THE EFFECTS OF A REMOTE CONTROL TACTILE FEEDBACK SYSTEM ON CONVERSATION SKILLS IN CHILDREN WITH AUTISM

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A few studies have examined the effects of a remote control tactile device (RCT) as an unobtrusive prompting method used to promote skills such as verbal initiations and play behaviors in children with autism. To date, however, no published studies have investigated the effects of the RCT as a consequence to increase and maintain conversation skills. This study was designed to determine whether the RCT, in conjunction with common training techniques (i.e. roleplays, visual feedback, and sibling coaching), could be used as a discrete and unobtrusive feedback system to promote conversation skills in high functioning children with autism. Results found that the RCT and training packages were effective in initially increasing rates of target responses. The effects however, did not always maintain with a return to baseline. Programming “naturally” maintaining communities of reinforcement was found to be a critical factor in the maintenance of the conversational responses.
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CHAPTER I
INTRODUCTION

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), some of the defining characteristics of autism include deficits in nonverbal behaviors such as eye-to-eye gaze and facial expression as well as deficits in verbal behaviors such as the ability to initiate or sustain a conversation with others (American Psychiatric Association, 1994). Unfortunately, such deficits make it unlikely that children with autism will develop strong, supportive peer social networks that are imperative to the everyday functioning of typically developing persons. In an attempt to build social networks for children with autism, much research has been conducted examining ways in which peers can be trained to initiate or respond to individuals with autism (e.g., Kohler et al., 1995; Kohler, Strain, Maretsky, & DeCesare, 1990; Kohler, Strain, & Shearer, 1992; Strain, Shores, & Timm, 1977). A small body of research has also been devoted to training siblings as social partners. Given the usual closeness in age and intense relationships between siblings, the use of nonhandicapped siblings as resources may offer great benefits to the child with autism, fostering behaviors such as social and play interactions (Celiberti & Harris, 1993). Research has shown that, through a variety of teaching techniques (e.g. coaching, modeling, roleplays, instructional feedback, group discussion and problem solving, and self monitoring and group contingency management) typically developing siblings can be trained to effectively reciprocate, initiate, and sustain social interactions with their sibling with autism (Baker, 2000; Celiberti & Harris, 1993; Clark, Cunningham, & Cunningham, 1989; Coe, Matson, Craigie, & Gossen, 1991; James & Egel, 1986; Schreibman, O’Neill, & Koegel, 1983). However, this body of research is limiting in two ways: first, many of these training packages involve the use of a change agent which interrupts the flow of the social interaction,
often resulting in the termination of the child-child interaction (see Strain & Kohler, 1999).

Second, much of the social skills training literature is focused on preschool and early childhood interactions, which typically involve short play exchanges (e.g., Kohler et al., 1995; Kohler, Strain, Maretsky, & DeCesare, 1990; Kohler, Strain, & Shearer, 1992; Odom, Hoyson, Jamison, & Strain, 1985; Strain, Shores, & Timm, 1977; Strain & Timm, 1974; Zanolli, Daggett, & Adams, 1996). As children get older, however, it is important that they are able to initiate, respond to, and maintain conversations, even when the topic may not be of particular interest to them. Unfortunately very little research currently exists using siblings or peers as conversational partners for children with autism.

In addition, a review of the literature found that very few researchers have targeted preadolescent or adolescent individuals with disabilities and focused on improving critical conversation skills such as eye gaze, staying on topic of conversation, asking questions, and facial expression (e.g. Gaylord-Ross, Haring, Breen, & Pitts-Conway, 1984; Gena, Krantz, McClannahan, & Poulson, 1996; Hunt, Alwell, & Goetz, 1988; Koegel & Frea, 1993; Williams, 1989). While a number of various techniques have been effective in teaching social and communicative interactions (e.g. self-management training, peer training, priming, script training, video modeling, and a tactile prompting device), the close physical presence of an adult to facilitate these interactions often stands in the way of creating normal childhood relations. That is, the adult or teacher may become part of the stimulus control of social interactions and the adult’s prompting and reinforcing techniques often interfere with the current ongoing interaction, resulting in a disruption or termination of the interaction (see McClannahan & Krantz, 1997; Oke & Schreibman, 1990).
In response to this obstacle, several researchers (Bingham-Watts, 1999; Russo, 1999; Shabani et al., 2002; Taylor & Levin, 1998) have investigated the effects of a less intrusive, tactile prompting procedure. Taylor and Levin were the first to use a tactile prompting device to teach a child to emit statements about play activities. The prompting device was a two part apparatus consisting of a transmitter and receiver. When activated, the receiver component slightly vibrated. First, the child’s hand was placed upon the device. The device was then activated every 60 s, and upon each activation, the child was physically prompted to turn his head toward the teacher and emit a statement about the current play activity. Using a most-to-least prompting hierarchy, prompts were faded, until the child emitted a verbal statement each time the device was activated. Over time, the child was taught to emit verbal statements when the device was activated while placed in his pocket. The experimenters compared the resulting number of verbal statements across three conditions: no prompt, verbal prompt only (fixed-time 60 s), and tactile prompt only (fixed-time 60 s). Results found increases in verbal statements during the tactile prompting condition, but decreases during the return to baseline.

In a replication of Taylor and Levin (1998), Shabani and his colleagues (2002) reported similar results using the tactile device as a discrete prompting strategy. Shabani et al. evaluated the effects of the tactile device in play contexts with typically developing peers and extended the Taylor and Levin study by including more participants and by attempting to systematically fade the number of tactile prompts while maintaining high rates of verbal initiations. Using normative data as a guide, the frequency of prompts was reduced based on the frequencies of peer initiations. Results were that verbal initiations and, to a lesser degree, verbal responses to peer initiations increased during tactile prompting conditions. However, attempts at fading the prompting device were not successful.
Bingham-Watts (1999) examined the effects of a prompt package including a remote control tactile prompting device (RCT) and script cards to teach a child with autism to initiate verbal statements across six different activities. First, the RCT was activated for 3 s and a script card containing an initiation statement was then turned over by the experimenter. Using a decreasing time-delay procedure, the experimenter provided a gestural prompt so the child would read the written script. After the child read the script, the experimenter and child engaged in that activity. When the child was consistently initiating without having the written script card turned over, the cards were removed from the setting and the child emitted initiation statements in response to the RCT rather than the written scripts. Eventually, the child emitted statements in the presence of certain activities prior to the activation of the RCT. In a latter phase of the study, the RCT was removed from the experimental setting. Results showed increases in the number of unprompted initiation statements emitted by the child. In addition, when the RCT was removed, the frequency of unprompted initiations remained high, and these results were found to generalize across people.

In a further examination of the RCT as a discrete prompting device, Russo (1999) examined the effects of an intervention package consisting of tactile, gestural and textual prompts on the play requesting behavior in a child with autism. Similar to Bingham-Watts (1999), Russo activated the RCT for 3 s, then turned over a written script card containing a play initiation statement. The child was then prompted to read the script, and the experimenter would then model several behaviors related to the context of the play materials. Following 2 min of interactive play, the experimenter again activated the RCT and turned over a second script card containing an additional play request for the same set of materials (i.e. “How else can we play with this?”). The experimenter then modeled additional behaviors related to the theme. The
proximity of the written script cards to the child was gradually faded until the cards were placed face down, across the room. During an RCT only condition the experimenter presented the child with a set of stimulus materials, said “let’s play”, and activated the RCT for 3 s. The experimenter then responded to all verbal and physical exchanges emitted by the child. After 2 min elapsed, the RCT was activated for 3 s. This procedure was implemented for three sets of stimuli, for a total of 5 min each. During a final intervention, the experimenter reintroduced the script cards and then faded them out. However, during this condition the experimenter no longer responded to unscripted play requests emitted by the child.

The results showed that the RCT as a prompting device was effective in increasing the number of play requests across different play activities. In addition, the duration of interactive play, the number of play theme topographies, the number of play action topographies and the number of typical play statements increased, while the number of atypical play statements decreased.

