



ELSEVIER

Contents lists available at ScienceDirect

Research in Autism Spectrum Disorders

Journal homepage: <http://ees.elsevier.com/RASD/default.asp>



Increasing social skills and pro-social behavior for three children diagnosed with autism through the use of a teaching package

Justin B. Leaf^{a,*}, Mitchell Taubman^a, Stephanie Bloomfield^a,
Letty Palos-Rafuse^a, Ron Leaf^a, John McEachin^a, Misty L. Oppenheim^b

^a Autism Partnership, USA

^b University of Kansas, Department of Applied Behavioral Science, 1000 Sunnyside Ave Room 4001, Lawrence, KS 66045, USA

ARTICLE INFO

Article history:

Received 22 May 2008

Received in revised form 6 July 2008

Accepted 8 July 2008

Keywords:

Autism

Social skills

Teaching interaction

Behavior therapy

Behavioral skills training

Early intervention

ABSTRACT

This study assessed the effectiveness of a Teaching Interaction procedure for four social skills across three participants diagnosed with autism. All social skills fell into four broad domains (i.e., social-communication, play, emotion skills, and choice/selection skills). In addition, a teaching package was used to increase communication between the three participants and three selected target peers. The teaching package consisted of the Teaching Interaction procedure, reinforcement, and priming of participants to demonstrate social skills and to engage with their target peers. Prior to intervention, participants displayed near zero levels of the four social skills that were targeted; after intervention, all three participants were able to demonstrate these skills. Prior to intervention, participants did not communicate or play with their selected target peer; after intervention, participants were able to increase the amount of play and communication. A multiple baseline design showed that the teaching package was effective in teaching both the targeted social skills and in increasing the development of initial associations that could lead to friendships for three children diagnosed with autism.

Published by Elsevier B.V.

An important skill for children to learn is how to build and maintain friendships. Children who have friendships do better in school (Ladd, Birch, & Buhs, 1999), have reduced aggressive behaviors (Lavalle, Bierman, & Nix, 2005), and have higher social cognitive skills (Lavalle et al., 2005), compared to

* Corresponding author. Tel.: +1 562 221 8581.

E-mail address: Leafku@ku.edu (J.B. Leaf).

children who do not have friendships. Researchers have also shown that children who do not have friendships have more social anxiety (Greco & Morris, 2005), are lonelier (Bauminger & Kasari, 2000), and stand a greater risk of attempting or committing suicide (Hardan & Sahl, 1999). Though friendships are critical, children with autism have difficulty in establishing and maintaining quality friendships. Researchers have shown that friendships for children with autism pop up sporadically (Bauminger & Shulman, 2003), often with the facilitation of parents (Bauminger & Shulman, 2003), and are of poorer quality (Bauminger & Kasari, 2000) than that of typically developing children. One reason why children with autism may have fewer and poorer quality friendships is that they lack social skills that could help facilitate friendships.

Part of the diagnostic criteria for autism is a qualitative impairment in social interactions, ranging from a child's inability to develop peer relationships appropriate to developmental level to not displaying non-verbal behaviors that are a part of social interactions (American Psychiatric Association, 1994). Researchers have further shown that children with autism may not display pretend play (Charman, 1997), may have poorer conversational skills (MacDonald et al., 2006), may lack a theory of mind (Baron-Cohen, 1995), and may have reduced emotional understanding (Downs & Smith, 2004). Since children with autism lack a variety of social skills, and this can impact their friendship development, behavioral intervention must focus on teaching social skills to children with autism.

A promising intervention that has been demonstrated to be effective for teaching social skills is the Teaching Interaction (TI) procedure (Minkin et al., 1976; Phillips, Phillips, Fixsen, & Wolf, 1971; Solnick, Braukmann, Bedlington, Kirigin, & Wolf, 1981). Teaching Interactions are a systematic form of instruction that states the behavior to the learner, breaks the skill down into smaller components, provides rationales, has the teacher demonstrate, has the learner role-play, and provides feedback. The TI procedure has been demonstrated to be effective in teaching a variety of skills to multiple populations (Bedlington et al., 1978; Minkin et al., 1976).

Minkin et al. (1976) implemented the TI procedure to increase the conversational skills of four girls ranging from 12 to 14 years who were identified as deficient in social communication. The researchers attempted to improve the four participants' ability to use conversational questions and positive conversational feedback during conversations. All participants showed an increased ability in asking conversational questions and giving positive conversational feedback following intervention. Maloney et al. (1976) were able to replicate these findings. Yeaton and Bailey (1978) implemented a TI procedure to increase elementary school children's ability to safely cross the street. Following implementation of the TI procedure, all 12 children were able to safely cross the street.

Behavioral Skills Training (BST) is a commonly used intervention that is similar to the TI procedure in every aspect except that BST does not provide the learner with a rationale. Behavioral Skills Training has been effective in teaching safety skills (Johnson et al., 2006), gun safety (Himle, Miltenberger, Flessner, & Gatheridge, 2004), training teachers to implement Discrete Trial Teaching (Sarokoff & Strumey, 2004), and other social skills (Bornstein, Bach, McFall, Friman, & Lyons, 1980). Pouche, Brouwer, and Swearingen (1981) showed that BST was effective in teaching three preschoolers how to successfully avoid being abducted by potential child molesters.

To date, no empirical study has assessed the effectiveness of the TI procedure on teaching social or language skills to children with autism. Though the TI procedure has not been directly evaluated, primary components of the TI, such as role-playing (Mesibov, 1984; Taras, Matson, & Leary, 1988), modeling (Apple, Billingsley, & Schwartz, 2005), and providing feedback (Taras et al., 1988), have been implemented with children with autism. The purpose of this study was to assess whether a teaching package that included the TI procedure, priming, and reinforcement was able to increase a variety of social skills for three children diagnosed with autism and to evaluate if participants would increase their communication and play towards selected target peers.

