

**Effects of the Program for the Education and Enrichment of Relational Skills Intervention
on Adolescents' Social Functioning**

by

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Abstract

The Program for the Education and Enrichment of Relational Skills (PEERS; Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012) is a manualized parent-assisted social-skills intervention for adolescents with autism spectrum disorder (ASD). Experiment 1 used behavioral performance data to assess the effectiveness of PEERS at improving social skills (reciprocal conversations, humor, and entering and exiting conversations). Following PEERS didactics, one participant engaged in high levels of correct responding for reciprocal conversations, five participants for humor, and three participants for entering and exiting conversations. Modified behavior skills training (BST) increased levels of correct performance for one participant in reciprocal conversations, five participants for humor, and one participant for entering and exiting conversations. Experiment 2 evaluated caregiver acquisition of feedback-delivery skills following PEERS and modified BST. Overall, all participants engaged in low levels of accurate feedback delivery following PEERS. Levels of correct feedback delivery increased following modified BST; however, the degree to which skills improved differed across participants and skills. Experiment 3 assessed BST and in-situ training on caregiver feedback-delivery skills and measured the effects of training caregivers on adolescents' social-skill acquisition. In-situ training was required to teach one caregiver to provide accurate feedback for two-way conversations. BST increased feedback-delivery skills on the other social skills. In general, adolescents' social skills improved with improvements to the caregivers' feedback-delivery skills.

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Effects of the Program for the Education and Enrichment of Relational Skills Intervention on Adolescents' Social Functioning

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by impairments in socialization and communication, and restricted or repetitive behaviors and interests (American Psychiatric Association (APA), 2013). One diagnostic feature of ASD is social-communication deficits. Social-communication deficits (APA, 2013), consist of difficulties with reciprocal conversations, nonverbal communication, and developing, maintaining, and understanding relationships.

A number of strategies have been used to improve the social skills of children and adolescents with ASD, including behavior skills training (BST; Hood, Luczynski, & Mitter, 2017; Peters & Thompson, 2015) and group interventions (e.g., Doston, Leaf, Sheldon, & Sherman, 2010). Previous literature has suggested that BST may be an effective method to teach social skills. For example, Peters and Thompson (2015) used BST to teach children with ASD to respond to their conversation partners' social cues. Correct responding increased following BST across differing social cue conditions (e.g., when the listener was interested or uninterested). Hood et al. (2017) demonstrated the effectiveness of BST to teach complex social skills by using BST to teach three participants to emit greetings and engage in an unscripted conversation.

One well-supported group-based social-skills intervention is the Program for the Education and Enrichment of Relational Skills (PEERS; Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012). PEERS is a caregiver-assisted intervention focused on teaching high-functioning adolescents with ASD strategies to make and keep friends, and manage peer rejection and conflict (Laugeson & Frankel, 2010). One strength of the PEERS intervention is the inclusion of caregivers in the implementation of the intervention in the natural environment. The

incorporation of caregivers in treatment helps promote adolescents' skill acquisition and increases the likelihood skills will maintain following treatment (Laugeson et al., 2012).

As part of the PEERS, adolescents and caregivers meet in separate groups that are facilitated by a PEERS leader. As part of the adolescent and caregiver group weekly meetings, the PEERS leader provides a verbal review of the target social skills (refer to Table 1) and reviews homework assignments. As outlined in the PEERS manual, the leader for the adolescent group models target skills, instructs adolescents to rehearse skills and delivers brief feedback following the skill rehearsal. Caregiver groups do not include modeling of skills or skill rehearsals.

Multiple clinical trials and randomized controlled trials have demonstrated the efficacy and effectiveness of PEERS (Laugeson, Frankel, Mogil, & Dillon, 2009; Laugeson et al., 2012; Van Hecke et al., 2013). Mandelberg et al. (2014) analyzed parent-reported measures that indicated following PEERS, adolescents in the treatment group had increased knowledge of social skills, hosted and attended more get-togethers, and demonstrated improved social skills. As reported by parents, treatment gains maintained at 1 to 5 years post-intervention. Although such findings are encouraging, the effectiveness of PEERS is based on indirect outcomes from parental reports and adolescents' performances on knowledge questionnaires.

Previous evidence suggests that caregivers are more likely to report biased outcomes in interventions when they are directly involved (Stratis & Lecavalier, 2015). Consequently, when evaluating PEERS, teachers may be more appropriate informants given they are not typically involved in the implementation of PEERS. Laugeson et al. (2012) used teacher reports to evaluate treatment effects of PEERS and found that improved social skills were not observed at posttest (i.e., teachers reported similar levels of social skills before and after PEERS). Despite

verbal reports of no treatment effects immediately after PEERS concluded, teachers reported improvements in adolescents' social skills during 14-week follow-up assessments. Given that significant improvements in skills were not reported at the end of the intervention, it is difficult to attribute reported improvements in social-skill functioning to the PEERS intervention as opposed to maturation or other uncontrolled extraneous variables.

Direct behavior observations are one of the most ecological methods of assessing individuals' social functioning (Carey & Stoner, 1994; Sheridan, Hungelmann, & Maughan, 1999). To date, there are a limited number of published studies that have assessed the effectiveness of PEERS using direct observation of participants' skills (e.g., Dolan et al. 2016). Dolan and colleagues (2016) used the Contextual Assessment of Social Skills (CASS; Ratto, Turner-Brown, Rupp, Mesibov, & Penn, 2011) to evaluate improvements in individual's social functioning before and after PEERS. CASS is a role-play structured clinic-based observation assessment aimed at evaluating the social skills of adolescents with high-functioning ASD. During the CASS, the adolescent interacted with one confederate for 3 min during the social-interest condition (i.e., confederate engaged in eye contact and attentive facial affect, posture, and gestures) and then with another confederate for 3 min during the boredom condition (i.e., confederate evaded eye contact and used disinterested facial expressions, posture, and gestures). Following the role-plays, participants' responses were coded into 10 categories. Trained coders collected frequency data for two items (i.e., Asking Questions and Topic Changes) and completed a rating scale (1 = *low* to 7 = *high*) for all other categories (i.e., overall involvement, overall quality of rapport, social anxiety, kinesic arousal, vocal expressiveness, gestures, positive affect, and posture). Overall, participants in the treatment condition demonstrated improvements in vocal expressiveness (i.e., the degree to the participant varied his or her pitch, tone, and

tempo), but did not significantly differ from the control condition in the other targeted areas following exposure to PEERS. Although these findings provide preliminary evidence that PEERS may not produce improved social functioning with all participants, the CASS uses indirect measures to assess social function (e.g., rating scales for eight items). Thus, the outcomes may not provide an accurate representation of participants' actual performance on the targeted social skills. Additional research should use direct observations to assess individual's social functioning prior to and following PEERS to further evaluate its effectiveness in teaching social skills.

Another gap in the assessment procedures used to evaluate PEERS is the lack of research on caregivers' skill acquisition following participation in the PEERS caregiver group. Given that adolescents' acquisition and maintenance of social skills is partially dependent on caregivers coaching (i.e., delivering feedback) outside of group meetings, additional assessment of parent's ability to deliver feedback is necessary. Feedback is defined as the delivery of information about previous performance that allows individuals to change their behavior (Daniels & Daniels, 2006). Performance feedback, in conjunction with other training components, is effective to teach participants with a wide range of disorders a variety of social skills, including assertiveness (Bornstein, Bellack, & Hersen, 1977), conversation and greeting skills (Chung et al., 2007; Deitchman, Reeve, Reeve, & Progar, 2010; Sibley et al., 2012; Thiemann & Goldstein, 2001), and identifying social cues (Peters & Thompson, 2015).

Few studies have examined the effects of parent feedback on the social skills of adolescents with ASD. In a notable exception, Mikami, Lerner, Griggs, McGrath, and Calhoun (2010) investigated the effects of the parental feedback on the social skills of children diagnosed with attention deficit/hyperactive disorder (ADHD) with 62 parent-child dyads. The intervention

aimed to increase parental behavior, including play dates arranged, delivery of corrective feedback, praise delivery, and warmth (i.e., delivering positive statements) while decreasing parental criticism of child behavior. Parent's facilitation of play dates and the frequency of corrective feedback during and following play periods significantly increased. However, experimenters did not report the direct effects of parental skill acquisition on child behavior.

It is important to consider the vital elements of feedback to better train caregivers how to provide feedback that will effectively help their child acquire skills. For example, caregiver feedback should be accurate, consistent, and include evaluative and descriptive elements. For feedback to be accurate and consistent, the verbal response (i.e., feedback) must be uniform to the predetermined definition of the target behavior and should be referred to following each occurrence of the behavior (Hirst & DiGennaro Reed, 2015; Hirst, DiGennaro Reed, & Reed, 2013). Given the potential for adolescents to be exposed to multiple and possibly conflicting sources of information (e.g., family members, teachers, community leaders), it is important that the feedback delivered by caregivers is accurate and consistent with the social-skills intervention being implemented. For example, Hirst and DiGennaro Reed (2015) found that inaccurate feedback had negative effects on skill acquisition, with inconsistent or incorrect feedback resulting in slower acquisition of target responses. In addition, the researchers demonstrated a relationship between the proportion of incorrect feedback and performance, with higher levels of incorrect feedback producing poorer performance. Researchers also highlighted the lasting effects of incorrect or inconsistent feedback, indicating that inaccurate feedback early in training produced delayed or no acquisition following the delivery of correct feedback, emphasizing the importance of accurate and consistent feedback early in training.

Feedback should incorporate descriptive and evaluative statements regarding the observed behavior. Johnson (2013) assessed the effects of objective feedback (quantitative information about performance), evaluative feedback (feedback containing evaluative statements regarding performance), combined objective and evaluative, and no feedback with undergraduate participants. Accuracy on a computerized simulated check-processing task showed the greatest improvements with the combined objective and evaluative feedback, suggesting that the inclusion of specific quantitative information and evaluative statements are important in producing significant changes in behavior during training. Overall, feedback produces the most consistent outcomes when the most effective characteristics (accuracy, consistency, evaluative statements, and descriptions of the observed behavior) are present.

To date, previous investigations of PEERS have primarily measured outcomes based on parent report of changes in adolescent's social functioning. The inclusion of direct observations of social skills as a measure of social functioning would enhance researchers' ability to assess the effectiveness of PEERS in producing observable and socially meaningful changes to participants' ability to engage in the targeted social skills. The primary purpose of Experiment 1 was to address this gap by collecting behavior observational data to investigate the effectiveness of PEERS at improving participants' social skills. Experiment 2 aimed to address the gap in the literature on caregiver-assisted group-based social-skills interventions by evaluating the effectiveness of PEERS at training caregivers to emit correct coaching skills (focusing on feedback delivery) to an individual after observing the individual engage in a social interaction. For both Experiments 1 and 2, BST was implemented when PEERS alone was not sufficient for participants (e.g., adolescents or caregivers) to acquire skills at mastery levels. Given that caregivers are the primary agent of change during and following PEERS, it is important to

evaluate their skill acquisition and the relationship between caregiver skill acquisition and changes in adolescent social-skill functioning. Therefore, Experiment 3 assessed the effects of BST and in-situ feedback on caregivers' feedback-delivery skills and how caregivers' feedback influenced adolescent skill acquisition.

General Procedures

Recruitment and Setting

Adolescent and caregiver participants were recruited from a community-based implementation of PEERS. Families independently signed up for PEERS by enrolling in the program through a community recreational center. Intake appointments took place prior to enrollment in the study. During the intake appointment, the experimenter provided the parents and adolescents with the purpose, structure, benefits, and risks of PEERS and the current study and with the opportunity to ask questions. Families that met the inclusion criterion were invited to participate in the study. Inclusion criteria required that adolescent participants: (1) be previously diagnosed with ASD, Asperger's Syndrome, or Pervasive Developmental Disorder – Not Otherwise Specified (diagnoses were verified based on documentation provided by participants' caregivers); (2) caregivers indicated social skills deficits as the primary area of concern; and (3) be committed to attending sessions over 14 weeks. The caregivers inclusion criteria required that caregiver participants (1) be the parent or primary caregiver of an individual previously diagnosed with ASD; (2) and committed to attending weekly meetings over a 14-week period. Parental consent and teen assent were obtained from individuals who elected to participate.

All intake, PEERS, and study sessions were conducted either in a university clinic therapy room or in a room located in a community recreational center. Rooms consisted of at

least two chairs, a camera, and tripod. The PEERS sessions took place in classrooms at a community recreational center. Separate rooms were used for caregiver and adolescent meetings. Approximately six adolescents and five to 10 caregivers were present for each meeting.

PEERS Didactics

The PEERS manual was used to guide the content and structure of the parent and adolescent groups (Laugeson & Frankel, 2010). The program consisted of 14 weekly 90-min sessions. Parents and adolescents attended separate concurrent sessions that consist of lessons on the key elements of making and keeping friends. Table 1 provides an overview of the skills targeted across the 14-week intervention. Group leaders included a Board Certified Behavior Analyst (BCBA[®]) with extensive experience working with individuals with developmental disorders and an experienced special education teacher from the local high school. Two psychology graduate students with experience working with children and adolescents with developmental disorders assisted the adolescent group leader throughout the duration of the study.

The PEERS intervention used various strategies to teach adolescents' social skills. Strategies included didactic instructions to introduce target skills, modeling through role-plays by the adolescent group leader and the graduate student assistant, and behavioral rehearsal and coaching of skills with other adolescents in the group. The group leader taught perspective-taking skills following social role-play scenarios. In addition, the group leader assigned weekly homework to encourage adolescents to practice skills outside of group (e.g., call a friend and practice trading information). The adolescent group reviewed homework assignments at the start of each session. The group leader and graduate student assistant delivered points to adolescent participants throughout the session by marking tallies next to the participants' names on a board

in front of the group. The trainer delivered points with descriptive praise. Participants earned points by completing the prior week's homework assignment, answering questions during the skill review, and practicing skills during role-plays. At the end of the 14-week program, participants were able to select prizes (e.g., gift cards, coloring sets) with the individual with the most points selecting an item first.

During the caregiver group, the group leader introduced caregivers to the same skills being targeted with the adolescents. The group leader described the skill and the components of the skill, provided rationales for why the target skill is important, and described coaching strategies for caregivers to help their adolescents correctly complete homework. In addition, group leaders reviewed homework and problem-solved difficulties that families were experiencing. During the last few minutes of every session, the group leaders met with adolescents and caregivers to discuss and coordinate when and how homework assignments would be completed.

