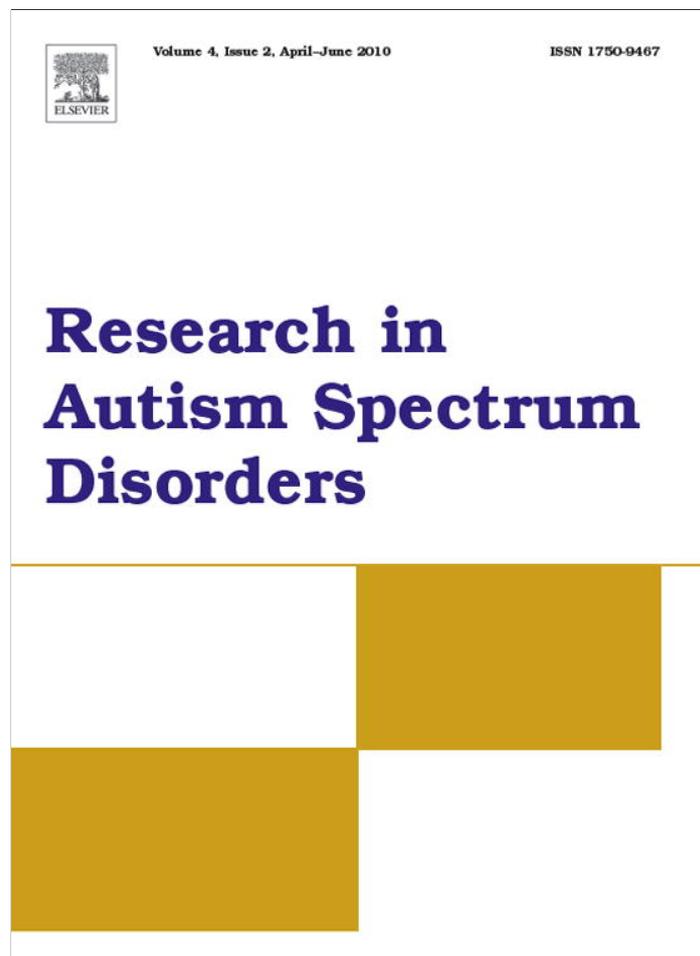


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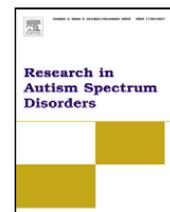
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The effectiveness of a group teaching interaction procedure for teaching social skills to young children with a pervasive developmental disorder[☆]

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ABSTRACT

Deficits in social skills are characteristic of children with autism. Clinicians often include teaching these skills as part of comprehensive curriculum. One method of developing social skills for children with autism is the teaching interaction procedure. This procedure involves describing the behavior, providing a rationale and cues when to use the behavior, dividing the skill into smaller steps, demonstrating the behavior, having the learner role play the behavior, and providing feedback. This study implemented a teaching interaction procedure as part of group social-skills instruction for five children diagnosed with an autism spectrum disorder. A multiple-probe design across behaviors and replicated across participants was used. All five participants acquired the social skills taught to them and generalization was promoted.

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Children with autism and other autism spectrum disorders typically have qualitative impairments in social interaction. That impairment can range from a child's inability to develop appropriate peer relationships to a lack of enjoyment and interest in others. The inability to engage in appropriate social interactions can have serious consequences for children with autism including a failure to develop friendships (Bauminger & Kasari, 2000), depression (Stewart, Barnard, Pearson, Hasan, & O'Brien, 2006), and failure in school (Ladd, Birch, & Buhs, 1999). Therefore, teaching social skills to children with autism is critical if these children are to develop meaningful relationships and enjoy a high quality of life as they grow older.

In the last 30 years, the number of evaluations of procedures to teach social skills to children with autism has dramatically increased (Matson, Matson, & Rivet, 2007). Some of the procedures used in these studies are: social stories (Barry & Burlew, 2004; Gray & Garand, 1993); video modeling (Apple, Billingsley, & Schwartz, 2005; Charlop-Christy, Le, & Freeman, 2000); discrete trial teaching (Leaf & McEachin, 1999; Lovaas, 1981, 1987; McEachin, Smith, & Lovaas, 1993); and behavioral skills training (Stewart, Carr, & LeBlanc, 2007). Though social stories, video modeling, and discrete trial teaching are some of the most common interventions for teaching social skills to children with autism, the teaching interaction procedure is a promising procedure that has been implemented clinically for children with autism for numerous years (Leaf, Taubman, & McEachin, 2008) and has recently been empirically evaluated (Leaf et al., 2009).

The teaching interaction procedure was first implemented and evaluated as a component of the Achievement Place Teaching Family Model (Hazel, Schumaker, Sherman, & Sheldon-Wildgen, 1983; Kirigin, Braukmann, Atwater, & Wolf, 1982;

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Minkin et al., 1976; Phillips, Phillips, Fixsen, & Wolf, 1971, 1974). The teaching interaction procedure is a systematic form of teaching where the teacher describes the behavior, provides a rationale of why the behavior should be used, provides the cues and characteristics of when the behavior should be displayed, and demonstrates the behavior. Then, the learner role-plays the behavior, and the teacher provides feedback (i.e., praise or corrective feedback) about the learner's performance throughout the interaction. The teaching interaction procedure was initially evaluated for teaching conversational skills (Minkin et al., 1976), although subsequently has been implemented to teach safety skills to elementary school children (Yeaton & Bailey, 1978), and for staff training (Harchik, Sherman, Sheldon, & Strouse, 1992). To date, only one study has used the teaching interaction procedure to teach social skills to children with autism (Leaf et al., 2009). In this study, each of three children with autism was taught four social skills in a one-to-one setting. Results of the study showed that each of the participants increased their pro-social behaviors from baseline levels.

The teaching interaction procedure is similar to other behavioral interventions. The procedure to which it is the most similar is behavioral skills training. The single difference between the two procedures is that the teaching interaction procedure provides the learner with a rationale. The provision of the rationale may be important in that the learner may provide himself or herself with self-instructions to engage in the appropriate behavior during times in which the teacher is not present. The teaching interaction procedure is also similar to social stories. The two major differences are that the teaching interaction procedure involves teacher demonstrations and role-playing, whereas social stories do not typically incorporate either of these two components. Teacher demonstration and role-playing may be important for children with autism because they provide opportunities for children to observe the correct social behavior and perhaps learn from observation as well as provide additional opportunities to practice the behavior and receive feedback.