1. Methods

1.1. Participants

Five criteria were set for participant inclusion within the study. Criteria for inclusion included: (1) scheduled to attend a majority of the summer school sessions; (2) have a DSM IV diagnosis of Autism

Table 1
Participant demographic information

Participant	IQ score	Vineland adaptive score	GARS autism index score	SSRS teacher score	SSRS parents score	CBCL parent score
Kenny	65 (WPPSI-III)	N/A	87	N/A	56	70
Brady	93 (WPPSI-III)	63	78	85	76	64
Greg	88 (WISC IV)	77	88	75	52	53

Kenny's parent and teacher did not provide researchers with the Vineland score or an SSRS assessment.

from an outside agency; (3) displayed full communication skills and the lack of serious disruptive behavior (e.g., self-injurious behavior or aggression); (4) have a previous history with TI and the implementation of a token economy; and (5) parental consent. These criteria resulted in three high functioning children with autism serving as participants. At the time of the project, all three participants were fully included, with supports, in typical kindergarten classrooms and were receiving an average of 25–30 h of ABA intervention per week. Table 1 contains the IQ scores, Gilliam Autism Rating Scale (GARS) autism index scores (Gilliam, 1995), Social Skills Rating Scale (SSRS) parents standard scores (Greshman & Elliot, 1990), Vineland Adaptive Scores (Sparrow, Balla, & Cicchetti, 1984), and Parents Child Behavior Checklist (CBCL) scores (Achenbach, 2007) for all participants.

Kenny was a 7-year-old high functioning child with autism. Through direct observation and both teacher and parent reports, it was determined that Kenny did not display communication skills with his peers unless a peer initiated a conversation. Direct observation and reports suggested that Kenny also displayed good play skills (e.g., parallel, cooperative, and interactive play) in structured situations with adults, but did not display these play skills with his peers. Direct observation and reports revealed that Kenny displayed some maladaptive behaviors (non-compliance, asking inappropriate questions, and task refusal); it was believed that these maladaptive behaviors, in combination with his inability to demonstrate appropriate behaviors in the natural environment, led to his having limited positive social interactions with his peers. Table 2 describes the target behaviors that were taught to Kenny.

Brady was a 6-year-old high functioning child with autism. Direct observation, parent, and teacher reports showed that Brady would often engage in inappropriate conversations with his peers, which primarily included whining at them or repeating what they said. Direct observation and reports indicated that Brady displayed limited play skills with his peers, but had a wide repertoire of play skills with adults. Though he displayed play skills with adults, he would play only if he was able to choose the activity. Direct observation also revealed that Brady displayed some maladaptive behaviors, such as crying, whining, flopping, and aggression towards others. Teachers reported that these behaviors

Table 2
Kenny target behaviors

Domain	Target skill	Operational definition
Play	Following a peer from activity to activity	When a selected peer moves from one outdoor play area to another outdoor play area, the participant will move with the selected peer within 5 s and be within 5 ft proximity of the peer
Conversation	Initiation	When a selected peer enters the room, the participant will make an introductory comment followed by an appropriate question
Emotional	Including a peer into a game or activity	When the participant and another peer are playing a game or an activity and there is a third peer sitting by themselves within 5 ft of the activity, the participant will invite the peer to play with them, walk over to the peer, and give them part of the activity
Choosing the same friend	Choosing the same peer throughout the day	When a teacher asks the participant to chose a friend to do an activity with, the participant will chose the same friend throughout the day

Table 3
Brady target behaviors

Domain	Target skill	Operational definition
Conversation	Not engaging in inappropriate conversation and switching topics when conversation is inappropriate	When a peer engages in inappropriate conversation (i.e., repeats the same word or phrase) the participant will not engage in the conversation nor ask the peer to repeat their statements. Next, the participant will ask an appropriate question of that peer
Play	Playing what a friend wants to play	When a selected peer asks the participant to play a different activity, the participant will either immediately play the other activity or will say, "Can you wait a minute?" and within 1 min go play the other activity
Emotional	Giving a compliment	When a selected peer approaches the participant with a piece of art work or project that they have worked on, the participant will say a general positive comment followed by a specific positive statement
Choosing the same friend	Choosing the same peer throughout the day	When a teacher asks the participant to chose a friend to do an activity with, the participant will chose the same friend throughout the day

might interfere with his ability to have positive relationships. Table 3 describes the target behaviors that were taught to Brady.

Greg was a 5-year-old high functioning child with autism. Though Greg was capable of having conversations, direct observation and reports showed that most of his conversations with peers were self-directed and off-topic. Greg also displayed good play skills (e.g., parallel, interactive, and imaginative play) in both structured and unstructured situations with his peers but would not engage in cooperative play (e.g., playing what his friend wanted him to play with). This caused many of his peers to not want to play with him. Direct observation also indicated that Greg displayed some non-compliant and controlling behaviors (e.g., making his friends do what he wants to do). Target behaviors for Greg can be found in Table 4.

1.2. Target skills

Each participant was taught four different social skills. The four social skills fell into four domains (i.e., play skills, language skills, emotional skills, and choosing the same friend). The first domain was play skills; skills taught in this domain were following a peer from activity to activity, playing what a friend wants to play, and sharing toys. The second domain was a language domain; skills taught in this domain were appropriate initiation, not engaging in inappropriate topics, switching topics, and on-topic statements. The third domain was emotional skills; skills taught in this domain were including a peer in an activity and giving a peer a compliment. The final domain that was taught to each of the

Table 4
Greg target behaviors

Domain	Target skill	Operational definition
Play	Sharing a toy	When a selected peer asks the participant if they could see an item that the participant is engaging himself or herself with, the participant will hand over the item immediately or say, "Can you wait a minute" and then hand over the item within a minute
Conversation	On topic statements	When a selected peer says a statement to the peer the participant will make statements that are on-topic with the selected peer's initial statement
Emotional	Giving a compliment	When a selected peer approaches the participant with a piece of art work or project that they have worked on, the participant will say a general positive comment followed by a specific positive statement
Choosing the same friend	Choosing the same peer throughout the day	When a teacher asks the participant to chose a friend to do an activity with, the participant will chose the same friend throughout the day

three participants was how to choose the same friend throughout the day (e.g., choosing Billy to turn in the attendance in the morning and then choosing Billy, not Ashley, to help clean up at the end of the day). Tables 2–4 provide information on each of the skills taught.