Confederate Training

The confederates for all three experiments were trained graduate students studying Applied Behavior Analysis or trained undergraduate students in Psychology. Depending on the experiment, confederates were trained to either engage in a social interaction with the adolescent participants or role-play a social interaction with another confederate. Prior to the study, confederates were trained using BST that consisted of instructions, modeling, role-plays, and feedback. The instructions and modeling phases were conducted in an individual or group format and included outlining the steps involved in the target social skill and discussing how to arrange the role plays to set up opportunities for the participant to practice the targeted skill. During the role-play and feedback components, confederates practiced implementing the role-plays as

outlined in each experiment and practiced responses to various potential participant responses (e.g., correct responses, incorrect responses, no responses). Confederates received feedback (praise and corrective statements) on their procedural fidelity. A confederate was considered trained when she performed the script with 100% fidelity across two role-plays.

Experiment 1

Participants

Two female and seven male adolescents, ages 14 to 18 years old ($M = 15.7$), met inclusion criteria and participated in Experiment 1. Seven participants identified as being Caucasian and two identified as being Hispanic. All adolescents were in their general education classrooms at their current schools. Seven participants' mothers and two participants' fathers participated in the caregiver group.

Social Skills Improvement System (SSIS; Gresham & Elliot, 2008)

The Social Skills Improvement System is a 79-item (caregiver form) questionnaire assessing adolescent cooperation, assertion, responsibility, and self-control. The measure has been used to assess treatment outcomes in social-skills training interventions (e.g., Laugeson et al., 2012; Mandelberg et al., 2014). The SSIS takes approximately 10 min to complete and aims to assess social competence through questions about interactions with peers, performance on household/classroom tasks, use of free time, and academic competence. Items include “takes turns in conversations,” “starts conversations with peers,” and “makes friends easily.” Caregivers rate items as either “Never,” “Sometimes,” or “Very Often.” SSISS provides standard scores along the dimensions of Social Skills and Problem Behaviors with a mean of 100 and a standard deviation of 15. Higher scores on the Social Skills Scale reflect better social functioning, whereas lower scores on the Problem Behaviors Scale suggest better behavioral functioning.

Caregivers were administered the questionnaire at two points in Experiment 1 (at the start of treatment and at the end of treatment).

Test of Adolescent Social Skills Knowledge (TASSK; Laugeson and Frankel, 2010)

The TASSK is a 26-item criterion-referenced measure developed to assess treatment changes related to adolescent knowledge about the target social skills addressed during PEERS. The test is completed by the adolescent and takes approximately 5 min to complete. Items are comprised of sentence stems related to the didactic lessons and include multiple choice responses. Higher scores reflected greater knowledge of adolescent social skills. Adolescents were administered the test at two points in Experiment 1 (at the start of treatment and at the end of treatment).

Data Collection and Dependent Variables

During sessions, data were collected on participants' responses during a conversation with confederates. Target responses included participants entering a conversation, engaging in a reciprocal conversation, responding to humor, and exiting a conversation. The definition for each target skill was based on descriptions in the PEERS manual. Entering a conversation was defined as any instance of the participant emitting a vocal response initiating a conversation by stating a greeting (e.g., "Hi," "Hey," and "Hello") or a response within 10 s to a similar greeting statement from another individual entering the room. Exiting a conversation was defined as any instance of a vocal response ending a conversation with a closing statement (e.g., "I enjoyed talking with you. Bye.") or a statement providing a cover story (i.e., a story explaining why you need to exit the conversation; e.g., "I enjoyed talking with you, but I have to get going now.") during a pause (3 s or longer) in a conversation. This also included vocal responding (e.g., saying "Bye") to a closing statement (e.g., "I have to go. Talk to you later.") emitted by another individual. This did

not include preemptive or inappropriate conversation exits (e.g., saying “Bye” when another individual is still talking). Reciprocal conversation skills included any instance of an independent vocal response that was more than two words, related to the topic of discussion, and occurred within 2-4 s of a peer or adult statement or question. Data were collected on the first three opportunities for the participant to respond to the confederates questions and statements. Appropriate humor was defined as any instance of the participant responding to a joke or “funny” story with a laugh or smile (i.e., the upward movement of one or two corners of the participant’s lips). A correct humor response required that the participant emit a comment or ask a question within 2-4 s of the presentation of the original “funny” story.

Errors included monopolizing the conversation (e.g., conversation hog), interruptions, and inappropriate vocalizations. Monopolizing the conversation was defined as any instance in which the participant spoke for longer than 1 min without asking questions or pausing for others to speak. Monopolizing the conversation included any statement inconsistent with current topic that was not introduced with a transition statement or question (e.g., “oh, have you heard about _____?”); returning to a perseverative or high-preferred topic following a transition by another person; or any instance of making more than three consecutive statements about one specific topic within 1 min without allowing the other person to make a statement or ask a question (including acknowledgement statements). Interruptions consisted of any instance in which the participant spoke for at least 2 s when another individual was already speaking. Inappropriate vocalizations consisted of any instance of the participant critiquing or delivering a negative statement regarding another individual’s appearance or behavior (e.g., “Your hair is frizzy today.”). This included unsolicited instructions (e.g., “Start your homework.”) or derogatory

language as a personal adjective/descriptive (e.g., “You’re stupid.”) of another individual paired with a singsong tone (voice rising and falling) or facial grimace (twisted facial expression).

Trained observers collected paper-and-pencil data on the correct and incorrect performance of each skill. The observer placed a tally under the correct or incorrect column depending on the participant’s performance after each opportunity to perform a conversational skill. The dependent measure was the percentage of correct responses, which was calculated by dividing the sum of correct responses by the total number of opportunities to respond and then multiplying by 100%.

Interobserver Agreement

Secondary observers included trained graduate and undergraduate research assistants who independently collected data. IOA was calculated by using proportional IOA for each component (e.g., Pence et al., 2014). Proportional IOA was calculated by dividing the smaller number by the larger number for each component (e.g., If Observer A scored 4 instances of correct implementation for one component, and Observer B scored 3 instances, the proportion was calculated by dividing 3 by 4). The proportions were summed and divided by the total number of components (the correct and incorrect columns for each component were each counted as one when adding the total number of components). IOA was assessed for 60% of sessions across all participants. Mean IOA was 92.3% (range, 74.6%-100%).

Procedural Integrity

Trained graduate and undergraduate research assistants assessed confederate’s implementation of role-plays by collecting procedural fidelity data. Observers collected data on confederate’s correct and incorrect responses during role-plays. Observers collected data on responses on confederate’s responses for entering the conversation, engaging in reciprocal

conversation, humor, and exiting the conversation. The percentage of procedural integrity was calculated by dividing the number of correct responses by the total number of opportunities to perform a skill and then multiplying by 100%. Procedural integrity was assessed for 46% of observations across all participants and averaged 97.1% (range, 94.4%-100%).

Experimental Design and Statistical Analysis

One to four sessions were conducted in each phase to evaluate participants' acquisition of social skills: baseline (range, 1-4 sessions), PEERS (range, 1-4 sessions), and post-BST (range, 0-3 sessions). The number of sessions differed across participants and was partly determined by participant availability and the sequence of skills taught during PEERS. Sessions were aggregated to assess performance during each phase. Data analysis was performed by visual inspection of the graphed performance.

Caregiver reports of adolescent social functioning and adolescents' knowledge of social skills following the PEERS intervention were also assessed. The Wilcoxon-Signed Rank Test was used to test for differences in pre-treatment and post-treatment assessments (Gibbons & Chakraborti, 2011). All statistical analyses were performed using SPSS version 17. Total scores for the SSIS-P (parent measure) and TASSK (student measure) were reported at the pre-treatment and post-treatment assessments.

Confederate Role-Play

Entering Conversation. Figure 1 depicts the role-play sequence. The participant and experimenter entered the room where one confederate was seated. The experimenter asked the participant to engage the confederate in a conversation with the statement, "Please practice using your social skills with [confederate's name]." The confederate was oriented toward the participant, engaged in eye contact, and refrained from commenting or changing her facial

expression. If the participant greeted the confederate within 1 min, the confederate returned the greeting and moved to the reciprocal conversation role-play. If the participant did not greet the confederate within 1 min, the confederate engaged in eye contact with the participant and delivered a greeting. The confederate waited 10 s for the participant to respond before moving to the reciprocal conversation phase.

Reciprocal Conversation. Following the entering conversation role-play, the confederate initiated the reciprocal conversation sequence. The confederate remained oriented towards the participant during the entire conversation and only terminated eye contact when the confederate engaged in inappropriate behavior. Following errors (i.e., inappropriate questions, monopolizing the conversation, and interruptions), the confederate briefly terminated eye contact for 2-4 s or until the behavior ended. During the reciprocal conversation sequence, the confederate waited for 20 s following the greeting sequence to provide an opportunity for the participant to ask a question or make a statement. If the participant asked a question or emitted a statement within 20 s, the confederate responded to the question or comment and waited 20 s for a follow-up comment or question. If the participant did not emit a question or statement within 20 s of entering the conversation, the confederate asked the participant a question (e.g., “How was your summer?”). The confederate waited 20 s for a response. If the participant did not respond within 20 s of the question, the confederate commented about her question (e.g., “Summers are very relaxing.”) or answered her own question (e.g., “I had a great summer.”). If the participant did not emit a response within 20 s of the comment, the confederate continued to emit comments or ask questions for two additional attempts prior to moving to the humor component. Confederates delivered a minimum of three questions or three statements during this phase. Additional questions and statements were emitted depending on the participant’s

responses. Confederates ignored all inappropriate questions or statements emitted by the participant and immediately redirected the conversation with the presentation of an appropriate question (e.g., “How did you spend your weekend?”).

Appropriate Use of Humor. At the beginning of this component, the confederate told a “funny” story. “Funny” stories were either a structured joke (e.g., “How does the ocean say bye?”) or a story about an individual making a comic mistake. Confederates identified one scenario from a set of stories about pets (e.g., a pet dressed up as a hotdog), siblings (e.g., playing a trick on a brother), or family members (e.g., a family getting lost on vacation) prior to the session. If the participant laughed or smiled following the “funny” story, the confederate immediately returned the smile or laugh. If the participant did not smile or laugh, the confederate smiled or laughed following the “funny” story and waited 20 s prior to delivering a second story. If the participant emitted a follow-up joke or provided a comment regarding the confederate’s joke, the confederate attended to the joke or comment and responded appropriately (e.g., maintained eye contact, smiled, and nodded following comments; maintained eye contact, smiled, and laughed following jokes). The confederate then delivered a second “funny” story, giving the participant two opportunities to respond to a “funny” story. Following the second “funny” story, the confederate moved to the exiting the conversation component.

Exiting a Conversation. Following the second opportunity for humor, the confederate began to engage in distracted behavior (e.g., looked away, fidgeted with pen). If the participant emitted an exit comment, the confederate directed eye contact to the participant, responded with an exit comment, and terminated the session by exiting the session area. If the participant emitted a comment or asked a question, the confederate delivered a brief response to the question or statement. The confederate ignored any inappropriate vocalizations. If no exit response occurred

following 1 min of providing minimal attention to the participant, the confederate terminated the session by exiting the role-play area.

Procedures

Baseline. Prior to receiving PEERS didactic instruction on the target skill, each participant engaged in a role-play with the trained confederate (as outlined in confederate role-play). Each session lasted approximately 3-7 min. No feedback was delivered during or following the role-play.

PEERS Didactics. During this phase, adolescents met each week in a group format and followed procedures as outlined in the PEERS manual. Participants received feedback from the adolescent group leader on skills intermittently as part of the rehearsal opportunities outlined in the PEERS manual. Sessions were conducted each week with participants in a similar manner to baseline. No feedback was delivered during or following sessions. All questions were ignored.

Modified Behavior Skills Training. In cases when the participants did not acquire skills following PEERS didactics, modified-BST was conducted. Only one social skill was targeted at a time during modified-BST. Modified BST consisted of verbal reviewing the skill, modeling, rehearsal, and feedback following role-plays. In contrast to typical BST procedures, the modified BST procedures used in the current study did not train participants to mastery criterion prior to post-BST sessions due to time constraints. During the verbal review for each target skill, the experimenter stated the rationale, outlined the skill, and provided exemplars using a PowerPoint presentation on a laptop. Modeling consisted of the experimenter engaging in a role-play with the confederate. Following the model, the experimenter vocally highlighted how the target skill was used in the role-play. Two rehearsals were conducted as outlined in the confederate role-play. Following the role-play, the experimenter delivered feedback to the participant on the

targeted skill. Feedback consisted of praise for correct responses and corrective statements for incorrect responses.

During the next PEERS visit after BST, the experimenter observed participants engage in the confederate role-plays. The experimenter delivered feedback to the participant in the form of praise for correct responses and corrective statements for incorrect responses at the end of each session. For example, praise was delivered if the participant correctly entered a conversation (e.g., “You did a great job using a cover story to enter the conversation.”). If the participant made an error, the experimenter provided brief instruction on correct social skill implementation (e.g., “You need to say ‘Hi’ and use a cover story when you are entering a conversation.”). The experimenter answered participants’ questions at the end of each session.

Social Validity Questionnaire

Following post-intervention assessments, participants were asked to complete a questionnaire regarding their participation in the study. A copy of the questionnaire can be found in Appendix A. Participants were asked to rank each item on a 5-point Likert scale (1- strongly disagree to 5- strongly agree). Items on the questionnaire consisted of statements regarding the effectiveness of the program and the trainers.

Results and Discussion

Caregivers completed the SISS to evaluate their adolescent’s social skill functioning at post-treatment when compared to their functioning at pre-treatment. The Wilcoxon Signed-Ranks Test was used to evaluate treatment outcome data. Table 2 depicts pre and post scores for the social skills and problem behavior scales on the SSIS across participants. Caregivers reported significantly higher levels of total social skill functioning at post-treatment in comparison to pre-treatment ($Z = -2.21, p < .02$). SISS subscale analyses revealed significant improvements in the

areas of parent-reported Communication ($Z = -2.14, p < .02$), Responsibility ($Z = -2.88, p < .02$), and Engagement ($Z = -2.032, p < .04$). No significant differences were found for the Cooperation, Assertion, Empathy, and Problem Behavior subscales. In regards to the TASSK, outcomes indicated significant difference from adolescents' pre- to post-treatment performances ($Z = -2.375, p < .02$).