A review of the literature found only one study in which a RCT had been used as a consequence. Wheat (2000) paired the RCT with previously established reinforcers in an attempt to condition the neutral stimulus as a reinforcer. Eye contact, instruction following, and verbalizations were the dependent measures in this study. In the first phase of the experiment, a series of test probes were conducted to determine if the RCT was, in fact, a neutral stimulus. During the second phase of the experiment, pairing and testing conditions were alternated in that the RCT was either paired with an established reinforcer, or tested for effectiveness in the absence of a reinforcer. The experimenter utilized a delayed conditioning method in which the RCT was presented contingent upon a target response, and, dependent upon the ratio schedule in effect, the established reinforcer immediately followed the delivery of the RCT. Results showed
that, after some pairing conditions, the frequency of the target responses were higher during the RCT probes conducted after pairing conditions as compared to probes conducted prior to pairing conditions. In addition, the results showed that the RCT is a device that may be used as a discrete and unobtrusive conditioned reinforcer, providing an alternative method of delivering reinforcers during social interactions or group situations.

All of these studies (Bingham-Watts, 1999; Russo, 1999; Shabani et al., 2002; Taylor & Levin, 1998; and Wheat, 2000) suggest that there may be several advantages to using a tactile device to promote social interactions in children with autism. First, the RCT appears to be a device that can be activated discretely and unobtrusively, thus eliminating problems associated with the presence of an adult. Second, the device can be used to promote a variety of social responses. Third, with appropriate programming the device can function as either a prompt or consequence for responses. However, as seen in the social training literature, effects of the RCT on social interactions do not always maintain (e.g. Shabani et al., 2001; Taylor & Levin, 1998). This has prompted some researchers to take a closer look at the communities of reinforcement that maintain those social responses (Baer & Wolf, 1970; Kohler & Greenwood, 1986).

Previous research has discussed the importance of using normative data as a reference point for individuals with disabilities (Minkin et al., 1976). The use of this data not only lends to the social validity of a study, but also gives researchers important information regarding the stimulus conditions under which a response occurs. Therefore, an important consideration when training persons with autism is to include the use of normative data as a guide for the topography, frequency, and duration of specific behaviors. Of the literature that has been discussed here, only two studies (Shabani et al., 2002; and Zanolli et al., 1996) reported the use of normative data as a reference for the participants with autism. Other studies have used parents
or outside judges to rate social or play interactions (Baker, 2000; Celiberti & Harris, 1993; Clark et al., 1989; Gena et al., 1996; James & Egel, 1986; Koegel & Frea, 1983; Oke & Schreibman, 1990; and Schreibman et al., 1983). While the use of judges does provide researchers with information regarding society’s acceptance of certain skills or interactions, it does not necessarily provide specific information as to how typically developing persons might respond under those conditions.

The purpose of the present research was to study the effects of the RCT, in conjunction with empirically validated treatment methods (i.e. roleplay, self-management, and sibling coaching; e.g. Celiberti & Harris, 1993; Clark et al., 1989; Coe et al., 1991; James & Egel, 1986; Koegel & Frea, 1983; Kohler et al., 1990; Oke & Schreibman, 1990; Strain et al., 1977; Williams, 1989), as a discrete and unobtrusive consequence following targeted conversational skills in adolescents with autism.
CHAPTER II

METHOD

Participants

Two sibling dyads participated in this study. Sibling dyad one consisted of a female subject, aged 11, diagnosed with Asperger’s syndrome (Participant 1), and her typically developing sister, aged 12. Sibling dyad two was a 12-year old female with Pervasive Developmental Disorder (Participant 2) and her typically developing 10-year old brother. Participant 1 was born 4 months prematurely and suffered from retinopathy of prematurity. She began wearing corrective lenses at an early age, and is legally blind without glasses. In addition, she was diagnosed with Pervasive Developmental Disorder at age 5. Since that time, she received a combination of speech services, vision services, and occupational therapy. She had also been receiving behavior analytic intervention for approximately 4 years. In addition, she attended a social skills training group at school, led by a school counselor twice per month for about 30 min. At the start of this study, Participant 1 was fully included at school, and was attending an after school program focusing on self-management, social, and daily independence skills for approximately 6-8 hours per week. However, by the end of the study, she was only occasionally attending the after school program (approximately 2-3 times per month) and all other services, except for the small group social skills had been discontinued.

Participant 2 was first diagnosed with autism at age 5 and had been receiving special services since age 3. Over the course of the previous 10 years, she had received speech therapy, occupational therapy, physical therapy, and special education instruction. In addition, she had been receiving behavior analytic intervention for approximately 4 years. At the start of this study, Participant 2 was receiving occupational therapy and approximately 6 to 9 hours a week of
in-home behavior analytic treatment services. In addition, she attended the same after school program as Participant 1, focusing on self-management, social, and daily independence skills for about 6-8 hours per week. Her participation in these services remained constant throughout the study.

Both of the typically developing siblings who participated in this study performed well in school and exhibited normal, active social lives engaging in a variety of play and leisure activities. Sibling 1 was an honor student who was also involved in orchestra and cheerleading. Sibling 2 was an above average student who was actively involved in soccer and baseball.

Setting

The study took place in each participant’s home. For sibling pair 1, experimental sessions were conducted in the family room furnished with a couch, love seat, coffee table, and entertainment center. For sibling pair 2, sessions took place in the children’s play area, which was a large room with two couches, a coffee table, entertainment center, book shelves, a computer, a stair master, and a foosball table. The siblings were seated across from each other on the floor around a large square coffee table in the center of the room. An easel was placed on the table, in between the two children and a book illustration was clipped onto the easel to allow for easy viewing.

Apparatus

The receiver component of the Remote Control Tactile Stimulus (RCT) consisted of a small plastic box three inches long by two inches wide by one inch thick. The interior of the box contained a battery holder and two AA batteries, a vibrating mechanism, and a circuit board. The box was attached to an adjustable belt that could be worn around the waist. A small, unmarked power button was located on the side of the receiver. When pressed “on” a small red light flashed
from the side of the receiver. Only when the power was “on” could the receiver receive a remote
signal from the transmitter. The transmitter was a hand held mechanism that was rectangular in
shape, three inches long, by one inch wide, by one inch thick. A two-inch antenna extended from
the top of the transmitter. Two small buttons labeled “pager” were located in the center of the
transmitter. Either button could be pressed to activate the transmitter. The receiver began silently
vibrating as soon as the transmitter button was pushed and continued to vibrate until the button
was released. A signal could reliably be sent from a distance of two miles. Appendix B provides
a diagram of the RCT.

Materials

This study required a total of 46 detailed illustrations from children’s picture books and a
small easel to place the pictures on. The purpose of the illustrations was to serve as topics of
conversation and to provide some consistency with regard to experimental control.

A Sony Digital 8 video camera recorder was used to videotape all experimental sessions.
The DCR-TRV140 was placed upon a tripod, located approximately 10 to 20 feet from where the
conversation took place. Two Radio Shack timers, the Dual Timer (set for 5 min) and the
Talking Timer (set at 30 s intervals) were used to time each conversation session.

Immediately following each session, the participant and her sibling were allowed to pick
a prize from a “grab bag” that contained four items. The grab bags contained items such as word
puzzle books, playing cards, bookmarks and candy. Once an item was chosen, it could not be put
back in the bag in order to choose a different item, and the three remaining items were kept in the
bag until chosen. Therefore, only one novel item was added to the bag prior to each session.
Prices for the items ranged from .50 cents to $7.99. To ensure that the items earned were
consistent with the interests of each child, each had a separate bag from which to choose.
Dependent Measures

Data were collected on three behaviors: eye contact or facial orientation, question asking, and smiling. Due to Participant 1’s vision difficulties, facial orientation was chosen as a target response. Facial orientation was scored when the child’s face moved right, left, up, or down to meet the sibling’s face. Facial orientation may have included complete or partial orientation of the child’s eyes to the sibling’s eyes. Facial orientation could occur at any time during the conversation, by itself, or in conjunction with another target behavior. For Participant 2, eye contact was scored when the child’s eyes moved up, down, left, or right to meet the sibling’s eyes. If the child’s face and/or body was already oriented toward the sibling, but the child’s eyes were not visible, an abrupt eyelid movement up or down toward the direction of the sibling’s eyes was scored as onset. Eye contact could occur at any time during the conversation, by itself, or in conjunction with an utterance or smile. The second target response for both participants was question asking, and was scored when the child either (a) asked a question after the sibling’s previous utterance, (b) confirmed or clarified a question or comment made by the sibling, or (c) initiated a question not related to the sibling’s previous utterance. The third target response for both subjects was smiling. Smiling at the sibling or picture stimulus was scored at anytime during the session. Smiling was defined as an upward curvature of the mouth, with teeth not required to be showing. Smiling could also occur by itself, or in conjunction with an utterance, eye contact, or facial orientation. Frequency measures were scored for all target responses. In addition, duration measures were scored for eye contact or facial orientation and smiling. The total duration of the vocal conversation was scored as well, however, separate duration measures were not scored for individual questions. See Appendix A for the complete observation code with examples and exclusions listed for each response.
Interobserver Agreement

