Peer-mediated Communication Skill Instruction in the Reverse Mainstreaming Environment for Students with Autism

Rachel Gross
California State University, Monterey Bay

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Peer-mediated Communication Skill Instruction in the Reverse Mainstreaming Environment for Students with Autism

Rachel Gross

Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Education

California State University, Monterey Bay
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COMMUNICATION SKILL INSTRUCTION FOR STUDENTS WITH ASD

Peer-mediated Communication Skill Instruction in the Reverse Mainstreaming Environment for Students with Autism

Rachel Gross

APPROVED BY THE GRADUATE ADVISORY COMMITTEE

Kerrie Lemons Chitwood, Ph.D.
Advisor and Program Coordinator, Master of Arts in Education

Erin Ramirez, Ph.D.
Advisor, Master of Arts in Education
Digitally signed by Kris Roney
Date: 2018.05.21 15:16:51 -08'00'

Kris Roney, Ph.D. Associate Vice President
Academic Programs and Dean of Undergraduate & Graduate Studies
Abstract

Due to deficits in social and communication skills, students with Autism Spectrum Disorder (ASD) often have challenges developing relationships and engaging in social interactions. This study replicates a previous study that measured the success of teaching conversational skills to students with ASD using behavior skills training (BST). This study amended the previous study by using peers more frequently during intervention and probes. A single-case multiple-baseline across skills design was implemented. The conversation skills targeted included eye contact, beginning a conversation, asking questions, ending a conversation, and nodding and smiling. Five kindergarten to second grade students who have a primary diagnosis of ASD and receive speech-language services participated in the intervention. The intervention setting used was a reverse mainstreaming instructional model. Results supported the findings of the previous study that BST is an effective communication skill intervention for students with ASD and also provided additional evidence that including peers in the intervention is important to the generalization of skills to other settings and partners.

**Keywords:** autism spectrum disorder, ASD, behavior skills training, BST, communication skills
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“Alone we can do so little, together we can do so much” – Helen Keller
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Peer-mediated Communication Skill Instruction in the Reverse Mainstreaming Environment

For Students with Autism

**Literature Review**

Scientists have long been aware of a difference in social outcomes between students with Autism Spectrum Disorder (ASD) and their typical peers (Henninger & Lounds, 2012). According to the fifth edition of the Diagnostic and Statistics Manual of Mental Disorders (DSM-V), the primary characteristics of ASD are deficits in social communication and patterns of repetitive, restrictive behaviors and limited interests (American Psychiatric Association, 2013). Particular focus in research surrounding ASD has been given to elementary school students due to the importance of early intervention in the development and mastery of pertinent skills such as language and social interaction (Dawson & Osterling,, 1997, Fletcher-Watson & Mcconachie, 2016, Locke, Williams, Shih, & Kasari, 2017).

Previous research has identified areas in which the two groups displayed a significant difference: engagement with peers (Corbett et al., 2013; Frankel, Gorospe, Chang, & Sugar, 2010; Macintosh & Dissanayake, 2006); level of inclusion in social groups (Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010); quality of relationships (Calder, Hill, & Pellicano, 2012); probability of rejection (Locke, Kasari, Rotheram-Fuller, Kretzmann & Jacobs, 2013); and ability to make friends (Bauminger, Solomon, & Rogers, 2009). Students with ASD were found to have more difficulty in these social areas in which interaction is an integral component. Without the skills necessary to interact appropriately with social peers, this leaves the students with ASD vulnerable to loneliness and rejection. In order to fill the deficit in these areas, it is important to understand what constitutes social interaction.
Social Interaction

Social interaction is defined as a verbal exchange between two people, the length and quality of which is determined by the conversational skills of the two participants (Peters & Thompson, 2015). Interactions are facilitated by the use of essential social language skills such as greetings, asking questions, giving information and asking others to play (Gottman, Gonso, & Rasmussen, 1975). Therefore, deficits in conversational skills could contribute to difficulties with social interactions. Part of developing relationships with peers involves knowing when to use specific conversational skills during interactions. Typical peers are usually able to learn social skills by observing peers and adults, but students with ASD often find this challenging. That is, children with ASD often need to be explicitly taught appropriate social communication skills. The subtleties of social language skills, particularly nonverbal elements, can often go unnoticed by students with ASD when observed in typical settings.

Though mainstreaming students with ASD in a general education classroom allows them to observe more typical examples of interactions between peers and more natural discriminative stimuli, students with ASD often require more direct instructional methods (Laushey & Heflin, 2000). Therefore, students with ASD who have not received specific training often have yet to develop the skills needed to interact appropriately with peers. In order to improve social interactions for students with ASD and increase their ability to develop meaningful relationships, numerous studies have implemented interventions to teach necessary conversational skills (Chin, Bernard-Opitz, 2000; Leaf et al., 2010; Peters & Thompson, 2015; Sevlever, Gillis, & Ferguson, 2015; Stewart, Carr, & LeBlanc, 2007). The positive results of these studies provide evidence to support the efficacy of specific intervention practices in teaching students with ASD to interact socially with their peers.
Teaching Social Skills to Students with ASD

Successful, research-based methods of teaching social skills to students with ASD include behavior skills training (BST) and teaching interaction procedure (TIP; Sevlever et al., 2015). Though both BST and TIP use a combination of evidence-based strategies to teach social skills (Wong et al., 2015), the two social skill interventions are not interchangeable. BST and TIP use similar procedures regarding using conversation partners and modeling, but have key differences that make each method suitable for particular subsets of students.