Table 3 displays the mean and range scores for questions on the social validity caregiver questionnaire. Overall, caregivers agreed there were opportunities for his or her child to use the social skills taught in the home and school setting ($M = 6.1$; range, 3-7), the trainers were helpful in learning social skills ($M = 6.5$; range, 5-7), the homework was applicable to the social skills taught ($M = 6.3$; range, 6-7), and the training was sufficient for learning how to teach his or her child social skills ($M = 6$; range, 3-7). In addition, caregivers agreed that the procedures were easy to use in his or her home ($M = 6.4$; range, 5-7), that he or she would seek services from the trainers again ($M = 6.6$; range, 5-7), and that PEERS was effective in increasing the use of social skills in his or her child's school and community ($M = 5.8$; range, 4-7). Caregivers did not agree that the homework assigned was too difficult ($M = 3$; range, 1-5), that the training did not increase the social skills of his or her child ($M = 2.1$; range, 1-4), or he or she did not learn the procedures well enough to use on their own ($M = 1.3$; range, 1-3).

Figure 2 depicts the percentage of correct responding for reciprocal conversations, humor, and entering and exiting conversations across participants. During baseline for reciprocal conversations (top panel), John engaged in zero levels of correct responding, six participants (Adam, Alex, Paul, Derek, Harry, and Maggie) engaged in moderate levels of correct responding (range, 50%-77%) and two participants (Damon and Katie) engaged in high levels of correct responding ($M_s = 84.3\%$ and 86.8% , respectively). Following the implementation of PEERS,

average levels of correct responding for reciprocal conversations increased to high levels for Adam ($M = 83.3\%$) and Damon ($M = 93.2\%$). Average levels of correct responding increased, but remained low for John ($M = 38.0\%$) and moderate for Alex, Derek, Harry, and Paul (range, 49.8%-78.3%). Average levels of correct responding slightly decreased for Katie and Maggie ($M_s = 81.9\%$ and 71.0% , respectively). Following the implementation of modified BST, average percentages of correct responding for reciprocal conversations increased to moderate levels for John ($M = 59.0\%$) and high levels for Maggie ($M = 82.3\%$). Although average percentages of correct responding increased for Alex, Paul, and Derek (range, 64.6%-79.0%) and decreased for Harry ($M = 65.9\%$), percentages maintained at moderate levels. Average percentages decreased to moderate levels for Adam, Damon, and Katie (range, 71.7%-78.4%). Overall, across all participants only one participant (Damon) engaged in above 90% correct responding during reciprocal conversations.

During baseline for humor (Figure 2, second panel), three participants (John, Alex, and Derek) engaged in low levels of correct responding (range, 0%-25%). Five participants (Adam, Paul, Damon, Harry, and Maggie) engaged in moderate average levels of correct responding (range, 66.5% - 77.1%). One participant (Katie) demonstrated high average levels of correct responding ($M = 100\%$). Following the implementation of PEERS, average levels of correct responding increased to high levels for Harry ($M = 93.8\%$) and moderate levels for Derek ($M = 50.0\%$). Average percentages increased for John, but remained low ($M = 13.3\%$) and decreased, but remained at moderate levels for Paul ($M = 45.0\%$). Average levels remained moderate for Adam and Damon ($M_s = 66.7\%$ and 75.0% , respectively) and high for Katie ($M = 96.7\%$) during the PEERS didactic phase. For Alex and Maggie, average percentages of correct responding decreased to zero levels following PEERS. During the post-BST phase, levels of correct

responding increased for Adam, Alex, Paul, Derek, and Maggie (range, 41.5%-100%). A slight decrease in levels of correct responding was observed for Harry ($M = 81.3\%$). Percentages of correct responding decreased to zero levels for John following the implementation of BST. BST was not conducted with Damon and Katie due to time constraints. In contrast to reciprocal conversations, five participants engaged in above 90% correct responding for responding appropriately to humor.

During baseline for entering and exiting a conversation (Figure 2, bottom panel), five participants (John, Adam, Alex, Derek, and Harry) engaged in low levels (range, 12.5% - 20.0%), three participants (Paul, Maggie, and Katie) engaged in moderate levels (range, 50.0% - 75.0%) and Damon engaged in high levels ($M = 95.0\%$) of correct responding. Following PEERS for entering and exiting a conversation, average levels of correct responding increased to high levels for Adam and Maggie ($M_s = 100\%$ and 83.3% , respectively) and to moderate levels for John, Alex, and Harry (range, 50.0%-58.0%). Average percentages of correct responding remained high for Damon ($M = 100\%$) and low for Derek ($M = 25.0\%$). Average percentages of correct responding decreased to low levels for Paul ($M = 25.0\%$) and moderate levels for Katie ($M = 50.0\%$). During post-BST, average levels of correct responding increased to high levels for Alex ($M = 100\%$) and moderate levels for Paul ($M = 75.0\%$). Average percentages remained moderate for John and Harry ($M_s = 50.0\%$ and 50.0%) and low for Derek ($M = 25.0\%$) and decreased to moderate levels for Adam and Maggie ($M_s = 75.0\%$). Overall, across all participants only one participant's performance increased to above 90% correct responding during PEERS (Adam) and one during post-BST (Damon).

Following PEERS, one participant engaged in high levels (above 90%) of correct responding for reciprocal conversations, five participants engaged in high levels for humor, and

three participants engaged in high levels for entering and exiting conversations. During post-BST, high-level performances occurred for one participant in reciprocal conversations, five for humor, and one for entering and exiting conversations. Overall, PEERS produced variable performances across participants. Variable responding also occurred during Post-BST sessions across participants and skills.

Researchers have noted the need for more objective behavioral observations to evaluate PEERS due to the subjective nature of caregiver reported outcomes (Laugeson et al., 2012). Similar to previous studies (Dolan et al., 2016; Laugeson et al., 2014; Schohl et al., 2013) results from parent-reported outcome measures indicated that adolescents demonstrated significantly improved social-skill functioning at post-treatment compared to baseline. In addition, performances on the TASSK suggested that adolescents demonstrated significantly improved knowledge of social skills from baseline to post-treatment. Although these findings support the effectiveness of the PEERS intervention at increasing adolescents social-skill functioning and knowledge of social skills, it is important to clarify that these outcomes do not provide any indication of changes in adolescents' observable social-skill functioning. In contrast to outcomes from parent-reported measures and adolescent questionnaires, data collected from confederate role-plays indicated that overall, for some participants PEERS was effective at improving observable social performance; however, for the majority of participants, performance did not improve to high levels across the targeted social skills (reciprocal conversations, responding to humor, and entering and exiting conversations).

The discrepancies in outcomes from the current investigation and previous studies evaluating PEERS may be due to the differences in outcome measures in which investigators report the effects of the PEERS investigation. To date, the majority of studies evaluating PEERS

have used caregiver reported measures as the primary outcome measure for detecting changes in social functioning (Doston et al., 2010; Laugeson et al., 2009; Laugeson et al., 2014). In addition to caregiver report measures, the current study used direct behavioral measures to evaluate adolescent performance during situations (role-plays) similar to interactions participants will encounter in the natural environment. Although caregivers reported improvements in adolescents' social functioning and data from confederate role-plays demonstrated some improvements in participants' social functioning, participants did not engage in high levels of performance that would suggest mastery of skills. The observed discrepancies in the current evaluation suggest that additional relevant information may be obtained by assessing adolescents during simulated and actual situations, to ensure that participants can perform skills during contextually appropriate situations. The use of objective measures of social functioning in addition to verbal reports (i.e., caregiver-reported measures, adolescent skills questionnaires) may provide a more accurate portrayal of adolescents' current social skills functioning.

The structure and duration of the role-play opportunities during group sessions as outlined in the PEERS manual may not provide optimal opportunities during group sessions for adolescents to receive quality feedback (praise and corrective statements) and adequate practice to effectively improve their functioning. One strength of PEERS is the caregiver component that instructs caregivers to coach adolescents on how to engage in the targeted social skills. An explanation for adolescents' sub-mastery skill acquisition during PEERS may be related to caregivers' acquisition of coaching skills, including how accurately and consistently caregivers provide evaluative and descriptive feedback. Given that caregivers are considered agents of change during and following PEERS, it is necessary to evaluate the accuracy with which parents provide feedback on correct and incorrect performance of social skills. The purpose of

Experiment 2 was to address the gap in the literature on caregiver-assisted group-based social-skills interventions by evaluating the effectiveness of PEERS at training caregivers to provide feedback to individuals following a social interaction.

Experiment 2

Method

Participants. Five female and one male caregiver, ages 39 to 68 years ($M = 52.5$), met inclusion criteria and participated in Experiment 2. All six participants identified as being Caucasian.

Experimental Design

A concurrent multiple-baseline across-skills design was used to evaluate caregiver acquisition of feedback delivery across target social skills. Data analysis was performed by visual inspection of the graphed performance.

In addition to visual analysis, quantitative statistical analysis techniques were implemented to further evaluate participant's acquisition of skills. The percentage of non-overlap of all pairs (NAP) was used to determine the probability that a randomly selected post-intervention data point will improve a randomly selected pre-intervention data point (Manolov, Losada, Chacon-Moscoso, & Sanduvete-Chaves, 2016). In short, the NAP determines the percentage of treatment data points that are improved from baseline data and was used to determine the effective size.

Data Collection and Dependent Variables

The dependent variable was the percentage of correct feedback delivery. Correct feedback was defined as the caregiver accurately delivering praise or corrective statements on target skills (i.e., reciprocal conversation, humor, and entering and exiting a conversation)

following a social interaction between two confederates. Praise consisted of a positive evaluative statement (e.g., good, awesome, amazing) and a descriptive statement explaining the correct response (e.g., responding to questions from others). Responses were recorded as incorrect praise if the descriptive statement did not identify the correct response emitted by the target confederate or if the praise statement did not include an appropriate positive evaluative statement. In addition, incorrect praise was marked if praise was not delivered for correct responses emitted by the target confederate. Corrective feedback was defined as the delivery of a brief statement identifying incorrect or limited responses emitted by the target confederate. Corrective feedback was required to include a descriptive statement explaining the incorrect behavior and specific strategies to improve the incorrect responses emitted by the target confederate (e.g., “Make sure not to interrupt others when they are speaking. Wait 1-2 s after a person stops talking to respond or make a comment.”). Inaccurate corrective feedback was marked if corrective feedback was not delivered regarding an incorrect response emitted by the target individual, if the corrective feedback did not identify specific behavior that require modification, if it did not provide a strategy for improvement, or if the corrective feedback was inaccurate.

Confederate Role-Play

Two confederates engaged in a social interaction at the start of each trial. One confederate was identified to the caregiver as the target confederate whom he or she was required to provide performance feedback. Behaviors targeted for feedback delivery were based on skills taught in PEERS: (a) reciprocal conversations; (b) responding to humor; (c) entering a conversation; and (d) exiting a conversation. The target confederate was trained to engage in appropriate and inappropriate eye contact throughout the contrived social interaction. Correct and incorrect responses were programmed into the role-play and remained consistent throughout

the study (i.e., confederate engaged in the same responses and incorrect responses for each skill during each session). Incorrect responses included errors of commission (e.g., interrupting the speaker) and omission (e.g., not delivering a greeting at the start of session). For example, during the role-play the target confederate was trained to answer questions and provide comments to the other confederate's questions, but not ask questions or provide adequate eye contact.

Interobserver Agreement and Procedural Integrity

IOA and procedural integrity were collected and calculated as outlined in Experiment 1. IOA was assessed for 41% of sessions across all participants. Mean IOA was 96.4% (range, 92.0%-100%). Procedural integrity was assessed for 46% of sessions across all participants and averaged 98.6% (range, 97.2%-100%).

Procedures

Baseline. For each skill, baseline data were collected prior to participants receiving PEERS didactic instruction on the targeted skill. At the start of the session, caregivers were instructed to observe a social interaction and to deliver performance feedback to the target confederate with the statement, "Please observe [confederate A's name] and [confederate B's name] engage in a social interaction. Following the interaction, please provide [confederate A's name] feedback as if she were your child." Following the role-play, caregivers were asked to provide performance feedback to the target confederate (i.e., confederate trained to emit incorrect and correct responses). The experimenter did not deliver feedback to caregivers on their use of praise or corrective feedback. Following caregiver questions, the experimenter responded with the statement, "I am sorry, but I cannot answer questions at this time."

PEERS Didactics. During this phase, the group leader instructed the parent group on the skill using the PEERS manual. Skills were introduced in the sequence outlined in Table 1.

Caregivers were provided definitions of the target skills. Sessions were conducted with caregivers in a similar manner to baseline. The experimenter did not deliver feedback to caregivers on their use of praise or corrective feedback during or following sessions and ignored all questions.

Modified Behavior Skills Training. Modified BST was implemented if caregivers did not acquire skills following the PEERS didactics. Modified BST, as outlined in Experiment 1, consisted of verbal review of the target skills, modeling, and rehearsal and feedback. During the verbal review, the experimenter used a PowerPoint presentation to state the rationale for delivering feedback, explained the components of good praise and corrective feedback statements, provided rationales for the components of feedback (i.e., explanation of why accurate, consistent, evaluative, and descriptive statements are important), outlined feedback delivery for each target skill, and provided examples. Following the verbal review, the experimenter modeled the skill by observing confederates engage in a social interaction and providing positive and corrective statement to the target confederate. During the rehearsal components, caregivers were instructed to deliver feedback to the target confederate after observing her engage in a social interaction. The experimenter delivered praise for correct feedback delivery and corrective statements for incorrect feedback delivery. Two rehearsal opportunities were provided for each skill target with modified BST.

Post BST. Caregivers were instructed to observe confederates engage in a social interaction. Sessions were conducted in a similar manner to baseline and PEERS didactics. At the end of each session, the experimenter provided the caregiver with the opportunity to deliver feedback. Following caregiver feedback, the experimenter delivered feedback to the caregiver in the form of praise and corrective statements. The experimenter delivered praise for correct use

of praise and corrective feedback based on the confederate social interactions. For example, praise was delivered if the participant accurately delivered instructive corrective feedback following the confederate incorrectly exiting the conversation. Brief instruction on the use of accurate feedback delivery was provided if the caregiver emitted an error when delivering feedback based on the confederate's responses. The experimenter answered participants' questions at the end of each session. Mastery criteria was defined as two consecutive observations at 100% accuracy.

Results and Discussion

Figures 3, 4, and 5 depict caregivers' performances across skills. For all participants sessions were discontinued prior to mastery criteria being reached for all skills due to time constraints (e.g., end of the 14-week PEERS intervention). During baseline, Kim (Figure 3, left top panel) engaged in low levels of correct feedback delivery for reciprocal conversation ($M = 16.5\%$), zero levels for humor (middle panel) and entering a conversation (bottom panel) feedback delivery, and variable levels of correct feedback for exiting a conversation (bottom panel; $M = 33.3\%$).