Two reliability observers were trained to score the target behaviors. Observer 1 was an undergraduate student in behavior analysis who worked with both subjects at their after school program. Observer 2 was a graduate student in behavior analysis and worked as an in-home therapist with Participant 2. Each observer actively participated in the refining of the dependent measures and underwent approximately ten to fifteen hours of training. Training included vocal quizzes over the operational definitions, the experimenter modeling examples and non-examples of each target behavior, watching and scoring videotaped demonstrations of conversations, as well as scoring live conversations. Appendix A provides a detailed analysis of the observer training code.

Reliability data for frequency measures of the three target responses were collected in vivo during the experimental sessions, while all duration measures were scored off videotape. Reliability was calculated as the number of agreements divided by the number of agreements plus disagreements multiplied by 100. Criterion for reliability was set at a minimum of 85% per target behavior maintained across three sessions. For Participant 1, interobserver agreement for frequency measures was calculated for 42% of the total sessions. Total agreement for frequency of face orientation was 86% (range 71%-100%), total agreement for asking questions was 92.7% (range 57%-100%), and the total agreement for the frequency of smiles was 88% (range 71%-100%). Interobserver agreement for the duration of face orientation and the duration of smiling was calculated for 23% of the total sessions. Agreement for the duration of face orientation was 90% (range 76%-98%), and agreement for the duration of smiling was 86.8% (range 80%-94%). Interobserver agreement for the duration of vocal conversation for the sister dyad was calculated for 26% of the total sessions. Agreement was 96%.
For Participant 2, interobserver agreement for frequency measures was calculated for 50% of the total sessions. Total agreement for frequency of eye contact was 93% (range 50%-100%), total agreement for asking questions was 100%, and total agreement for the frequency of smiles was 92% (range 50% to 100%). Interobserver agreement for the duration of eye contact was calculated for 23% of the total sessions. Interobserver agreement for the duration of smiling was calculated for 26% of the total sessions. Agreement for the duration of eye contact was 98% (range 93%-100%), and agreement for the duration of smiling was 93% (range 75%-100%). Interobserver agreement for the duration of vocal conversation for the sister/brother dyad was calculated for 26% of the total sessions. Agreement was 89%.

**Procedures**

**Normative Samples.**

Prior to beginning the study, two samples of conversations between typically developing children were observed under baseline conditions. Two sisters aged 10 and 11 years, and a brother-sister dyad aged 10 and 12, respectively, were observed having a conversation. Each dyad was observed on two separate occasions. Data were collected on each of the four persons, and information from these videotaped observations was used to determine an age-appropriate range of the target responses for these particular stimulus conditions for the children participating in this study.

**Pre-Experimental Procedures.**

Prior to the start of the study, the experimenter spent approximately 2 consecutive hours with each sibling to build rapport and engage in positive social interactions. During this time, the experimenter also explained to the siblings the purpose of the experiment as well as the advantages and disadvantages of their participation. Advantages included taking an active part in
helping the participant learn and engage in more proficient conversation skills, and the chance to earn prizes for a small amount of work. Disadvantages included having to return home immediately after school 2 to 3 days a week for the duration of the study. During rapport building, the sibling chose games or activities that he or she wished to play with the experimenter. Examples included playing a James Bond Play Station game and driving a go-cart in the backyard of the family’s home. During the last hour of the rapport building session, the video camera was turned on to desensitize the children to the camera and to minimize reactivity during the study. Additionally, each sibling was asked to name some items of interest that they wished to earn for participating in the study. It was explained that not all desired items would be received, and that the experimenter had the final choice of items that could be earned. The siblings were offered the choice of earning an item after each experimental session, or of waiting and earning a bigger award at the end of the study. Some choices for the bigger award included a day at Six-Flags Theme Park, a day at Main Event Games, or a day out with a friend at an event of their choice. Both siblings chose to earn smaller items at the end of each experimental session.

**Baseline.**

Experimental sessions were conducted 2 to 3 times per week, each lasting 5 min. Upon arriving at the children’s home the experimenter placed the easel on the table and arranged the video camera at an angle that ensured both children could be seen in the viewfinder. The timers were then set, and the children were asked to discontinue their current activities and to come have a conversation. Once the children were seated, the experimenter made a final check with the video camera and made any necessary adjustments. The video camera was then set to start recording. At this time, the experimenter placed the illustration on the easel and then took position on the floor, approximately 5 feet in front of where the dyad was seated. The
experimenter then gave the instruction “Please discuss what is going on in the picture”.
Immediately after giving this instruction, the timers were started. While the siblings were having a conversation, the experimenter and reliability observer collected frequency data on the three target responses. At 5 min, when the Dual Timer expired, the experimenter said “Thank you, that’s all for today. You both did an excellent job and may pick out of the grab bag now.” The video camera was then turned off and the experimenter presented the children with their respective bags from which each chose an item.

**RCT and Roleplay.**

During this phase of the study, the experimenter first noted positive attributes about the participants’ current performance (i.e. “You’re a good listener”, or “You participate very well when having a conversation with your sibling.”). Then, they were asked to name one or two things that they felt they were doing well during the sessions. A rationale for engaging in “good conversation skills” (i.e. the current target behavior) was then provided. For instance, at the start of the first intervention session for eye contact, the experimenter explained that eye contact is an important skill to engage in both when another person is talking and when you are the person doing the talking. Appendix A provides detailed roleplay scripts for each of the target responses.

After a rationale was provided, the experimenter and participant practiced taking turns engaging in the target response. If the child did not perform the response independently, then a gestural (e.g. experimenter pointing to eyes as a cue to look) or verbal (e.g. “repeat that statement and look at me this time”) prompt was provided. Once the child performed the response independently a minimum of three consecutive times, then the RCT was introduced.

For the introduction of the RCT, the experimenter asked the participant to hold the receiving end of the RCT and was told that it would vibrate, at this time, the experimenter then
activated the RCT for the first time. The child and experimenter then traded parts and the child activated the mechanism while the experimenter held the receiver. At no time did either participant express anxiety about wearing the RCT. The child was then told that the RCT was a communication system between the experimenter and child that functioned as a way of the experimenter quietly giving feedback and saying “good job” when talking with their sibling. In order to demonstrate how the communication system would work, the RCT was activated contingent on an alternative response. For example, the experimenter instructed the participant to raise her hand, and then activated the RCT when the child performed the desired response. Next, the child practiced engaging in a target behavior while talking with the experimenter and wearing the RCT. Throughout the first session of each intervention on a new response, the experimenter asked the child to make a statement of understanding regarding the contingency in place. For instance, the experimenter might ask “When are you going to feel this vibrate?” or “Tell me when you’re going to feel this.” A minimum of three consecutive unprompted responses were required before the child was told to go have a conversation with her sibling. This minimum criterion was set to demonstrate that the participants were capable of engaging in the target response independently. Once this minimum criterion was met, the sibling was brought in the room, picture was placed on the easel, and the instruction to begin the conversation was given.

The roleplay intervention for the second and third target behaviors differed only in that the RCT was immediately introduced (because the children were already aware of how it worked) for the target behavior. See Appendix A for a detailed script of how the RCT was introduced.

On the second session of intervention on a new response, the experimenter said “Tell me when you’re going to feel this vibrate today” to check the participant’s understanding of the
current contingency in place. After the second session, no questions were asked; the experimenter simply asked the child to put the belt on and then the session began.

RCT and Visual Feedback.

