Effect of PEERS® Class on Conversational Skills of Adults with Autism in College

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Abstract

Using a single-case multiple baseline (MBL) across behaviors design, the purpose of this study was to investigate the effects of the PEERS® for Young Adults manualized intervention on the acquisition of introductory conversational skills by five adults on the autism spectrum. Five participants attended the PEERS® group in a classroom at a rural state university campus. Visual analysis of level and trend as well as Non-overlap of All Pairs (NAP) and TAU-U measures of effect demonstrated that the PEERS® intervention were indicative of a strong effect on the participants' acquisition of conversational behaviors and general knowledge related to starting, entering, and exiting conversations. Implications for practitioners, higher education faculty, and adult service providers are discussed.

Keywords: autism, social skills, behavioral skills training, postsecondary, PEERS®

Individuals on the autism spectrum are a heterogenous group with diverse strengths and abilities. As a group, many of those on the autism spectrum prefer to be described as neurodivergent or "on the spectrum" as they understand autism as an inherent part of an individual's identity (Botha et al., 2020). Many experience challenges in developing friendship making skills such as finding common interests, having conversations, and handling disagreements. In fact, these social skills challenges are a defining feature of an autism spectrum disorder (ASD) diagnosis (American Psychiatric Association, 2013). Furthermore, deficits in friendship making skills are associated with academic underachievement, unemployment, and limited independence (Brady et al., 2020). Although research has identified resources for teaching social skills to school age students with ASD (Babb et al., 2020; McMahon et al., 2013; Wong et al., 2015) only the Program for the Education and Enrichment of Relational Skills (PEERS®) for Young Adults curriculum has been validated for use with individuals over the age of 18-years on the autism spectrum diagnosis (Gantman et al., 2012; Laugeson et al., 2017; Laugeson et al., 2014). The impact of social skills deficits can thwart success in postsecondary education, friendships, and employment outcomes for individuals with ASD (no associated intellectual disability). College students on the autism spectrum also have higher levels of stress and social anxiety (Hiller et al., 2018). Only 14% of young adults in a nationally representative sample who had received special education services through the ASD category had paid employment at the time of interview (Roux et al., 2014; Schall et al., 2020), compared to 54% of young adults in the general population at a comparable time (Taylor et al, 2012).

Communication skills have been shown to be a predictor of postsecondary success for students on the autism spectrum (Wei et al, 2016). Social skills groups are frequently used in the K-12 setting as an evidence-based practice to teach interpersonal skills to individuals on the autism spectrum and have been validated as a research-based intervention for individuals with ASD age six to 21 years. However, interpersonal skills groups are not frequently offered as a postsecondary disability related service (Elias &

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White, 2018; Reichow et al., 2013). Investigations of how best to structure interpersonal skills support on college campuses are needed (Accardo et al., 2019).

Social Functioning and Adults with ASD

Young adults on the autism spectrum in college report needing support in the following: social skills, executive functioning skills, time management, managing unexpected change, and social skills compared to typical college students (Accardo et al., 2019; Alverson et al., 2015). Adults on the autism spectrum report that they experience challenges with anxiety, depression, communication with faculty and peers, organizational skills and time management (Accardo et al., 2019). While university accessibility support services offices may be adept at providing support to students with learning disabilities and sensory impairments, they are often ill equipped to provide the specific supports needed by students on the autism spectrum to assist them in the social communication challenges that define their disability (Brown, 2018).

Limited research exists on specific behavioral skill training (BST) of social skills in postsecondary settings for conversational skills, job interviews and responding to feedback from a supervisor for adults with ASD and intellectual disability (Grob et al., 2019; Roberts et al., 2020; Ryan et al., 2019; Whittenburg et al., 2020). There also exists a paucity of research on developing friendships for college students on the autism spectrum. Although social skills groups are frequently used in K-12 settings, and are recognized as evidence-based practices for individuals with ASD aged six to 21-years old, they are not commonly reported in postsecondary settings as a typical disability related service (Elias & White, 2018; Reichow et al., 2013; Wong et al., 2019). Lack of social competence and ineffective social skills have been barriers to postsecondary education completion, loneliness and depression for adults on the autism spectrum (Tobin et al., 2014; Koegel et al., 2014). Social skills groups utilizing BST are evidence-based interventions that may help to mitigate these challenges, and set young adults up for greater success in their chosen vocation and/ or postsecondary education (Ellingsen et al., 2017). The largest difference between the above cited studies and the current study is that the prior studies did not utilize an established and validated curriculum, and the current study does.

