Effects of a Group Teaching Interaction Procedure on the Social Skills of Students with Autism Spectrum Disorders

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Abstract: One of the distinct characteristics of children with Autism Spectrum Disorders (ASD) is significant delays in socialization. Students with ASD often struggle to develop meaningful social relationships with their peers. Learning appropriate socialization skills is a necessary first step that is often taught using a systematic, direct instruction approach. The purpose of this study was to assess the effectiveness of a Teaching Interaction (TI) procedure on four social skills across four elementary-aged participants with ASD. All participants received training on the same social skills within a group setting through daily instruction at school. A modified multiple-probe design showed that the TI procedure was effective in teaching all the targeted social skills to the participants. Prior to intervention, the participants showed relatively low levels of the four social skills targeted; however, after intervention, all participants showed a significant increase in their ability to perform the skills. Furthermore, the data show that all participants maintained the learned social skills over time.

Autism Spectrum Disorder is diagnosed by pediatricians throughout the United States at a rate of one in 68 children (Center for Disease Control, 2012). One of the core deficits of students with Autism Spectrum Disorders (ASD) is a qualitative impairment in the area of socialization. This deficit in the development of social skills is characterized by a lack of understanding of the nonverbal behaviors that regulate social interactions, failure to build developmentally-appropriate peer relationships, the lack of joint attention to objects or enjoyment, and a lack of social or emotional reciprocity (American Psychiatric Association, 2013). Researchers have found that children with ASD have friendships that may occur periodically, most commonly through the facilitation of their parents and/or teachers (Bauminger & Shulman, 2003). However, these relationships are often qualitatively different when compared to those of typically-developing children (Bauminger & Kasari, 2000). One explanation for this marked difference in socialization for children with ASD may be that they lack the necessary social skills to facilitate reciprocal relationships. Because socialization is a core deficit for students with ASD that has the capacity to negatively affect their social functioning throughout their lives, behavioral interventions should focus on teaching social skills to these students (Flynn & Healy, 2012).

Much attention has been given to defining the qualitative differences of the social interactions of students with ASD, but there is little agreement in the literature about how to most effectively address the teaching of these core skills (Flynn & Healy, 2012), which may be the result of differences that occur in the manifestation of the disability (Kasari et al., 2005). A large body of literature supports intensive one-on-one instruction for students with ASD, but this method may be difficult to implement in a typical classroom setting, and less effective in teaching some pivotal skills such as social interaction (Steege, Mace, Perry, & Longenecker, 2007). Teaching social skills through a group instructional format provides several advantages over individual instruction of the same skills. Charlop, Schreibam, and Tryon...
(1983) found that group social skills instruction provides an increased opportunity for students to learn through observation of their peers. Additionally, this instructional format allows not only for more students to be instructed at one point in time, but allows for instruction to be provided in a more naturalistic environment. Students with ASD present with a noted difference in their ability to generalize information taught in contrived environments (Charlop et al., 1983). Therefore, teaching socialization skills within the context of a social group provides an opportunity for the targeted skills to be practiced and shaped within the naturalistic setting, which may lead to an increased likelihood of generalization (Dotson, Leaf, Sheldon, & Sherman, 2010).

Over the past 30 years, researchers have utilized the principles of applied behavior analysis (ABA) to design a number of social skills interventions for students with ASD (Matson, Matson, & Rivet, 2007). A variety of interventions have been utilized to address this skill deficit. Social stories (Barry & Burlew, 2004; Gray & Garand, 1993), video modeling (Apple, Billingsley, & Schwartz, 2005; Charlop-Christy, Le, & Freeman, 2000), discrete trial teaching (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993), and behavioral skills training (Stewart, Carr, & LeBlanc, 2007) are several of the interventions that have resulted in a positive effect on the social skills development of students with ASD. One specific intervention that shows potential to assist students in this population in advancing their social competence is the Teaching Interaction procedure (TI; Leaf et al., 2009).

TI is based upon the principles of applied behavior analysis and is a systematic teaching procedure during which the teacher describes the behavior, provides a rationale for the use of the behavior, provides cues of what social situations are appropriate for its use, and then demonstrates the behavior for the students. The learners’ roles within TI are to role play the behavior being taught and adjust this performance based upon feedback from the teacher. TI is very similar to behavioral skills training, but it differs in that it provides a rationale for the behavior. This rationale is provided to encourage the student to engage in self-instruction and self-management of the social skill when in socialization situations outside of the presence of the teacher (Leaf, Dotson, Oppenheim, Sheldon, & Sherman, 2010). Minkin et al. (1976) initially implemented TI with four adolescent girls with social deficits, and found that all participants demonstrated an increase in conversational skills. In a follow-up study, Maloney et al. (1976) systematically replicated the Minkin et al. (1976) study and reported similar findings.