Following PEERS didactic, Kim demonstrated low levels of correct feedback delivery for reciprocal conversations ($M = 16.5\%$). For humor, Kim delivered accurate feedback during one session and no feedback during other sessions ($M = 33.3\%$). Levels of correct responding were high for exiting the conversation ($M = 80.0\%$), but remained low for entering the conversation. Modified-BST was implemented for reciprocal conversation and humor. Following modified-BST, levels of correct responding increased and maintained at mastery levels for reciprocal conversation and humor ($M_s = 91.5\%$ and 100% , respectively).

Dory (Figure 3, right column) engaged in low levels of correct responding during baseline for reciprocal conversations (top panel) and zero levels during humor (middle panel) and entering the conversation (bottom panel). Dory initially did not provide feedback on exiting a conversation; however, levels of correct feedback increased to mastery levels across baseline and these levels maintained during PEERS didactics. Levels of correct feedback for reciprocal conversations were variable following the PEERS didactics ($M = 33.3\%$). Following PEERS didactics, performance on feedback delivery for humor increased to mastery levels ($M = 100\%$). Variable levels of correct feedback on entering the conversation were observed during PEERS didactics ($M = 50\%$). Modified-BST was implemented for reciprocal conversations. Following BST, Dory's correct use of feedback increased ($M = 77.3\%$), however mastery criteria were not met.

Figure 4 displays results for Susan (left column) and Karen (right column). During baseline, Susan (top panel) engaged in zero levels of correct feedback delivery for reciprocal conversation, humor (middle panel), and entering a conversation (bottom panel). Across the first three sessions during baseline, Susan did not deliver feedback on exiting a conversation; however, she provided correct feedback across the last two sessions on exiting a conversation ($M = 40.0\%$).

Following PEERS didactics, Susan engaged in low levels of correct feedback for reciprocal conversations ($M = 11\%$), humor ($M = 16.7\%$), and zero levels of correct feedback delivery for entering and exiting conversations. Modified-BST was implemented for the reciprocal conversations and entering and exiting a conversation. Following modified-BST, levels of correct feedback on reciprocal conversations increased to moderate levels ($M = 49.5\%$),

however mastery criteria were not achieved. Levels of correct responding for entering and exiting a conversation increased to mastery levels ($M_s = 100\%$ and 100%).

Karen (Figure 4, right top panel) engaged in low levels of accurate feedback delivery during baseline for the reciprocal conversation ($M = 16.5\%$) and zero levels for humor (middle panel) and entering a conversation (bottom panel). During baseline, levels of correct feedback delivery were initially zero for exiting a conversation (bottom panel), however performance increased to mastery levels ($M = 50\%$) and remained at high levels of accuracy following PEERS and BST. Following PEERS didactics, levels of correct responding remained low for reciprocal conversations ($M = 22\%$) and at zero for humor and entering a conversation. Following BST, Karen engaged in moderate levels of accurate feedback delivery on reciprocal conversations ($M = 49.5\%$) and low, variable levels for humor ($M = 25\%$). Levels of accurate feedback delivery for entering and exiting the conversation were at high levels following BST.

Sarah (Figure 5, left panel) engaged in zero levels of correct feedback during baseline for reciprocal conversations (top panel), humor (middle panel), and entering and exiting conversations (bottom panel) during baseline and following PEERS didactics. Following modified-BST, levels of correct responding increased for reciprocal conversation ($M = 41.3\%$), humor (100%), and entering and exiting conditions (100%), however mastery criteria were not achieved for any of the skills. Additional sessions were not conducted for skills nearing mastery due to time constraints.

During baseline for Ethan (Figure 5, right panel), zero levels of correct feedback delivery occurred for reciprocal conversation (top panel), humor (middle panel) and entering a conversation (bottom panel). Ethan initially demonstrated low levels of correct responding for exiting the conversation, however performance increased to mastery levels ($M = 60\%$).

Following PEERS didactics, levels of correct responding for reciprocal conversations and humor remained at zero. Following modified-BST, levels of correct feedback increased to moderate levels for reciprocal conversation ($M = 49.5\%$) and to high levels for humor ($M = 100\%$), however mastery criteria were not achieved for either skill. No training occurred for entering and exiting a conversation due to the Ethan's lack of attendance on the day PEERS didactic was conducted for those skills.

NAP was calculated to interpret the effect size or efficacy of treatment. Specifically, the higher NAP, the more effective the treatment (NAP < 50% unreliable treatment; NAP 50-70% questionable effectiveness; 70-90% fairly effective; > 90% highly effective). Outcomes for each participant are detailed in Table 5. No significant improvements were observed from baseline to PEERS for Kim, Susan, Karen, Sarah, and Ethan. For Dory, significant percentages of improvement from baseline to PEERS were observed for humor. NAP statistics indicated significant percentages of improvement following modified-BST (compared to baseline) for reciprocal conversation and humor for Kim, reciprocal conversation for Dory, and entering a conversation for Susan. Outcomes for percentages of improvement following modified-BST are based on the sequential treatment effects of the PEERS didactic and modified-BST procedures. Thus, it is unknown whether participants' improvements observed following modified-BST are due to participants exposure to both procedures or modified-BST alone.

To date, caregivers' acquisition of feedback delivery skills following PEERS has not been directly or indirectly assessed. Experiment 2 evaluated caregivers' feedback delivery on the social skills targeted during PEERS (i.e., reciprocal conversation, responding to humor, and entering and exiting conversations). Following PEERS, Kim acquired the reciprocal conversation and exiting the conversation skill, Dory acquired the humor and exiting a conversation feedback

delivery, and Karen acquired the exiting feedback delivery skill. Following modified-BST, levels of performance increased to moderate to high levels (two participants for humor and one participant for entering and exiting a conversation) or mastery criteria (one participant for reciprocal conversations, humor, and entering and exiting a conversation).

Four of six participants met mastery for providing feedback on exiting conversations during baseline. All four participants showed a pattern of responding where they did not provide feedback delivery on the first two to three sessions, followed by multiple sessions with 100% accuracy. One explanation for this finding is that the confederate error for exiting a conversation role-play was more salient than errors for the other skills. The error for exiting a conversation role-play was also the last skill observed by caregivers prior to delivering feedback. Therefore, it is also possible that the temporal location of the exiting a conversation error may account for caregivers achieving mastery of the skill during baseline. Future studies may further evaluate the contrived confederate role-plays to assess their validity in representing social-skill deficits by collecting data on the errors individuals with ASD typically demonstrate for target skills (e.g., exiting a conversation). In addition, conducting parametric evaluations of the frequency and types of errors in the contrived confederate role-plays may provide insight to the saliency of errors necessary for caregivers to identify incorrect and correct social-skill responses.

Based on PEERS, adolescents' acquisition and maintenance of social skills is dependent on caregivers coaching adolescents to emit skills taught during and following PEERS. Researchers have conducted component analyses of BST to determine the necessity of instructions, modeling, and rehearsal with performance feedback when training caregivers (Drifke, Tiger, & Wierzba, 2017; Ward-Horner & Sturmey, 2012). In general, researchers have shown that instructions alone are often insufficient to increase performance to consistently high

levels and that rehearsal and performance feedback are necessary to achieve mastery-level performance (Drifke et al., 2017; Feldman et al., 1989; Ward-Horner & Sturmey, 2012). Results from the current study are consistent with prior evaluations of training packages in demonstrating that review of instructions (PEERS manual) is insufficient in improving performance to mastery levels.

Low and variable levels of correct feedback delivery were observed across caregiver performances in Experiment 2, suggesting that caregiver's delivery of inaccurate and inconsistent feedback could be problematic given that PEERS addresses adolescents' social-skill functioning in part through caregiver coaching in naturalistic settings. Further analyses of caregiver errors across targeted skills demonstrated that common errors included absent (59%), nonspecific feedback (27%), or inaccurate feedback (14%). Given that the effectiveness of the PEERS intervention could be enhanced through direct caregiver training on delivering feedback, future implementations of the PEERS intervention should consider incorporating procedures to directly assess and train caregivers using training packages that include rehearsal and performance feedback.

One limitation to the current evaluation was that changes in phases were dependent on caregiver attendance and the PEERS manual timeline. For example, only a certain number of sessions were run in some phases due to limited opportunities for sessions to be conducted before reciprocal conversations were reviewed in the PEERS curriculum. In addition, due to the 14-week time limit, modified BST was not implemented on all skills with all caregivers and phases were not run out based on caregiver performance. Future studies should assess the effects of BST on caregiver skill acquisition through a systematic application of procedures.

Although more effective than PEERS didactics, modified BST was ineffective at increasing levels of correct responding to mastery level for all caregivers in Experiment 2. A more extensive BST package may be necessary for caregivers to acquire skills. In-situ training consists of delivering in-the-moment feedback (praise and corrective statements) and can improve the effectiveness of BST (Himle et al., 2004; Miltenberger et al., 2005). The purpose of Experiment 3 was to evaluate a more extensive BST package (including in-situ feedback) on participants' performances to give feedback to adolescents on their social skills. In addition, given that caregiver feedback is proposed as an agent of change for adolescents' skill acquisition, a secondary purpose of Experiment 3 was to investigate the effects of caregiver's acquisition of feedback delivery skills on adolescent social-skills acquisition.

Experiment 3

Method

Participants. Two caregiver-adolescent dyads participated. One caregiver was identified for each adolescent participant. One dyad consisted of a female caregiver (grandmother) age 69-years old (Kathy) and a female adolescent age 16-years old (Dawn). The second dyad consisted of a female caregiver (mother) age 48-years old (Kelly) and a female adolescent age 19-years old (Daisy). All participants identified as Caucasian.

Experimental Design. A concurrent multiple-baseline across-skills design was used to evaluate caregiver acquisition of feedback delivery for targeted social skills and adolescent acquisition of social skills. Data analysis was performed by visual inspection of the graphed performance. Similar to Experiment 2, quantitative statistical analysis techniques were calculated to further evaluate participant's acquisition of skills.

Data Collection and Dependent Variables. During sessions, data were collected on adolescents' responses during the confederate role-play and on caregivers' feedback delivery skills after observing the adolescent engage in a social interaction. The primary dependent variable was the percentage of correct delivery of feedback (caregivers) and the secondary dependent variable was the percentage of correct social skill responses (adolescents). The same data collection procedures were used from Experiments 1 (adolescents) and 2 (caregivers). Response definitions were also identical to those used in Experiments 1 and 2 for adolescent and caregiver responses with the addition of eye contact. For adolescents, correct eye contact was defined as any instance of the participant engaging in 1 s or more of visual orientation to the conversation partner's eyes or eye region. Mastery criteria was defined as three consecutive observations at 100% accuracy. For eye contact, mastery criteria was defined as three consecutive observations with 80% or more 5 s intervals with eye contact.

Interobserver Agreement and Procedural Integrity. The IOA and procedural integrity calculation procedures from Experiment 1 were used. IOA was assessed for 38% of sessions across both dyads. Mean IOA was 91.3% (range, 82.6%-100%). Procedural integrity was assessed for 42% of observations across all participants and averaged 96.4% (range, 92.8%-100%).

Procedures. Caregiver baseline. Prior to training, baseline sessions were conducted with caregiver-adolescent dyads. At the start of the first session, the experimenter delivered the following instruction: "Before we start teaching you the skills your adolescent will be learning, we want to observe you providing feedback to your child after observing her engage in a social interaction with a confederate. During this session, I will not answer questions or provide

additional information.” The caregiver was asked to sit behind a two-way mirror to observe the role-play.

At the end of the role-play between the confederate and adolescent, caregivers were instructed to enter the treatment room and provide the adolescent feedback on her performance. Caregivers were given the instruction, “Please enter the treatment room and provide your child with feedback regarding his or her performance during the social interaction with the confederate.” Sessions were terminated following 30 s with no vocal responses from the caregiver or adolescent or if the caregiver indicated that she had completed delivering feedback (e.g., “I have nothing more to add.”).

No feedback was delivered to caregivers by the experimenter following sessions. All questions were redirected with statements such as, “I can’t answer that right now,” and “Thank you for following instructions.”

Adolescent baseline. The experimenter instructed the adolescent to engage with the confederate in a social interaction upon entering the treatment room. The following instruction was delivered at the start of each session: “Please engage in a conversation with [confederate’s name] and make sure to use your social skills. Following your conversation, your [caregiver title] will provide you feedback on your performance.” Confederates engaged in role-plays as outlined the confederate role play in Experiment 1. Following the role-play, caregivers were instructed to deliver feedback to the adolescent. Sessions were terminated following 30 s with no vocal responses from the caregiver or adolescent. Experimenters refrained from delivering feedback, commenting, or answering questions.

Caregiver BST. Following baseline sessions, the experimenter used BST to train caregivers on feedback-delivery skills. BST consisted of verbal review, modeling, role-plays,

and performance feedback. During the instruction portion of the training, the experimenter reviewed components of feedback delivery, as described in Table 4, with emphasis placed on errors that the caregiver engaged in during baseline. During the verbal review, the experimenter used a PowerPoint presentation to state the rationale for delivering feedback, review the components of correct praise and corrective feedback, outline feedback delivery for each target skill, and provide examples.

Two confederates role-played a social interaction to assist the experimenter in modeling feedback delivery. During the role-play, the confederates' social interaction included the same components discussed during PEERS, including entering a conversation, engaging in a reciprocal conversation, responding appropriately to humor, and exiting a conversation. The confederate engaged in correct responding to questions and comments and incorrect entering, initiating comments, responding to humor, eye contact, and exiting responses during the conversation. Following the conversation, the experimenter modeled delivering feedback to the target confederate by delivering praise for correct responses and corrective statements for incorrect responses. The experimenter answered participants' questions during and following training.

After the experimenter modeled delivering feedback, the caregiver observed the confederates role-play a conversation. The confederate engaged in correct and incorrect responses during the role-play and the engaged in different errors across role-plays. The caregiver practiced providing performance feedback to the target confederate. The experimenter provided feedback to caregivers regarding their delivery of performance feedback. Mastery criterion for BST was 100% accurate feedback across three consecutive role-plays.

Caregiver delayed feedback. Delayed feedback sessions occurred following BST. During delayed feedback sessions, adolescents were instructed to engage in a role-play with a confederate. Following the role-play, caregivers were instructed to deliver feedback to adolescents based on her performance. Following the caregiver delivering feedback to the adolescent, the experimenter and the caregiver moved to another room where the experimenter delivered praise to the caregiver for her correct delivery of feedback to the adolescent and corrective statements on incorrect or absent feedback. Mastery criteria were three consecutive observations with 100% accurate feedback. The experimenter answered questions after the caregiver provided feedback.

