation of the SD for the next trial for that target. For
example, if an error occurred for target 2 the next presentation of target 2 the trainer would tap the item and then immediately put her hand on the item to begin playing with the toy. If Dakota made one error with one target then the highest percentage she could obtain would be 60% for that session. Two errors would result in the participant getting 20% for the session. A phase line was put in and the procedure described above was used for the remaining sessions. This change allowed Dakota to have more independent opportunities to respond, which resulted in her mastering target 5 in 3 sessions and target 6 in 5 sessions. After the change in procedure targets 1-3 stayed at 80% or higher until the end of intervention (see Figure 2).

During session 24 Dakota dropped to 60% for target 4. Dakota was observed to attend little during this session. She looked out the window quiet often and her little brother knocked on the door, which was seemingly distracting to her.

Dakota’s parents received parent training within 1 week of her completing intervention and 2 months later, follow up data were taken. During follow up Dakota presented levels similar or higher than baseline for targets 1-3 and 5-6 and for target 4, she presented levels at follow up that were lower than what was seen during baseline (see Figure 2 & 3). For target 1 she averaged 30% during baseline and for follow up she averaged 46.7%, slightly higher than baseline. For target 2 she averaged 26.7% during baseline and averaged 33.3% during follow up. For target 3 she averaged 35% and during follow up she averaged 33.3%. Targets 3 and 4 were on a downward trend at the end of intervention. The average for target 4 during baseline was 80% and during follow up it was 33.3%. The average for targets 5 and 6 during baseline was 0% and during follow up was also 0%. This will be discussed further in the discussion.
Figure 2. Targets 1-3 for Participant 1. The circles indicate when stimuli were changed.
Figure 3. Targets 4-6 for Participant 1. The arrows indicate when prompts were faded and the circles indicate when stimuli were changed.
**Participant 2**

Probes were conducted during baseline for Riley in an effort to shorten the exposure to baseline testing. During baseline target 1 was between 40% and 60%, with the exception of session 1 where it was 100% and was on a slight downward trend (see Figure 4). Targets 2 and 4 showed quite a bit of variability with a range between 80% and 0% during baseline. Although the data points for target 2 were variable they were on a downward trend (see Figure 4). Target 4 displays a slight an upward trend at the start of intervention. Target 3 was moderately variable during baseline with a range between 60% and 0% and displayed a downward trend. Target 5 had one session at 20% and all other sessions were at 0% and target 6 maintained at 0% throughout baseline (see Figure 5). As with participant 1, the first 3 trials of each target were prompted during the first session of intervention.

During intervention, target 1 ranged from 40% to 100%, showing only moderate variability. Target 2 had dips during session 34 and 37 to 60% but maintained between and 80% and 100% after that (see Figure 4). Quite a bit of variability was seen for target 3, ranging between 40% and 100%. After mastering target 3, he dropped to 60% during sessions 41 and 48. Target 4 had one drop to 60% during session 48. Targets 5 and 6 alternated between 80% and 60% after mastery for several sessions. These dips in data are thought to have been due to a motivational issue because he had already mastered the targets and variability was still seen. Riley mastered targets 1 and 2 after 4 sessions. He mastered targets 3 and 4 after 8 sessions. Similar to Dakota’s data, it took Riley longer to master targets 5 and 6. He mastered target 5 after 14 sessions and target 6 after 12
sessions. The sessions continued after mastery in order to fade out the embedded prompts (objects near eyes and then nose) for targets 4, 5 and 6.

No parent training was conducted with Riley’s parents following completion of the intervention phase. Target 1 maintained at 40% throughout follow up which is well below the average for baseline of 52.9%. Targets 2 and 3 show a downward trend during follow up. Riley averaged 35.7% during baseline for target 2 and averaged 26.7% during follow up. He averaged 34.3% during baseline for target 3 and averaged 26.7% during follow up. Target 4 shows a slight increasing trend, however, the data points are well below what was seen during baseline. He averaged 35.7% during baseline and had an average of 6.7% during follow up. Targets 5 and 6 returned to 0% and maintained at 0% throughout follow up.
Figure 4. Targets 1-3 for Participant 2. The circles indicate when stimuli were changed.
Figure 5. Targets 4-6 for Participant 2. The arrows indicate when prompts were faded and the circles indicate when stimuli were changed.
Participant 3