TI has since been utilized to teach safety skills to young children without disabilities (Yeaton & Bailey, 1978), and to facilitate staff training (Harchik, Sherman, Sheldon, & Strouse, 1992).

Leaf et al. (2009) were the first researchers to implement TI, combined with a token economy system, to teach social skills to students with ASD. Four pro-social behaviors were taught to each of the three participants in a one-to-one setting, and all the participants showed an increase in all targeted social skill behaviors. The study expanded the research base through demonstrating that the use of the TI procedure is effective for teaching social skills to students with ASD.

Leaf et al. (2010) expanded their research by implementing the TI procedure to improve social skills behaviors of five students with ASD in a group clinical setting. They sought to determine if the TI procedure was as effective in a group setting for this population, as it was within a one-to-one setting. Whereas children with ASD have noted deficits in observational learning necessary for learning within a group instruction environment (Varni, Lovaas, Kogel, & Everett, 1979), Leaf et al. (2010) evaluated the effectiveness and possible advantages of teaching participants with ASD within a group setting. All five elementary-aged participants showed marked improvement from baseline in the performance of the social skills targeted. The study extended the research through the implementation of TI in group social skills instruction, as well as evaluating the sustainability effect of the outcomes for each participant.

Dotson et al. (2010) systematically replicated the earlier Leaf et al. (2010) study with five adolescents with ASD in a private after-school program in a university setting, two days per week. The results of this study were consistent with the previous research and found marked increases in the pro-social be-
haviors targeted for the participants. Results showed that group instruction increased the probability of observational learning of the participants and allowed them to see multiple exemplars of the same social skill. Taken as a whole, the Dotson et al. (2010) and Leaf et al. (2010) studies demonstrated that group instruction of social skills utilizing TI is a promising method for teaching social skills to students with ASD.

Although the TI intervention, as well as other social skills treatments that have been found effective for teaching social skills to children with ASD, many have only been studied within highly controlled clinical settings. With the rise in identification of students with ASD, school systems nationwide are searching to find an approach to social skills training for this population that is both effective and cost-efficient (Flynn & Healy, 2012). One-to-one teaching is highly costly to implement within the school-based setting, and group interventions are often the route educators must take to address the needs of their students in a cost effective manner (Chasson, Harris, & Neely, 2007). However, without the appropriate systematic intensive instruction backed by empirical research, schools are struggling to provide appropriate social skills instruction for students with ASD (Cappadocia & Weiss, 2010; Flynn & Healy, 2012).

The purpose of this study was to extend the Leaf et al. (2010) study through investigating the effectiveness of group TI instruction on improving the social skills of four students with ASD within a school-based setting. The purpose of this study was to specifically answer the following research questions:

1. To what extent will the implementation of a group TI procedure improve the social skills of students with ASD when taught in a school-based environment?
2. Post-intervention, to what extent will the social skills acquired by the participants be sustained over time?

Method

Participants

A set of six inclusionary criteria were set for participation in this study. Criteria for students were as follows: (1) an educational placement in a self-contained special education elementary classroom for students with ASD; (2) a DSM-IV diagnosis of Autism Spectrum Disorder; (3) functional verbal communication skills; (4) a previous history of social skills instruction; (5) social needs reported by the teacher and parents’ answers on the Social Skills Improvement System (Greshman & Elliot, 2008); and, (6) parental permission. Direct observations of participants in their school environments, record reviews, and parent interviews were utilized to determine potential participants within one school setting. The first four eligible children to return parental permission were included in the study.

Mike was a 10-year-old student with Asperger’s Syndrome. Mike had a Childhood Asperger Syndrome Test (CAST) score of 24, which placed him within the range for Asperger’s Syndrome. He had participated in a self-contained classroom setting since the age of five. Through direct observation and both parent and teacher reports, it was determined that Mike showed difficulty following directions, joining and participating in activities with his peers for a sustained amount of time, and ignoring classroom disturbances. Mike was observed with fully functional language, developed play skills, and did not have a history of challenging behavior that caused environmental damage. However, Mike did display some stereotypical, self-stimulatory behaviors (i.e., jumping, vocal outbursts, and perseverations).