To date, only the PEERS® social skills curriculum has been validated as evidence based for young adults with ASD who are over 18-years-old (Laugeson et al., 2015; McVey et al., 2017; Reichow et al., 2013; Wyman & Claro, 2019). The PEERS® for Young Adults curriculum, developed at UCLA, has been validated by more than a dozen research studies, across three continents (Laugeson, 2017; Laugeson et al., 2015; McVey et al., 2016; Wyman & Claro, 2019). Table 1 illustrates how BST is embedded within this manualized program.

PEERS® for Young Adults

PEERS® for Young Adults manualized curricula have been validated for use with participants ages 17-35-years-old (Laugeson, 2017; Laugeson et al., 2015). The interpersonal skills taught in the manualized PEERS® intervention include skills that are foundational in establishing and maintaining healthy relationships, such as starting and maintaining conversations. Young adult PEERS® participants attend didactic lessons with role plays, behavioral rehearsals, and performance feedback. Simultaneously, participants' chosen social coaches (sibling, friend, parent or case worker) attend concurrent social coaching sessions that teach social coaches both the skills and strategies to promote generalization (Laugeson, 2017). Each conversational skill taught consists of a series of steps that participants demonstrate via role plays following explicit skills instruction as part of the social skills groups. See Table 2 for task analysis and operational definition of the steps of each skill.

To date, scant research on the effectiveness of PEERS® for Young Adults has been conducted in a seminar-style university class setting (Authors, in press). Research investigating PEERS® for Young Adults has demonstrated it as ecologically valid, developmentally appropriate, and generalizable instruction in interpersonal skills; PEERS® for Young Adults manualized curricula have been validated for use with participants ages 17-35 years old (Laugeson et al., 2015). However, most research has been conducted by clinical psychologists and psychiatrists in outpatient settings. To date, no research on the effectiveness of PEERS® has been conducted in a seminar-style university setting without social coaching. The typical inclusion criteria for previous investigations of PEERS® for young adults included: young adult was between 18 and 24 years of age; had a previous diagnosis of ASD from a licensed health or medical professional; had social challenges as reported by the caregiver; was willing and motivated to participate in the treatment; was fluent in English; had a social coach who was fluent in English and willing to participate in the study; had a composite IQ score of 70 or greater. None of the inclusion criteria indicate a requirement that the participant be attending a post-secondary institution. In addition, although pre/ posttest variables have been measured, no research has measured the actual behavioral skill acquisition

Table 1

Comparison of BST Steps and PEERS® Procedure

BST Step	PEERS® Procedure
Instruction	Didactic Instruction
Modeling	Video Modeling
Rehearsal	Behavioral Rehearsal & HW Activities
Feedback	HW review and social coaching

of participants. The classes in the PEERS® curriculum manual that target conversational skills include a similar theme: starting/ initiating conversations, entering group conversations, and exiting conversations (Laugeson, 2017). Furthermore, there has been little research on the effect of PEERS® on demonstration of observable conversational behaviors (White et al., 2015). The current study, described below, adds to the literature by addressing these identified research gaps.

The purpose of this study was to investigate the effects of the manualized PEERS® curriculum on the acquisition of introductory conversational behavior skills by five adults with ASD who are college students. The research questions investigated were (a) What are the effects of the manualized PEERS® for Young Adults curriculum on the conversational skills demonstrated during in class role plays by young adults with ASD who attend college? (b) What are the effects of participation in manualized PEERS® for Young Adults curriculum-based class on participants' general knowledge of conversational skills?

Methods

A multiple baseline across behaviors (MBL) design was used to examine the effects of the social skills group on the acquisition of introductory conversational behavior skills. With MBL research design, effects are demonstrated by introducing the intervention to different conversational behavior skills in a staggered fashion and then comparing the results to baseline data on those skills. In these designs, repetition across multiple AB data series are compared with the staggered introduction of the intervention across time. Thus, in MBL, baseline begins at the same time for all participants, and the intervention phase occurs in a staggered fashion. Each time the intervention is introduced, a comparison is made between behaviors demonstrated during intervention and those demonstrated during baseline. The minimum number of phase repetitions according to Horner et al. (2005) is three. In single case design research such as MBL across behaviors, the independent variable is systematically manipulated with the researcher determining when and how the conditions change (Kratchowill et al., 2010). Thus, when behaviors change only during intervention, and not during baseline without treatment, a functional relationship is demonstrated (Kazdin, 2011). The second research question was investigated using a comparison of means between pretest and posttest.

Participants

Participants were recruited via email fliers sent to contacts from the student accessibility services office of a large, rural, northeastern university, the autism Society of a northeastern state, and the database of a university affiliated autism research institute. A 20-minute participant screening interview was conducted with participants and their social coach (who may have been a parent, sibling or peer) by the first author in order to determine if the participants met the inclusion criteria for this study including (a) were 18-years-old or older and attend at least one college class, (b) self-reported as having problems making friends, (c) educational records/ previous IEPs reflect a receptive and expressive language score that was within average range (standard score >75), (d) had a diagnosis of ASD yet had no significant intellectual disability in their medical records, and (e) self-reported to have no severe mental health or behavioral problems (i.e. schizophrenia, bipolar disorder).