Each of the target skills was selected based upon individual participant deficits, which were determined through interviews and direct observation. In addition, these domains were selected because it was hypothesized based upon naturalistic observations of typically developing children, interviews with typically developing children, parents, teachers, and licensed psychologists that these domains may be necessary for children to develop and maintain friendships.

1.3. *Setting*

The study took place at a private behavioral intervention agency's 8-week summer school program. The summer school program was divided into two classrooms: Classroom 1 resembled a typical kindergarten class while Classroom 2 resembled a typical first grade class. Both typically developing children and children with ASD were enrolled in each of the two classrooms. Twelve children attended the kindergarten classroom, 8 of whom were children with ASD, while 11 children were enrolled in the first grade classroom, 6 of whom were children with ASD. The summer school ran 3 days a week for 6 h a day. Though learners attending the summer school program were primarily diagnosed with autism, it should be noted that this was not the participants' primary classroom and during the regular school year, they were placed in typically developing classrooms. A 30-min session was conducted each day of the summer school program. For purposes of teaching, children were relocated to a one on one setting located adjacent to the children's classroom. The one on one setting was structured to be as similar to the classroom environment as possible.

1.4. *Experimental design*

A multiple baseline design across skills, replicated across participants, was used to evaluate the effects of the teaching package on skill acquisition. The study consisted of three phases: baseline, teaching, and maintenance. Once stability was seen during baseline on the first two skills, intervention began. Once a skill had received at least three sessions of teaching, and skill acquisition could be seen, as determined by a rise above baseline levels during probe sessions, a new skill was introduced and the previous skill was put on maintenance. This continued until all skills had received intervention. In addition, a pre–post-test was implemented to evaluate the corollary effects of the teaching package on participants' play and communication levels with a select target peer.

1.5. *Probe sessions*

Structured probe sessions were conducted to assess participants' baseline levels, acquisition, and maintenance of target skills and occurred at least 1 h after any teaching. Probe sessions were essentially a way to assess generalization from the teaching to a more natural setting; probe sessions did not follow teaching, no reinforcement was provided to the participant, participants had to demonstrate the behavior with a person that differed from the teaching session, and the participant was not primed. Probe sessions remained consistent across conditions. Probe sessions were conducted with the help of a typically developing peer who was not the participant's target peer. These peers would engage in behaviors that created opportunities for participants to demonstrate their target behaviors (e.g., a peer would show the participant a drawing that he had made, which should set the occasion for the participant to give a compliment). Typically developing peers were used instead of target peers for two reasons. One, the typically developing peers had to engage in behaviors that would elicit certain behaviors, which the target peer may be incapable of doing. Second, the researchers did not want to promote any additional interactions between the participant and the selected target peers. Probe sessions were conducted in different locations (i.e., setup, room location, duration, number of opportunities) dependent upon the target behavior (see Table 5). However, during all probe sessions, the participant, a typical peer, first author, and reliability scorer were in the

Table 5
Probes

Skill	Participants	Setting	Duration	Discriminative stimulus	Opportunities
Following a peer Initiation	Kenny	Outdoor playground	2 min per probe	Telling Kenny to play with a certain child	4
	Kenny	Adjacent room	30 s per probe	Child walks into the room and starts to play with Kenny	10
Including a peer into a game	Kenny	Classroom	1 min per probe	Kenny and peer play a game and a third child sits by the game	4
Choosing the same friend	All participants	Classroom	2 min per probe	Teacher tells participant to chose a friend to engage in an activity	4
Not engaging in inappropriate behavior	Brady	Classroom	30 s per probe	Another child next to Brady starts engaging in a repetitive Joke	10
Playing what a friend wants	Brady	Adjacent room	2 min per probe	Brady and another child are told to choose something to play with	4
Compliments	Brady and Greg	Classroom	30 s per probe	Peer shows participants something they have made	10
Sharing	Greg	Adjacent room	30 s	Peer asks Greg if he can play with an item Greg has	4
On topic statement	Greg	Adjacent room	3 min	Greg and Peer are told to talk about anything	1

room with a video camera. The number of opportunities presented to the participant for each of the target behaviors was kept constant throughout the study (see Table 5).

1.6. Teaching package

The primary component of the teaching package was the TI procedure, which was used to train the specific skills to the participants. The TI procedure began with the teacher describing to the participant what behavior was going to be worked on throughout the session (e.g., “Today we are going to work on sharing”). The second step was the provision of a meaningful rationale of why the participant should engage in the behavior (e.g., “If you share your toys with your friends they might ask you to play”). Then, the participant had to provide his own rationale for why he should engage in the described behavior. Next, the teacher asked the participant what specific skill steps were involved in the behavior. After the participant stated all of the steps, the teacher asked the participant in what situations and with whom they could use the target behavior (e.g., “you should share with Ralph”). Throughout the didactic portion of the TI procedure, participants were reinforced with “friendship tickets” (the token economy used throughout the study) for answering questions correctly. Incorrect answering of questions resulted in corrective feedback and the teacher providing a prompt in the form of questions. After two consecutive incorrect responses, the teacher verbally stated the answer and had the participant reiterate.

Next, the teacher modeled the behavior, either with the participant or with another teacher, omitting one of the sub-steps. Afterwards, the participant was asked to evaluate how the teacher had performed. If the participant said they did a bad job and provided a reason why it was an inaccurate display, the participant received reinforcement (i.e., friendship ticket) and was then asked how the teacher could improve. If the participant gave an incorrect response, corrective feedback was given (e.g., “That’s not it.”) followed by the teacher providing the learner with the correct response. Then, the teacher modeled the behavior without omitting any of the steps, and asked the participant the same questions. The same consequences were given for correct or incorrect responding. The next component of the TI was having the participant role-play the target behavior with the teacher. The teacher provided a clear discriminative stimulus of when the participant should begin, and then provided no further prompting. At the conclusion of the participant’s role-play, feedback was offered on what steps the participant did correctly and what steps needed to be worked on. Friendship tickets were provided to the participant for compliance with the TI and for accurately role-playing the behavior. The participant role-play and feedback cycle continued until the participant was able to practice the behavior without omitting any of the specific steps. This procedure was implemented for every target behavior across all three participants.