Teaching interaction procedures have typically been implemented in a one-to-one format, as have most discrete trial teaching procedures (Leaf & McEachin, 1999; Lovaas, 1987). Group instruction, however, may have several benefits for both children with autism and for practitioners. First, group instruction may help promote observational learning (Gursel, Tekin-Iftar, & Bozkurt, 2006; Ledford, Gast, Luscre, & Ayres, 2007). Since many children with autism display deficits in observational learning (Varni, Lovaas, Koegel, & Everett, 1979), group instruction may provide opportunities for children to learn from seeing peers practice desired behaviors. Second, group instruction places children with autism in greater proximity to other children, which may increase the opportunity for children to interact. A third possible advantage of group instruction for teaching social skills is that the teaching often requires the learner to interact with others (Rotholz, 1990) and may promote generalization of skills. A fourth possible advantage of group instruction is that it may be more efficient in teaching social skills to multiple clients.

The purpose of the present study was to evaluate the effectiveness of the teaching interaction procedure in teaching social skills to a group of five children with autism. The study evaluated how well each participant displayed social skills taught to them.

1. Methods

1.1. Participants

Five children, ages 4–6 years old, participated in this study, all who were diagnosed with an autism spectrum disorder. To be included in the study, participants had to meet several criteria: (a) they had to be able to communicate in full sentences; (b) they had to have good receptive language (i.e., able to understand over 200 words, and both close-ended and open-ended questions); (c) they could not have an immediate history of self-injurious, aggressive, or severe disruptive behaviors. Direct observations of participants in their natural environments and parental interviews were used to determine if potential participants met these criteria.

Buddy was a 5-year-old boy independently diagnosed with autism by a school psychologist. Buddy had a Mullens Scales of Early Learning standard score of 87 and a Gilliam Autism Rating Scale (GARS) autism quotient of 98. In addition to these two assessments, Buddy had a Preschool Language Scale-4 standard score of 87, and a Social Skills Rating Scale-Parent (SSRS-P) standard score of 63. Buddy could speak in full sentences, had good play skills, and engaged in no obvious aberrant behaviors.

Brady was a 6-year-old boy independently diagnosed with autism by a pediatric neurologist. The only assessment administered was the SSRS-P in which he received a standard score of 98. Brady could speak in full sentences, had limited play, had numerous self-stimulatory behaviors (e.g., hand flapping, repeating questions, and perseverations), and engaged in some non-compliant behaviors (e.g., elopement, flopping, and answering questions incorrectly).

Jeremy was a 5-year-old boy independently diagnosed with autism by a psychologist. Jeremy had a Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III) full IQ score of 89 and a SSRS-P standard score of 59. Jeremy could speak in two to three word sentences, engaged in limited play, and had some non-compliant behaviors (i.e., screaming and refusing to do work).

Larry was a 4-year-old boy independently diagnosed with Aspergers syndrome by a psychologist. Larry had a WPPSI-III full IQ score of 89. Larry had an Autism Diagnostic Observation Schedule (ADOS) score of 11 and a Childhood Autism Rating Scale (CARS) score of 27.5. Larry's Vineland Adaptive Behavior Composite standard score was 85 and his SSRS-P standard score was 106. Larry could speak in full sentences, had moderate play skills, and engaged in repetitive behaviors.

Hank was a 4-year-old boy independently diagnosed with pervasive developmental disorder-not otherwise specified by a psychologist. Hank had a WPPSI-III full IQ score of 117 and a Vineland Adaptive Behavior Composite standard score of 82. Hank also had a Behavior Assessment System for Children Adaptive score of 37, and a SSRS-P standard score of 67. Hank could speak in full sentences and had moderate play skills.

In addition to the participants in the study, two typically developing children (Annie and Lisa) participated in the social skills group and this study. They were used as a peer model, participated in all teaching sessions, and occasionally role-played skills with the teacher. No data was collected on their behavior.

1.2. Setting

Teaching took place in an afterschool program within a preschool classroom at a mid-western university. The preschool classroom had two indoor play areas with access to an outdoor play area. Instruction took place with children sitting next to each other in a semi-circle facing the lead teacher (first author). Directly behind them were two or three support teachers who provided praise to participants for on task-behavior and who redirected any inappropriate behavior (e.g., eye gazing, falling to the floor, or other self-stimulatory behavior).

1.3. Social skills group

The social-skills group met twice a week for 1.5 h per meeting for 7 months for three of the participants (Buddy, Brady, and Jeremy) and for 5 months for two of the participants (Larry and Hank). The purpose of the social skills group was to teach a variety of social skills to five children diagnosed with an autism spectrum disorder. During each group meeting participants engaged in two instructional periods designed to teach the target skills, engaged in structured and unstructured games and activities (e.g., duck-duck goose, painting, reading stories), and learned other skills not related to the present study (e.g., identifying emotions and practicing social communication). During each group all the participants received the same teaching interaction procedure.

All participants utilized a token economy in which they earned tickets throughout the day for engaging in appropriate social behaviors, following instructions, and answering questions. Tickets were also earned during the teaching interaction procedure for answering questions and role-playing correctly. All tickets earned could be cashed in at the end of the session for tangible items such as bouncy balls, stuffed animals, light up toys, and whoopee cushions. The more highly preferred items required more tickets than did the items that were not as highly preferred. Participants were taught how to use the token system prior to the start of teaching of the social skills.

1.4. Social skills taught and measures of social skills

Four social skills were taught: showing appreciation, giving a compliment, making an empathetic statement, and changing the game when someone was disinterested. Buddy, Brady, and Jeremy were taught all four skills. Larry and Hank were taught making an empathetic statement and changing the game when someone was disinterested; they were not taught showing appreciation or giving a compliment because they entered the group later than the other participants. The skills taught were chosen based on parents' answers on the Social Skills Rating Scale (Greshman & Elliot, 1990), informal parental interviews, and direct observation of participants. Each of the four skills was task analyzed into smaller component steps (see Table 1), it was the participants performance on each of these component steps which was assessed during various probes conducted throughout the group's meeting time to determine skill acquisition, maintenance, and generalization.

Three types of tests, or probes, were used throughout this study to assess participants learning: teaching probes, baseline/maintenance probes, and generalization probes. Teaching probes were used as a part of the teaching interaction procedure and provided an ongoing measure of participants' progress during teaching. Teaching probes involved presenting a social

Table 1
Skill breakdown.