BST is a form of instruction that includes giving direct instruction, modeling, rehearsing, and providing feedback (Apendix A; Sevlever et al., 2015). For example, using BST, students with ASD were taught to respond to non-verbal cues (e.g., body language, facial expressions and gestures) that their conversation partner showed disinterest in the conversation topic by asking a question or changing the topic (Peters & Thompson, 2015). After being taught to label non-verbal cues and to perform specific skills when they encountered them, the students knew when to use specific language skills to further engage their peers, increasing the chance of success in making friends. Furthermore, BST traditionally does not include explicit emphasis on rationale and cues. The absence of or lack of emphasis on these elements undermines the student’s overall understanding of when and why they perform these skills. Teaching the subtleties and underlying rationale for social cues to students with ASD may improve participation in mainstream settings where they will encounter typical peers. Previous research has shown that students with ASD with a higher understanding of cues and rationale behind social interactions tend to develop closer friendship relationships (Bauminger et al., 2009). The lack of training regarding rationale and cues highlights the main difference between BST and TIP.
TIP includes overlapping methods of BST such as direct instruction, modeling and rehearsal and feedback, but unlike BST, it also allocates specific instructional time to providing rationale for the targeted behavior and examining cues (Sevlever et al., 2015). Sevlever and colleagues (2015) explored the use of TIP to teach conversational skills such eye contact, initiating a conversation, ending a conversation, asking questions, nodding, and smiling with higher functioning verbal children with ASD. Results of the study showed TIP to be successful in increasing the students’ average group performance of all five targeted behaviors from baseline. Individual results showed more variability across skills. However, Sevlever and colleagues (2015) noted the intervention would be difficult to implement with students who are less verbal, and that BST could be more appropriate depending on the abilities of the population.

A critical choice was made in this study to use group instruction as opposed to 1:1 instruction (Sevlever et al., 2015). The implementation of a group intervention is important because it was not only a more efficient way to introduce the skills to multiple students, but it also provided the students with multiple people with whom to practice the skills, a key condition for generalization to occur.

**Generalization and the importance of discriminative stimuli.** Student outcomes improve when the student is able to generalize (i.e., transfer and maintain) skills they are taught across novel settings and people (Sevlever et al., 2015). Sevlever and colleagues (2015) noted several limitations to generalization of skills, specifically the lack of typical peer conversation partners during probes and the clinical setting in which the probes were taken (Sevlever et al., 2015). These limitations could be remedied by subsequent researchers taking probes in more typical settings in order to improve student outcomes. This requires that the discriminative stimuli taught for the skills occur across settings and people. *Discriminative stimuli* describe a
phenomenon that occurs when the presence of a stimulus causes a person to act a certain way and another way when it is absent (Cooper, Heward, & Heron, 2007). Discriminative stimuli let a person know that they need to perform a certain skill or activity. For example, a bell could be used to cue a student that they need to line up from recess. The cue can be audible, visual, or sensory, but it should be related to the skill and should occur in a natural setting, not just in a constructed classroom activity (Cooper et al., 2007). The more naturally the stimulus occurs in the general environment, the easier the student is able is generalize the skill (Cooper et al., 2007; Spencer & Higbee, 2012). Therefore, the discriminative stimuli used during conversational skill instruction should be as close to the discriminative stimuli the student will encounter in typical settings in order to improve the likelihood of generalization.

**Reconciling limitations to generalization.** Sevlever and colleagues (2015) took steps to improve the likelihood of generalization by attempting to imitate natural stimuli and settings. The study employed both clinicians and peers as conversation partners during instruction. The rationale behind using peers during instruction is that if a student with ASD does not practice speaking with typical peers during instruction, they could experience difficulty interacting with peers in the general education setting or outside the classroom (Sevlever et al., 2015). Furthermore, research suggests that typical peers could be added to instruction and skill probes to better replicate the experience of typical peer interaction and improve the generalization of the conversational skills learned (Peters & Thompson, 2015). Peers have been shown to be instrumental by presenting a more appropriate and relatable model as well as appropriate discriminative stimuli for conversation. For example, the implementation of a peer buddy modeling system in a play skills intervention found that students with ASD who had peer coaches were more likely to use the targeted play skills (Laushey & Heflin, 2000). This study
highlighted the importance of providing peer partners to practice the skills as peers are found in typical settings and more likely to deliver the appropriate stimuli. This provides support for using peers as coaches, models, or practice partners during the instruction of new skills to promote generalization to typical settings and interactions.

**Facilitating generalization to peers.** Given that elementary students spend approximately six hours a day, five days a week at school, students with ASD need to be able to interact with their typical peers in order to prevent isolation. With a maximum ratio of one adult to thirty-one children in the typical public elementary classroom setting (California Department of Education, 2018), peers represent most of the available language partners for students with ASD, making school an ideal setting for instruction. However, due to the high ratio of children to adults, mainstream classrooms are rarely able to provide the level of support needed to instruct students with ASD and can be distracting learning environments. Therefore, in many instances the instructional setting must be altered from the mainstream classroom setting to a self-contained special day classroom (SDC) that can provide a similar, but more controlled environment. The SDC setting, with its lower ratio of students to adults, provides opportunities for direct instruction on social interaction skills that are likely not taught in a general education classroom. Yet, the SDC setting does not necessarily facilitate the transfer or generalization of conversational skills to the typical classroom environment, as there usually are few to no general education peers in the SDC class (Schoger, 2006). Therefore, further steps must be taken to facilitate generalization of skills to typical peers.