The second component of the teaching package was priming the participants to use the skills that were just taught throughout the day and to interact with certain target peers. This was done to assess whether the teaching package could increase the pro-social behavior of the participant towards a select target peer. Priming was conducted prior to the participant leaving the research room. The final component of the teaching package was the reinforcement system that was implemented both during the TI and throughout the day. The reinforcement system was a simple token economy where participants received “friendship tickets” contingent on specific behaviors. During structured teaching, participants could receive one friendship ticket contingent upon answering questions correctly or demonstrating the role-play correctly. During the rest of the day, participants could receive one friendship ticket if they demonstrated any of their target skills with any peer, or if the participants were prompted to demonstrate their target skill with their target peer (i.e., the peer that they were primed to demonstrate their skills with). If the participants demonstrated their target skills with their target peers without any prompting, they would receive two friendship tickets. During every exchange of a friendship ticket, the instructor or teacher paired descriptive praise of the behavior in which the participant was engaging. This differential reinforcement system was used to increase social interactions between the participants and peers and was not faded for the duration of the study.

Friendship tickets could be exchanged for tangible items throughout the day. The exchange of friendship tickets occurred whenever the participant requested to “cash in” their tickets. Tickets could

be exchanged differentially; the more tickets the participant had, the bigger the reinforcement they could receive. “Cash in” values were set at 10, 20, 40, and 80 tickets. These values were arbitrarily set, but with the expectation that participants could generally receive at least two tangible items per day. If the participant wanted to save up for a larger item, the values would hopefully ensure that it would take at least 2 days for this exchange to occur. Items that participants could purchase were determined by asking the participants what they wanted.

Though participants had experience with token economies, the friendship ticket system was briefly explained at the start of the first intervention session. During the first teaching session, the instructor informed the learner how they could earn tickets (stated previously), how many tickets it would take to earn certain items (e.g., “If you want to earn a piece of candy you need to earn 10 tickets.”), answered any questions that the participant had about the system, made a list of reinforcers that the participant wanted to work for, and divided that list of reinforcers into the different values of the system. The three components of the teaching package were used to teach each participant their target skills and to help form initial relationships with target peers.

1.7. Target peers

The study not only taught participants specific social skills, but examined whether or not participants increased their levels of conversation and play with a select peer from the classroom. This examination was used to determine if the teaching package could help promote the beginning of friendships between the participant and a select target peer. Criteria for target peers included: (1) the participant and target peer had to have had over 30 h of exposure to each other without a friendship being formed, as reported by their parents and teachers; (2) the participant and target peer could not be siblings; and (3) neither the target peer nor the participant could have shown any malice towards each other (e.g., negative statements, teasing, or bullying). Target peers could be typical or non-typically developing; however, in this study all target peers had a DSM IV diagnosis of autism.

1.8. Pre–post-test

A pre–post-test was conducted at the beginning and at the conclusion of the study. The pre–post-test assessed the frequency of conversations between each participant and their target peer, as well as the percentage of intervals of play between each participant and their target peer. This assessment was used to determine if the teaching package could increase the conversation and play between the participant and a selected peer. Both the pre- and post-tests were conducted during two different indoor free-play sessions lasting ten minutes each. Participants were not primed of what behaviors to engage in during the pre- or post-test and were not reinforced for engaging with their target peer during the pre- or post-test. In addition, pre- and post-tests were conducted within the natural classroom setting so that all teachers and students could partake during the pre- and post-test probes.

Conversation was defined as at least two statements or one question and one statement directed towards another peer that was not a directive order (e.g., asking them to do something) or a self-stimulatory statement. Play was defined as at least two consecutive seconds of the participant being on-task with the materials, script, or imaginative game with their target peer, free from self-stimulatory behavior, and free from parallel or solitary play. Results of the pre–post-test were used to indicate if participants and target peers began to form social interactions with each other.

1.9. Data collection

Pen and paper were used to collect all data on participant’s behaviors during the probe conditions. Each of the target behaviors were broken down into smaller components and the scorers marked if the participant engaged or did not engage in each step of the target behavior for each of the opportunities presented to the participant throughout the day (see Table 5). Therefore, in order for the participant to be considered engaging in the skill, they had to have displayed all the steps of the task analysis. For the pre–post-test, pen, paper, and a timer were used to collect data on the participant’s behaviors. For the play behavior, a 15-s partial time interval data sheet was used in which the observer marked whether

or not the participant was engaging in play. If the participant engaged in play (two consecutive seconds) at any point during the interval, scorers marked that interval as play occurring. For the conversation behavior, a data sheet in which time was divided up into 15-s intervals was given to scorers who marked the frequency of conversations within each interval.

1.10. Reliability

In vivo, point-by-point reliability was used for 30% of all probe sessions across the three participants. Two independent observers conducted reliability sessions. Inter-observer reliability was calculated by taking the total number of agreements of the two observers over the total number of agreements plus the number of disagreements and then multiplying the total by 100%, for each of the sub-steps of the behavior (e.g., each of the four steps for initiation). The pre–post-test reliability was done via video recording; all scorers were kept blind of the purpose of the study and what condition they were viewing. Pre–post play reliability was calculated by taking the total number of intervals with agreements of the two observers over the number of intervals with disagreements plus the number of intervals with agreements and then multiplying the total by 100%. Conversation reliability was calculated by taking the total number of intervals where both observers agreed on the frequency of conversation occurrences over the total number of intervals where both observers agreed on the frequency of conversation plus the total number of intervals where observers disagreed on the frequency of conversation and then multiplied the total by 100. Inter-observer agreement for skill acquisition had a mean of 94.5%, with a range of 88–100%; inter-observer agreement during the pre–post-test for play was 100% and conversation was 88%, with a range of 85–100%.