The skill	Step 1	Step 2	Step 3	Step 4	Step 5
Showing appreciation	Face the person with at least 2 s of eye contact	Saying "Thank You"	Giving an appreciative step "Saying I Like It"	Positive voice tone throughout	N/A
Giving a compliment	Face the person or item with at least 2 s of eye contact	Give person a general compliment "That's cool"	Give a specific compliment about the item "I like how you colored the elephant"	Positive voice tone throughout	N/A
Making an empathetic statement	Face the person	State the persons name	Make a general empathetic statement "Are you okay?"	Make a sympathetic statement "That looks like it hurt"	Appropriate voice tone throughout
Changing the game	Play a game with other person	When the other person looks bored or disinterested ask them if they want to play something else within 10 s	Get the game, toy, activity that other person said they wanted to play within 15 s	Play the new game/activity for no less than 10 s	Face the person throughout

situation to a participant that was intended to set the occasion for a participant to display the social skill currently being taught. Participants received praise and tokens for what they did correctly during the probe and/or corrective feedback and a request to re-practice the skill if any part of the skill was incorrect. Baseline probes were presented prior to any teaching to evaluate participants' skills prior to the teaching. Maintenance probes were presented after each skill had been taught to evaluate how well a previously taught social skill maintained over time. Both involved presenting a social situation to a participant as in the teaching probes, but there were no programmed consequences based on a participants' performance on either type of probe. Generalization probes were presented to participants prior to, during, and following the teaching of each social skill to evaluate whether participants would display appropriate social skills when an occasion to use a social skill was presented by a person not involved in teaching. There were no programmed consequences for performance on the initial generalization probes. At the end of the study, if generalization to a person not involved in training had not occurred, we evaluated the effects of programmed consequences (i.e., providing social praise and tokens for correct responses and providing corrective feedback and having the participant re-practice if incorrect response) and of giving participants reminders to use their social skills.

1.5. *Experimental design*

The experimental design of this study was a multiple probe design (Tawney & Gast, 1984) in which the skills of the participants were tested or probed on all skills at the beginning of the study, then one skill was taught followed by probes of all of the skills, then a second skill was taught followed by probes of all of the skills, and so on until all skills were taught.

1.6. *Experimental procedures*

1.6.1. *Baseline sessions*

During each baseline session, participants initially engaged in free-play activities with toys or dress up materials. Periodically, a support teacher took a participant away from the free-play activities to another part of the classroom and conducted generalization probes without any demonstrations, teaching, or consequences for participant performance. Then, the participant returned to the free-play activities. This continued until all of the generalization probes scheduled for that baseline session were completed, at which time the participants met together in a group. When the participants were together in a group, the lead teacher called each of the participants individually to the front of the group and conducted baseline probes (as described above). This continued until all of the baseline/maintenance probes scheduled for the session were completed. The order in which participants were asked to engage in baseline probes was randomly determined prior to the start of the baseline/teaching session. Baseline sessions continued until each participant had completed at least three baseline/maintenance probes and three generalization probes for each skill in the study.

1.6.2. *Teaching sessions*

Following the baseline sessions, teaching began. During the initial part of each teaching session participants engaged in free-play activities and the support teachers conducted generalization probes similar to baseline sessions. As soon as all of the generalization probes scheduled for that session were completed, the participants met as a group and one of the social skills was taught using the teaching interaction procedure.

Teaching began with the lead teacher stating what social skill was to be taught (e.g., "Today we are going to talk about giving a compliment."). Each participant was then asked to state what he would be learning throughout the session. Next, the lead teacher asked each of the participants to provide a rationale of why they should engage in the behavior (e.g., "If you give a compliment to your friends it would make them happy."). Then the lead teacher asked each of the participants to describe a time or situation when they could use the skill (e.g., "I could give a compliment when a friend shows me a picture."). Following that, the lead teacher described the specific steps of the skill. During this part of the teaching, the lead teacher asked one of the participants to state or describe the first step and then asked the rest of the participants to restate the step. This procedure continued until all steps were stated in the correct sequential order.

Following the description of the behavior, the lead teacher demonstrated the skill for the participants. For the demonstration, a support teacher engaged in a behavior that should set the occasion for the social skill being taught that session (e.g., the support teacher showed a picture to the lead teacher). Then, the lead teacher either appropriately displayed the social skill being taught (e.g., "That's cool! I like the dog in the picture.") or displayed a social skill that contained only part of the steps of the skill being taught. Next, the lead teacher asked the participants as a group to state if the lead teacher had displayed a correct or incorrect demonstration of the social behavior. If the lead teacher had displayed a correct demonstration of the social skill, then the group moved on to the role-playing phase of teaching. If the lead teacher had displayed an incomplete demonstration of the social skill, the participants were individually asked to identify one step of the skills that was demonstrated correctly and the step or steps that were not included in the demonstration. Then, the demonstration was repeated with the lead teacher displaying a correct demonstration of all steps of the social skill and the group moved on to the role-play phase of teaching.

In the final component of the teaching interaction, participants role-played (engaged in a teaching probe) the social behavior currently being taught in front of the group. Each participant was called up in a random order one at a time and the lead teacher displayed a behavior that should set the occasion for the participant to display the social behavior currently

being taught as described earlier. If the participant correctly displayed the behavior, praise and tickets were given to the participant. If the participant incorrectly displayed the behavior or omitted a step of the behavior the participant received corrective feedback and another chance to role-play the social skill. During the second role-play the participant received the same consequences for correct or incorrect demonstration as they did on the first role-play. If, after two role-plays, the participant did not display the behavior correctly, the participant was prompted by the lead teacher, as needed, to perform the social behavior correctly. Thus, only if a third role-play was needed, did the teacher use prompts (which usually involved the teacher reminding the participant which step of the skill was next).

Only the first teaching probe for each teaching session was counted towards the mastery criteria in this study. Mastery criterion was three consecutive role-plays, across at least 2 days, where the participant displayed all of the steps of the social skill. If all but one of the participants in the group reached mastery criterion, the participant was allowed at least six more teaching sessions to reach mastery before the group moved on to the next skill.