During this phase of the study, in addition to the RCT, a visual feedback system was implemented. First, data from the normative samples were analyzed and the average middle frequency was determined. This number then became the frequency goal for the participants to engage in. During the first session of this phase, the participants were provided with rationales as to why it is important to make eye contact or face orientation, ask questions, and smile when talking with someone. They were told that other children their age engage in these behaviors quite often, and that it was important for them to engage in these behaviors as often as other children do. The participants were then shown a sample bar and line graph, with a goal line drawn in at the top. It was explained to the participants that during each session the experimenter would count the number of times they had engaged in each of the target responses, and at the end of each session, they would be told the numbers and would graph their own data. It was also explained that they were to try to reach the goal line by engaging in the behaviors a certain number of times. The children were then given the choice of which type of graph they would prefer to track their data on, and both girls chose a bar graph. Individual graphs were then hand made by the experimenter, with a “goal line” drawn at the top of the graph, depicting the number of target responses the child was to reach in order to meet her goal. With the experimenter’s help, the child was then asked to graph her data from the previous session. Descriptive feedback was given regarding the child’s response frequency for that session. For instance, if the participant engaged in three smiles, the experimenter said “Last time I was here you did a great job and had three smiles, let’s see how many you can do today.” Throughout this phase, the
participants were shown their graphs immediately prior to the beginning of that day’s session, depicting data from the previous sessions. This was done to remind the child of how many responses she had engaged in previously, and how close she was to her goal. During the conversation, the RCT was activated each time the participant emitted a target response. Immediately following the 5 min conversation, the experimenter totaled the frequency of each target response and wrote it on the data sheet. The girls were then given their graphs and data sheet and told to graph their totals for each response.

**RCT and Sibling Coaching (Dyad 2 only).**

The purpose of this phase was to inform the sibling of some skills that he could engage in that would improve the quality of the conversations with his sister. Specifically, the sibling was instructed to ask questions and to reciprocate his sister’s eye contact with orientation and a smile and was told that these behaviors may be effective in getting his sister more engaged in the conversation. Prior to the start of each session, the experimenter placed that day’s illustration on the easel and sat down with the sibling. The experimenter asked the sibling to state what behaviors he was to engage in, then told him to have a conversation with the experimenter, pretending she was his sister. The experimenter then played the part of the sister (Participant 2), exhibiting little vocal and nonvocal behavior. If the experimenter looked at the sibling, and the sibling did not reciprocate eye contact, then either a verbal or gestural prompt was used to cue the sibling to reciprocate eye contact. If more than 1 min passed without the sibling asking a question, then the experimenter provided a verbal prompt, telling the sibling that it had “been a while” since he had asked a question. After the sibling asked a minimum of three consecutive unprompted questions and reciprocated eye contact independently a minimum of three consecutive times, the coaching session was terminated. Participant 2 was then asked to come
into the room, with the picture already in place, the timers were set, and the experimenter gave an instruction to begin the conversation. The RCT was activated each time the participant engaged in a target response.

**Experimental Design**

During the first phase of the study a multiple baseline design across response classes was used (A= baseline, B= RCT + roleplay) to examine the effects of the RCT as a feedback system for conversation skills (i.e. face orientation/eye contact, question asking, and smiling). During the second phase of the study a reversal design was used (A= baseline, C= RCT + visual feedback). Participant 2 differed in that an additional intervention was implemented (D= RCT + sibling coaching).
CHAPTER III

RESULTS

Figure 2 shows the frequency, in rate per minute, of each of the target responses for Participant 1. The gray shaded areas display the high-low range of the normative data represented by a typically developing female, the same age as the participant. Data were collected across two sessions, when the female was engaged in conversation with her sister. The top graph of figure 2 shows the results for face orientation. The rate of responding for the typically developing female was 2.4 per min across two sessions. During the initial baseline, overall face orientation for Participant 1 was much lower (range .4 to 2.4 per min) than that of the typically developing female. The participant displayed age-appropriate levels of face orientation only one time. However, with the introduction of the RCT and roleplay package, there was a dramatic increase in face orientation (range 2.8 to 7.6 per min), with results higher than those shown in the normative data. With a return to baseline, face orientation fell but remained close to the normative data, and higher than initial baseline levels (range 1.4 to 3.6 per min). With the introduction of the RCT and visual feedback phase, face orientation again increased slightly (range 3.0 to 4.2 per min), and maintained at typical or slightly above typical levels at baseline (range 2.2 to 4.8 per min). While there was quite a bit of variability in the response rates of Participant 1, there was little cross over between the first, second, and third baselines, suggesting a definite increase in responding with the feedback package and maintenance of higher response rates with each reversal.

The second graph in figure 2 shows the data for question asking. The normative data range fell between .6 and 1.6 per min. During the initial baseline, overall question asking for the participant was lower (range 0 to 1.4 per min) than the large range depicted in the normative
data. With the introduction of the RCT and roleplay package, question asking increased (range .6 to 1.6 per min) to levels representative of the normative sample, and remained in or near the range during the next baseline (range .4 to 2.4 per min). With the introduction of RCT and visual feedback, the rate of question asking again increased (range 1.0 to 2.0 per min) to typical levels, but dropped slightly in the last baseline (.4 to 1.6 per min). Participant 1 displayed a large amount of variability for question asking throughout the entire study, however data collected on each of the normative samples also showed much variability. It is apparent that there was an increase in responding with each of the interventions, but those increases did not maintain with reversals to baseline.

The third graph in figure 2 shows smiling data for Participant 1. Rates of smiling for the normative sample were 1.8 to 3.2 per min. During the initial baseline, overall response rates for smiling (range .6 to 3.4 per min) were within the normative range. With the introduction of the RCT and roleplay package smiling remained variable (range 1.4 to 3.0 per min). However, with the introduction of RCT and visual feedback, smiling stabilized (2.8 to 3.2 per min), and rates continued to remain at typical levels with a reversal to baseline (range 2.2 to 5 per min), with the last session showing a large increase.

The bottom graph in figure 2 shows data on the total duration (in seconds) of the time that the sibling dyad was engaged in conversation. Normative data of two sisters having a 5 min conversation showed that they spent nearly all (291 to 299 s) of that time vocally engaged. Results of Participant 1 and her sister reveal that they were slightly below the normative samples, but were vocally engaged at high rates throughout the study (223 to 300 s). The average duration of conversation for the sister dyad was 264 s, or 4 min 24 s.
Figure 3 shows duration data (in seconds) for Participant 1. The gray shaded areas display the high-low range of the normative data represented by a typically developing female, the same age as the participant. The top graph in figure 1 shows durations for face orientation. Normative data show the range of face orientation duration to be between 98 and 145 s. During baseline, Participant 1 was well below this range, engaging in face orientation between 6 and 51 s. With the introduction of the RCT and roleplay package, duration of face orientation increased to levels as high as 126 s (range 31-126 s). Throughout the next conditions, overall duration of face orientation remained lower than the typical sample, however it was still higher than the initial baseline conditions. During the RCT and visual feedback condition, duration of face orientation ranged between 30 and 71 s, and remained between 8 and 58 s during the last baseline, with the last three sessions at least 40 s or higher.

The second graph in figure 3 illustrates the duration (in seconds) of smiling. Data from the normative sample revealed a large range between 16 and 50 s. During the initial baseline, Participant 1’s smiling was comparable to the normative sample, with durations at or above the sample. The participant fell below the normal range only during two sessions (range 8 to 135 s). During the RCT and roleplay condition, duration of smiling remained within the normative range, except for one session, in which the duration fell to only 7 s (range 7 to 62 s). During the RCT and visual feedback condition, duration of smiling increased to levels slightly above the normative data (range 56 to 100 s) and remained stable as compared to the two previous conditions. Long smiling durations maintained with a return to baseline (range 51 to 110 s).