2. Results

2.1. General results

All participants were able to demonstrate their target behaviors when, and only when, the teaching package was implemented (see Figs. 1–3). With the exception of selection skills, all participants showed an immediate increase in behavior following the first TI for each of their target behaviors (see Figs. 1–3). For Figs. 1–3, probe sessions are displayed across the x-axis while either the percentage of opportunities that the participant engaged in the skill 100% correctly or the frequency of on topic statements made are displayed across the y-axis. Each of these figures is divided into four panels with each of the panels representing a different social skill.

Kenny increased his play skill, following a peer around, from a baseline level of zero activities to a level ranging from 0% to 100% following intervention (see Fig. 1). Similar results were seen for Kenny's targeted conversation behavior, initiation, which increased from a baseline level of 0% to a level ranging from 50% to 100% of opportunities to initiate a conversation, following intervention (see Fig. 1). Kenny's emotional skill, including a friend, also had a baseline level of 0% and increased to a post-intervention level that ranged from 75% to 100% of opportunities to include a friend (see Fig. 1). Kenny's selection skills showed the least increase of behavior from a baseline level of 0% of opportunities to a post-intervention level ranging from 25% to 100% of opportunities to select the same peer (see Fig. 1).

Brady increased his play skill of playing what a friend wants to play from a baseline level of 0% to a post-intervention level ranging from 0% to 100% of opportunities to play what a friend wants to play (see Fig. 2). Similar results were seen for Brady's conversation behavior, not engaging in inappropriate behavior and switching to an appropriate topic of conversation, from a baseline level of 0% to a post-intervention level ranging from 0% to 100% of opportunities (see Fig. 2). Brady's conversation skill returned to baseline levels during the ninth, tenth, and eleventh probe due to the fact that, while he refrained from engaging in inappropriate behaviors, he did not switch to more appropriate topics of conversation. Brady's emotional skill, compliments, also had a baseline level of 0% and increased to a post-intervention level that ranged from 50% to 70% of opportunities (see Fig. 2). Brady's selection skills showed an increase of behavior from a baseline level of 0% of

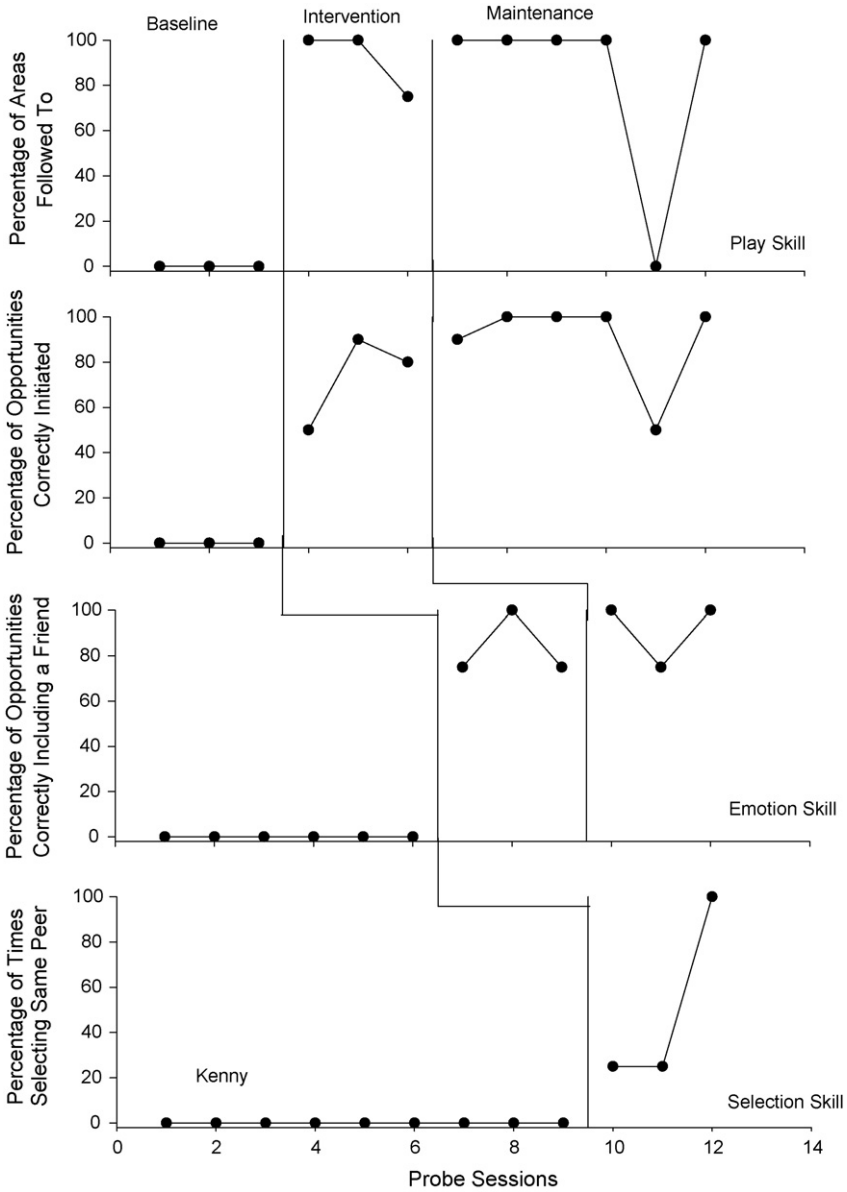


Fig. 1. Kenny acquisition graph.

opportunities to a post-intervention level ranging from 50% to 100% of opportunities to select the same peer (see Fig. 2).