Caregiver in-situ feedback training. Caregivers who did not meet mastery criterion after at least five consecutive sessions during the delayed feedback phase received in-situ feedback. Caregiver in-situ feedback was conducted with Kathy for reciprocal conversation skills. During in-situ feedback, the caregiver wore a bug-in-the-ear device. Through the earpiece, the experimenter delivered praise immediately following correct delivery of feedback on the targeted social skill only (e.g., reciprocal conversation). Following errors on the target skill (e.g., failing to deliver praise or corrective feedback), the experimenter provided a brief verbal prompt on the correct feedback response. Following the observation, the experimenter delivered feedback to the caregiver on areas of her performance that were satisfactory and areas that require improvement. The mastery criteria to return to delayed feedback were two consecutive observations with 100% correct feedback delivery.

Caregiver implemented BST (Kelly). In cases where adolescent skills did not reach mastery criterion following the caregiver in-situ feedback training, caregivers were taught to use BST to directly teach the social skill to their adolescent. Caregiver-implemented BST was

conducted with Kelly and Daisy for reciprocal conversation skills. The experimenter used BST to teach Kelly to implement the BST procedure with Daisy (see Experiment 1 BST section). BST with caregivers consisted of verbal review, modeling, rehearsal, and feedback. Instructions included describing the components of BST, providing rationale for the procedure, and providing examples of how to use BST procedures to train skills. Next, the experimenter modeled all the correct steps of BST to teach the target social skill. During role-plays, Kelly used BST to train the target social skill (reciprocal conversation) to a confederate. Feedback consisting of praise for components implemented accurately and corrective statements for inaccurate responses was delivered following each role play. Mastery criteria were three consecutive role-plays with 100% fidelity.

Adolescent behavior skills training (Kelly and Daisy). Following training, Kelly used BST to teach reciprocal conversation skills to Daisy. Caregivers used a PowerPoint presentation to review the components of reciprocal conversations with adolescents and emphasized specific skills that Daisy performed incorrectly. After the verbal review, caregivers modeled the social skill by engaging in a social interaction with the experimenter. The correct and incorrect performance of each skill was modeled across three social interactions. After the caregiver and confederate modeled the target social skill, adolescents practiced engaging in a social interaction with a confederate. Caregivers delivered feedback to adolescents by delivering praise for accurate responses and corrective statements for inaccurate responses on the target social skill following each role-play. Mastery criteria for BST with Daisy were three sessions with 100% accuracy.

Maintenance. Maintenance sessions were conducted with participants that met mastery criterion. Sessions were conducted similar to baseline sessions. The experimenter did not deliver feedback during or following sessions and did not answer caregiver and adolescent questions.

Results and Discussion

Figure 6 depicts results from Experiment 3 for the first dyad with Kathy (caregiver; left column) and Dawn (adolescent; right column). During baseline for reciprocal conversation, Kathy (left top panel) engaged in zero levels of correct feedback. Following the introduction of delayed feedback, levels of correct feedback on reciprocal conversations increased slightly, but remained low ($M = 11.1\%$). Percentages of correct feedback increased to high levels for reciprocal conversations with Kathy following the implementation of in-situ feedback ($M = 100\%$) and remained high following the return to delayed feedback where mastery criteria were met ($M = 100\%$). High levels of performance maintained during maintenance sessions ($M = 96.2\%$). Dawn (right top panel) engaged in low to moderate levels of correct reciprocal conversation responding during baseline ($M = 35.8\%$). Levels of correct responding remained low to moderate during caregiver training with delayed feedback ($M = 43\%$) and caregiver in-situ feedback ($M = 42\%$). Following the return to caregiver delayed feedback, levels of correct responding were initially variable, but increased to high levels ($M = 69.3\%$). Mastery criteria were met during the caregiver delayed-feedback phase, following a two-month break in treatment.

During baseline for humor, Kathy (left second panel) engaged in zero levels of correct feedback. Percentages of correct feedback increased to mastery levels in the delayed feedback phase ($M = 100\%$) and remained high during maintenance sessions ($M = 94.4\%$). Dawn (right second panel) engaged in variable, low levels of correct responding for humor during baseline

($M = 23.1\%$). During the caregiver delayed-feedback phase, levels of correct responding to humor increased to moderate levels ($M = 68.3\%$). Mastery criteria were achieved during the caregiver delayed feedback phase ($M = 79.6\%$) and remained high during maintenance ($M = 100\%$).

Kathy (right third panel) engaged in zero levels of correct feedback delivery in baseline for entering and low levels for exiting ($M = 9.1\%$) conversations. During delayed feedback, percentages of correct feedback increased to mastery levels ($Ms = 100\%$). Kathy's performance remained high during maintenance ($Ms = 100\%$). For entering conversations, Dawn engaged in high levels of correct responding during baseline (left third panel; $M = 90.9\%$). Zero levels of correct responding were observed for exiting conversations during baseline. Percentages of correct responding remained high during caregiver delayed feedback phase for entering the conversation ($M = 100\%$) and increased to mastery levels for exiting conversations ($M = 50\%$). Dawn's levels of correct responding for entering and exiting the conversation remained high following a two-month break in treatment ($Ms = 100\%$).

Kathy's percentages of correct feedback delivery for eye contact were initially low and variable, but increased to mastery levels during baseline ($M = 38.5\%$). Levels of correct feedback remained high during maintenance sessions ($M = 100\%$). Dawn engaged in high levels of correct eye contact and met mastery criteria during baseline ($M = 82.3\%$). Percentages of correct eye contact remained high during maintenance ($M = 82.1\%$).

Table 6 depicts NAP outcomes for participants in Experiment 3. The NAP statistics were not commutated for skills mastered during baseline. For Kathy, NAP indicated no significant improvements from baseline to the first caregiver delayed feedback and in-situ sessions for reciprocal conversation. Significant differences were identified for the NAP outcomes for

percentages of improvement from baseline to the second caregiver delayed feedback phase. Significant percentages of improvement from baseline to delayed feedback were observed for humor and entering and exiting conversations. NAP demonstrated significant improvements from baseline to treatment for the second parent training delayed feedback for reciprocal conversations and the delayed feedback phase of parent training with humor for Dawn's performance. No significant improvements were identified for the first implementation of caregiver delayed feedback or in-situ feedback for reciprocal conversations and caregiver delayed feedback for exiting the conversation.

Figure 7 depicts results for the second dyad, Kelly (caregiver, left column) and Daisy (adolescent, right column). During baseline, Kelly (left top panel) engaged in low levels of correct feedback delivery for reciprocal conversation ($M = 11.1\%$). Following the introduction of delayed feedback, correct feedback on reciprocal conversations increased to high levels and mastery criteria were met ($M = 77.8\%$). Percentages of correct feedback remained high during maintenance ($M = 100\%$). Daisy (right top panel), engaged in moderate levels of correct responding during baseline for reciprocal conversations ($M = 43.3\%$). Daisy's correct responding remained at moderate-to-low, variable levels during the caregiver delayed-feedback phase ($M = 37.9\%$). Following the implementation of caregiver BST, levels of correct reciprocal conversations increased to mastery levels ($M = 86.1\%$). Levels remained high during maintenance ($M = 100\%$).

During baseline for humor, Kelly (left second panel) engaged in overall low levels of correct feedback ($M = 16.7\%$). Percentages of correct feedback increased to mastery levels following delayed feedback ($M = 100\%$) and remained high during maintenance ($M = 87.5\%$). Daisy (right second panel) engaged in moderate levels of correct humor responding during

baseline ($M = 55.2\%$). During the delayed feedback phase, percentages of correct responding for humor increased to high levels and mastery criteria were achieved ($M = 93.3\%$). Percentages of correct responding remained high during maintenance ($M = 95.8$).

Kelly demonstrated low levels of correct feedback delivery for entering conversations ($M = 20\%$) and zero levels for exiting conversations. Following the implementation of delayed feedback, percentages of correct feedback increased to mastery levels for entering and exiting conversations ($M_s = 100\%$) and remained high during maintenance. During baseline, Daisy's levels of correct responding for entering and exiting conversations were low with two high data points occurring for entering conversations ($M_s = 20\%$ and 0% , respectively). Mastery criteria were achieved for the entering and exiting conversations during the caregiver delayed-feedback phase ($M_s = 100\%$ and 66.7% , respectively). Levels remained high for entering and exiting the conversation following a two-month break in treatment ($M_s = 100\%$).

Kelly's levels of correct feedback on eye contact were low during baseline ($M = 13.6\%$). Levels of correct feedback increased to mastery levels following the implementation of delayed feedback ($M = 100\%$) and remained high during maintenance. Daisy engaged in low levels of eye contact during baseline ($M = 18.7\%$). A gradual increase to mastery levels of correct responding was observed during the caregiver delayed-feedback phase ($M = 73\%$). The percentage of correct eye contact remained high during maintenance ($M = 84\%$).

Table 7 depicts outcomes for NAP for Kelly and Daisy. NAP was not computed for skills mastered during baseline sessions. For Kelly, NAP indicated significant percentages of improvement from baseline to caregiver delayed feedback phases for the humor, entering conversation and exiting conversation skills, and eye contact. NAP outcomes for percentages of improvement from baseline to caregiver delayed feedback phase for reciprocal conversations

approached significance. For Daisy, the NAP demonstrated significant improvements from baseline to caregiver implemented BST for reciprocal conversation skills and baseline to the delayed feedback for humor, eye contact, and entering and exiting a conversation. No significant improvements were identified from baseline to caregiver delayed feedback conditions for reciprocal conversations.

Experiment 3 evaluated procedures to train caregivers to deliver feedback. BST and delayed feedback were sufficient to increase caregiver feedback delivery to mastery levels for the majority of skills targeted. In-situ feedback was necessary for one participant (Kathy) to meet mastery criteria on delivering feedback for reciprocal conversations. A secondary purpose was to assess the effects of caregiver's skill acquisition on adolescent's performance during a social interaction. As caregiver's delivery of correct feedback improved, adolescent's performance also improved. These findings indicated that caregiver's feedback effectively improved adolescent's social functioning.

These findings contribute to the training literature by further demonstrating the necessity of rehearsal and performance feedback during training (Miltenberger et al., 2004). In regards to the PEERS curriculum, findings indicate that modifications to the PEERS manual may improve both adolescents and caregiver acquisition of skills. For example, caregiver groups should incorporate BST procedures, including using structured modeling of skills, skill rehearsal, and feedback on performances to weekly group meetings to teach parents how to provide feedback on the targeted social skills. Following BST with caregivers, procedures may also include an opportunity for caregivers to provide in-vivo feedback to adolescents during their rehearsal of skills in the adolescent group. The inclusion of structured rehearsal opportunities (e.g., caregivers

and adolescents' practice skills together) may improve both caregiver and adolescents' performances in social settings following the group.

One dyad required caregiver in-situ feedback for skills to be acquired. Although in-situ feedback was necessary for Kathy to delivery accurate and consistent feedback for reciprocal conversation, mastery criteria were obtained for humor, entering and exiting a conversation, and eye contact following BST and with delayed feedback. Two potential hypotheses may explain this outcome. First, targeted skills may vary in difficulty and reciprocal conversations could be more a complex skill compared to skills such as entering and exiting conversations. As a result, more intrusive procedures may be necessary to acquire the skill. Once such a skill is acquired, the general skill of feedback delivery may generalize to other less difficult social skills. For both dyads, caregiver acquisition of the feedback delivery for skills occurred prior to adolescent acquisition of skills for reciprocal conversation, humor, and exiting a conversation. A second hypothesis is that for some caregivers in-situ feedback may be necessary to acquire general coaching skills that then generalize across skills. Therefore, regardless of the sequence of skills targeted, a more intrusive training procedure may be necessary for acquisition to occur and for less intrusive procedures to be effective in acquiring subsequent skills. Future studies should examine this effect to determine if findings can be replicated when the sequence of targeted skills is alternated. By controlling for sequencing effects, studies may determine if in-situ feedback is necessary to acquire general feedback-delivery skills.

Caregiver-implemented BST was necessary to achieve mastery level performance on reciprocal conversation skills with Daisy. However, Daisy acquired skills necessary to response appropriately to humor, enter and exit conversations, and make appropriate eye contact with only parent feedback that was delivered at the end of the role-play. Dawn's performance increased to

mastery levels following exposure to accurate and consistent parent feedback without caregiver-implemented BST. These finding extends the social-skills literature by demonstrating that caregiver feedback alone may be effective in improving adolescent's skills. By using caregivers as trainers, treatment packages targeting adolescent social-skill acquisition may increase in effectiveness because of caregivers' ability to implement procedures more frequently across multiple settings.

General Discussion

The primary goal of the current study was to assess the impact of PEERS on the social functioning of adolescents with high-functioning ASD and the coaching skills of the caregivers participating in the program. A secondary goal was to determine the direct effects of caregiver's acquisition of coaching skills on adolescent's social-skills performance (Experiment 3). Outcomes from Experiment 1 indicated that PEERS and brief BST were not effective at consistently improving the social performance of adolescents to high levels at post-treatment evaluations across all skills. However, caregivers rated adolescents' social functioning as being significantly improved as compared to functioning prior to the intervention. Experiment 2 evaluated the effectiveness of PEERS at improving caregivers' delivery of feedback. Three caregivers acquired at least one skill (humor, entering a conversation, and exiting a conversation) following PEERS didactics and three participants met mastery levels following BST. In Experiment 3, Kathy required in-situ training to be able to provide feedback to her daughter, Dawn, on reciprocal conversations. Besides this skill, caregivers acquired feedback-delivery skills on social skills following BST and when the trainer delivered feedback following the caregiver's performance. Adolescents' performance improved across social skills with consistent accurate caregiver feedback.

The PEERS intervention is considered one of the most empirically supported social-skills interventions for adolescents with high-functioning ASD in part because of its inclusion of caregivers as coaches (Laugeson et al., 2012; Rao et al., 2008). Similar to previous evaluations of PEERS, the present study replicated findings of significantly improved adolescent social-skill knowledge and caregiver ratings of adolescents' social functioning following PEERS (Laugeson et al., 2009; Laugeson et al., 2012; Reichow & Volkmar, 2010). The current study extends the PEERS intervention literature by incorporating behavioral observation of participants' skill functioning to the treatment assessment package. Currently, the majority of studies evaluating peers rely solely on caregiver report data to assess treatment outcomes. Although caregiver report is important when investigating social skills, it is also important to evaluate individuals' performances in simulated situations to assess if skills will occur accurately under relevant conditions (Johnson et al., 2006; Nuernberger et al., 2013). Consequently, conclusions made regarding social functioning based only on caregiver report do not provide adequate understanding of how an individual will behave in target situations or settings. Findings from the current investigation further demonstrate the importance of incorporating in-vivo assessments in skill-acquisition training packages. Obtaining behavioral data on adolescents' actual performance during social interactions may provide vital information regarding the complete effects of social-skill interventions.