Figure 4 shows the frequency results, in rate per minute, of the three target responses for Participant 2. The gray shaded areas display the high-low range of the frequency of the responses demonstrated by a typically developing female, the same age as the participant. Data were
collected across two sessions, when the female was engaged in conversation with her brother. The top graph in figure 4 shows eye contact results. Results of normative data show eye contact to occur at rates ranging between 2.4 and 3.4 per min. During the initial baseline, Participant 2 emitted much lower levels of eye contact (range .2 to 3.6 per min) as compared to the normative sample. Only two baseline data points were in the normative range. With the introduction of the RCT and roleplay package, eye contact initially increased, but within three sessions, decreased to zero responses (range 0 to 4.2 per min). Interestingly, eye contact initially increased again when the contingency was removed, but decreased dramatically and remained low during the second baseline condition (range 0 to 3.4 per min), with several sessions occurring in which no eye contact was emitted by the participant. With the introduction of RCT and visual feedback package, eye contact increased above the previous baseline levels, but remained below the normative sample (range .4 to 1 per min). However, these results did not maintain during the next baseline condition, in which eye contact fell to rates ranging between .2 and .6 per min. With the introduction of RCT and sibling coaching, eye contact again increased to rates higher than the previous baseline (range .2 to 1.2 per min), and maintained during the last baseline (range .2 to 1.6 per min), but was still lower than the normative data.

The second graph in figure 4 shows results of question asking for Participant 2. The normative sample displayed here shows limited engagement in question asking, with a rate of .2 per min. Overall, Participant 2’s question asking was higher than the normative sample, with baseline rates ranging between 0 and 1 per min. Question asking increased during the RCT and roleplay condition (range .2 to 1.2 per min), but decreased to 0 per min throughout the next baseline condition. Question asking again increased during the RCT and visual feedback intervention (range 0 to 1.2 per min), but did not maintain during baseline (range .2 to .6 per
During the last intervention, RCT and sibling coaching, question asking ranged from .2 to 1 per min, and maintained at high rates in the final baseline (.6 to 1.2 per min).

The third graph in figure 4 shows data on smiling for Participant 2. The normative data range was between 1.4 and 1.8 per min. Participant 2 emitted variable rates of smiling throughout baseline, ranging from 0 to 1.6 per min, with only one session falling in the normative range. With the introduction of the RCT and roleplay package, smiling initially increased as compared to the last four sessions of baseline, but did not maintain (range .2 to 1.2 per min), and did not fall into the normative data range. Smiling remained slightly variable during the RCT and visual feedback condition (range .2 to 2.2 per min), but decreased to .4 per min throughout the next baseline condition. However, smiling rose to the normative range and stabilized during RCT and sibling coaching (range 1.2 to 1.8 per min), and maintained during baseline (.8 to 2.2 per min).

The bottom graph in figure 4 shows results of the total duration (in seconds) of the time that the sibling dyad was engaged in conversation. Normative data of a sister/brother dyad having a 5 min conversation showed that they were vocally engaged for 270 to 272 s. Duration of conversation between Participant 2 and her brother remained well below the normative sample, with duration falling as low as 40 s until the last intervention. The average duration of their conversations before that intervention was 137 s, or 2 min 17 s. During the RCT and sibling coaching condition, the duration of their conversations increased and maintained at high rates, falling within range of the typical sample durations. The average duration of their conversations increased to 219 s, or 3 min 39 s.

Figure 5 shows duration results (in seconds) for Participant 2. The gray shaded areas display the high-low range of the normative data represented by a typically developing female,
the same age as the participant. The top graph in figure 5 shows duration data for eye contact. Normative sample data show the range of eye contact between 1 and 14 s. Overall, Participant 2 fell within this range throughout the study. It is interesting to point out however, that duration of eye contact increased dramatically with the introduction of the RCT and roleplay package. During the previous baseline, the duration of eye contact was between 1 and 44 s. However, duration increased with the first intervention, to rates as high as 249 s. Duration returned to typical levels with the next baseline, and remained in the normative range.

The second graph in figure 5 shows data on duration of smiling. Duration of smiling from the normative sample averaged 18 s across two sessions. Overall, Participant 2’s smiling durations were below this level during baseline, with only three sessions at the normative level (range 0 to 35 s). The duration of smiling increased to typical levels with the introduction of the RCT and roleplay package, but did not maintain. Duration again increased during the RCT and visual feedback condition, but remained quite variable (range 2 to 17 s), and decreased to lower levels during baseline (range 3 to 5 s). However, during the RCT and sibling coaching condition, the duration of smiling increased dramatically, and stabilized (range 11 to 28 s). These rates remained slightly above or slightly below the normative sample during the final baseline, with only one session dropping to a low duration (range 4 to 23 s).
CHAPTER IV
DISCUSSION

The results of this study demonstrate that each of the interventions was effective in increasing the frequency of the targeted conversation skills. However, the maintenance of these skills varied across participants and experimental conditions. Additional procedures were required to increase and maintain these behaviors at a higher rate as compared to baseline levels. Overall, these results support previous studies showing that the RCT is a device that can be used discretely and unobtrusively without disrupting the ongoing social situation (Bingham-Watts, 1999; Russo, 1999; Shabani et al., 2002; Taylor & Levin, 1998).

The RCT and roleplay condition showed that the RCT as a consequent event for delivering praise was initially effective for both participants, across all target responses. For Participant 1, the RCT and roleplay condition resulted in an increase in face orientation and question asking, however, smiling remained at baseline levels. When the RCT and roleplay were discontinued, face orientation decreased, but remained higher than the initial baseline and question asking remained at about the same frequency but was variable. These two behaviors occurred at frequencies high enough to fall within the range of the normative data during the second baseline. Since smiling was not affected by this intervention there was not a return to baseline before the next intervention. For Participant 2, the introduction of the RCT and roleplay resulted in initial increases in eye contact, question asking, and smiling. Toward the end of this intervention, however, rates decreased across all targets and remained low for eye contact and at zero for question asking during the next baseline. For smiling, there was not a return to baseline before the next intervention because at this point all of the target behaviors were very low. One explanation for the RCT and roleplay being only temporarily effective in increasing the eye
contact for Participant 2 might be due to negative comments that the sibling made regarding the participant’s eye contact. The sibling made comments to the participant such as “Stop staring at me” and “Why are you looking at me?” in a negative tone. Duration results showed that, for the first two sessions of the intervention, the participant spent an average of 3 min 45 s looking at the sibling during the 5 min conversation. It was during these two sessions that the sibling made negative comments. At the start of the third session the participant was observed to sit with her hand covering the side of her face, blocking her view of the sibling. Although negative comments also occurred for Participant 1, the sibling said them while slightly laughing. Also, the sibling of Participant 1 continued to provide reinforcement for the new topography of the response, while the sibling of Participant 2 did not.

The effect that the increased duration of eye contact and face orientation had on the siblings’ behavior points to another important component of training conversation skills. In addition to teaching the topography of a behavior, the duration and the appropriate stimulus control conditions also have to be trained. It was specified in the roleplay that the participants should look or orient toward their sibling when the sibling was speaking as well as when they were speaking to their sibling. However, it was not specified as to when it would be appropriate to look away. Rather than looking at the picture stimulus, looking toward the sibling for a few seconds, then turning back toward the picture stimulus, both participants oriented toward their sibling for apparently uncomfortable lengths of time, resulting in both siblings making negative comments to the participants regarding their face orientation/eye contact.

Another important consideration that these effects show is that the training of conversation depends on two sources of reinforcement: the trainer and the conversational partner. While the RCT may have functioned as positive feedback for the behavior of Participant
2, the negative consequences provided by the sibling may have overshadowed that function; that is, the negative consequences may have been stronger than the praise, resulting in a decreased frequency of the behavior.

Following the RCT and roleplay condition, the RCT and visual feedback condition was implemented to further increase the frequency of the responses, to stabilize performance at age-appropriate frequency levels, and to strengthen the praise with a self-management component. During this intervention condition, both of the participants were given frequency goals derived from their normative comparison. The use of these data as aims for “social norms” lends to the strength and social validity of the study (Minkin et al., 1976). During this intervention, face orientation increased again for Participant 1 and remained at or higher than the normative data during the next baseline. Question asking also increased above previous baseline levels, however rates decreased during the last baseline and were variable, but still within the range of the normative data. Rates of smiling stabilized at the upper range of the normative data and maintained at a high level during the last baseline. For Participant 2, eye contact again increased and remained more stable as compared to the previous conditions. Question asking and smiling also increased, but remained variable throughout the condition. Rates of all responses decreased again with a return to baseline conditions, suggesting that the variables needed to maintain the responses in the absence of the intervention were not in place. The use of a visual feedback system proved to be effective for both participants. These results suggest that the effectiveness of the RCT as feedback may depend on the motivation system in place.