Greg increased his play skill, sharing a toy, from a baseline level of 0% to a post-intervention level ranging from 50% to 100% of opportunities (see Fig. 3). Similar results were seen for Greg's conversation behavior, on-topic statements, which increased from a baseline level of zero on topic statements to a post-intervention level ranging from 2 to 11 on topic statements (see Fig. 3). Greg's emotional skill, giving a compliment, also had a baseline level of 0% and increased to a post-intervention level that ranged from 70% to 100% of opportunities (see Fig. 3). Greg's selection skills

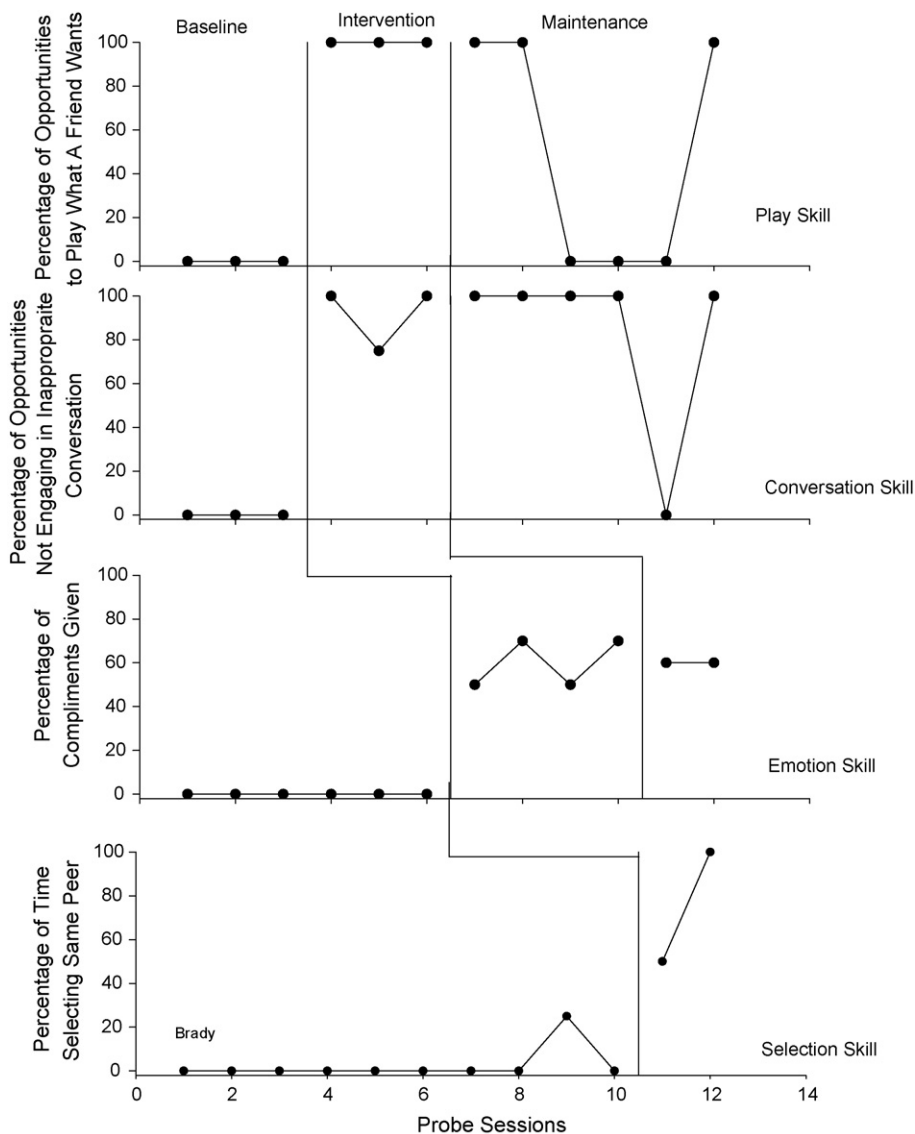


Fig. 2. Brady acquisition graph.

showed the lowest increase, with a change of behavior from a baseline level of 0% of intervals to a post-intervention level ranging from 0% to 50% of opportunities (see Fig. 3).

2.2. Pre-post-test

All three participants increased their rate of conversation with their target peer, as well as increased their rate of play with that same target peer (see Table 6). All three participants showed low levels of conversation towards their target peer, ranging from zero to four conversational interactions during the pre-test and rose to 6–15 conversations during the post-test. All three participants also showed low levels of play with target peers during the pre-test, ranging from 0% to 15% of intervals, with an increase ranging from 30% to 90% during the post-test.