During the teaching interactions, both prompting and positive reinforcement were used. A flexible prompting approach (Soulaga, Leaf, Taubman, McEachin, & Leaf, 2008) was used. During the parts of teaching when participants had to answer questions, various prompts were used: another participant was asked to answer the question and the participant was taught to restate the answer, or the lead teacher rephrased the question in a different way designed to increase the likelihood that the participant would provide the correct answer, or the lead teacher stated the answer and asked the participant to repeat the answer.

Positive reinforcement was also provided to participants' contingent upon correctly answering questions and correctly role-playing the behavior. Positive reinforcement consisted of social praise from the lead teacher as well as tickets that were part of a classroom token economy system. Tickets were provided differentially based upon correct responding: participants received more tickets for answering or role-playing correctly the first time without any prompts and fewer tickets for correct responding the second or third time.

1.6.3. Maintenance sessions

Maintenance sessions were used to evaluate how well the skills previously taught maintained over time and to provide a continual assessment of skills that had yet to be taught. Maintenance sessions were conducted once all participants reached mastery criterion on the teaching probes or once all but one participant reached mastery criterion and extra teaching sessions were implemented. Maintenance sessions were identical to baseline sessions. Maintenance sessions were continued until stability in the data was seen.

1.7. Generalization probes

Generalization probes were conducted throughout baseline, teaching, and maintenance sessions. Generalization probes were implemented to assess if participants generalized the skills taught to them to a novel adult. Although generalization probes occurred throughout the entire study, the type of generalization probes did differ. Three types of generalization probes were conducted throughout the study: generalization probes with no reinforcement or reminding, generalization probes with reinforcement but no reminding, and generalization probes with reinforcement and reminding.

Generalization probes were always presented prior to the baseline, teaching, or maintenance probes during a session. A generalization probe started when one of the support teachers (not the lead teacher) engaged in a behavior that should set the occasion for an appropriate social skill from one of the participants. The support teachers used for generalization probes never conducted teaching on the social skills analyzed within this study. Probing order of the participants was randomly determined. The first variation of generalization probes was one where no consequences were provided based upon participants' performance and there were no reminders. However, if the participant did not reach mastery criterion (three consecutive sessions at 100%) on generalization probes they received the second variation of generalization probes in order to promote generalization.

The second variation of a generalization probe was the same as the first variation except that the participant received positive reinforcement for correct demonstration of the skill, or, following an incorrect performance, was provided corrective feedback and were asked to re-practice. If the participant did not reach mastery criterion using the second variation, the third variation was used to promote generalization. In the third variation, a participant received a reminder (priming) to display the appropriate social skills prior to the probe (a participant was told by one of the support teachers that in the near future he or she would be expected to display a particular social skill and was told what the steps of the skill were). This priming occurred approximately 1–2 min before the support teacher presented the probe. Additionally, a participant received positive reinforcement for correct demonstration of the skill or, for an incorrect performance of the skill, they received corrective feedback and were asked to re-practice. Table 2 contains a brief description of the teaching and generalization probes.

1.8. Social validity

All parents were provided information about the procedures as well as the results prior to completing a 17 question survey that was given to all parents to determine their satisfaction with the procedures, their satisfaction with the results, their satisfaction with the skills taught, and whether the parents felt the skills generalized to their home setting. Parents

Table 2
How skills are probed.

Skill	Baseline, maintenance, and teaching probes	Generalization probes
Showing appreciation	Lead teacher gives a small item (e.g., piece of candy) to the participant	Support teacher gives a different small item (e.g., small toy) to the participant
Giving a compliment	Another child shows a drawing that she made to the participant	Support teacher shows a different drawing that she made to the participant
Making an empathetic statement	Lead teacher acts like he got hurt playing a game	Another teacher runs into an object and acts hurt
Changing the game	Lead teacher plays a game with the participant and at some point during playing the lead teacher stops playing and puts his head in his hand	Another teacher plays a game with the participant and at some point during playing the lead teacher stops playing and looks around the room

Table 3
Social Validity Scale.

Type of question	1 point	2 point	3 point	4 point	5 point
Satisfaction questions	Dissatisfied	Not satisfied	Somewhat satisfied	Satisfied	Very satisfied
Importance questions	Very unimportant	Unimportant	Neutral	Somewhat important	Very important
Generalization questions	Never	Rarely	Sometimes	Often	Very often

were provided graphs of their children’s performance, a brief description of the procedures, and the lead author was available for any questions that the parents may have had. Parents were asked to indicate their satisfaction using a five point Likert-type scale ranging from dissatisfied (1) to very satisfied (5) as shown in Table 3. All surveys were kept anonymous, by emailing parents the survey and having them place it in an envelope and placing it in a box within a separate room. Surveys were analyzed by examining the total sum of each of the questions (across all surveys returned) and dividing by the number of surveys received.

1.9. Data recorded and accurate recording

The performances of participants during the various probes were the measures of the effects of teaching. During each probe, observers scored the occurrence or nonoccurrence of each step of the social skill that was appropriate to the situation presented (see Table 1). If a participant included a step that was not part of the relevant social skill the step was not scored, although this rarely occurred.

During some probes, two observers independently scored the behavior of the participants to evaluate the reliability of the recording of participants’ behavior. This was done during 44% of baseline/maintenance probes and teaching probes and 57% of generalization probes. The calculation of reliability between observers was done as follows: the number of relevant skill steps that the two observers agreed on was divided by the total number of skills steps and multiplied by 100%. The reliability between observers averaged 94.8% (range 80–100%) for baseline/maintenance and teaching probes and 92.8% (range 75–100%) for generalization probes across all social behaviors.

To evaluate treatment fidelity during the study, teaching sessions were videotaped and 30% were randomly selected to be scored by two independent observers. The observers scored whether the following events occurred during each teaching interaction procedure: (a) the teacher described the social behavior to be taught to participants; (b) the teacher provided a rationale for the behavior; (c) the teacher described a situation when each participant could appropriately display the behavior; (d) the teacher stated and described each of the skill steps; (e) the teacher demonstrated each step of the behavior to participants; (f) each participant role-played the behavior with the teacher; (g) the teacher asked at least one question to each participant during teaching; (h) the teacher provided consequences appropriately to each of the participants for correct performance in answering questions or during the role-plays. The observers recorded the presence or absences of all eight of the above events in 99% of the videotapes. Agreement between the observers was calculated by comparing whether observers agreed or did not agree on the presence of each of these events for each videotape. The observers agreed on scoring of the events on 100% of the instances.