One method of facilitating interactions between students in the SDC classroom and their typical peers in the general education classroom is reverse mainstreaming, also known as reverse inclusion. Reverse mainstreaming describes the practice of bringing typical peers into the special
education classroom for specific activities or for co-education with students with disabilities (Simpson & Regan, 1988). Few studies examine reverse mainstreaming as a method of peer interaction, fewer still measure the impact of using typical peers as instructors of communication skills in a reverse mainstreaming setting. Some studies that implemented reverse mainstreaming noted benefits for students with special needs involving interaction, such as increased communication skills and development of interpersonal relationships (Dean & Nettles, 1987; Rafferty & Griffen, 2005; Schoger, 2006).

The limited amount of available research surrounding reverse mainstreaming and students with ASD could indicate that reverse mainstreaming has yet to become a popular practice in the treatment of students with ASD. However, in a study using BST to teach conversational skills, Peters and Thompson (2015) noted that a limitation of their study was a lack of exposure to appropriate peer conversation partners during intervention and probe sessions, a limitation to which reverse mainstreaming poses a solution. Therefore, in order to reconcile the needs for proper instruction and the needs for generalization, using reverse mainstreaming in an SDC classroom is an appropriate method with which to replicate the experiment by Sevlever and colleagues (2015) while addressing some of the study limitations.

**Methods**

**Purpose of the Study**

The current research seeks to improve upon the work of Sevlever and colleagues (2015), addressing noted limitations to their conversational skills study by making alterations to the intervention measures and procedures. In contrast, the current study utilized novel peer partners during the conversation probes, more frequent instructional sessions, and conversation probes taken within the reverse mainstreaming special education classroom setting as opposed to a
clinical setting. In addition, the instructional method was altered from TIP to BST to address the needs of students with lower verbal skills, diminishing the focus on detailed rationale and cues. These changes were made with the goal of improving the level of generalization of skills to other typical settings and peers, as well as meeting the needs of a more diverse population of students with ASD.

The current study specifically analyzed whether using BST to teach conversational skills in a reverse mainstreaming setting, with peer-mediated conversation activities, is an effective method of improving conversations across partners and settings for students with ASD. Positive results could provide additional support for BST methods and modeling/prompting principles explored by previous studies (Laushey & Heflin, 2000; Peters & Thompson, 2015), while also corroborating the findings of Sevlever and colleagues (2015).

**Research Question**

Does a peer-mediated conversational skills intervention, using BST, increase conversational skills with across partners and settings for elementary students with ASD?

**Hypothesis**

The current study was a replication of the Sevlever and colleagues (2015) study that identified BST as a successful conversation instructional method for students with ASD. Sevlever and colleagues (2015) provided that a limitation to a participant’s generalization of skills was a lack of peer conversation partners and typical classroom settings during conversation probes, which the current study rectified with the inclusion of peer partners and classroom settings in conversation probes during baseline and intervention. With this in mind, it was anticipated that the probes during and following intervention phases, including the final
generalization probe of the general education setting, would show a change in performance for some or all targeted skills from baseline levels.

**Research Design**

This study used a single-case multiple-baseline across skills design (McMillan, 2016; Sevlever et al., 2015). The baseline phases of all five targeted skills began at the same time and once the first target skill reached baseline stability (see Procedures for baseline criteria), the first target skill intervention phase began, with all other skills remaining in baseline phase. As in the parent study (Sevlever et al., 2015), the current study was constrained by the time available to complete the project, approximately one semester. Therefore, phase changes were determined by group performance in ongoing conversation probes as opposed to individual performance, though individual performance was recorded and considered in phase-changing decisions. If a majority of students reached mastery levels (i.e., 85% correct responses for three consecutive conversation probes) or a stable plateau (three data points +/- 25%), the intervention phase of the next target skill began. Moving to a new phase of instruction included the description and modeling of a new skill as well as a review of previous skills, followed by rehearsal. All target skill intervention phases ended at the same time, as all previously targeted skills continued in intervention phase and they were reviewed at all subsequent instructional sessions. After the intervention phases ended, a generalization phase began, consisting of a single generalization probe of the targeted skills in the general education environment following the final instructional session (see Appendix B).

**Independent variable.** The independent variable was peer-mediated conversational skill intervention using BST sessions, which has been noted in various studies as an effective method of conversational skill instruction (Peters & Thompson, 2015; Sevlever et al., 2015).
**Dependent variable.** The dependent variable was percentage of correct responses out of possible opportunities the students have to engage with peers in the conversational skill being tested, which differed based on the phase of the intervention, in the order of eye contact, beginning a conversation (greeting), ending a conversation (farewell), asking questions (“What are you doing?”), and nodding and smiling (Sevleve et al., 2015). Operational definitions of these target skills were determined in order to provide criteria for correct practice of skills. For example, eye contact was defined as “providing eye contact for 50% of the conversation” and asking questions was defined as “asking at least one question relevant to the topic of conversation”. Complete operational definitions are included in Appendix B.

**Setting & Participants**

The study took place in a public elementary school located on the central coast of California that serves grades pre-kindergarten through fifth grade. The school has a population of 394 students and houses the special education preschool and kindergarten to second grade special day class (SDC). Approximately 38% of the student population are English Learners. Within the school, 46 students qualify for special education (Education Data Partnership, 2017). The study participants were selected by convenience and therefore represent a nonrandom sample (McMillan, 2016). The students were available by their location in a kindergarten to second grade SDC classroom. The students selected represented a purposeful sample in that they met the criteria of a primary diagnosis of ASD which is the population of interest and qualify for speech and language services. There were five students included in the study.