Since the duration of conversation between Participant 2 and her sibling had dropped to only 40 s, and had been low for the previous 14 sessions, a sibling coaching condition was implemented to increase the participant’s conversation skills and to train the sibling to be a
naturally maintaining community of reinforcement. During this intervention eye contact increased to levels above the previous baseline, but remained below the normative data comparison. Increases in question asking and smiles were also observed and remained at higher rates during the last baseline, as compared to previous baseline levels. These results suggest that the sibling’s mutual exchange of the social behaviors trapped the participant’s behaviors and worked to maintain the responses in the absence of training. In addition, the duration of conversation between the sister/brother dyad also increased and remained at high levels during the last baseline.

Previous research has noted that the natural communities of reinforcement, specifically peer reinforcement, may serve to provide a solution to the failure of some skills to generalize (Baer & Wolf, 1970; Kohler & Fowler, 1985; Kohler & Greenwood, 1986). In a study investigating whether the reciprocity of behaviors between children was related to the maintenance of those behaviors over time, Kohler and Fowler found that the peers’ reciprocal exchange of social behaviors was positively related to the maintenance of those behaviors over time. Specifically, those target behaviors that were consistently reciprocated by untrained peers were found to maintain for 6 to 8 week baseline periods, whereas those responses that were not reciprocated by peers decreased after training. The authors suggested that the social reciprocity of a behavior may function to trap the behavior in the absence of the original training conditions. Other authors have also recognized that behavioral traps are an essential component to facilitate the generalization and maintenance of social behaviors (Ayllon & Azrin, 1968; Baer & Wolf, 1970; see Gudmundsdottir, Ala’i-Rosales, & Sherman, 2001 for a review of entrapment). In this study, participants were experiencing two contingencies at once; the experimenter, who was delivering the RCT as praise for the responses, and the sibling who was either responding
conversationally, ignoring, or providing negative comments as the target responses occurred. It appears as if the sibling of Participant 1 functioned as a naturally maintaining community of reinforcement without direct training from the experimenter. Throughout the study, this sibling emitted behaviors that appeared to be significant in maintaining and strengthening the social responses of the participant. For instance, during conversations, she often took on the role of characters in the illustrations, varying her voice inflections and facial expressions, thus setting the occasion for the participant to orient toward her and laugh or smile. In return, the participant often followed her sister’s lead and played the role of a different character. This often resulted in the sibling dyad talking to each other via characters in the illustration and laughing together. This may explain why the two girls exhibited high durations of vocal conversation throughout the study. In contrast, the sibling of participant 2 was quiet and often ignored the participant’s responses. Thus, the duration of vocal conversation was much lower as compared to the sister/sister dyad. Future studies investigating social interactions may find it beneficial to directly measure the reciprocal interactions of siblings.

The results of this study suggest that the naturally maintaining communities of reinforcement are important for the maintenance and generalization of social behaviors. If a naturally maintaining community of reinforcement is in place, it is likely that the social behavior will continue to maintain in the absence of the RCT. It may be possible that previous attempts to remove or fade the RCT were unsuccessful because the communities of reinforcement were not in place (e.g., Shabani et al., 2002; Taylor & Levin, 1998). Further research is needed to determine if this is the case. In addition, reinforcement and feedback contingencies placed upon the dyad, or peer group, rather than the child with autism, may make it more likely that the dyad will support the participant’s performance. For instance, researchers have reported that group
contingencies, partially dependent on their individual behavior and partially dependent on the performance of other group members makes it more likely that various behaviors directed at influencing and supporting one another’s performance are exhibited (see Strain & Kohler, 1999 for a review). Similarly, researchers can program contingencies in which reinforcement is dependent upon children asking and answering questions about their conversational partner’s interests (e.g. likes and dislikes, asking how their day was, etc). In a situation such as this, the peer may become more valuable to the child with autism, which in turn may readily trap those social responses, ensuring their generalization and maintenance.

In summary, this study extends the previous body of literature in two important ways: (1) this is the first study to examine the use of the RCT to increase conversation skills, and (2) the function of the device was instructed and demonstrated through roleplays with the participants rather than explicitly trained. This study shows that the RCT is a device that can be used as a discrete and unobtrusive feedback system that does not disrupt the ongoing social situation. In addition, the RCT may be supported by other common training techniques. The results of this study point to the importance of having naturally maintaining communities of reinforcement in place, as well as the importance of training the topography of social responses under appropriate stimulus conditions. The use of age-appropriate normative data adds to the strength of the study, allowing for a visual analysis of how the participants in this study responded during conversational situations as compared to their peers. Future research may find it beneficial to use these data in determining the appropriate topography and stimulus conditions under which social behaviors should occur, in addition to the frequency of behaviors. This information is important for the social acceptance of children with autism, allowing more typical characteristics to be emitted so that others in their environment will respond more favorably.
APPENDIX A

OBSERVATION CODE, OBSERVER TRAINING PROTOCOL, AND DATA SHEETS
Conversation Skills Observation Code

**Target behaviors:** For each participant, two nonverbal behaviors and one verbal behavior will be scored.

**Facial Orientation** (Participant 1) Onset of facial orientation will be scored at the point when the child’s face moves right, left, up, or down to meet with the sibling’s face. This may include complete or partial orientation of the child’s eyes to the sibling’s eyes. Facial orientation may occur at any time during the conversation; by itself, or in conjunction with another target behavior. For frequency measures, only the onset of facial orientation will be scored. If the duration of facial orientation continues in conjunction with another target behavior, the orientation itself is only counted once (at onset). Adapted from Jacobs, 1999.

**Examples:**
- The child is looking down at the picture stimulus and fully raises her head to meet the sibling’s face.
- The child’s face is turned slightly to the right directed toward the picture stimulus and she turns her head to the left to meet the sibling’s face.
- The child is looking at the picture stimulus and making a comment and turns her head to the meet sibling’s face while also smiling.
- The child is looking down at the picture and slightly tilts or raises her head to meet the siblings face.
- A distraction occurs in the background (i.e. phone rings, dog barks, etc.) and the child’s face meets the siblings face and then turns toward the distraction.
- The child’s face is not oriented toward the sibling’s face, but the child’s eyes move to meet the sibling’s face.

**Exclusions:**
- The child’s face is directed toward the picture stimulus and never meets the sibling’s face.
- The child is talking while looking at the picture.
- The child is smiling while looking at the picture.
- A distraction occurs in the background (i.e. phone rings, dog barks, etc.) and the child turns her head and/or body around to orient toward the distraction and in doing so, engages in fleeting orientation with the sibling.
- The child’s face is oriented toward the sibling and the child’s eyes are directed at the sibling’s face, but the child moves her eyes away from the sibling (keeping her face oriented), then moves her eyes back to the sibling. *The onset of face orientation is scored, however the second instance of eye gaze at the sibling is not scored because the child’s face has remained oriented (there is no offset of orientation).*

**Eye Contact** (Participant 2) Eye contact will be scored when the child’s eyes move up, down, left, or right to meet the peer’s eyes. If face and/or body is already oriented toward the peer, but the child’s eyes are not visible, an abrupt eyelid movement up or down toward the direction of the peer’s eyes will be scored as onset. For frequency measures, only the onset of eye contact will be scored. Eye contact may occur at any time during the conversation; by itself, or in conjunction with an utterance or smile. Adapted from Jacobs, 1999.
Examples:
- The child looks at the picture, then moves her eyes to meet the peer’s eyes when making an utterance.
- The child is looking down at the picture stimulus and fully raises her head and gaze to meet the sibling.
- The child’s face is turned slightly to the right directed toward the picture stimulus and she moves her eyes to the left to meet the sibling’s face.
- The child is looking at the picture stimulus and making a comment and moves her eyes to meet sibling’s face while also smiling.
- The child is looking down at the picture and slightly tilts or raises her eyes to meet the sibling’s face.
- A distraction occurs in the background (i.e. phone rings, dog barks, etc.) and the child’s eyes meets the sibling’s eyes and then turns toward the distraction.