2. Results

2.1. Effectiveness, maintenance, and generalization results

Figs. 1–3 display performance on all of the teaching probes, baseline/maintenance probes, and the generalization probes for Buddy, Brady, and Jeremy, respectively. Fig. 4 shows Larry’s and Hank’s data. Each panel within these figures represents one of the social skills taught, and the different types of data points indicate the different types of probes, as shown on the figures.

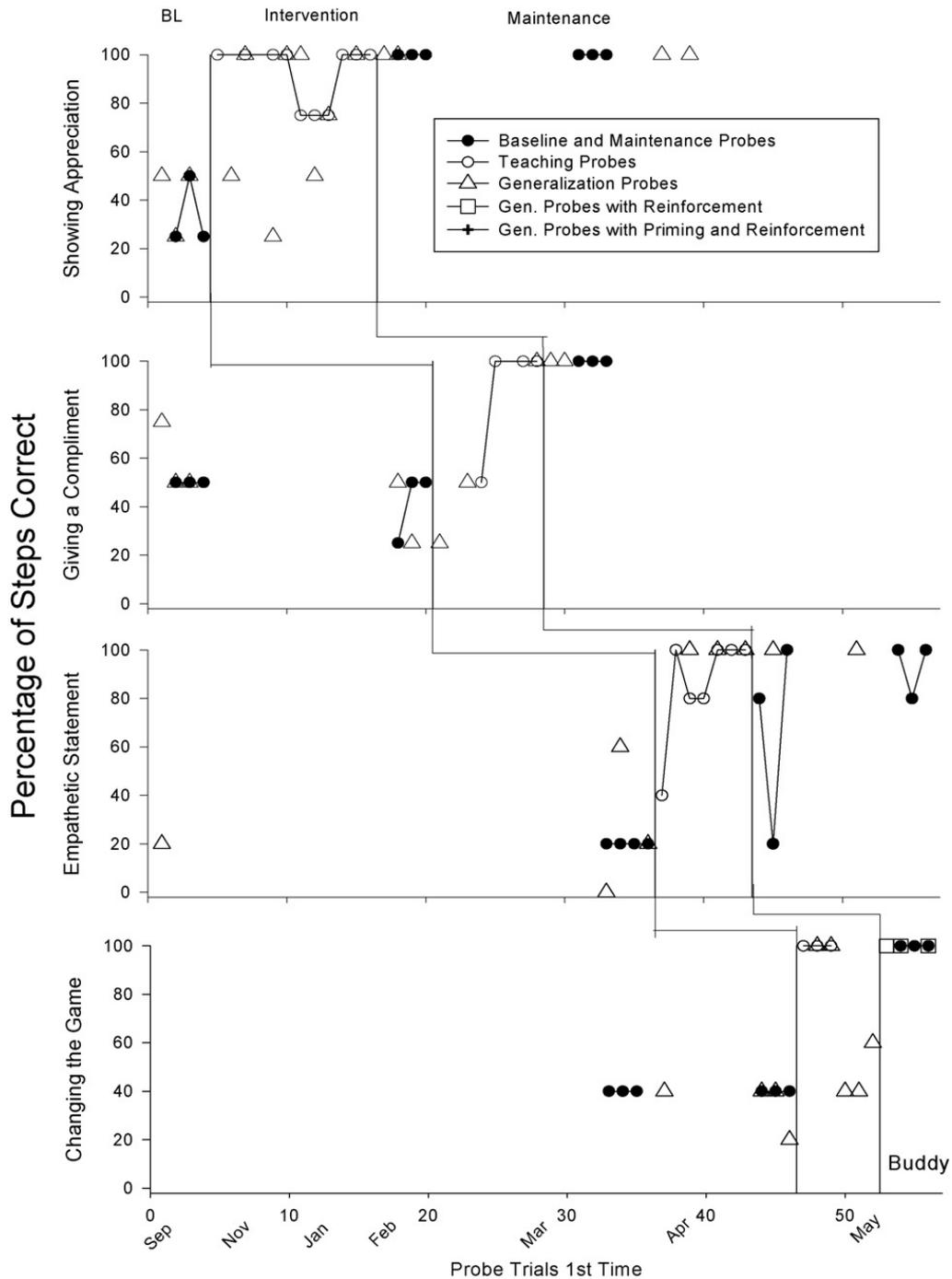


Fig. 1. Buddy. Percentage of steps performed correctly on the various probes.

During baseline probes Buddy displayed no more than 50% of the steps correctly. Once intervention began Buddy reached mastery criterion for each of the four social skills taught and maintained each of the target social skills near mastery criterion levels once intervention had ended (see Fig. 1). Buddy also generalized three of his social skills to another teacher without any reinforcement or priming and generalized his final skill with the addition of positive reinforcement.

During baseline probes Brady displayed no more than 50% of the steps correctly. Once intervention began Brady reached the mastery criterion for each of the four social skills taught and maintained each of the target social skills near mastery criterion levels during maintenance probes (see Fig. 2). Brady also generalized two of his skills to another teacher without any reinforcement or priming, one of his social skills with the addition of positive reinforcement, and one of his social skills with the addition of positive reinforcement and priming.

During baseline probes Jeremy displayed the four social skills at a consistently low level. Once intervention began Jeremy reached the mastery criterion for three of the four social skills taught (see Fig. 3). The only skill that did not reach mastery criterion was showing appreciation. This may have been because Jeremy's attendance in the group was inconsistent while