Connor had slight variability for target 1, ranging between 80% and 40% during baseline, but he was on a downward trend prior to intervention (see Figure 6). Target 2 displayed moderate variability and ranged between 60% and 0% and was on a downward trend at the start of intervention (see Figure 6). Target 3 ranged between 40% and 0% and was on a downward trend at the start of intervention. Target 4 was already in the child’s repertoire at the start of the study, but it was on a downward trend at the start of intervention and ranged between 100% and 60% (see Figure 7). Targets 5 and 6 were at 0% throughout baseline.

The first 3 trials of each target, with the exception of target 4, were prompted during the first session of intervention, so it was expected that the first data points of intervention would be low. Data for targets 1-3 are quite variable dipping to 60% even after mastery (see Figure 6). It is hypothesized that this was a motivational issues rather than lacking skill acquisition based upon observation of the first author. He had already mastered the skills but was observed not wanting to take the newly presented toy. Connor had one dip during intervention for target 4, due to prompt fading, and then maintained at 100% (see Figure 7). The data for target 5 displayed a dip to 20% during session 12 but maintained an upward trend throughout. Target 6 was on an upward trend throughout intervention and maintained at 100% after mastery (see Figure 7). Connor mastered target 1 in 5 sessions. It took 12 sessions for Connor to master target 2. Connor mastered targets 3 and 4 in 6 sessions. Target 4 required 6 sessions due to the fading of prompts (from eye level to nose level) which occurred during the second session (before mastery). Target 5 was mastered after 11 sessions, and target 6 was mastered after 9
sessions. With the exception of the second target, targets 5 and 6 were acquired after the other targets met mastery. Connor’s data was consistent with the performance seen with participants 1 and 2. No data have been collected on follow-up for Connor at this time.
Figure 6. Targets 1-3 for Participant 3. The circles indicate when stimuli were changed.
Figure 7. Targets 4-6 for Participant 3. The arrows indicated when prompts were faded and the circles indicate when stimuli were changed.
Multiple-Baseline and Nonconcurrent Replication

Dakota and Riley completed intervention in 25 sessions and Connor completed intervention in 14 sessions. Dakota and Riley mastered their skills in a very similar order. Dakota mastered target 4 (eye contact was strong when she started the study) then target 3, next targets 1 and 2, and finally targets 5 and 6 (see Figure 8). Riley mastered targets 3 and 4, then targets 1 and 2, and finally targets 5 and 6 (see Figure 8). Connor mastered targets in a slightly different order, he mastered targets 1 and 3, then target 4 (eye contact was strong when he started the study and prompts were faded out early), then targets 6 and 5, and finally target 2 (see Figure 8). For all three participants targets 5 and 6 were acquired after most of the other targets, although it is less dramatic with Connor. In figure 5 you can see dips in the data to 60% during intervention. These dips were more prevalent for Riley and Connor and occurred one time for Dakota during the second phase of intervention (same procedure used for Riley and Connor). The decreases for Dakota during the first phase of intervention can be related to the stringent procedure and artificial ceiling that was put in place. The variability that is seen throughout intervention will be discussed further in the next section.
Figure 8. Percentage of opportunities for correct responding for Dakota, Riley, and Connor during baseline, intervention and follow up.
Initiation Probes

Initiation probes were taken at the end of every session to see whether or not the child would begin making initiations, although this was never specifically trained. The purpose of the initiation probes was to compare with previous studies which state that initiations must be trained separately and do not develop during responding to joint attention training (Taylor et al., 2008). Dakota made eye gaze initiations; (no pointing initiations were made), during the intervention probes 41.7% of the time (see Figure 9). During baseline and follow up she made no eye gaze or point initiations. Riley made no initiations during the probes throughout baseline, intervention, and follow up. Connor made eye gaze initiations; no pointing initiations were made, during the probes in intervention 14.3% of the time (see Figure 9). No follow up data on initiation probes are provided for Connor because he has not completed follow up.
Figure 9. Percentage of initiations made during probes in baseline (blue), intervention (red), and follow up (green) for all three participants.
Social Validity

The parents for all three participants filled out a questionnaire prior to starting the study. In the questionnaire they all felt as if this training was very important for their child and that they would all like to be involved in their child’s training. All of the parents said that they could spend greater than 30 minutes a day working with their child. Dakota and Riley’s parents stated that they could work with their child greater than 5 days per week and Connor’s parents stated that they could work with their child 3-4 days per week.