Bob was an 8-year-old boy diagnosed with high functioning autism. Bob had a Gilliam Autism Rating Scale-Second Edition (GARS-2) autism quotient of 85, which determined his probability of autism as very likely. He had participated in a self-contained classroom setting since the age of five. Bob had average to above average intellectual ability and could speak in full sentences. However, he had limited interest in the play or interests of others, had numerous self-stimulatory behaviors, and engaged in some non-compliant behaviors (i.e., flopping, cursing, and refusal to participate in activities). Bob’s parents and teacher reported that his ability to build and maintain friendships, even with peers of whom he had years of exposure, was limited.

Larry was a 10-year-old boy diagnosed with
Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS). Larry had a GARS-2 autism quotient of 104, which determined his probability of autism as very likely. As a result of difficulty following teacher directions and impaired social skills, he had participated in the self-contained special education classroom for three years. Through direct observation and parent report, Larry did engage in numerous repetitive, self-stimulatory behaviors (i.e., hand flapping and perseverations). He did have functional communication skills.

Barbara was an 8-year-old girl who had been diagnosed with Asperger’s Syndrome. Barbara had a GARS autism quotient of 85, which determined her likelihood of autism as highly probable. She had been serviced in a self-contained special education program since the age of three. Barbara was able to communicate in full sentences, had very limited cooperative play skills, and engaged in repetitive behaviors (i.e., bouncing, flapping, and scripting).

Setting

The study took place at a public elementary school during the regular school day. It occurred within a self-contained classroom for seven students with ASD. A 45-minute social skills group session was conducted each day for 34 sessions. Maintenance data were collected for two additional sessions. All students in the classroom participated in the social skills group; however, data were only utilized for the first four students with parental permission. Instruction took place with children sitting next to each other in a semi-circle facing the lead teacher (the first author). Directly behind them was one support teacher/paraprofessional that provided praise to participants for on task-behavior and redirected any inappropriate behavior (e.g., inappropriate touching of others, lying on the floor, or other self-stimulatory or distracting behaviors) using standard classroom procedures, or specific procedures outlined in the student’s Individualized Education Program (IEP).

Social Skills Group

The social skills group met each school day for 45-minutes per session for all four participants across all phases. The purpose of the social skills group was to teach a variety of socially appropriate behaviors to the four students diagnosed with ASD. During each group meeting, participants engaged in structured activities designed to teach the targeted social skills. All students received the same teaching interaction procedure.

Social Skills Targeted and Measures

Four social skills were taught to the participants utilizing the teaching interaction procedure for this study. The skills taught were chosen based upon social needs reported by the teacher and parents’ answers on the Social Skills Improvement System (Greshman & Elliot, 2008) and direct observation of participants. The targeted skills were identified as asking for help from an adult (i.e., raising a hand), ignoring classmates when they are distracting (i.e., continuing to focus on task at hand), joining activities that are already started (i.e., entering play appropriately), and responding appropriately when a game is changed (i.e., continuing play when game changes or using appropriate verbal language to exit game). These skills were reported as important skills for each participant. Each of the four skills identified were operationally defined and behaviorally task analyzed into smaller component steps. Participants were assessed on each component step of the overarching social skill to determine skill acquisition and maintenance of each skill. The dependent variable was the percentage of skill steps successfully performed by the participant (see Table 1).

Design

The single-case design utilized for this study was a modified multiple-probe design across skills. A modified multiple-probe design was utilized because the research study was conducted in a classroom environment by the classroom staff. Therefore, in order to minimize the interference of standard classroom instruction, consecutive baseline sessions were
The study consisted of three phases: baseline, intervention, and maintenance. Data for all three phases were collected on the percentage of skill steps performed correctly for each skill. Baseline sessions were continued until data were stable and each participant completed at least five data points in baseline. Stability of baseline data was achieved when all data points lay within 50% of the mean. All interventions for each participant continued for a minimum of five data points. Mastery criterion was defined as a performance of 100% of all skill steps over two consecutive sessions. If mastery criterion were not achieved for a skill within 10 sessions, the intervention ceased for that skill.

Procedure

Baseline. Each session began with cooperative free play activities while the teacher conducted performance probes on each social skill with each participant. During performance probes, the teacher engaged in a behavior that set the occasion for the participant to perform the targeted social skill. For example, while the teacher was engaging in a game to build a tower of blocks, she quickly changes her appearance to look disinterested in building the block tower. After the student responded to the social situation, data were recorded to document the number of steps performed correctly for each skill. The teacher did not provide any teaching or programmed consequences for the performance of the participants during baseline probes.