Exclusions:
- The child’s head is pointed down, toward the table or floor
- The child’s face is directed toward the picture stimulus and thus does not allow for the child’s eyes to meet the sibling.
- The child is talking while looking at the picture.
- The child is smiling while looking at the picture.
- A distraction occurs in the background (i.e. phone rings, dog barks, etc.) and the child turns her head and/or body around to orient toward the distraction and in doing so, engages in fleeting orientation with the sibling.

Smiles (Participants 1 & 2) Appropriate smiling at the peer or picture stimulus may occur at anytime during the session. Smiling is defined as an upward curvature of the mouth. Teeth need not be showing. Smiling may occur at any time during the conversation; by itself, or in conjunction with an utterance or eye contact. For frequency measures, only the onset of the smile will be scored. If the duration of the smile continues in conjunction with another target behavior, the smile itself is only counted once (at onset).

Examples:
- The child smiles when talking about a preferred game
- Child smiles when listening to peer make a statement.
- The corners of the child’s mouth are turned upward, but teeth are not showing.
- The corners of the child’s mouth are turned upward and teeth are showing.

Exclusions:
- The child has a “straight face” during the conversation
- The corners of the child’s mouth are pushed back rather than turned upward.
- The child manipulates her mouth with her fingers and in doing so, pushes the corners of her mouth in an upward position.
- The child suppresses a smile by covering her mouth with her hand (making the mouth not visible), or by tightening her lips together.

Asking Questions (Participants 1 & 2) The child (a) asks a question after a peer’s last utterance, (b) confirms or clarifies a question or comment from the peer (e.g. “What did you say?”), or (c) initiates a question not contingent on a peer’s utterance (e.g. What do you think that is?).
Adapted from Thiemann & Goldstein, 2001.
Examples:
  o The child says “This is fun, can we do it again?”
  o The child says “What is that?”
  o The child says “What did you say?” to clarify what the peer has said.
  o When talking about dogs, the child asks “Do you have a dog?”
  o The child makes a statement beginning with the phrase “I wonder....”
  o Following the sibling’s says “There’s a man walking his dog”, and the child says “where?”
  o The child says “What?”
  o The child says “What did you do today? Did you go to school?” is SCORED AS TWO (2) QUESTIONS!
  o The child says “What is this? Why does it look like that? I’ve never seen it before.” SCORED AS TWO (2) QUESTIONS!!
  o The child engages in roleplay of a character in the picture and in doing so asks a question.

Exclusions:
  o The child says “I think it’s going to rain today.”
  o The child says “I went to the Fall Festival today & carved pumpkins.”
  o Any statement not in the form of a question.
  o The child utters “huh” in response to a sibling’s utterance. (“Huh” is not a word)
  o The child begins saying “What do you....” but does not complete the sentence.
  o IF AN UTTERANCE MADE BY THE CHILD IS NOT AUDIBLE, THEN MARK AN ‘X’ IN THE INTERVAL.
Observer Training Protocol for Conversation Code

Learning the Code

Step 1: Observer reads over entire code (definitions, examples, and exclusions) and asks the trainer questions.

Step 2: Observers are given verbal quiz consisting of 20 questions covering the entire code.
- Questions answered incorrectly are immediately followed with corrective feedback, discussion and clarification. At the end of the quiz, the questions that were missed are returned to. If the same question is answered incorrectly more than once, corrective feedback, discussion and clarification is provided again, and the observer is asked to review the code again. Another quiz (that differs from the previous one) is given at the next meeting.
- For clarification purposes, examples and exclusions are re-worded or added to.
- As part of the quiz, each of the definitions are recited by the observer.
- The quiz also includes examples and exclusions of each response for the observer to identify.

Step 3: Modeling of behaviors: The trainer models examples and exclusions of all responses in the code. The trainer and observer discuss rules and violations as the behaviors are modeled.
- After the trainer models behaviors, the observer then demonstrates examples and exclusions of each behavior.

Step 4: Watch examples of each target response on tape. Trainer and observer discuss the tapes and state examples and exclusions as they appear on video.

Step 5: Observers provide feedback to the trainer as to how the code could be better clarified. They also give additional examples and exclusions to be added to the code.
- If revisions are made, steps 1, 3, and 4 (if available on tape) are repeated to cover the new material.

Identifying Response Types on Tape

Step 1: Each response is observed separately.

Step 2: Trainer labels the behaviors as they occur on tape. After the first few responses, the observer labels with the experimenter.

Step 3: Trainer fades out the labeling and the only the observer labels.
- If the observer labels a response incorrectly or fails to label an occurrence of a response, the tape is stopped and the trainer provides feedback, discussion, and clarification.
Scoring Responses (*on tape and **in vivo)

Step 1: Observer and trainer look at data sheet and discuss how it is to be used.

Step 2*: After identifying responses on tape, the observer and trainer watch a 5- min sample and score one response type.

Step 3: Observer and trainer add up totals on data sheet, and discuss any disagreements.
   • The tape is re-wound and paused at the point of disagreement. A decision is made as to whether the response falls under the definition. Clarification is provided and examples or exclusions are modified (if necessary).

Step 4: Steps 2 and 3 are repeated for each response type.

Step 5: From the beginning of the segment, all response types are scored at once, and step 3 is repeated.

Step 6: A new segment is viewed, with all responses being scored at the same time. Step 3 is repeated.

Step 7: The observer provides feedback regarding the data sheet & the ease of use. The observer gives helpful advice on how the data sheet can be more user friendly.
   • After each change of the data sheet, step 1 is repeated.
   • New and revised data sheets are used for scoring & this step is repeated until a final data sheet has been made.

Step 8: The trainer and observer practice scoring duration measures. Steps 2 and 3 are repeated, with only a single duration response being scored at any time.

Step 9**: The observer and trainer watch live 5 min samples of mock experimental sessions.
   • All frequency responses are scored during a sample.
   • Observer and trainer practice placing themselves away from each other, but where each person can readily observe all behaviors. Observers are informed they may move at any time if their view becomes blocked.
   • After the sample, discussion, feedback and clarification is provided.
   • This is practiced until the trainer and observer reach 85% or higher agreement on each behavior three consecutive times.
Observer Data Sheet

Date________    Session________________

Child_______    Observer_____________    Primary / Reliability

*Place a tally mark in the appropriate box as the behavior occurs during the corresponding interval.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Facial Orientation</th>
<th>Smiles</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31s-1:00m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:01-1:30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:31-2:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:01-2:30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:31-3:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:01-3:30</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3:31-4:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:01-4:30</td>
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</tr>
<tr>
<td>4:31-5:00</td>
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<td></td>
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</table>

Total
Freq.:        

% IOA:        

<table>
<thead>
<tr>
<th>Eye Contact</th>
<th>Smiles</th>
<th>Questions</th>
</tr>
</thead>
</table>

Rate Per Minute:

Duration of Conversation:

Picture Used:
**Observer Data Sheet**

Date________ Session_____________

Child_______ Observer__________ Primary / Reliability

*Place a tally mark in the appropriate box as the behavior occurs during the corresponding interval.*

<table>
<thead>
<tr>
<th>Interval</th>
<th>Eye Contact</th>
<th>Smiles</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31s-1:00m</td>
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<tr>
<td>1:01-1:30</td>
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<td>1:31-2:00</td>
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<td>2:01-2:30</td>
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<td>4:31-5:00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Freq.:</th>
<th>Eye Contact</th>
<th>Smiles</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>% IOA:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rate Per Minute:</th>
<th>Eye Contact</th>
<th>Smiles</th>
<th>Questions</th>
</tr>
</thead>
</table>

Duration of Conversation:

Picture Used:
# Face Orientation Roleplay Data Sheet

<table>
<thead>
<tr>
<th>Date</th>
<th>Session</th>
<th>Start Time</th>
<th>Stop Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Child** | **Observer**

Mark a + if target performed independently, a P if prompted.

|   |   |   |   |   |   |

*criteria is 3 consecutive independent responses before moving on to RCT.

Total # of prompted responses __________

Total # of independent responses __________

Number of statements of understanding: when to engage in target response

---

# RCT Data Sheet

Mark a + if target was performed independently, a P if prompted.

|   |   |   |   |   |   |

*criteria is 3 consecutive independent responses then converse w/sib.