In the post-questionnaire, administered after the completion of follow up, Dakota’s parents reported that they spent less than 10 minutes per day working with her and spent 3-4 days working with her per week. The results from the social validity questionnaire determined that Dakota’s parents felt that their child benefitted from being involved in the study and that they benefitted from receiving parent training. The questionnaire also determined that Dakota’s parents would want to be involved in a study similar to this one and also liked having the researcher in their home (see Table 1).

In the comments section of the questionnaire, they stated “Dakota changed so much from this training. She now makes eye contact most of the time. She is willing to share and take turns. She will sit and listen to instructions even when she doesn’t understand what the instructions are. She responds to her name and follows simple instructions with hand gestures. With more training similar to this, Dakota will thrive in social settings.”

Riley’s parents report that they feel that he benefitted from the training provided during this study. His parents also reported that they spent 20 minutes a day working on
joint attention skills for more than 5 days a week. Working with their child 5 days a week is consistent with the pre-questionnaire but they spent less time than reported during the pre-questionnaire (see Table 1). His parents reported that they would like their child to participate in studies similar to this one in the future and that they liked having a researcher in their home. In the comments section of the questionnaire they said “Riley has improved with following a point and responding to his name—we could see the improvement…” The post-questionnaire has not been collected from Connor’s parents at this time because he has not yet completed follow up.

A parent scoring survey was also given to the parents of Dakota and Riley, Connor’s parents did not return the scoring survey and therefore no data were collected. The parent scoring survey allowed the parents to score the average percentage of time they felt their child engaged in joint attention initiating and responding. The survey enabled the researchers to determine if the parents saw a change in their child initiations or responding to initiations during play time. Dakota’s parents assessed that she made progress in the average percent of time she spent engaging in joint attention behaviors for 4 of the 5 questions. She made progress in the average percentage of time she made eye contact while playing, initiated social interaction using eye contact, responding to social initiations using eye contact, and responded to social interactions using verbalizations while playing. They reported that prior to intervention, the average percentage of time Dakota initiated social interactions using verbalizations while playing was 10% and post-intervention they reported that this was at 0%. The increase in ratings ranged from a 40% increase to a 10% increase. Riley’s parents reported an increase in all 5 questions from
pre- to post-intervention. They reported a 30% increase for 4 of the 5 questions. The other question was reported as a 20% increase (see Table 2).
Table 1

*Parent Questionnaire Results*

<table>
<thead>
<tr>
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<th>Pre</th>
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<th></th>
</tr>
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<tbody>
<tr>
<td><strong>Do you feel that this training is important to your child?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Would you like to be involved in your child’s training?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>How important do you feel it is to be involved in your child’s training?</strong></td>
<td>Very</td>
<td>Very</td>
<td>Very</td>
<td></td>
</tr>
<tr>
<td><strong>How many minutes per day is it possible for you to work with your child?</strong></td>
<td>&lt;30 mins</td>
<td>&lt;30 mins</td>
<td>&lt;30mins</td>
<td></td>
</tr>
<tr>
<td><strong>How many days per week is it possible for you to work with your child?</strong></td>
<td>&lt;5 days</td>
<td>&lt;5 days</td>
<td>3-4 days</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>Post</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Do you feel your child benefitted from this training?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td><strong>Do you feel that you benefitted from receiving training?</strong></td>
<td>Yes</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td><strong>Approximately how much time did you spend a day working on joint attention with your child?</strong></td>
<td>&gt;10 mins</td>
<td>20 mins</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td><strong>Approximately how many days per week did you spend working on joint attention with your child?</strong></td>
<td>3-4 days</td>
<td>&lt;5 days</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td><strong>Would you want your child to participate in future studies, similar to this one?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td><strong>How did you feel about having researchers in your home?</strong></td>
<td>Liked it</td>
<td>Liked it</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* The post-questionnaire was not filled out by P3 because he has yet to complete follow up. For P2 the question: “Do you feel that you benefitted from receiving training” is N/A because P2’s parents have not yet received training.
Table 2