**Participant 1.** Nicolas is a male six-year-old student with a diagnosis of ASD whose primary language is English. He has secondary diagnoses of Sensory Disorder (SD) and Attention Deficit Hyperactivity Disorder (ADHD). He has a high vocabulary and speaks to
others frequently but lacks the pragmatics, self-regulation skills and specific vocabulary needed for the target conversational skills.

**Participant 2.** Ophelia is a female seven-year-old student with ASD whose primary language is English. She exhibits the behavior of echolalia, often repeating what has been said to her rather than using spontaneous language to converse with others. Her focus is not often on her surroundings and her eyes tend to wander during interactions. When she does make eye contact with others, she responds by laughing or putting her hands in front of her face.

**Participant 3.** Zeke is a male seven-year-old student with ASD whose primary language is English. While he likes to greet others, he does not often use eye contact when speaking to others. He often plays alone and does not make conversation with others unless they are impeding his play.

**Participant 4.** Conner is a male seven-year-old student with a diagnosis of ASD and qualifies as an English Language Learner (ELL). When speaking to others, he rarely uses more than a few words, does not make eye contact, and often flaps his hands in front of his face repetitively. He does like to make conversation about specific topics of interest, but rarely asks questions of others unless prompted.

**Participant 5.** Jared is a male seven-year-old student with ASD whose primary language is English. He also has a secondary diagnosis of ADHD. He does not make eye contact with consistency and does not engage others in conversation during activities without full teacher prompting and modeling.

**Measures**

During baseline and intervention sessions, conversation probes were taken by staff while observing individual participants conversing with different peers in the reverse mainstreaming
environment (see Appendix B). The observer scored the participant responses given during opportunities the participant had to use the target skill with the peer conversation partner as correct (+) and incorrect (-) as in the parent study (Sevlever et al., 2015). The unit of measurement was the percentage of correct responses in total opportunities. Mastery criterion were met when the group performance met 85% correct responses out of total opportunities (Leaf et al., 2010). To measure generalization, a final conversation probe was given in a general education setting following the completion of all intervention phases to see if the skill levels were maintained and generalized to a typical setting.

Validity. This measure was used by Sevlever and colleagues (2015) to indicate the level of mastery in order to make decisions regarding phases changes. The measure of mastery of 85% correct responses is found in a review of studies of BST by Leaf and colleagues (2010). All variables were clearly defined prior to the initiation of the study (see Research Design for definitions of the independent variable and dependent variable).

Reliability. Reliability was determined by inter-observer agreement (IOA) of at least 20% of conversation probe sessions, achieving a rate of 80% or higher agreement to demonstrate reliability (McMillan, 2016). IOA was measured during conversation probes for at least one of the five students at each session (see Appendix C for IOA form). These IOA-measured conversation probes amount to 31.26% of conversation probes in the classroom (30/96 conversation probes). The IOA data sheets were scored by an independent scorer to ensure IOA was within an acceptable range, falling 80% or higher (McMillan, 2016). Average IOA for this study was 95.26% (Range 80-100%, SD = 7.52%). The staff members that participated in data collection were all given training in the operational definitions of the behaviors they were
observing as well as the documentation procedures on the probe data collection sheets. This training strengthened their ability to capture their data collection accurately.

**Intervention**

Participants in this study have limited language ability; therefore, BST was selected over TIP. This is because participants with limited language ability would have difficulty participating in the rationale portion of TIP instruction (Sevlever et al., 2015). The students instead received BST similar to the Peters and Thompson study (2015) and they participated in instruction with typical peers present in the activity acting as models, listeners and conversation partners. The intervention included teacher instruction and modeling of the target skill, peer modeling of the target skill, partner conversation work to practice the skill, and a period of feedback from the instructor and conversation partners (see Appendices A and C for BST procedure manual and fidelity checklist). The peers were taught how to respond appropriately to participant use of the skill while the adult moderator prompted the student with ASD as needed.

Each session lasted 15-20 minutes. This differed from 45 minute sessions in the parent study due to the time constraints of reverse mainstreaming peer partners. This difference was reconciled by increasing the number of intervention sessions per week from one to three. The tri-weekly intervention sessions integrated BST by beginning with a ten-minute period of instruction, which included a visual, verbal and textual description of the skill, as well as modeling of the targeted conversational skill between instructors and peers. Participants were encouraged to label correct and incorrect uses of the target skill. This was followed by a ten-minute period of participant practice in role play conversations with an array of peer partners and instructor partners. Conversations consisted of 1-2-minutes of speaking and listening to a peer or
adult partner until the participant had engaged in at least two or more conversations, after which the student was prompted to engage with another peer or adult, as time allowed.

During role play, instructors provided feedback with verbal praise, reinforcement tokens, or corrective prompts as needed to improve the participant’s performance of the skill. Participant responses were recorded on probe sheets by supporting aides and the instructor to track performance during instruction sessions (see Appendix B). This procedure was used during instruction of all the target skills taught during the study (Eye contact and Beginning a conversation). Previously targeted skills were reviewed in each session and students were encouraged to use previously taught skills during conversation practice to continue maintenance of the skills. This procedure process was derived from the one used in the parent study by Sevlever and colleagues (2015).