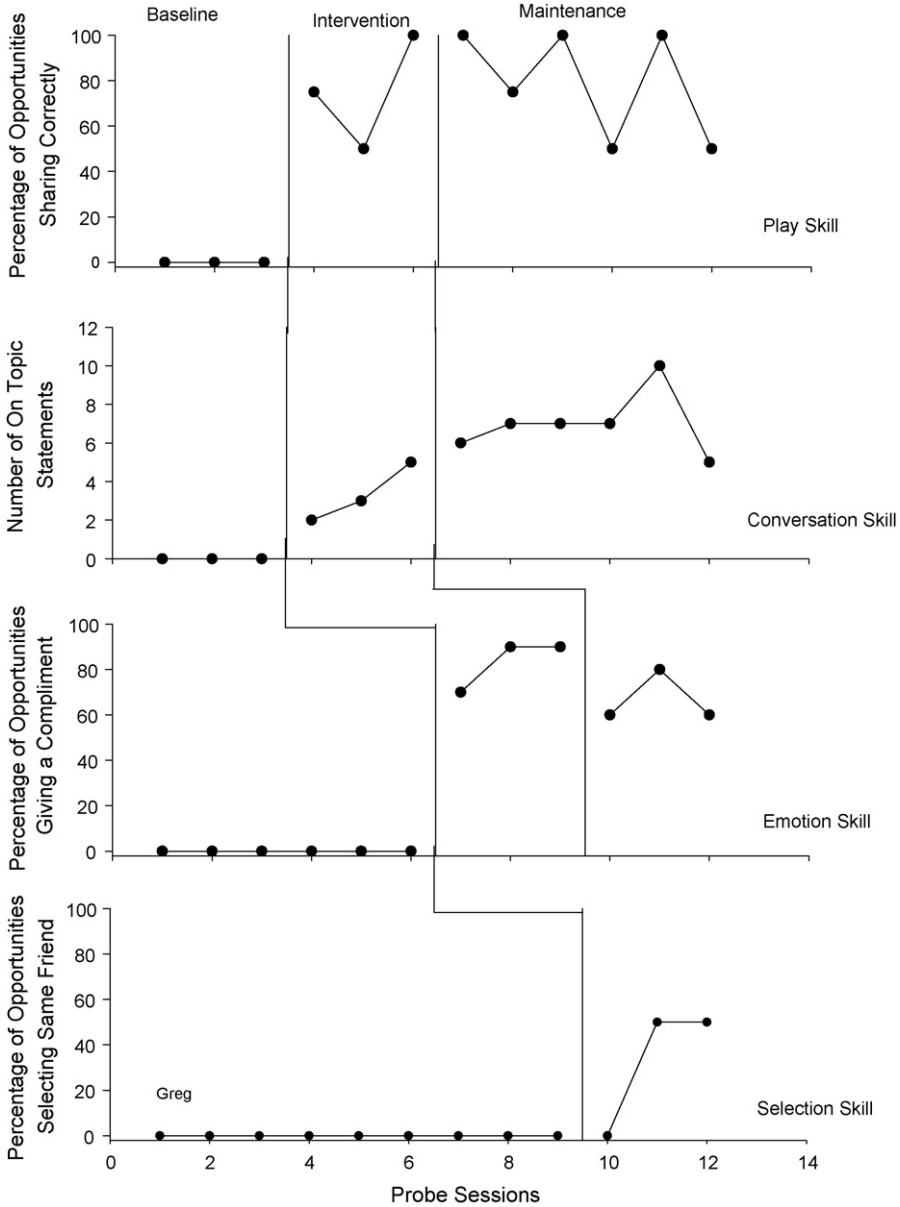


Fig. 3. Greg acquisition graph.

3. Discussion

The teaching package was effective in teaching skills in the domains of play, conversation, emotion, and choosing the same peers for the three participants. An increase in both conversation and play between participants and target peers can also be seen once intervention was implemented. Results are similar to previous research on the effectiveness of the TI procedure, which show that it can be effective in teaching conversation skills (Minkin et al., 1976) as well as general social skills (Kifer,

Table 6
Pre–post-test

Participant and target peer	Pre-conversation (frequency)	Post-conversation (frequency)	Pre-play (percentage of intervals)	Post-play (percentage of intervals)
Kenny and Rob	0	6	0	30
Brady and Nick	2	8	0	37.5
Greg and Aaron	4	15	15	90

Lewis, Green, & Phillips, 1974; Wilner et al., 1977). This study adds to the research on the effectiveness of the TI procedure in several ways. For one, it is the first empirical attempt to look at the TI procedure for children diagnosed with autism. Second, it is one of the first empirical studies to look at the effectiveness of the TI on play skills. Third, it is one of the first studies to examine the effects of a teaching package that include the TI procedure, reinforcement, and priming on increasing conversation and play between participants and target peers. These results can have implications for clinicians attempting to teach social skills and promote friendships for children with autism.

Social skills have typically been taught through the implementation of social stories (Gray & Garland, 1993), video modeling (Charlop & Milstein, 1989), or structured Discrete Trial oriented teaching (Lovaas, 1987). The TI procedure provides clinicians with an alternative teaching method that may be effective for teaching a variety of social skills. There are several reasons why clinicians might choose to implement the TI procedure when teaching social skills to children with autism. First, it provides the learner with the opportunity to practice the new skill in a structured teaching setting. Second, the TI procedure provides the learner with opportunities to develop multiple independent rationales of why they should display the behavior; this may serve as self-instruction for the learner and may increase the likelihood that they will engage in the appropriate behavior. Third, the TI procedure can be implemented spontaneously. Unlike other procedures (social stories or video modeling), the TI procedure can be implemented without requiring any additional stimuli or setup.

The TI procedure was one component within a larger teaching package used within the study. The teaching package used in this study may also be beneficial for clinicians who want to increase peer relationships for children with autism. If clinicians reinforce children with autism for displaying social skills (play, conversation, emotion, choosing the same friend) towards their peers, it may increase the likelihood of friendships forming. Reinforcement procedures may be one way to help children with autism start to build friendships, because it increases the likelihood that they will display the appropriate skills towards their peers. Though this study used a reinforcement procedure, the procedure was never faded out. Therefore, it is uncertain if children's pro-social behavior would maintain; future researchers should examine different ways to fade out this type of reinforcement.

Future researchers should also conduct a component analysis of the teaching package to determine which components are most responsible for behavior change. Similarly, the TI procedure has multiple components, and it may be difficult to determine which of these components are responsible for behavior change. Behavioral Skills Training is a procedure similar to the TI procedure that does not provide the learner with a rationale; results of studies on BST have shown it to be effective (Himle et al., 2004; Pouche et al., 1981). A component analysis of the TI procedure should be conducted so that clinicians know which components are necessary for behavior change.

Due to the short time period of this study (i.e., 2 months), more extensive generalization data were not taken. Therefore, it is unknown if the target behaviors or initial positive relationships generalized to other settings or to other peers. In addition, no maintenance data was taken on the final skill, choosing the same peer throughout the day; therefore, it is not clear if this skill maintained over time. Future researchers should assess generalization in other settings and over a longer period of time in order to determine if the teaching package can produce a generalized and lasting behavior change. Another limitation is that treatment fidelity was not measured; future researchers should assess the fidelity with which the teaching package is implemented. A final limitation is that social validity was

not assessed; therefore, it is impossible to determine if consumers were satisfied with behavior change.

The teaching package that was implemented in this study was demonstrated to be an effective way of teaching social skills to children with autism. In addition, the teaching package was able to increase the conversation and play interactions between the participants and target peers. Clinicians should consider the use of the TI procedure for teaching social skills to children with autism and the use of a teaching package in the development of friendships for children with autism.