**Parent Scoring Survey Results**

<table>
<thead>
<tr>
<th></th>
<th>P1</th>
<th>P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg % of time child makes eye contact with you while playing</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>Avg % of time your child initiates social interaction using eye contact while playing</td>
<td>50%</td>
<td>90%</td>
</tr>
<tr>
<td>Avg % of time your child responds to social initiations using eye contact while playing</td>
<td>50%</td>
<td>70%</td>
</tr>
<tr>
<td>Avg % of time your child initiates social interactions using verbalizations while playing</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Avg % of time your child responds to social interactions using verbalizations while playing</td>
<td>0%</td>
<td>20%</td>
</tr>
</tbody>
</table>

*Note. The parent scoring survey was administered before the participants started baseline and after they completed intervention (before parent training and follow up).*
Interobserver Agreement

Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

Participant 1. Reliability data were taken for 52% of all videoed sessions. Agreements averaged 97.3% across all observations, with a range of 92% to 100%.

Participant 2. Reliability data were taken for 49% of all videoed sessions. Agreements averaged 94.6% across all observations, with a range of 88% to 99%.

Participant 3. Reliability data were taken for 56.3% of all videoed sessions. Agreements averaged 96.9% across all observations, with a range of 91% to 100%.

Fidelity of Implementation

This measure assessed correct execution of joint attention bids by the researcher and correct application of contingencies following the child’s response. See Appendix C for an example of the data sheet.

Participant 1. Treatment integrity was scored for 72% of the videos that were recorded and interobserver agreement was taken for 62% of those videos. Treatment integrity for implementation of all six targets averaged 97.6%, with a range of 64% to 100%. Interobserver agreement for the trainer’s behavior was 97.6%, with a range of 95% to 100%.

Participant 2. Treatment integrity was scored for 56.3% of the videos that were recorded and interobserver agreement was taken for 72.2% of those videos. Treatment integrity for implementation of all six targets averaged 99.9%, with a range of 93% to 100%. Interobserver agreement for the trainer’s behavior was 99.4%, with a range of 97% to 100%.
Participant 3. Treatment integrity was scored for 56.2% of the videos that were recorded and interobserver agreement was taken for 50% of those videos. Treatment integrity for implementation of all six targets averaged 99.5%, with a range of 91% to 100%. Interobserver agreement for the trainer’s behavior was 98.5%, with a range of 96% to 100%. This data does not include anything from follow up, as follow up has yet to be collected.
Discussion

The purpose of the present study was to evaluate an in-home training protocol that taught the above six targets non-sequentially, to examine the effectiveness of providing a short parent training and what effects that may have on maintenance results, and to determine if training responding to joint attention would generalize to joint attention initiations. The results suggest that the targets may develop in a systematic way (5 and 6 coming on board at the end of intervention) but training concurrently is an effective way of training. Participants 1 and 2 acquired targets 5 and 6 last and participant 3 acquired targets 5 and 6 near the end of his training. The results also show that participant 1 and 3 made JA initiations during probes throughout intervention. Lastly, the results indicated that the short parent training provided at the end of intervention did not help maintain JA responding for participant 1.

Previous research taught the above six targets in a sequential order, however prior to this study there was no research to support that this was necessary. This study provides support to the previous literature, in that the participants acquired targets 1-4 prior to targets 5 and 6, with the exception of Connor. Connor acquired target 1, 3, and 4, then 5 and 6, and finally target 2. It is hypothesized that Connor took longer to acquire target 2, tapping object, not because he did not have the skill but because he was not interested in the materials being presented to him. Although preference assessments were conducted during the study (when the researcher felt the child was becoming satiated
with the materials) the items being presented were always competing with the item that
the child was already engaged with.