The current study also extends the social-skills literature by examining the direct effects of caregiver acquisition of coaching skills on adolescent's social functioning. To date, few studies have directly examined this relationship between caregiver skills and adolescents social functioning (Hassan et al., 2018; Stewart, Carr, & LeBlanc, 2007). In one exception, Hassan et al. (2018) evaluated a brief BST package and in-situ training to teach four caregivers to use BST

to improve their child's social skills within specific contexts (controlled setting and free play "party" setting). Caregivers met mastery criterion following brief BST; however, skills did not generalize to natural environments until in-situ training was implemented. Contrary to Hassan et al., findings from the current evaluation suggest that modified-BST (i.e., participants were not trained to mastery criterion prior to post-BST sessions) was not effective at improving caregiver acquisition of feedback delivery skills in contrived settings (Experiment 2). However, similar to Hassan et al., skills were acquired by caregivers when the trainer delivered feedback following caregiver's performance of skills in Experiment 3. Caregiver acquisition of skills in Experiment 3 and Hassan et al., demonstrate the advantageous effects of accurate and consistent feedback and caregivers implementing feedback-delivery skills directly with their child or adolescent. However, the current evaluation did not conduct generalization probes in naturalistic settings (e.g., school classroom). As a result, additional research is necessary to make conclusions regarding the components necessary to replicate outcomes from Experiment 3 in comparison to Hassan et al.

Participants in Experiment 1 and 2 demonstrated submastery levels of performance across multiple targeted skills, with only a few skills reaching mastery levels following PEERS and BST. For adolescents in Experiment 1, PEERS and BST may not have increased performances to high levels for all skills because of the complexity of social skills targeted and the level of deficits exhibited by adolescents. Previous social-skill evaluations (e.g., Hood et al., 2017; Slocum et al., 2015), have suggested a positive correlation between social-skill complexity and intrusiveness of procedures. Future implementations of the PEERS intervention should consider increasing adolescents' exposure to skill rehearsals and performance feedback to help ensure skills are acquired to proficient levels. In addition, the PEERS curriculum may also

consider incorporating procedures to help train caregivers during the group meeting given findings from Experiment 3 that caregivers' skills improved with skill rehearsals and performance feedback.

Previous training literature demonstrates the importance of consistently and immediately delivering consequences (e.g., accurate and descriptive feedback; reinforcers) following the occurrence of targeted or nontargeted behaviors during training (e.g., Green, Myerson, & McFadden, 1997). The current PEERS protocol stipulates specific consequences for adolescent behavior throughout the weekly groups meetings (i.e., points for completing weekly homework assignments and participation in group, feedback following rehearsals, selecting prizes based on points earned at the end of the intervention). Although the addition of specific consequences is an improvement to social-skills training packages, the delay and dosage of consequences (e.g., reinforcers) in PEERS did not support behavior change in the current study. For example, receiving one point for completing the previous week's homework assignment and trading-in points for items at the end of the intervention is not likely to support behavior change during or following group meetings. In addition, the dosage of specific consequences may also have affected outcomes in Experiment 1. Specifically, the frequency and quality of PEERS leaders' feedback delivered following the rehearsals during groups was not controlled by experiments and may have not promoted skill acquisition. However leaders conducted sessions as outlined in the manual of feedback. In addition, it is unknown the level of appropriate feedback caregivers may have provide outside of group meetings. During Experiment 3, caregivers immediately and consistently provided feedback (praise and corrective instruction) following adolescent responses. The increase in the feedback delivery may explain the observed improvements in performance for adolescents (Kang, Oah, & Dickinson, 2003). Further investigation is necessary

to evaluate these hypotheses. Future researchers could use a parametric evaluation where the delays and levels of feedback are systematically manipulated across multiple PEERS implementations for caregiver and adolescent groups, to determine if skill acquisition can be increased within the group setting. Future studies may also examine the adolescent group leaders' behavior and its affects adolescents' skill acquisition. For example, studies may evaluate the effects of incorporating additional planned reinforcement procedures, such as delivering edible and tangible items based on correct responding during group activities or providing more frequent opportunities to exchange points (Nuernberger et al., 2013). The evaluation should also include preference and reinforcer assessments to ensure that items used will promote behavior change.

Limitations to the current evaluation including schedule restrictions for Experiment 1 and 2 and the lack of generalization and maintenance probes in Experiment 3. For the first two experiments, sessions occurred in conjunction with the PEERS meetings. Therefore, only a limited number of sessions could occur within each condition given the PEERS intervention schedule (i.e., one 90-min session per week). As a result, we aggregated our observations within subjects to compare the effects of our conditions (PEERS and modified BST) across participants as oppose to a concurrent multiple-baseline across-skills design. Future researchers should evaluate the effects of PEERS on adolescent and caregiver skill acquisition with a higher degree of experimental control using a single-subject experimental design. However, given the aim of Experiment 1 and goals of the PEERS program (i.e., improvement in skills from baseline to post-intervention), conclusions based on the design are still applicable to the question at hand.

Another limitation to the current investigation and other social-skills training programs for individuals with ASD is the lack of generalization and maintenance evaluations (Rao et al.,

2008; Williams White et al., 2007). Results from Experiment 3 suggest skills may maintain following a brief break from treatment. Specifically, participants demonstrated high performances and met mastery following a 2-month break from training. More systematic evaluations of how skills are demonstrated in the natural environments (e.g., school) and with different individuals (e.g., same-aged peers, relatives, teachers, and novel people) after a prolonged cessation of treatment (e.g., 6 month follow-up) is necessary to confirm the clinical utility of observed improvements.

Findings from the current evaluation add to the body of research on social-skills training and caregiver-training packages. Although the PEERS intervention is an empirically validated group social-skills treatment package, modifications to the curriculum may enhance its effectiveness. The PEERS intervention should be modified to include in-vivo observations of skills to pre- and post-intervention assessments, additional opportunities for adolescents to rehearse skills during group meetings, incorporating direct training to caregivers (consisting of modeling, skill rehearsals, and performance feedback), and modifying consequences to correct and incorrect behaviors emitted during group. The proposed changes may enhance the group and allow for group participants to increase their performances on targeted skills to clinically significant levels that maintain and generalize to other settings.

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Table 1

Overview of the PEERS Intervention

Session	Didactic lesson	Description
1	Introduction and trading information	Caregivers and adolescents are taught how to trade information during conversations in order to find common interests
2	Conversational skills	Caregivers and adolescents are instructed on key elements of having a reciprocal conversation with peers
3	Electronic communication	Caregivers and adolescents learn about the appropriate use of voicemail, email, text messaging, instant messaging and the Internet in developing pre-existing friendships
4	Choosing appropriate friends	Adolescents introduced to the social hierarchy of peer groups in schools and begin to identify groups they might fit in with.
5	Appropriate use of humor	Parents and adolescent learn the basic rules around appropriate use of humor.
6	Peer entry strategies	Caregivers and adolescents are given instruction about the precise steps involved in joining conversations with peers
7	Peer entry strategies	Caregivers and adolescents are given instruction about the precise steps involved in joining conversations with peers
8	Get-together	Caregivers and adolescents are given instructions about how to plan and implement successful get-togethers with friends
9	Good sportsmanship	Caregivers and adolescents are taught the rules of good sportsmanship
10	Handling teasing	Caregivers and adolescents are taught how to appropriately respond to teasing from peers
11	Handling bullying and bad reputations	Caregivers and adolescents are given strategies for handling bullying (i.e., physical attacks) and how to change a bad reputation
12	Handling arguments and disagreements	Caregivers and adolescents are given instruction about the important elements necessary to resolving arguments and disagreements with peers
13	Handling rumors and gossip	Caregivers and adolescents are given concrete strategies for minimizing the effects of rumors and gossip
14	Graduation party ceremony	Adolescents are rewarded with a graduation party

Table 2

Social Skills Improvement Scale and Test of Adolescent Social Skills Knowledge Scores

Participants	Pre-Social Skills SS (PR)	Post-Social Skills SS (%)	Post-Problem Behavior SS (%)	Post-Problem Behavior SS (%)
John	74 (7%)	81 (12%)	130 (95%)	123 (93%)
Adam	83 (13%)	83 (13%)	102 (60%)	108 (77%)
Alex	64 (2%)	65 (2%)	138 (96%)	128 (94%)
Paul	86 (17%)	98 (42%)	111 (82%)	108 (77%)
Derek	71 (5%)	82 (13%)	140 (97%)	130 (95%)
Damon	85 (15%)	--	120 (91%)	--
Harry	--	--	--	--
Maggie	77 (6%)	89 (24%)	128 (95%)	117 (85%)
Katie	56 (<1)	107 (69%)	156 (>99)	105 (62%)
Average	74.5	86.4	128.1	117

Note. PR = Percentile Rank; SS = Standard Score. Higher scores on the problem behavior scale are indicative of more problem behaviors.

Table 3

Social Validity Parent Questionnaire

Question	Mean	Range
There are opportunities for my child to use the social skills taught in his/her home and school.	6.1	3 - 7
Based off of my experience with trainers, I found my trainer helpful to learn social skills.	6.5	5 - 7
The homework assigned was too difficult to complete.	3	1 - 5
The homework was applicable to the social skills my child was learning.	6.3	6 - 7
The training was sufficient for learning how to teach my child social skills.	6	3 - 7
It would be easy to use the procedures I learned in my home.	6.4	5 - 7
The training did not increase the social skills of my child.	2.1	1 - 4
Based off of my experience with the trainers, I would seek the help of these trainers again.	6.6	5 - 7
I did not learn the procedures well enough to use on my own.	1.3	1 - 3
PEERS was effective in increasing the use of social skills in my child's school and community.	5.8	4 - 7

Table 4

Caregiver Behavior Skills Training

Component	Materials	Description
Verbal Review	PowerPoint presentation; laptop	Participants will be provided instructions on how to deliver positive praise and instructive statements perform target skills and the rationale for their importance
Modeling	Confederates; fidelity data sheet	(1) Participant will observe two confederates engage in a conversation; (2) observe the experimenter deliver feedback to the target confederate using a fidelity data sheet
Role-play & Feedback	Confederates; fidelity data sheet	(1) Participant will observe two confederates engage in a conversation; (2) Participants will practice delivering positive feedback for correct behavior and instructive statements for incorrect behaviors demonstrated by the target confederate; (3) the experimenter will deliver praise following participant's correct response and instruction following incorrect responses

Table 5

Summary of Percent of All Nonoverlapping Data Points (NAP) for Experiment 2

Participant	Condition	Baseline to PEERS Didactics			Baseline to Modified-BST		
		NAP (%)	Sig.	Category	NAP (%)	Sig.	Category
Kim	RC	50	NS	Unreliable	100	.05	Highly
	Humor	66.7	NS	Questionable	100	.03	Highly
	Entering	60	NS	Questionable	50	NS	Unreliable
	Exiting	73.3	NS	Fairly	83	NS	Fairly
Dory	RC	50	NS	Unreliable	100	NS	Highly
	Humor	100	.05	Highly	–	–	–
	Entering	75	NS	Fairly	–	–	–
	Exiting	75	NS	Fairly	–	–	–
Susan	RC	66.7	NS	Questionable	100	NS	–
	Humor	50	NS	Unreliable	63	NS	Questionable
	Entering	50	NS	Unreliable	100	.05	Highly
	Exiting	30	NS	Unreliable	80	NS	Fairly
Karen	RC	50	NS	Unreliable	81	NS	Fairly
	Humor	50	NS	Unreliable	63	NS	Questionable
	Entering	50	NS	Unreliable	100	NS	Highly
	Exiting	75	NS	Fairly	75	NS	Fairly
Sarah	RC	50	NS	Unreliable	100	NS	Highly
	Humor	50	NS	Unreliable	100	NS	Highly
	Entering	50	NS	Unreliable	100	NS	Highly
	Exiting	50	NS	Unreliable	100	NS	Highly
Ethan	RC	50	NS	Unreliable	100	NS	Highly
	Humor	50	NS	Unreliable	100	NS	Highly
	Entering	–	–	–	–	–	–
	Exiting	–	–	–	–	–	–

Note. NS = not significant; RC = reciprocal conversation.

Table 6

Summary of Percent of All Nonoverlapping Data Points (NAP) for Experiment 3 Dyad 1

Participant	Condition	Baseline to DF			Baseline to CA In-Situ			Baseline to 2 nd DF		
		NAP (%)	Sig.	Category	NAP (%)	Sig.	Category	NAP (%)	Sig.	Category
Kathy	RC	66.7	NS	Questionable	100	NS	Highly	100	.04	Highly
	Humor	100	.04	Highly	–	–	–	–	–	–
	Entering	95	.02	Highly	–	–	–	–	–	–
	Exiting	100	.01	Highly	–	–	–	–	–	–
	Eye Contact	–	–	–	–	–	–	–	–	–
Dawn	RC	83	NS	Fairly	91	NS	Highly	97	.01	Highly
	Humor	93	.00	Highly	–	–	–	–	–	–
	Entering	–	–	–	–	–	–	–	–	–
	Exiting	75	NS	Fairly	–	–	–	–	–	–
	Eye Contact	–	–	–	–	–	–	–	–	–

Note. NS = not significant; RC = reciprocal conversation.

Table 7

Summary of Percent of All Nonoverlapping Data Points (NAP) for Experiment 3 Dyad 2

Participant	Condition	NAP (%)	Baseline to DF		Baseline to AD BST		
			Sig.	Category	NAP (%)	Sig.	Category
Kelly (CA)	RC	89	NS	Fairly	–	–	–
	Humor	92	.05	Highly	–	–	–
	Entering	90	.04	Fairly	–	–	–
	Exiting	100	.04	Highly	–	–	–
	Eye Contact	95	.02	Highly	–	–	–
Daisy (AD)	RC	43	NS	Unreliable	100	.03	Highly
	Humor	100	.01	Highly	–	–	–
	Entering	90	.02	Fairly	–	–	–
	Exiting	88	.03	Fairly	–	–	–
	Eye Contact	100	.00	Highly	–	–	–

Note. NS = not significant; RC = reciprocal conversation.