**Procedures**

Initial baseline data was taken for all planned target skills during nine sessions of reverse mainstreaming activities before the start of the intervention. This allowed for multiple conversations per session, but students received no instruction or feedback. As the parent study had a short baseline due to time constraints, an effort was made in the current study to provide more baseline sessions to attempt to establish a steady baseline performance for the first target skill, which was defined as three data points falling within a range of 25%. The order in which the skills were introduced was determined by the authors of the parent study (Sevlever et al., 2015; see Appendix B). At the start of the first intervention phase, the students received three sessions a week of BST in the first conversational skill (i.e., eye contact) including peers as conversation partners during instruction. After group mastery or stability was achieved for the
first skill (i.e., stable group performance above 85% or within +/- 25%; Leaf et al., 2010) the intervention phase for the next target skill began.

During each conversation probe, baseline data for the planned subsequent target skills continued to be collected along with data on the currently targeted skill performance and maintenance of previous targeted skills. This pattern continued until the end of the study period. Following the intervention phase of the last target skill (beginning a conversation), a final generalization probe of each participant was taken in the general education environment to assess for maintenance and generalization level of the skills taught. This form of data collection mirrored that found in the parent study, but includes more frequent instructional sessions and probes (Sevlever et al., 2015).

**Procedural fidelity.** To ensure fidelity of the intervention procedures, an aide that was present in the classroom observed and monitored 20% of the intervention phase sessions (3/15) with a fidelity checklist (see Appendix D) to measure fidelity to the intervention procedures (McMillan, 2016). Average fidelity was calculated as 100% for this study.

**Ethical Considerations**

As with all research projects, ethical considerations were addressed prior to beginning data collection. No elements of the study caused participants to experience physical or psychological harm. Participation in the study activities was voluntary, though formal permission was not required due to the instructional nature of the setting where observation took place. Names of participants, staff and settings were changed to maintain the anonymity and privacy of the participants and staff involved. The students were intended to benefit from the intervention being used in the study. The described components of the study complied with ethical considerations in educational research (McMillan, 2016).
Validity threats. Personal bias was avoided by the use of inter-rater observers. In order to avoid discrepancies due to subjective behavioral terms, the inter-raters were trained in specific operational definitions (see Appendix B) as well as examples of various behaviors to establish consensus of what does and does not constitute the target behaviors. If the student received outside services that the other students do not, this could imply their progress is not due to the intervention. Prior to beginning observations, it was determined that the participants did not receive speech or social services other than the speech and language services provided by the school, which all participants do receive. Selection bias was avoided by using every student who met the criteria and who were available to the study in the classroom. Instead of selecting only three students to meet minimum research standards, the five students available who are diagnosed with ASD and receive speech and language services in the classroom were included (McMillan, 2016).

Social validity. Following the end of the final intervention phase, two independent observers performed a social validity questionnaire, a four-point Likert scale (i.e., 1 = strongly disagree to 4 = strongly agree; see Appendix E). The questionnaire, derived from tools used by Berger, Manston and Ingersoll (2016), asks eight questions designed to evaluate the observed intervention (BST) for the usefulness, satisfaction and social significance of the results (Kennedy, 2005). Participant responses were kept confidential and descriptive statistics were conducted to gain insights regarding the intervention. Observers agreed with the following statements: that the treatment was effective, that the treatment increased the target skills, that the treatment increased the students’ skills in multiple contexts, that the treatment improved student interactions, and that they would be willing to carry out the treatment themselves. They disagreed that the treatment was quickly increasing the students’ targeted skills. Observers could
not agree whether the students’ skills would maintain at the same level after the treatment ended.

**Proposed Data Analyses**

The data collected during probes was graphed according to the model of the parent study. Percentage is an approved form of data analysis for quantitative, nonexperimental, descriptive studies (McMillan, 2016). The percentage data was analyzed throughout the intervention process to determine when to make phase changes. The overall results were analyzed by studying the trends presented in data from the intervention probes and the generalization probe. The graphs were visually analyzed to inspect for nonoverlapping data between baseline and intervention. Researchers made observations regarding the success of the intervention and generalization of skills based on this information.

**Results**

The individual results of performance of all five skills for each student are provided in the Figures 1-5. The x axis represents the number of sessions and the y axis represents the percentage of correct responses in the student’s performance during the probe at each session. The individual graphs consist of five sections, each representing performance for one of the skills measured and the phase-lines denote changes in the probe-type (baseline, intervention, generalization). During this study, two skills (Eye Contact and Beginning a Conversation) entered the intervention phase, while the remaining three skills remained in baseline and were not tested in the generalization probe following the end of the intervention phase of the first two skills. Percent Nonoverlapping Data (PND) was calculated for the intervention data points in comparison to the baseline data points for Eye Contact and Beginning a Conversation.

Nicolas attended 21 of 21 sessions and completed 73 conversations in total (see Figure 1). For Eye Contact, during baseline his average performance was 11.11% (Range 0-50%).
during intervention his average performance was 80.30% (Range 33.33-100%, PND=66.66%), and in the generalization probe taken in his general education environment his performance was 100%. For Beginning a Conversation, during baseline his average performance was 49.5% (Range 0-100%), during intervention his average performance was 100% (No range, PND=0%), and in the generalization probe taken in his general education environment his performance was 100%. For Asking Questions, Ending a Conversation, and Nodding and Smiling, his average baseline performance was 11.25% (Range 0-50%), 27.08% (Range 0-66.66%), and 2.92% (Range 0-33.33%), respectively. These three skills were not targeted by the intervention during the study due to time restrictions. Nicolas did not reach mastery criterion (85%) for any of skills prior to intervention.
Figure 1. Percentage of Correct Responses Across Conversation Probes for Nicolas.