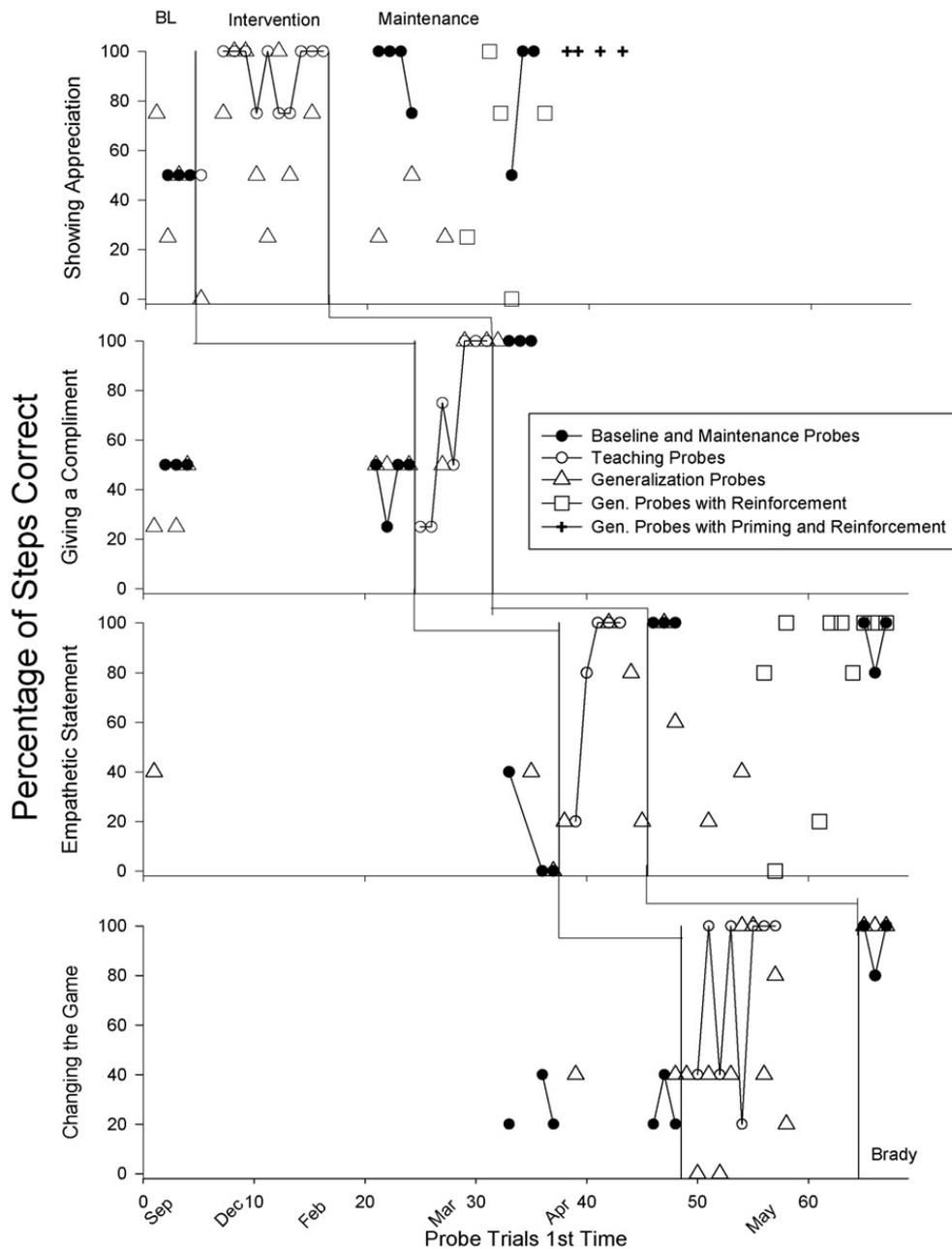


Fig. 2. Brady. Percentage of steps performed correctly on the various probes.

showing appreciation was being taught. Jeremy maintained each of the target social skills near mastery criterion levels during maintenance probes. Additionally, Jeremy generalized two of his skills to another teacher without any reinforcement or priming, generalized one skill with the addition of reinforcement, and generalized one skill with the addition of reinforcement and priming.

During baseline probes Larry and Hank each displayed the two social skills at a consistently low levels. Once intervention began, Larry and Hank reached the mastery criterion for the two skills taught to each of them (see Fig. 4). Larry maintained both of his social skills near mastery criterion levels while Hank maintained one of his social skills near mastery criterion levels. Larry generalized one of his skills without any reinforcement or priming and generalized one skill with the addition of reinforcement. Hank did not generalize his skills to high levels.

In summary, Buddy and Brady reached mastery criterion on the teaching probes for all four skills taught, Larry and Hank reached mastery criterion on the teaching probes for the two skills they were taught, and Jeremy reached mastery criterion for three of the four skills taught to him. All but Hank maintained skills near mastery criterion on the maintenance probes up to 8 weeks after intervention had been terminated. Thus, each participant learned all or almost all of the skills taught, and learned each skill only when teaching was implemented for that skill.