Whalen and Schreibman (2003) also discuss that after the child responded to a
joint attention initiation the child was given the item that he or she attended to. The
current study provided only social attention in the form of praise and tickles. The
definition of joint attention is the ability to coordinate attention between an object and a
person in a social context (Whalen & Schreibman, 2003). By providing a toy (tangible)
to the child for engaging in joint attention responding or initiating it seems you may be
reinforcing a request rather than joint attention (a shared interaction).

The results of parent training for Dakota indicates that the parent training did not
aide in maintenance of the six targets, however, follow up was taken 2 months after the
completion of training rather than 1 month. Riley’s skills were assessed approximately
one month after he completed intervention. His results conclude that he did not maintain
the joint attention responding, as was seen with Dakota. His parents received no training
until after follow up was taken, therefore, no parent training was in place to influence
maintenance performance. During the post-questionnaire his parents’ reported that they
worked with him for approximately 20 minutes a day, 5 days a week on joint attention
skills. Because they had no training after intervention it is unclear what exactly was
worked on and maintenance data show that what the parents did work on did not help
maintain the 6 targets that were taught during the study.

Initiation probes were conducted in order to determine if training responding to
joint attention would generalize to initiation of joint attention bids. Dakota had the most
initiations during these probes and also during her sessions. She pointed along with the
trainer three times during her intervention sessions and shifted eye gaze with the trainer five times during one session. Dakota also began saying novel words including her name, bubbles, and lion during her sessions. Dakota’s mother also reported that she was pointing and saying new words, such as cracker and saying numbers 1-5. This is a significant observation because Dakota was not receiving any other intervention throughout the study. Connor also made eye gaze initiations during the initiation probes but had no observed initiations during his sessions. Connor began saying novel words during the study and increased his length of utterances from 1 word to 2-3 words. Because Connor was also in therapies during the study, it is unclear whether these increases in language are linked with the study. Riley had no initiations during his probes but was observed pointing during one session. It is important to note that during the probe sessions, both Connor and Dakota only made eye gaze initiations. Pointing initiations were only made by Dakota and Riley during sessions. Pointing initiations never occurred during the probe sessions. It is unclear why eye gaze initiations would occur and pointing initiations would not.

The social validity questionnaire given from pre- to post-intervention showed Dakota’s parents found the intervention to be very important to their child, that they benefitted from the parent training and that they would want to be involved in similar studies. Dakota’s parents report that they worked on joint attention training for less than 10 minutes per day, 3-4 days per week. In their initial questionnaire they reported that they were able to work with her for more than 30 minutes per day for more than 5 days per week. The researcher was unable to determine why the parents spent less time and fewer days working on joint attention with their child.
During this study a short training was conducted to train the parents to implement the procedures discussed above, however, after this training the researcher provided no other training or follow up with the parents. Also, the parents were not given any specific instructions on how often or how much they should work with their child.

The parents also filled out a parent survey to evaluate their child’s joint attention skills (responding and initiating) during play from pre- to post-intervention. Dakota and Riley’s parents indicated that they made increases in the average percentage of time they engaged in joint attention skills while playing (see Table 2), with the exception of Dakota making initiations with verbalizations during play (which the parents indicated a decrease from 10% to 0%). No survey was filled out for Connor, as it was given to his parents but never returned during pre-intervention.

There are several limitations to this study that center on method and design. One limitation of this study is the change in procedure for Dakota. The strict procedure resulted in placing an artificial ceiling on her scores due to the inclusion of a prompt, to aide responding on trials following errors. Because of inclusion of the prompt, Dakota was not able to respond independently and thus, her % measure for the session was capped. For example, one error automatically resulted in getting 60% for that target. After removing the initial prompt (after an error occurred) from the training procedure an increase in all targets was seen.

Another limitation of this study is that the third participant was conducted as a non-concurrent replication. It would have been preferred for him to be included as part of the multiple-baseline across participants. During recruitment of participants it was difficult to find participants that qualified for the study who were able to sit in a chair for
10-15 minutes and who had little to no problem behaviors. The first three participants were found; however, the first participant was dropped prior to starting baseline because he was engaging in tantrum like behaviors, such as kicking, screaming, and crying, when left alone with the primary researcher. The other participants had already started their MSWO and were ready to start the study, therefore, the research team decided to go ahead and start them and find a third participant to be conducted non-concurrent of the other two.