Ophelia attended 20 of 21 sessions and completed 62 conversations in total (see Figure 2). For Eye Contact, during baseline her average performance was 41.67% (Range 25-75%), during intervention her average performance was 86.66% (Range 50-100%, PND=66.66%), and in the generalization probe taken in her general education environment her performance was 100%. For Beginning a Conversation, during baseline her average performance was 45.83% (Range 0-100%), during intervention her average performance was 88.89% (Range 66.66-100%,
PND=0%), and in the generalization probe taken in her general education environment her performance was 100%. For Asking Questions, Ending a Conversation, and Nodding and Smiling, her average baseline performance was 11.84% (Range 0-50%), 25.44% (Range 0-75%), and 4.39% (Range 0-33.33%), respectively. These three skills were not targeted by the intervention during the study due to time restrictions. Ophelia did not reach mastery criterion (85%) for any of skills prior to intervention.

Figure 2: Percentage of Correct Responses Across Conversation Probes for Ophelia
Zeke attended 20 of 21 sessions and completed 68 conversations in total (see Figure 3). For Eye Contact, during baseline his average performance was 8.33% (Range 0-50%), during intervention his average performance was 58.33% (Range=25-100%, PND=40%), and in the generalization probe taken in his general education environment his performance was 100%. For Beginning a Conversation, during baseline his average performance was 18.75% (Range 0-75%), during intervention his average performance was 72.22% (Range= 66.66-100%, PND=33.33%), and in the generalization probe taken in his general education environment his performance was 66.66%. For Asking Questions, Ending a Conversation, and Nodding and Smiling, his average baseline performance was 3.13% (Range 0-50%), 17.08% (Range 0-50%), and 3.13% (Range 0-50%), respectively. These three skills were not targeted by the intervention during the study due to time restrictions. Zeke did not reach mastery criterion (85%) for any of skills prior to intervention.
Conner attended 18 of 21 sessions and completed 55 conversations in total (see Figure 4).

For Eye Contact, during baseline his average performance was 0% (No range), during intervention his average performance was 55.55% (Range 25-50%, PND=100%), and in the generalization probe taken in his general education environment his performance was 66.66%.

For Beginning a Conversation, during baseline his average performance was 11.31% (Range 0-50%), during intervention his average performance was 61.11% (Range= 33.33-75%, PND=...
66.66%), and in the generalization probe taken in his general education environment his performance was 100%. For Asking Questions, Ending a Conversation, and Nodding and Smiling, his average baseline performance was 1.47% (Range 0-25%), 27.94% (Range 0-66.66%), and 0% (No range), respectively. These three skills were not targeted by the intervention during the study due to time restrictions. Conner did not reach mastery criterion (85%) for any of skills prior to intervention.

Figure 4: Percentage of Correct Responses Across Conversation Probes for Conner
Jared attended 18 of 21 sessions and completed 55 conversations in total (see Figure 5). For Eye Contact, during baseline his average performance was 31.25% (Range 0-50%), during intervention his average performance was 79.63% (Range 50-100%, PND=78%), and in the generalization probe taken in his general education environment his performance was 100%. For Beginning a Conversation, during baseline his average performance was 49.4% (Range 0-100%), during intervention his average performance was 100% (No range, PND=0%), and in the generalization probe taken in his general education environment his performance was 100%. For Asking Questions, Ending a Conversation, and Nodding and Smiling, his average baseline performance was 6.37% (Range 0-50%), 58.33% (Range 25-100%), and 0% (No range), respectively. These three skills were not targeted by the intervention during the study due to time restrictions. Jared did not reach mastery criterion (85%) for any of skills prior to intervention.
Students with ASD struggle to perform social conversation skills which inhibits their ability to socialize with peers. Those peers can range in age from children to adults as the students with ASD mature from childhood to adulthood. Teaching students with ASD effective skills to socialize in childhood can improve their experience in school and quality of life in adulthood (Fletcher-Watson & Mcconachie, 2016). In order to teach students with ASD these
skills, effective interventions put into practice once evidence of their efficacy is produced. The purpose of this study was to analyze the effectiveness of BST while also evaluating the importance of peer partners and setting to generalization of skills. In addition, the results potentially support or refute exploratory enquiries in the study, such as whether reverse mainstreaming facilitates peer-mediated instruction and generalization of conversational skills or if BST is effective for students with ASD with higher sensory needs and lower verbal skills.

The results of this study indicate a functional relationship between the use of BST as an effective intervention for conversational skills and participant performance of these skills. In the intervention phases of Eye Contact and Beginning a Conversation, an immediate improvement is not evident, but a slow upward trend in skill use is depicted across all five participants’ performances (see Figures 1-5). This slow upward trend suggests that student’s skills are being reinforced (i.e., increased), whether it be by the token system or by social interaction. These results are promising, particularly considering acquisition was likely slowed due to participants’ competing behaviors resulting from attending deficits and sensory processing disorders. The slowness of the trend could also pertain to the variable speed of progress typically shown by students with ASD with low verbal skills (Tager-Flusberg & Kasari, 2013).