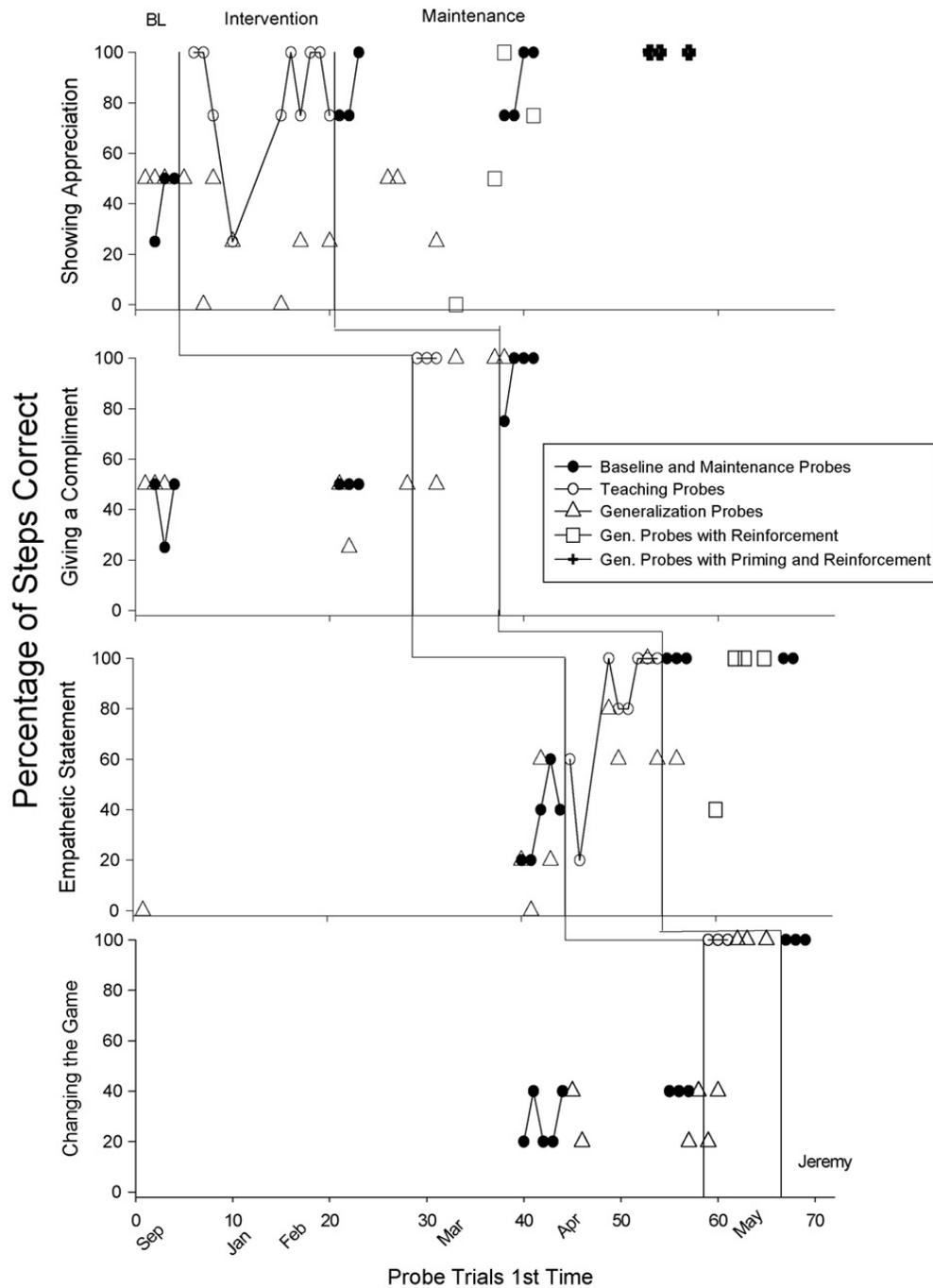


Fig. 3. Jeremy. Percentage of steps performed correctly on the various probes.

Mixed results were obtained in the generalization probe data: 57% of the skills needed no promotion of generalization to reach 100% across 3 days, 28.57% of skills needed reinforcement and re-practice to reach 100% across 3 days, and 14.28% of skills needed priming. Only Hank did not reach 100% across 3 days possibly due to the fact that he had to withdraw from this study four sessions prior to teaching sessions ending.

2.2. Efficiency measures

The average number of teaching session probes, groups, and weeks it took for each participant to reach mastery criterion are displayed in Table 4. Participants were able to learn each of the social skills in no more than 10 instructional periods (two instructional periods were conducted during each group meeting) and in no more than 5 social skills group meetings. Since, Jeremy did not reach mastery criterion on his first skill, showing appreciation, it was not assessed in the efficiency measures.

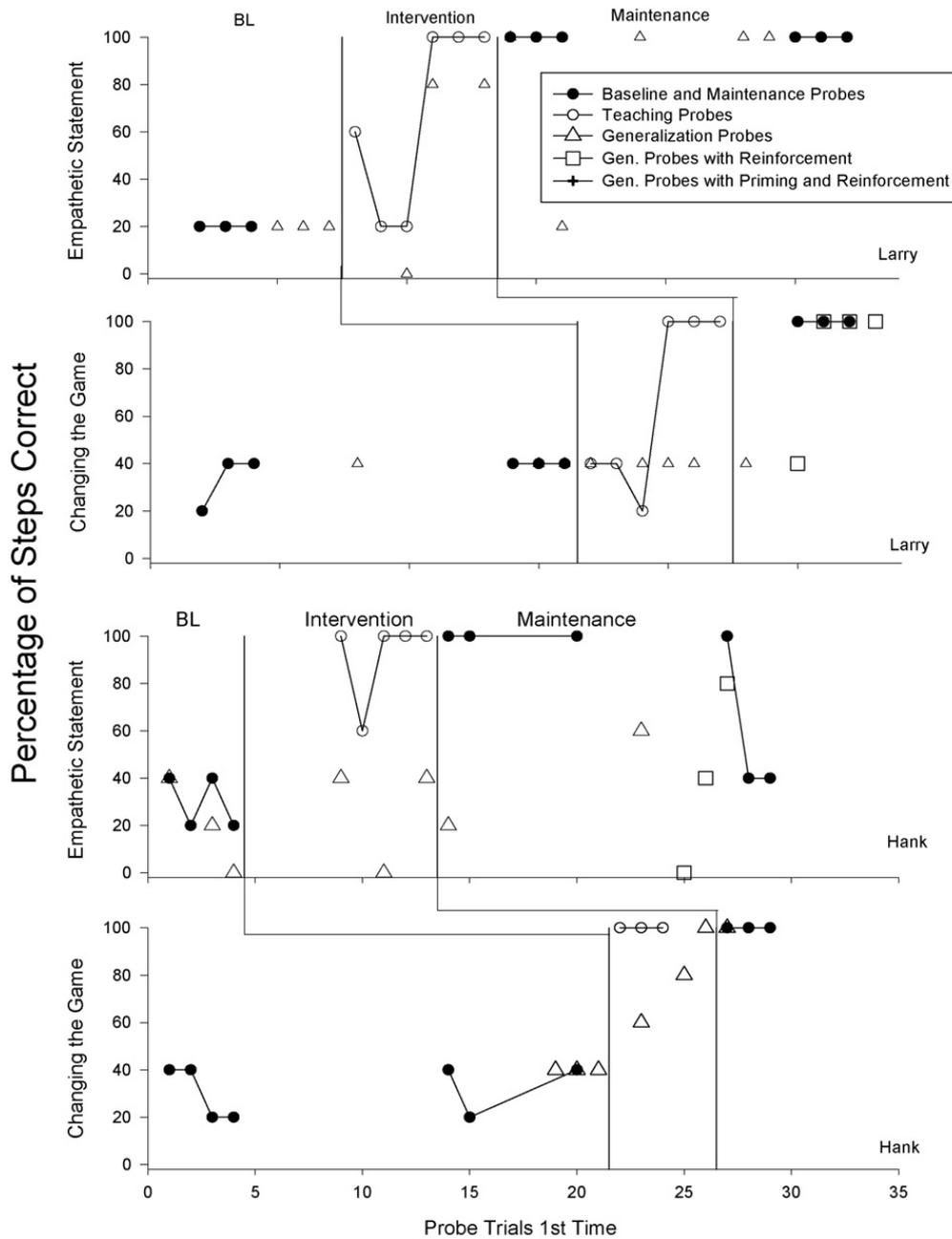


Fig. 4. Larry and Hank. Percentage of steps performed correctly on the various probes.