The last identified limitation of this study was the participants’ involvement in other therapies. Only 1 of the 3 participants did not have any other therapies during the study. When examining collateral effects it is difficult to identify if the changes were a result of the current study or a result of other therapies they were receiving. Although the researcher communicated with the therapy providers of the participants, there is no way of knowing whether or not they refrained from working on joint attention skills during their sessions.

Future research should examine the effects of establishing and abolishing operations in relation to joint attention training. Throughout the study it was observed, although not specifically targeted, that the participants would not orient to the presented items or the items that the trainer wanted them to look at if it was competing with a higher preferred item. For example, if the child was engaged with a high preferred item and another high but less preferred at the moment was presented, then it was likely that the child would not respond (pick up the new toy and manipulate it). It was also observed that attention grabbing items, such as items that move and/or make sounds, needed to be used for targets 5 and 6 in order to gain their attention and for them to orient
to the item (Taylor & Hoch, 2008). For Dakota, the trainer had been pointing and shifting eye gaze (target 5 and 6) to an Eeyore stuffed animal and was getting little to no response from her. Once the trainer changed the stimuli to bubbles and other toys that moved or made sounds, the child’s data had a significant increase.

Future research should also examine the number of sessions or amount of time it takes for participants to acquire joint attention responding when the skills are taught sequentially in an in-home setting. More research is necessary to determine whether or not training simultaneously or sequentially is the more efficient way of training. Participant 1 and 2 acquired the targets in 25 sessions (approximately 2 months) and participant 3 acquired the targets in 15 sessions (approximately 1.5 months). Whalen and Schreibman (2003) report that response training took between 16 and 26 days when targets 1-6 were taught sequentially, however, their training took place three days a week for 1.5 hours. The current study took place three days a week for 15-20 minutes. Twenty-five sessions broken down into total number of hours equals 8.3 hours, this is the most time that intervention took for the current study. For the Whalen and Schreibman (2003) study the most time it took was 39 hours, provided the number of days is number of sessions. They provide no intervention data that would allow us to know if the number of days it took to acquire the skills is equal to number of sessions. Substantially less time was spent providing intervention to the participants in the current study and future research should expand on this by examining how much time is really necessary for children to acquire joint attention responding.

Further research should evaluate the collateral effects of training responding to joint attention bids. The study found that 2 of 3 participants were making joint attention
initiations during probes; however, it is unclear why they only made eye gaze initiations during the probes. During sessions 2 of 3 participants were also making point initiations. Further evaluation is also necessary to determine why 2 of 3 participants made pointing initiations during sessions but never during the initiation probes.

Another collateral effect of training responding to joint attention bids that should be examined is an increase in verbalizations. The primary researcher noted an increase in verbalizations for all three of the participants as they went through intervention. Dakota seemed to have the biggest increase; however, no data were collected on her verbalizations. Her caregivers reported that she was saying several novel words and she was starting to imitate words. Connor increased from saying 1 word to saying 2-3 words throughout his sessions, however, it is unclear whether or not the increase in verbalizations is a result of the study or a result of the therapies he received during the study. Riley started imitating more sounds during the study and his caregivers reported that he was saying more sounds and had began pointing. Like Connor, it is unclear whether or not Riley’s increase in vocals and pointing is a result of the study or a result of the therapies he received during the study.

A final recommendation for future research is to develop a more effective parent training protocol and to examine potential factors that would inhibit parents from working with their child. The results of this study determine that parent training did not aide in Dakota’s maintenance of responding to joint attention skills. Future research should examine the motivation of parents to work on a skill set with his or her child. It is unclear whether or not the parents worked on joint attention at all, as we rely on their verbal report and did not observe the behaviors taking place. Future research should also
examine in-situ training with the parent while they are working with the child, which would allow the researcher to provide immediate feedback to help shape the parents’ joint attention initiations. Perhaps setting up a schedule or a contract with the parents for how often they will work with the child would evoke an increase in responding on the part of the parents.