Teaching Interaction Procedure. The lead teacher (first author) began the group by stating what social skill was to be taught during each session. Each participant was then prompted to restate what he/she would be learning that day. The teacher then prompted each participant share the rationale for engaging in the targeted skill with the group, and provided an example of when it may be appropriate to utilize the skill. Following this step, the teacher then provided the specific task-analyzed steps necessary to successfully complete the targeted skill (Table 1). For each step, the teacher used a choral response technique to have all students stating each step in the sequence of the targeted skill. Following the description of the behavior, the
teacher provided a demonstration of the behavior. The support teacher engaged in a behavior designed to evoke the targeted social skill. The lead teacher then engaged in the social skill correctly, partially correct, or incorrect. If the lead teacher engaged in a partially correct or incorrect demonstration, the participants were asked individually to identify the steps that were completed incorrectly, and how to correct them. With the guidance of the participants, the lead teacher then demonstrated the targeted skill correctly.

The final component of the TI procedure occurred when the participants independently engaged in the role-playing of the targeted skill. The lead teacher began by engaging in a behavior that should evoke the targeted social skill by the participant. If the participants correctly engaged in the targeted skill, behavior-specific praise and primary reinforcement was delivered. If the participants engaged incorrectly in the targeted skill, corrective feedback, prompting, and a second opportunity to role-play the social skill were provided. The teacher also provided a behavior-specific verbal reminder of the expected performance of each step of the targeted skill. During the second attempt, if the participant engaged in the skill correctly they received behavior-specific praise and primary reinforcement.

Inter-Observer Agreement (IOA)

In order to ensure reliability of data, point-by-point IOA (Cooper, Heron, & Heward, 2007) was calculated on 33% of all performance probes. The teacher and another trained observer independently recorded participant behaviors. Inter-observer agreement was calculated by totaling the number of times the observers agreed on the scoring of each skill step (as correct or incorrect) divided by the total number of agreements plus disagreements and multiplying by 100%. The mean percentage of agreements was 93.3%, with a range of 80–100%.

Procedural Fidelity

Procedural fidelity was measured for 30% of the intervention sessions. These sessions were observed by two trained observers. The observers scored whether the planned events during each teaching interaction procedure occurred by the teacher. The events recorded were (a) labeling and asking the participant to state the behavior, (b) asking the participant to provide a rationale, (c) asking the participant to state when to display the behavior, (d) asking the participant to state each of the behavioral steps, (e) demonstrating the social skill, (f) asking the participant to evaluate the experimenter’s demonstration of the social skill, (g) asking the participant to role-play the social skill, and (h) providing feedback on the role-play. The observers recorded the occurrence or non-occurrence of each component of the teaching interaction procedure described above. Procedural fidelity was 100% across all teaching interactions scored. The reliability amongst the two observers was also 100%.

Social Validity

Social validity was measured using a parental survey constructed by the first author. Parents were asked to complete the survey, as the researcher and the paraprofessionals were involved in the study and the results may have been biased if individuals directly involved had provided social validity information. Additionally, the parents reported the social problem, therefore the researchers wanted to focus on their responses to the intervention. Three subsets of questions were asked to determine the level of satisfaction, importance of targeted social skills, and generalization of performance resulted from the study. A 5 point Likert-type scale was utilized. Surveys were returned for all four participants. Parents reported that they were “very satisfied” or “somewhat satisfied” with the social skills selected for targeted behaviors, procedures implemented, and the results of the study. All of the parents reported that they felt that the social skills taught were “very important”, and 100% of the parents reported that they were “very satisfied” with the teaching interaction procedure. Finally, the parents reported that generalization of the social skills taught was occurring outside of the school-based environment.
Results

All participants were able to demonstrate the targeted social skill behaviors when, and only when, the TI procedure was implemented. Figures 1–4 represent the baseline, intervention, and maintenance data for all four participants. Sessions were displayed on the horizontal axis, while the percentage of skill steps exhibited correctly by the participant on each social skill were displayed on the vertical axis. Asking for help from adults, ignoring classmates when they are distracting, joining activities that are already started, and responding appropriately when others changed the game were the targeted social skills for each participant. Each panel within the figures represents one of the social skills targeted in the teaching interaction procedure intervention. All participants were given pseudonyms to ensure that their anonymity was maintained.

When visually analyzing the data, a predictable baseline was established prior to intervention for all participants. Stability was established when the baseline data points lay within 50% of the mean and showed a predictable pattern of behavior. Throughout baselines for each skill, all four participants’ data stabilized after five sessions. Baseline data for all the participants confirmed relatively low levels of performance across all social skills.