2.3. Social validity results

All five parental surveys were returned. Table 5 represents all questions that were on the social validity survey, the average score across all parents, and the range of scores across all parents. Parents were either very satisfied or somewhat satisfied with the procedures implemented, the targets selected, as well as the results of the study. All of the parents were very satisfied with skills taught and with the results of the study, while 66.67% of parents were very satisfied with the teaching interaction procedure. Finally, the parents felt that some generalization of the skills taught was occurring in the home setting.

3. Discussion

Results from this study indicate that all five children acquired social skills when the teaching interaction procedure was implemented. In addition, most participants maintained their skills up to 8 weeks after intervention had been terminated, and generally, high levels of generalization occurred following the teaching. Finally, social validity ratings from parents indicated that they were satisfied with the teaching interaction procedures and the results of the study. Results of this study

Table 4
Efficiency of teaching procedures.

Social skill taught	Average number of sessions	Average number of probes	Average number of groups	Average number of weeks
Showing appreciation	3 (range 3)	3 (range 3)	2.33 (range 2–4)	1.75 (range 1.5–2)
Giving compliments	4.66 (range 3–7)	4.66 (range 3–7)	2.33 (range 2–3)	0.83 (range 0.5–1)
Making empathetic statements	6.2 (range 5–8)	6.2 (range 5–8)	3.8 (range 2–5)	1.5 (range 1–2)
Changing the game	4.44 (range 3–8)	4.44 (range 3–8)	2.8 (range 2–5)	1.4 (range 0.5–3)

Table 5
Social validity results from parents.

Question	Average score	Range of scores
Overall how satisfied are you with the skills taught	5.0	5.0
Overall how satisfied are you with the teaching interaction procedure?	4.67	4–5
Overall how satisfied are you with the results?	5.0	5.0
How important do you think it is to teach your child to show appreciation?	5.0	5.0
How important do you think it is to teach your child to give a compliment?	5.0	5.0
How important do you think it is to teach your child to make empathetic statements?	5.0	5.0
How important do you think it is to teach your child to change a game?	4.83	4–5
How satisfied are you with the results of teaching how to show appreciation?	4.75	4–5
How satisfied are you with the results of teaching how to give a compliment?	5.0	5.0
How satisfied are you with the results of teaching how to make an empathetic statement?	4.83	4–5
How satisfied are you with the results of teaching how to change the game?	4.25	4–5
Since the group has begun has your child demonstrated showing appreciation outside of the group?	4.5	4–5
Since the group has begun has your child demonstrated giving a compliment outside of the group?	3	2–4
Since the group has begun has your child demonstrated making an empathetic statement outside of the group?	2.8	2–5
Since the group has begun has your child demonstrated changing the game outside of the group?	2.3	1–3

expand the literature in several ways and have several implications for clinicians implementing social skills interventions for children with autism.

First, this study provides further empirical support as to the effectiveness of the teaching interaction procedure for teaching social skills to children with autism. Additionally, this study extends the research by implementing the teaching interaction procedure as part of group instruction and by evaluating maintenance of the skill.

Second, the generalization of skills taught to participants was relatively high. It is not clear why such high amounts of generalization occurred in the present study in contrast to earlier studies using other social skills interventions (e.g., [Delano & Snell, 2006](#)), but it may be because the teaching procedure used a group teaching format or because the generalization probes occurred in the same classroom as where the teaching occurred (though in a different area of the classroom).

Third, this study adds to the research on the effectiveness of group instruction for children with a pervasive developmental disorder. Traditionally, children with autism are taught using discrete trial teaching in a one-to-one instructional format. Although children with autism are typically taught in this format, it has been recommended that children with autism receive group instruction as part of intervention ([Leaf, McEachin, & Taubman, 2008](#); [Leaf, Taubman, & McEachin, 2008](#)) and numerous studies have shown the effectiveness of group teaching for children with autism (e.g., [Kamps, Dugan, Leonard, & Daoust, 1994](#); [Taubman et al., 2001](#)). Additionally, [Kamps, Walker, Locke, Delquadri, and Hall \(1990\)](#) compared the effects of one-to-one instructional format to that of group instruction utilizing different teachers for teaching word recognition to three children with autism. The results of this study suggest that both of the instructional formats were effective in teaching all three participants the word recognition task. When an experienced teacher implemented group instruction it was as or more effective than when the teacher implemented one-to-one instruction.

There were several limitations in the present study that should be addressed in future research. First, though generalization occurred at high rates, it was only tested in a different area of the classroom and with a different person; it was not tested in other environments (i.e., school, home, community) or with peers. Though parents reported that generalization was occurring in the home, no direct observations of this were conducted. Clearly, future research is warranted to assess if the teaching interaction procedure would be successful in participants generalizing skills to both their peers and to other environments.

Second, not all participants reached mastery during generalization probes. One possible way to promote generalization in teaching is to have multiple teachers of the social skills. In the present study, only one teacher implemented the teaching interactions and a different teacher implemented the generalization probes. The use of multiple teachers may be a way to promote generalization because it provides the learner with multiple exemplars ([Stokes & Baer, 1977](#)).

Third, although all of the participants were diagnosed on the autism spectrum, they were all relatively high functioning in that they all demonstrated basic language and play skills and low levels of aberrant behavior. Therefore, it is unknown how

effective the teaching interaction procedure would be for children with autism who had more restricted skills and what, if any, procedural modifications might be needed to teach the type of social skills that were taught in the present study.

Fourth, it is not clear what components of the teaching interaction procedure are needed to create a behavior change. The teaching interaction procedure has multiple components. Additionally, there are procedures similar to the teaching interaction procedure such as behavioral skills training (Himle, Miltenberger, Flessner, & Gatheridge, 2004; Lafasakis & Sturmey, 2007; Stewart et al., 2007) that do not contain all of the components of the teaching interaction, yet are also effective in teaching multiple skills. Therefore, a component analysis may be warranted to determine which components, or combination of components, are needed to produce effective and efficient learning.

Finally, this study assessed the effectiveness of the teaching interaction procedure utilizing a single-subject design. The use of a single-subject design is appropriate for assessing the effectiveness of interventions across a small number of participants, and can control for threats to internal validity such as maturation effects, repeated exposure to teachers, and testing effects. This design does not however, control for threats to external validity such as selection bias and how the effects of the procedures may vary across a wider variety of potential participants. Therefore, future research seems warranted to analyze the teaching interaction procedure with larger numbers of children with pervasive developmental disorders.

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