Overall, the average performances of skills are higher for all participants in both intervention phases of Eye Contact and Beginning a Conversation than corresponding baseline average performances. However, the varying PND between baseline and intervention phases across participants and skills would suggest that the effectiveness of BST is variable., or at least not efficient. PND is a measurement of intervention effectiveness (Banda & Therrien, 2008). For Eye Contact, only one participant (Connor, PND=100%) achieved PND that qualifies BST as a highly effective intervention (PND=90-100%), but several participants did achieve moderately
effective (PND=70-90%) and minimally effective (PND=50-70%) results (Banda & Therrien, 2008). Nathan and Ophelia’s PNDs were both 66.66% and Jared’s PND was 78%. Zeke’s PND of 40% for Eye contact fell into the not effective range (0-50%; Banda & Therrien, 2008). Most of the students had low PND for the skill of Beginning a Conversation. Nathan, Jared and Ophelia’s performance had PND of 0% and Zeke had PND of 33.33% between the baseline and intervention phases, but all average performances in the intervention phase were higher than average baseline performances (Figures 1, 2, 3 and 5). However, Connor had a PND of 66.66% (minimally effective) and his average performance increased during intervention for Beginning a Conversation (Figure 4). Given more time, there could be a further increase in skill performance and a higher PND for all participants. It should be noted that the intervention phase for Beginning a Conversation lasted only three sessions, which likely impacted the PND as the participants may have needed more opportunities to respond to the intervention. Many evidence based practices for students with ASD, such as Discrete Trial Training (DTT), emphasize repeated opportunities to practice skills to show growth (Wong et al., 2015).

Overall, the results of this study are consistent with the parent study (Sevlever et al., 2015) in that the baseline was unstable and deviation between data points was high due to the small and varying number of conversations taking place each session (Sevlever et al., 2015). The positive average results of this study also agree with the findings of the parent study, where the average group performance of skills increased from baseline during intervention phases, though individual results varied.

The study data showed that skills that had not been taught (Asking Questions, Ending a Conversation, Nodding and Smiling) showed performance volatility during their baseline and some skill performance seemed to increase during the intervention phases of Eye Contact and
Beginning a Conversation (Figure 3, Asking questions). This volatility could be due to background knowledge the students have of the skills prior to the study or an ability for students to observe and replicate the skills from the modeled conversations, though those skills were not explicitly taught during the instruction segment of the BST session.

Unexpectedly, data volatility was more prevalent in the data for Beginning a Conversation and Ending a Conversation. This volatility was apparent across all participants’ performances. These particular skills have a short window of opportunity for use during conversations (at the beginning and the end), which does not allow for correction throughout the conversation. Comparatively, the baseline performances of Asking Questions and Nodding and Smiling were relatively stable and low across all participants. The reason(s) for this stability could be that participants have less background knowledge of these skills, there are more opportunities for these skills throughout a conversation, and/or the skills could be more difficult to observe and imitate based on the complexity of the rationale for these skills.

Limitations

There were several limitations that impacted the strength of the findings. The first limitation is that the data stability criteria was difficult to attain. Baseline was collected over nine sessions, but stability criteria, as originally defined, was not reached for all students. This impacts the validity of any data taken during the intervention phase and generalization phase, as it is unknown whether the baseline represents the students’ true baseline ability level. One reason for the lack of stability was the varying number of conversations that took place each session. Due to time constraints of the reverse mainstreaming peers and varying participant compliance, the students averaged three conversations per session during baseline, but sessions ranged from two to four conversations. This caused the deviation of percentages of correct skill use to
increase beyond the +/- 25% over three data points criteria, resulting in a longer baseline phase. Researchers decided to begin the first intervention phase (Eye contact) based on the fact that the majority of participants had reached data stability criteria, in accordance with the parent study’s choice to make phase changes based on group performance. Student illnesses were also a noted limitation of this study. During the first week of intervention for Eye Contact, all participants missed at least one session due to illness, potentially slowing the rate of skill acquisition due to increased time between instructional sessions. A further limitation to the study was the length of timeline for the study. The timeline of the study was constrained by the length of the master’s program for which the thesis was written. The baseline phase had nine sessions, while the intervention phase of Eye Contact had a maximum of twelve sessions and the intervention phase of Beginning a Conversation only had three sessions before the study completed. Only two of the planned five conversational skills were able to be taught and generalization probes took place two days after intervention ended as opposed to after a longer period, which provides a valid measurement of whether skill levels were maintained over time.

**Future Directions**

Further research should use a BST program that allows more time during sessions. In this study, peer availability, participant behavior and time available during the school day limited the number of conversations possible for each session. If the number of conversations per session were consistent in order to be able to compare session performance accurately, data stability might be attained. Additional time would allow for the predetermined number of conversations to take place. In addition, a longer timeline should be used in further research to allow time for students to reach mastery. For many students, their performance had an upward trend that was cut short by the completion of the study. With the addition of a longer timeline and longer
sessions with a consistent number of conversations, the validity of the evidence of the effectiveness of BST for these five conversational skills would be strengthened.

**Summary**

The findings of this study would support the following statements: (1) BST, as implemented in this study, is an effective intervention to teach conversational skills to students with ASD, but effectiveness varies for individuals and across different skills; (2) Using both peers and adults in treatment conversations could support generalization to most other conversation partners and settings; (3) Using the SDC classroom environment as an intervention setting could support generalization of skills to a general education typical classroom setting.