When examining the data between phases, an immediacy of effect was shown by all participants across all social skills after intervention sessions began. The data also showed a consistency of data patterns between and across phases, with no variability. Mike’s performance on social skill steps averaged 21% steps correct during baseline phases; however, his performance notably increased in the intervention phases to a range of 84% to 92% steps correct with a mean of 88%. Larry’s performance on social skill steps averaged 15% during baseline phases and 89% in the intervention phases. His scores in the intervention phases ranged from 84–92% steps correct. Similarly, Bob’s baseline scores had a mean of 16% steps correct and a mean of 90% steps correct in intervention phases. Barbara’s performance followed these same patterns with a mean of 18% steps correct across baseline phases and a mean of 88% steps correct after intervention.

Discussion

The purpose of this study was to investigate the effect of a group TI procedure on the social skills acquisition of students with ASD in a school-based setting. Results from this study demonstrated that all four children acquired social skills when the group TI procedure was implemented. Additionally, all participants maintained these skills at high levels after intervention concluded. Social validity ratings from the parents indicated that they were “very satisfied” with the teaching interaction procedure, and the intervention outcomes. The results demonstrated a strong functional relation between the independent variable and the dependent variables. These results expand the literature base related to the use of the TI procedure with students with ASD. Furthermore, this study also provides several implications for practitioners implementing social skills interventions for students with ASD.

During the intervention phase, all participants had 100% non-overlapping data points between baseline and intervention data for all social skills targeted. Once intervention began, all the participants met mastery criteria for all four social skills taught. Furthermore, maintenance data show that the participants’ performance of these social skills was maintained at or near mastery criterion levels once the intervention had ended. All participants, with the exception of Mike, maintained a mean of 100% steps correct during the maintenance phase conducted 5 weeks after the intervention phases ceased. It is notable that maintenance data were conducted after a break in the school calendar for 2 weeks. Therefore, the data show that all participants were able to maintain high levels of the skills learned over time. The data suggest that the group TI procedure was a causal factor for the improvements in social skills observed by the participants. A functional relation was found between the group teaching interaction procedure and social skill acquisition and maintenance for all participants. This functional relation is evidenced by four demonstrations of effect within participants and four replications of effect across participants.
ing a group teaching interaction procedure to teach social skill acquisition to children with ASD. Although children with ASD are traditionally taught pivotal skills using discrete trial
teaching in a one-to-one teaching environment, Leaf et al. (2010) established that group instruction utilizing the teaching interaction procedure for acquisition of social skills for students with autism was a viable method of instruction. However, their study was con-

![Graph showing results for Larry.](image)
ducted in a clinical setting and did not demonstrate generalization to the natural context. The current study was conducted within an applied, school-based environment within the
confines of a classroom. The participants in this study exhibited more challenging behaviors than in previous studies with reference to the teaching interaction procedure (Dotson et al., 2010; Leaf et al., 2009, 2010). The results demonstrate that a group social skills
environment utilizing the teaching interaction procedure was effective in teaching critical social skills to children with ASD within a school-based setting. Therefore, the results of this study suggest evidence of an alternative method of teaching pivotal social skills to children with ASD within the applied setting that fosters skill acquisition, as well as maintenance of learned behaviors over time.

Although the group TI procedure implemented in the current study resulted in positive effects for all participants, three main limitations warrant future investigation. First, the current study was conducted in a self-contained classroom for children with ASD and other developmental disabilities. These findings were significant and support the current research of the TI procedure and group instruction, but future research is necessary to investigate the generalization of these skills to the general education environment and amongst neuro-typical peers. The use of multiple peers, teachers, and environments provides students with multiple exemplars to promote generalization (Stokes & Baer, 1977). Further research is warranted to investigate how to best accomplish broad generalization of the acquired social skills taught through the group teaching interaction procedure.

Second, the research design was limited as the researcher found it necessary to modify the design to limit baseline probes to fit the confines of the classroom environment. However, this modification did not appear to alter the outcome of the data collected within the intervention phases. Across participants, the data showed a consistent change in level and trend across all targeted skills within the intervention phase, and consistency within the baseline data collected. Future empirical research utilizing a more rigorous single-case design is warranted to provide replications of the current study within the applied setting. Such replications will provide support for how the group TI procedure can provide teachers with an evidence-based group intervention for teaching students with autism of all ages how to effectively navigate their social environment.

Last, the social validity measure that was utilized in the study was not standardized. Wolf (1978) outlined three levels that factor heavily into social validity. First, the outcomes of the intervention must be important and relevant to the individual. Second, persons in the participant’s environment should consider intervention procedures acceptable. Third, the effects of the intervention should have significance clinically (i.e., produce a clinical change in responding). Although a large amount of research implements researcher constructed surveys, these instruments may be less sensitive than those that have been rigorously tested (Carter, 2007). Within future research, a standardized form of measurement for social validity may provide more extensive evaluation of the TI intervention.


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