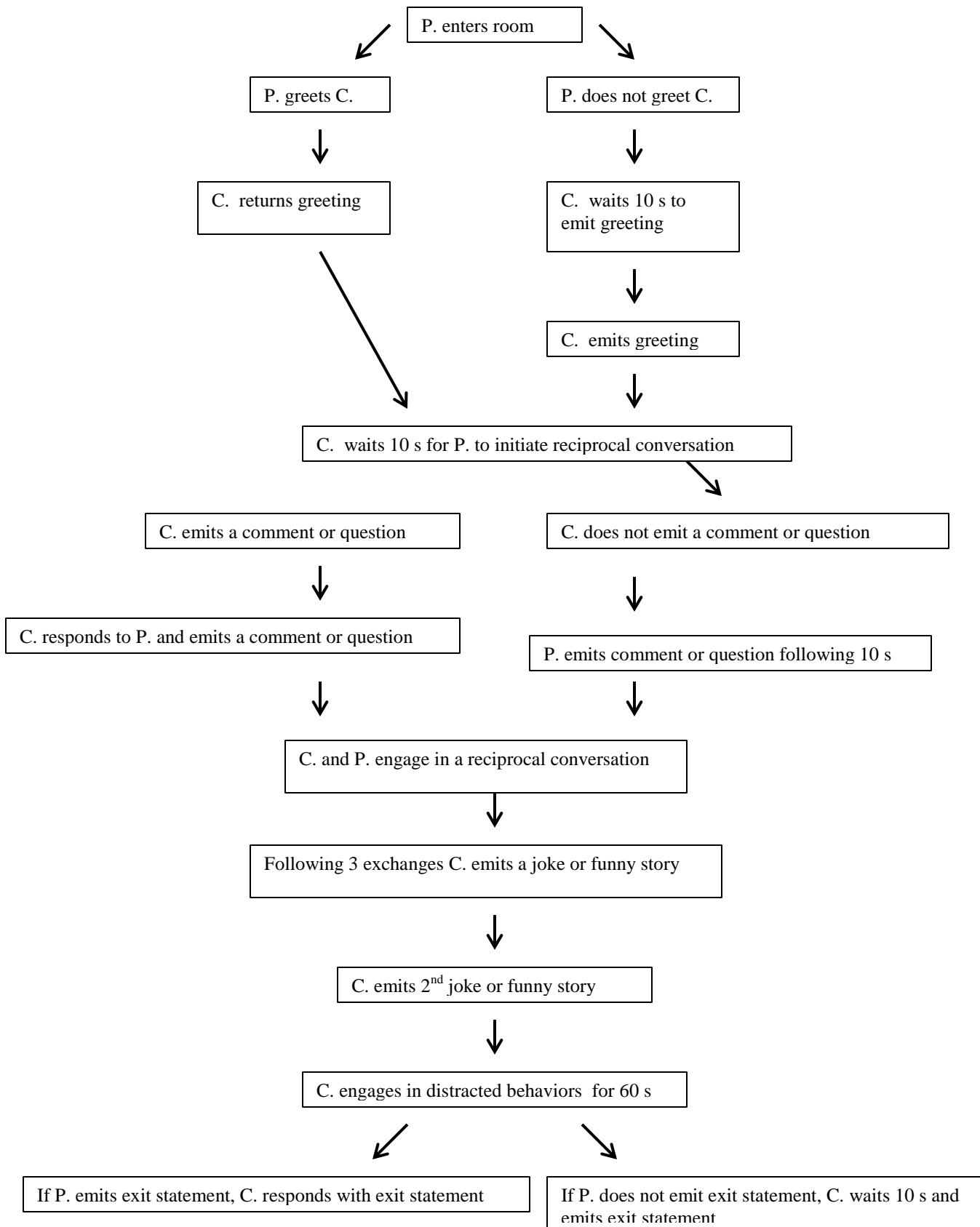


Figure 1. Flow chart depicting confederate role-plays for Experiment 1 and 2.

Average Percent Correct Responses

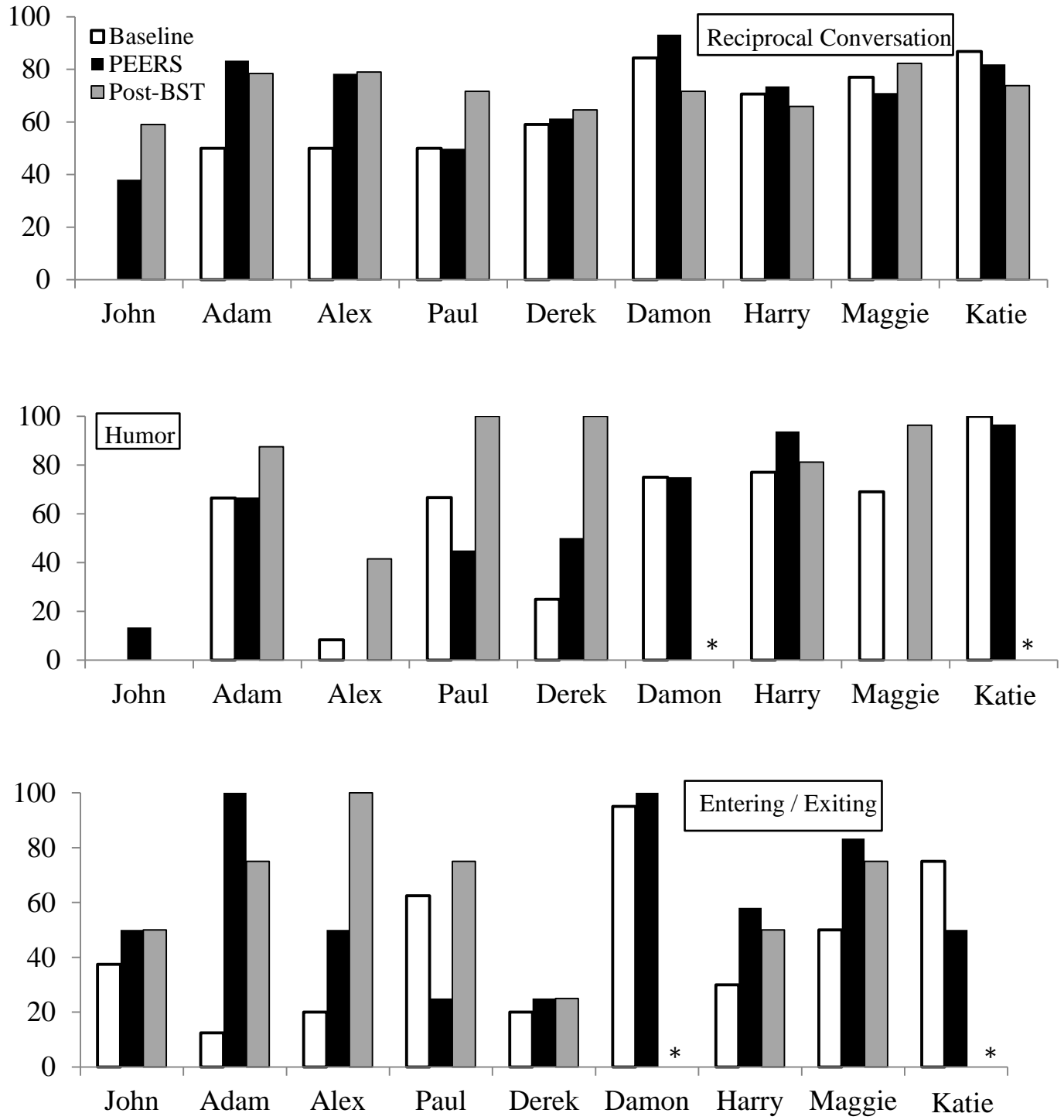


Figure 2. Percentage of correct responses for reciprocal conversations (top), humor (middle), and entering and exiting conversations (bottom) across participants during baseline, PEERS, and post-BST. Asterisks indicate that the Post-BST sessions were not run with that participant.

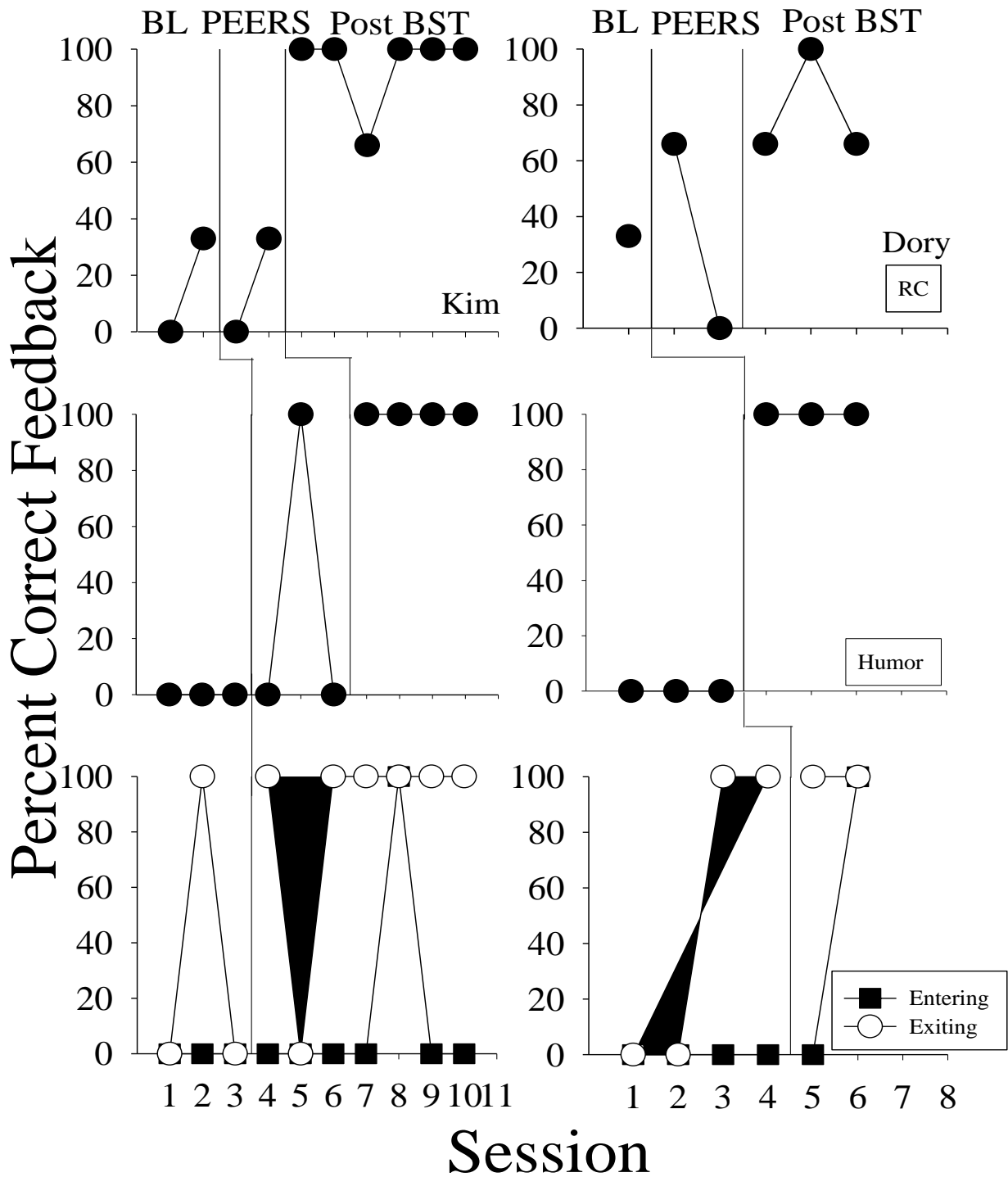


Figure 3. Percentage of correct responses across sessions for reciprocal conversations (RC), humor, and entering and exiting conversations across baseline (BL), PEERS, and post- BST sessions for Kim and Dory.

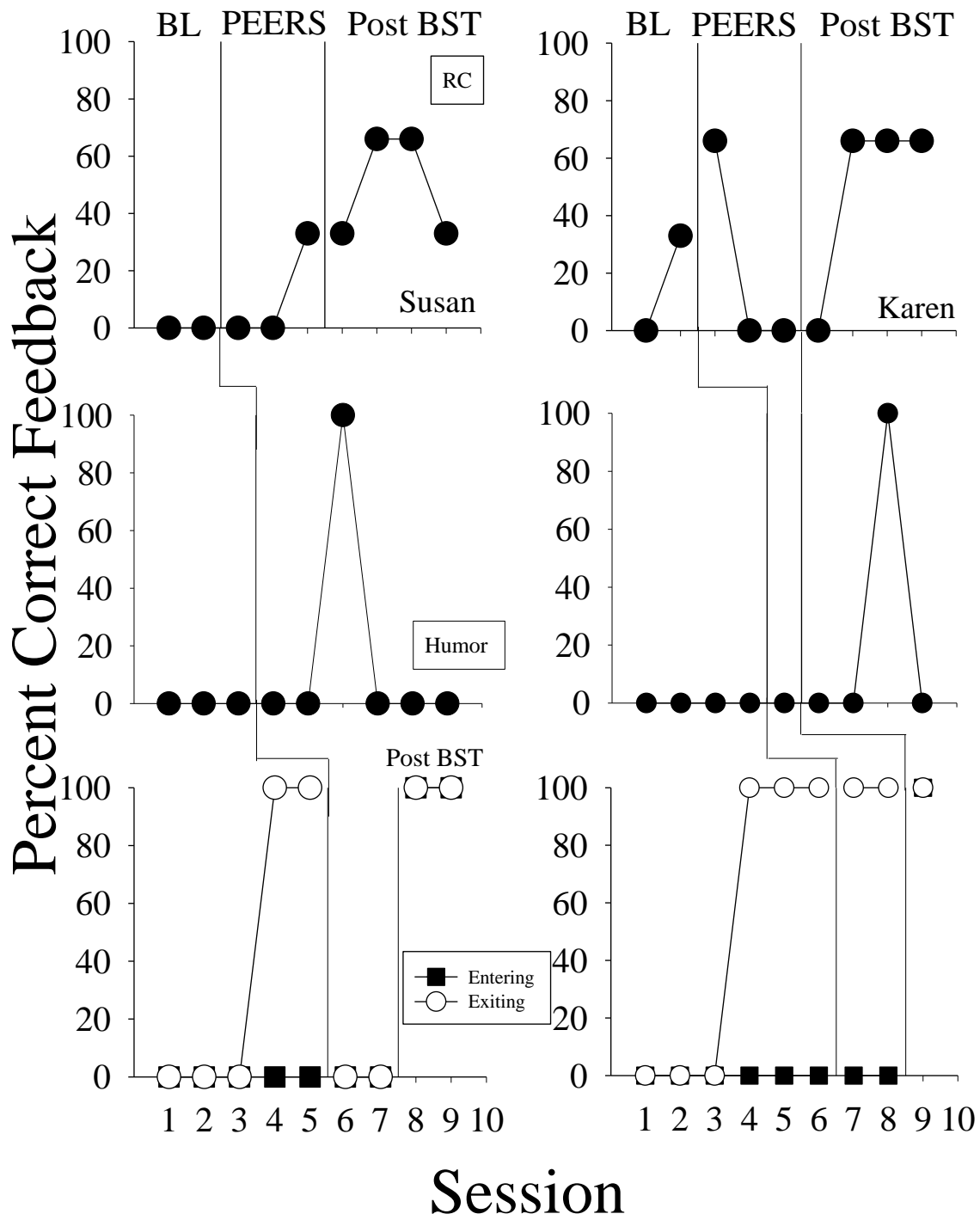


Figure 4. Percentage of correct responses across sessions for reciprocal conversations (RC), humor, and entering and exiting conversations across baseline (BL), PEERS, and post- BST sessions for Susan and Karen.