References

- Achenbach, T. M. (2007). *Child behavior checklist*. Burlington, VT: University Associates in Psychiatry.
- American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Apple, A. L., Billingsley, F., & Schwartz, I. S. (2005). Effects of video modeling alone and with self-management on compliment-giving behaviors of children with high-functioning ASD. *Journal of Positive Behavioral Interventions*, 7, 33–46.
- Baron-Cohen, S. (1995). *Mind blindness*. Cambridge, MA: MIT Press.
- Bauminger, N., & Kasari, C. (2000). Loneliness and friendship in high-functioning children with autism. *Child Development*, 71, 447–456.
- Bauminger, N., & Shulman, C. (2003). The development and maintenance of friendship in high-functioning children with autism. *Autism*, 7, 81–97.
- Bedlington, M. M., Solnick, J. V., Schumaker, J. B., Braukmann, C. J., Kirigin, K. A., & Wolf, M. M. (1978). *Evaluating group homes: The relationship between parenting behaviors and delinquency*.
- Bornstein, M. R., Bach, P. J., McFall, M. E., Friman, P. C., & Lyons, P. D. (1980). Application of a social skills training program in the modification of interpersonal deficits among retarded adults: A clinical replication. *Journal of Applied Behavior Analysis*, 13, 171–176.
- Charlop, M. H., & Milstein, J. P. (1989). Teaching autistic children conversational speech using video modeling. *Journal of Applied Behavior Analysis*, 22, 275–285.
- Charman, T. (1997). The relationship between joint attention and pretend play in Autism. *Development and Psychopathology*, 9, 1–16.
- Downs, A., & Smith, T. (2004). Emotion understanding, cooperation, and social behavior in high Functioning autism. *Journal of Autism and Developmental Disorders*, 34, 625–635.
- Gilliam, J. (1995). *Gilliam autism rating scale examiner's manual*. Austin, TX: Pro-Ed.
- Gray, C., & Garland, J. D. (1993). Social stories: Improving responses of students with autism with accurate social information. *Focus on Autistic Behavior*, 8, 1–10.
- Greco, L. A., & Morris, T. L. (2005). Factors influencing the link between social anxiety and peer acceptance: Contributions of social skills and close friendships during middle childhood. *Behavior Therapy*, 36, 197–205.
- Greshman, F. M., & Elliot, S. N. (1990). *Social skills rating scale*. Circle Pines, MN: American Guidance Service.
- Hardan, A., & Sahl, R. (1999). Suicidal behavior in children and adolescents with developmental disorders. *Research in Developmental Disabilities*, 20, 287–296.
- Himle, M. B., Miltenberger, R. G., Flessner, C., & Gatheridge, B. (2004). Teaching safety skills to children to prevent gun play. *Journal of Applied Behavior Analysis*, 37, 1–9.
- Johnson, B. M., Miltenberger, R. G., Knudson, P., Egemo-Helm, K., Kelso, P., Jostad, C., et al. (2006). A preliminary evaluation of two behavioral skills training procedures for teaching abduction prevention skills to school children. *Journal of Applied Behavior Analysis*, 39, 25–34.
- Kifer, R. E., Lewis, M. A., Green, D. R., & Phillips, E. L. (1974). Training pre-delinquent youths to negotiate conflict situations. *Journal of Applied Behavior Analysis*, 7, 357–364.
- Ladd, G. W., Birch, S. H., & Buhs, E. S. (1999). Children social and scholastic lives in kindergarten: Related spheres of influence? *Child Development*, 70, 1373–1400.
- Lavalle, K. L., Bierman, K. L., & Nix, R. L. (2005). The impact of first-grade "Friendship Group" experiences on child social outcomes in the fast track program. *Journal of Abnormal Child Psychology*, 33, 307–324.
- Lovaas, I. O. (1987). Behavioral treatment and normal education and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, 55, 3–9.
- MacDonald, R., Anderson, J., Dube, W. V., Geckeler, A., Green, G., Holcomb, W., et al. (2006). Behavioral assessment of joint attention: A methodological report. *Research in Developmental Disabilities*, 27, 138–150.
- Maloney, D. M., Harper, T. M., Braukman, C. J., Fixsen, D. L., Phillips, E. L., & Wolf, M. M. (1976). Teaching conversation-related skills to pre-delinquent girls. *Journal of Applied Behavior Analysis*, 9, 371.
- Mesibov, G. B. (1984). Social skills training with verbal autistic adolescents and adults: A program model. *Journal of Autism and Developmental Disorders*, 14, 395–404.
- Minkin, N., Braukman, C. J., Minkin, B. L., Timbers, G. D., Timbers, B. J., Fixsen, D. L., et al. (1976). The social validation and training of conversational skills. *Journal of Applied Behavior Analysis*, 9, 127–139.
- Phillips, E. L., Phillips, E. A., Fixsen, D. L., & Wolf, M. M. (1971). Achievement place: Modification of the behaviors of pre-delinquent boys within a token economy. *Journal of Applied Behavior Analysis*, 4, 45–59.
- Pouche, C., Brouwer, R., & Swearingen, M. (1981). Teaching self-protection to young children. *Journal of Applied Behavior Analysis*, 14, 169–176.
- Sarokoff, R. A., & Strumey, P. (2004). The effects of behavioral skills training on staff: Implementation of discrete trial teaching. *Journal of Applied Behavior Analysis*, 37, 535–538.
- Solnick, J. V., Braukmann, C. J., Bedlington, M. M., Kirigin, K. A., & Wolf, M. M. (1981). Parent–youth interaction and delinquency in group homes. *Journal of Abnormal Child Psychology*, 9, 107–119.
- Sparrow, S., Balla, D., & Cicchetti, D. (1984). *Vineland adaptive behavior scale*. Circle Pines, MN: American Guidance Service.

- Taras, M. E., Matson, J. L., & Leary, C. (1988). Training social interpersonal skills in two children. *Journal of Behavior Therapy and Experimental Psychiatry*, *19*, 275–280.
- Wilner, A. G., Braukmann, C. J., Kirigin, K. A., Fixsen, D. L., Phillips, E. L., & Wolf, M. M. (1977). The Training and validation of youth-preferred social behaviors of child-care personnel. *Journal of Applied Behavior Analysis*, *10*, 219–230.
- Yeaton, W. H., & Bailey, J. S. (1978). Teaching pedestrian safety skills to young children: An analysis and one-year follow-up. *Journal of Applied Behavior Analysis*, *11*, 315–329.