The findings of this study found that although the targets can be taught simultaneously, targets 1-4 were acquired before targets 5 and 6 (with the exception of Connor). All of the participants were able to acquire all six targets in between 1.5 months and 2 months. Previous research shows assessment data pre- and post-training but does not show the actual intervention data. The intervention data in this study allows us to see what acquisition looks like for all six targets across all three participants. Previous research has trained responding to joint attention and then has trained initiations without looking to see if any initiations started to occur during the response training. This study showed that for 2 of the 3 participants’ eye gaze initiations occurred during the initiation probes. Also, 2 of the 3 participants made eye gaze and/or pointing initiations during sessions. The current study also provides evidence that more efforts need to be taken when providing parent training in order to help the children maintain the responding to joint attention skills.
References


Appendices
Appendix A: Parent Scoring Survey

Adapted from V. Fogel & R.G. Miltenberger, 2008

Pre or Post (Circle one)

Date Administered:

On a scale of 0% to 100%, please rate the following statements:

The average percentage of time your child makes eye contact with you while playing

0  10  20  30  40  50  60  70  80  90  100

The average percentage of time your child initiates social interaction using eye contact while playing

0  10  20  30  40  50  60  70  80  90  100

The average percentage of time your child responds to social initiations using eye contact while playing

0  10  20  30  40  50  60  70  80  90  100

The average percentage of time your child initiates social interactions using verbalizations while playing

0  10  20  30  40  50  60  70  80  90  100

The average percentage of time your child responds to social interactions using verbalizations while playing

0  10  20  30  40  50  60  70  80  90  100
Appendix B: Parent Questionnaire for Pre-Training

Name: ___________________________ Date: ___________________________

Child's Name: ___________________________

Does your child currently receive therapy? If so, what therapy and for how long?


Do you feel that this training is important for your child?

Y  N

Would you like to be involved in your child's training?

Y  N

How important do you feel it is to be involved in your child's training?

Not at all  Somewhat  Important  Very important

How many minutes per day is it possible for you to work with your child?

>10 mins  30 mins  <30 mins

How many days per week is it possible for you to work with your child?

>2 days  3-4 days  <5 days

Please list your child's most preferred toys/activities

1  6

2  7

3  8

4  9

5  10
Appendix C: Parent Questionnaire for Post-Training

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<th>Question</th>
<th>Options</th>
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<td>Name:</td>
<td>Date:</td>
</tr>
<tr>
<td>Child's Name:</td>
<td></td>
</tr>
<tr>
<td>Do you feel that your child benefitted from this training?</td>
<td>Y, N, Don't Know</td>
</tr>
<tr>
<td>Do you feel that you benefitted from receiving training?</td>
<td>Y, N, Don't know</td>
</tr>
<tr>
<td>Approximately how much time did you spend a day working on joint attention with your child?</td>
<td>&gt;10 mins, 30 mins, &lt;30 mins</td>
</tr>
<tr>
<td>Approximately how many days per week did you spend working on joint attention with your child?</td>
<td>&gt;2 days, 3-4 days, &lt;5 days</td>
</tr>
<tr>
<td>Would you want your child to participate in future studies, similar to this one?</td>
<td>Y, N, Don't know</td>
</tr>
<tr>
<td>How did you feel about having researchers in your home?</td>
<td>I liked it, It was difficult/inconvenient, No opinion</td>
</tr>
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Additional Comments:
## Appendix D: Data Sheet for Trainer Behavior

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<thead>
<tr>
<th>Target</th>
<th>Trainer Behavior</th>
<th>Error correction</th>
<th>Provide Social Statement</th>
<th>Opportunity given</th>
<th>Prompting procedure correct</th>
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### Eye Contact

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### Follow gaze

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<th>Provide Social Statement</th>
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67
Appendix E: Data Sheet for Child Behavior

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<th>Engaged with toy</th>
<th>Manipulates new toy (5s)</th>
<th>Error Correction</th>
<th>Correct</th>
<th>Follow point</th>
<th>Engaged w/ Toy</th>
<th>Makes eye contact</th>
<th>Turn head in direction of trainer’s point</th>
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