These findings should influence the way that children with ASD are taught conversational skills. In this study, peer partners were used during the modeling element of instruction and during the majority of conversation practice during probes. The results of the generalization probe in the general education classroom setting, as opposed to the SDC classroom, indicated that generalization across settings was high for the majority of skills. This indicates that peer-mediated instruction is beneficial for skills to transfer, or generalize, to settings where peers are available as conversation partners. In preschool and elementary school settings, where intervention for students with ASD often takes place, the use of reverse mainstreaming to provide students with ASD with peer partners could be beneficial to the acquisition of conversational skills and generalization to other settings where young peers interact. Higher acquisition and generalization of conversational skills to peer settings could increase the likelihood that students with ASD develop more meaningful relationships with their peers earlier in their lives and their social outcomes could evolve to be more like those of their typical peers.
References


of the International Society for Autism Research, 6(6), 10.1002/aur.1329.

http://doi.org/10.1002/aur.1329

## Appendix A

Behavior Skills Training (BST) Procedure Manual

<table>
<thead>
<tr>
<th>Step</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provide rationale for the target skill being trained.</td>
</tr>
<tr>
<td>2</td>
<td>Vocally describing steps of the target skill.</td>
</tr>
<tr>
<td>3</td>
<td>Provide trainee with written summary of target skill steps.</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrate the target skill.</td>
</tr>
<tr>
<td>5</td>
<td>Have trainee practice performing the target skill.</td>
</tr>
<tr>
<td>6</td>
<td>Observe and record trainee correct vs incorrect performance of target skill.</td>
</tr>
<tr>
<td>7</td>
<td>Provide supportive and corrective feedback (the latter if applicable).</td>
</tr>
<tr>
<td>8</td>
<td>Repeat Steps 5, 6 and 7 until trainee correctly performs target skill.</td>
</tr>
</tbody>
</table>
## Appendix B

**Inter-observer Reliability Form**

<table>
<thead>
<tr>
<th>Date</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Observer A</td>
<td></td>
</tr>
<tr>
<td>Observer B</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student</th>
<th>Observer</th>
<th>Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Eye Contact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starting a conversation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asking questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ending a conversation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nodding and smiling</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Inter-observer Reliability (% Agreement)**

(Acceptable Agreement = .80 or 80%)
## Appendix C

Conversation Probe Data Sheet

<table>
<thead>
<tr>
<th>Target skill</th>
<th>Conversation</th>
<th>Percentage Correct</th>
<th>Mastery Criteria Met?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correct response: + Prompted / No response: -</td>
<td>(Correct responses/total responses)</td>
<td>(100%)</td>
</tr>
<tr>
<td>Eye Contact</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Beginning a conversation</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Asking Questions</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Ending a conversation</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Nodding and smiling</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

### Operational Definitions

**Eye Contact** - Child displays appropriate eye contact for more than 50% of conversation

**Beginning a conversation** - Child appropriately begins conversation by saying “Hi” (or any equivalent, e.g., “What’s up?”) or by introducing themselves

**Asking questions** - The child asks at least one question related to the topic of conversation

**Ending a conversation** - The child ends the conversation appropriately by saying “Bye” (or some equivalent, e.g., “Talk to you later”)

**Nodding and smiling** - Child will nod at least twice and smile at least once during the conversation
Appendix D

BST Procedural Fidelity Checklist

<table>
<thead>
<tr>
<th>Date</th>
<th>Time Start/End</th>
<th>Observer</th>
<th>Teacher</th>
</tr>
</thead>
</table>

**Step 1 – Show and Tell**

<table>
<thead>
<tr>
<th>Does the teacher provide rationale for target behavior?</th>
<th>+ - + - + - + - + - + - + -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the teacher provide a visual of or model the target skill?</td>
<td>+ - + - + - + - + - + - + -</td>
</tr>
<tr>
<td>Does the teacher vocally describe the skill?</td>
<td>+ - + - + - + - + - + - + -</td>
</tr>
<tr>
<td>Does the teacher provide a written summary of the target skill?</td>
<td>+ - + - + - + - + - + - + -</td>
</tr>
</tbody>
</table>

**Step 2 – Observe and Record**

<table>
<thead>
<tr>
<th>Does the teacher have the student practice performing the target skill?</th>
<th>+ - + - + - + - + - + - + -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the teacher observe and record the performance of the target skill?</td>
<td>+ - + - + - + - + - + - + -</td>
</tr>
</tbody>
</table>

**Step 3 – Provide Feedback**

| Does the teacher provide feedback to the student? | + - + - + - + - + - + - + - |

| Total correct (+) | + + + + + + + + + + + + |
| Total Possible (+ or -) | + + + + + + + + + + + + |
| Percentage Correct (+/total possible) | + + + + + + + + + + + + |
## Appendix E

### Social Validity Questionnaire

<table>
<thead>
<tr>
<th>Questions</th>
<th>1 Strongly disagree</th>
<th>2 Disagree</th>
<th>3 Agree</th>
<th>4 Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 This treatment was effective</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 I found this treatment acceptable for increasing the student’s targeted skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Using the treatment improved targeted skills across multiple contexts (classroom, mainstreaming)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 I think the student’s targeted skills would remain at an improved level even after the treatment ends</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 This treatment improved student interactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 This treatment quickly improved the student’s targeted skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 I would be willing to carry out this treatment myself if I wanted to increase the student’s targeted skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 I would suggest the use of this treatment to other individuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>