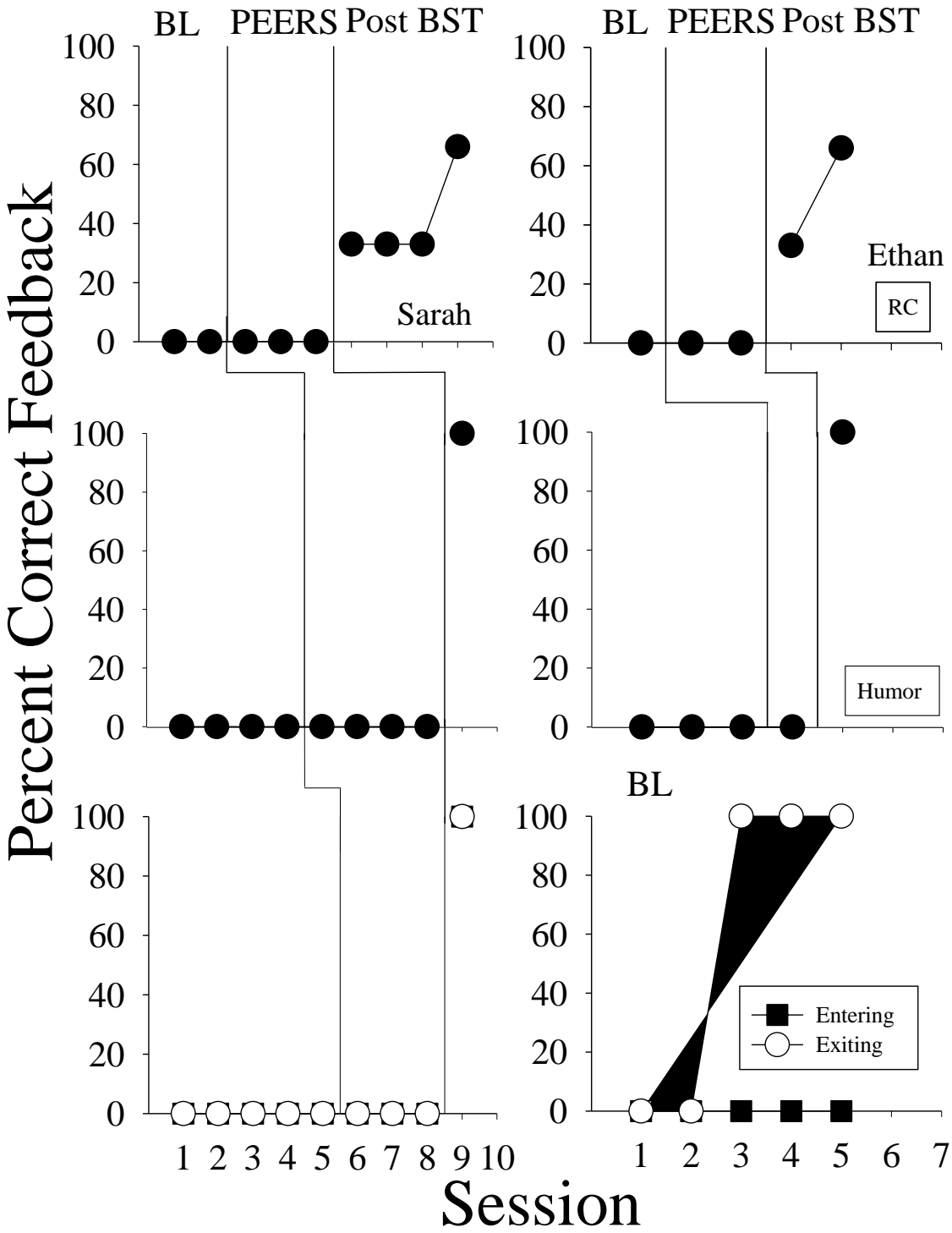


Figure 5. Percentage of correct responses across sessions for reciprocal conversations (RC), humor, and entering and exiting conversations across baseline (BL), PEERS, and post- BST sessions for Sarah and Ethan.

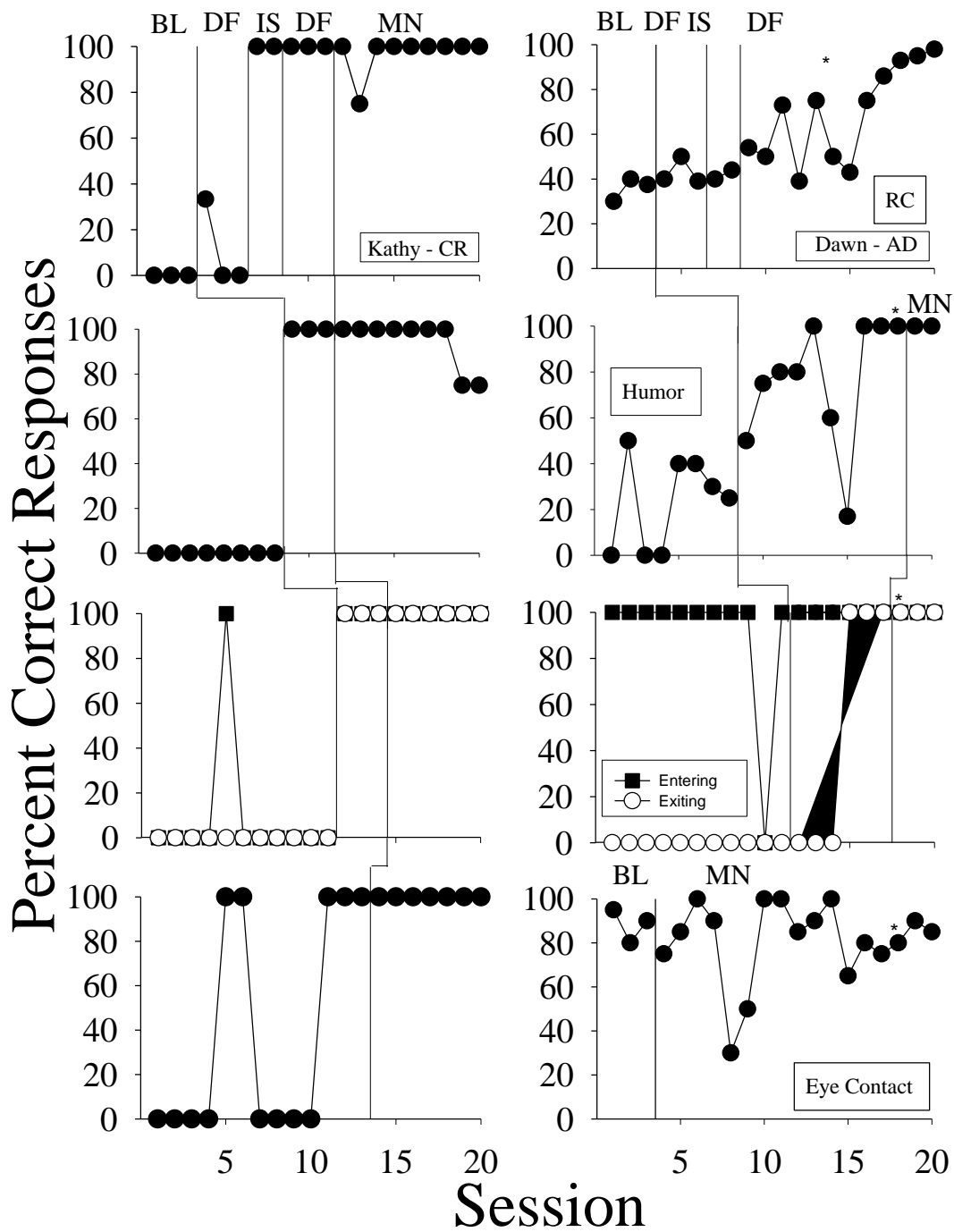


Figure 6. Percentage of correct responses for reciprocal conversations (RC), humor, entering and exiting conversations, and eye contact across sessions during baseline (BL), caregiver delayed feedback (DF), caregiver in-situ feedback (IS), and maintenance (MN) for Kathy (caregiver) and Dawn (adolescent). Asterisks indicate a two month break in treatment.

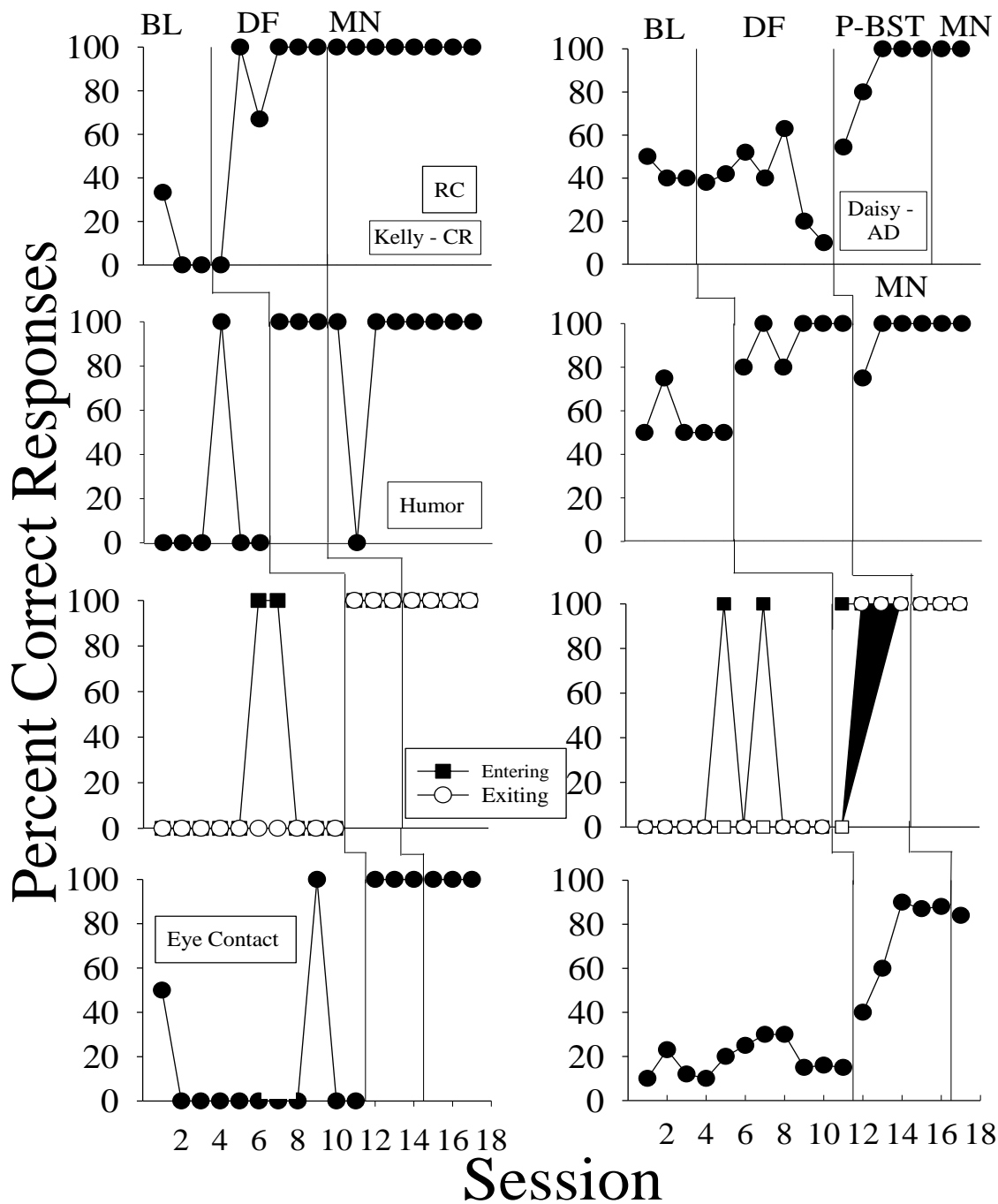


Figure 7. Percentage of correct responses for reciprocal conversations (RC), humor, entering and exiting conversations, and eye contact across sessions during baseline (BL), caregiver delayed feedback (DF), caregiver in-situ feedback (IS), and maintenance (MN) for Kelly (caregiver) and Daisy (adolescent). Asterisks indicate a two month break in treatment.

Appendix A – Social Validity Questionnaire

Instructions: Please rank the following statements on a 1 (strongly disagree) to 5 (strongly agree) point scale. Circle the number you feel best represents your opinions regarding your participation in the intervention. Please answer all questions.

Questionnaire

		<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Somewhat Disagree</i>	<i>Neutral</i>	<i>Somewhat Agree</i>	<i>Agree</i>	<i>Strongly Agree</i>
There are opportunities for my child to use the social skills taught in his/her home and school.	N/A	1	2	3	4	5	6	7
Based off of my experience with trainers, I found my trainer helpful to learn social skills.	N/A	1	2	3	4	5	6	7
The homework assigned was too difficult to complete.	N/A	1	2	3	4	5	6	7
The homework was applicable to the social skills my child was learning.	N/A	1	2	3	4	5	6	7
The training was sufficient for learning how to teach my child social skills.	N/A	1	2	3	4	5	6	7
It would be easy to use the procedures I learned in my home.	N/A	1	2	3	4	5	6	7
The training did <u>not</u> increase the social skills of my child.	N/A	1	2	3	4	5	6	7
Based off of my experience with the trainers, I would seek the help of these trainers again.	N/A	1	2	3	4	5	6	7
I did not learn the procedures well enough to use on my own.	N/A	1	2	3	4	5	6	7
PEERS was effective in increasing the use of social skills in my child's school and community.	N/A	1	2	3	4	5	6	7