Total # of prompted responses __________

Total # of independent responses __________

Number of times the RCT was delivered: target response.

|   |   |   |   |   |   |

Total # of RCT deliveries __________

Number of statements of understanding: when RCT will be activated

|   |   |   |   |   |   |

Total # of statements of understanding __________

1. Very glad you're talking w/…. It seems like you're having fun!
2. I think that you're a good listener. What do you think you do well?
3. One imp thing to do when you're having a conversation is to look at the person. Face Orientation is a skill that everybody does when they're talking to someone, and it's a skill that you will be able to use forever. It's good to do this when you talk to them, and also when they are talking to you.
4. So, when should you look at the person's face?
5. Good, let's practice!

---

# RCT Data Sheet

Mark a + if target was performed independently, a P if prompted.

|   |   |   |   |   |   |

*criteria is 3 consecutive independent responses then converse w/sib.

Total # of prompted responses __________

Total # of independent responses __________

Number of times the RCT was delivered: target response.

|   |   |   |   |   |   |

Total # of RCT deliveries __________

Number of statements of understanding: when RCT will be activated

|   |   |   |   |   |   |

Total # of statements of understanding __________

1. Let me show you this. (rct) Hold it & it's going to vibrate. Do you feel it? Isn't it cool! Here, you can try it on me! Isn't that fun?!
2. We're going to use this to tell you when you do something good in conversation w/ sib. This will be our communication system. It's my way of quietly telling you "good job" when you do something good talking w/sib. Every time you do something good, you're going to feel this vibrate.
3. Let me show you. Raise hand. See how it works? Everytime you raise hand you feel it vibrate. Let's try another one.
4. Put this around your waist, just like a belt.
5. Let's practice having a conversation and turning your face toward my face. Do you remember when you're supposed to look toward me?
6. Ok, so when you look toward my face it means you're doing good, and what's going to happen?
7. When you feel it vibrate, it's my way of quietly cheering for you & saying "Good job!" But, I won't be able to look at you when it vibrates because I'll be doing work on my clipboard.
8. Let's practice looking over there when you feel it vibrate.
9. Now let's go have a conversation w/sib.
Eye Contact Roleplay Data Sheet

Date___________ Session___________ Start Time_______ Stop Time_______
Child___________ Observer____________

Mark a + if target performed independently, a P if prompted.

*criteria is 3 consecutive independent responses before moving on to RCT.

Total # of prompted responses __________
Total # of independent responses __________

Number of statements of understanding: when to engage in target response

Total # of statements of understanding__________

1. Very glad you're talking w/.... It seems like you're having fun!
2. I think that you're a good listener. What do you think you do well?
3. One imp. thing to do when you have a conversation is to look at the person. Eye contact is a skill that everybody does when they're talking to someone, and it's a skill that you will be able to use forever.
4. So, when should you look at the person?
5. Good, let's practice!

---

RCT Data Sheet

Mark a + if target was performed independently, a P if prompted.

*criteria is 3 consecutive independent responses then converse w/sib.

Total # of prompted responses __________
Total # of independent responses __________

Number of times the RCT was delivered: target response.

Total # of RCT deliveries __________

Number of statements of understanding: when RCT will be activated

Total # of statements of understanding__________

1. Let me show you this. (rcit)
   Hold it & it's going to vibrate. Do you feel it? Isn't it cool! Here, you can try it on me! Isn't that fun?!
2. We're going to use this to tell you when you do something good in conversation w/ sib. This will be our communication system. It's my way of quietly telling you "good job" when you do something good talking w/sib. Every time you do something good, you're going to feel this vibrate.
3. Let me show you. Raise hand. See how it works? Everytime you raise hand you feel it vibrate. Let's try another one.
4. Put this around your waist, just like a belt
5. Let's practice having a conversation and making eye contact. Do you remember when you're supposed to look at me?
6. Oh, so when you look at me it means your doing good, and what's going to happen?
7. When you feel it vibrate, it's my way of quietly cheering for you & saying "Good job!"
   But, I won't be able to look at you when it vibrates because I'll be doing work on my clipboard.
8. Let's practice looking over there when you feel it vibrate.
9. Now let's go have a conversation w/sib
## Question Asking Roleplay Data Sheet

<table>
<thead>
<tr>
<th>Date_________</th>
<th>Session_________</th>
<th>Start Time_______</th>
<th>Stop Time_______</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child_________</td>
<td>Observer_________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mark a + if target performed independently, a P if prompted.

|  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|

*criteria is 3 consecutive independent responses before conversation with sibling.

Total # of prompted responses __________

Total # of independent responses __________

---

Number of statements of understanding: when to engage in target response

|  |  |  |  |  |  |  |  |

Total # of statements of understanding________

---

1. Very glad you're talking w/.... It seems like you're having fun!
2. One thing that I like is that you are always so focused on the conversation. What do you think you do well?
3. We've been working on you looking at the person a while now, and you've been doing an excellent job! Next we are going to start working on asking questions during the conversation. This is an impt. skill because it will allow you to talk more during the conversation.
4. Just like before, you will feel the vibration every time you ask a question. But, if your sib. interrupts you and you don't get to say the whole sentence, then it won't count.
5. When are you going to feel the vibration?
6. Good, let's practice!
Smiling Roleplay Data Sheet

Date____________ Session____________
Child____________ Observer____________

Mark a + if target performed independently, a P if prompted.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

*criteria is 3 consecutive independent responses before conversation with sibling.

Total # of prompted responses __________
Total # of independent responses __________

Number of statements of understanding: when to engage in target response

| 1 | 2 | 3 | 4 | 5 |

Total # of statements of understanding_________

1. Very glad you're talking w/…. It seems like you're having fun!
2. You have been doing a wonderful job! I am so proud of you for working so hard! What are some things that you think you have been doing well?
3. We've worked on looking at the person and asking questions now, and you've been doing an excellent job! The next we are going to start working on is smiling. This is an impt. skill because it lets the person you are talking with know that you are enjoying yourself and having a good time.
4. This time you will feel the vibration every time you smile.
5. When are you going to feel the vibration?
6. Good, let's practice!
**Sibling Roleplay Data Sheet**

<table>
<thead>
<tr>
<th>Date___________</th>
<th>Session___________</th>
<th>Start Time_______</th>
<th>Stop Time_______</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child___________</td>
<td>Observer___________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mark a + if target performed independently, a P if prompted.

| 1. Very glad you're talking w/…. It seems like you're having fun! |
| 2. You have been doing a wonderful job talking with your sister! I really appreciate the effort you put into these conversations. You have helped her so much! |
| 3. There are a few things I would like for you to do. First, I think it's really important for you to look at your sister when she looks at you, and also to return her smiles. When you reciprocate eye contact, and smile at her, she may be more likely to look at you and smile more often. Also, if you ask her more questions, it will allow her to be more vocally engaged in the conversation, because she will have to answer you. |
| 4. Let's practice having a conversation. Pretend I'm your sister. Remember to look at me, smile, and ask me questions. |

*Criteria is 3 consecutive independent responses before conversation with sibling.*

Total # of prompted responses __________

Total # of independent responses __________

Number of statements of understanding: responses to engage in.

|  |  |  |  |  |  |  |  |

Total # of statements of understanding__________
APPENDIX B

FIGURES
Figure 1. The remote control tactile stimulus.
Figure 2. The top three graphs show the frequency of the target responses shown in rate per minute. The gray shaded areas represent normative data collected across two sessions. The bottom graph depicts the total time (in seconds) the sister dyad was engaged in conversation for each session.
Figure 3. The graphs display the total duration (in seconds) of face orientation and smiling for each session. The gray shaded areas represent normative data collected across two sessions.
Participant 1

Graph showing the duration of face orientation and smiling over sessions for Participant 1. The graph is divided into phases: Baseline, RCT, B. L., RCT, B. L. The duration is measured in seconds, with a range from 0 to 100. The graph includes a shaded area representing normative data.
Figure 4. The top three graphs show the frequency of the target responses shown in rate per minute. The gray shaded areas represent normative data collected across two sessions. The bottom graph depicts the total time (in seconds) the sister/brother dyad was engaged in conversation for each session.
Figure 5. The graphs display the total duration (in seconds) of eye contact and smiling for each session. The gray shaded areas represent normative data collected across two sessions.
REFERENCES