Six participants met the inclusion criteria. The results are reported for the group of five as one withdrew from the study when they moved out of state. One participant (aged 19-years) identified their gender as non-binary, three identified as male (aged 18, 19 and 22-years), and one female (aged 19-years) par-

ticipated in a 16-week PEERS® class provided at the college. All participants were Caucasian and in their first or second year of undergraduate studies. All participants' primary diagnosis was ASD. Social coaches (i.e. family members, guardians or case workers) participated in a separate, but concurrent social coaching classes as outlined in the PEERS® for Young Adults manualized curriculum (Laugeson, 2017). Written consent was obtained from the parents/guardians of the participants, and assent was obtained from all participants during Step-Up orientation.

Setting

The setting for this investigation were classrooms in the student union of a rural public university. All participants were attending a 4-year college, and the PEERS® classes were run similar to an evening class rather than the medical mental health outpatient clinical setting used in previous PEERS® for Young Adults research (Laugeson et al., 2015). Each room contained the following: tables and chairs arranged around a central table, a dry erase board and a place to hang participants' coats. The rooms were also commonly used for university student run clubs and social gatherings.

Instructors

Instructors included an assistant professor of special education, two graduate social work students, and three undergraduate students majoring in social service-related fields: human development, psychology, and sociology). The assistant professor had more than 20-years of experience teaching individuals with ASD ages 3 to 29-years, and had been certified by the UCLA Semel Institute to deliver the PEERS® for Young Adults (Laugeson, 2017) intervention. The graduate and undergraduate students received approximately 18-hours of training in how to deliver the PEERS® intervention. One graduate student facilitated the young adult intervention classes with support from the undergraduate students. The assistant professor conducted the social coaching intervention classes with support from the other graduate students.

PEERS® Classes

Although the entire 16-week PEERS® for Young Adults curriculum was implemented as outlined in the manual (Laugeson, 2017), behavioral skills data were only collected for the first four classes due to the limited availability of graduate and undergraduate student data collectors. Thus, data were collected on behaviors observed during the participant role-play portion of each class on the first four lessons from the PEERS® for Young Adults curriculum (i.e., trading information, starting, entering, and exiting conversations). These skills were chosen as they are the foundational skills for future friendship development (Laugeson et al., 2015). The first part of each lesson involved a 30-minute review of homework activities practiced from the previous class (i.e., making a phone call, trading information, and finding a common interest with a peer). The next 20-30 minutes involved instruction in the steps for each skill, including video models, followed by 20-30 minutes of behavioral role play rehearsal by participants with feedback from the instructors. The instructors followed the PEERS® for Young Adults manual to ensure fidelity (Laugeson, 2017).

Each conversational skill taught consisted of a series of steps that participants demonstrated via role plays following explicit skills instruction as part of the social skills groups. See Table 2 for task analysis and operational definition of the steps of each skill. The instructor listed each step and asked the participants to respond to the perspective taking questions such as: "Why would it be important to 'Watch from a distance'?" This was repeated for each step. Then, the instructors would role play nonexamples and examples via role plays for the participants to observe. After each role play, the following perspective taking questions were asked: "Do you think that person would want to continue to talk to me?", "Why or Why not?", and finally, "Which steps did we include or leave out?", (Laugeson, 2017). Following the explicit instruction, the instructors facilitated the behavioral role plays of the participants while delivering verbal feedback, and gestural, or physical prompts to help participants complete the steps. Behavioral mastery data were collected on participants' demonstration of the skills during in-class role-plays. Although role plays were intended to last the last 30 minutes of class, during many of the classes, participants asked for more time to practice and these role plays often lasted 45-60 minutes.

One lesson was utilized to teach each one of the three conversational skills. Skills consisted of a series of concrete steps that were derived from didactic and Socratic instruction, using inappropriate and appropriate role play demonstrations as teaching tools. For example, after viewing a role play demonstration, the instructor might elicit group feedback on what steps were followed, what the interaction was like for the other person, and why behaviors could be important/problematic in an interaction. The final portion of the session consisted of behavioral rehearsal skills practice, in which the group leaders created structured opportunities for the participants to practice the skill targeted in that lesson (e.g., starting conversations).

A 90-minute social coaching class ran concurrently with the young adult class, but in a separate room. The first author served as the instructor for the social coaching part of the PEERS® manualized curriculum. Social coaches were chosen by the young adults to coach them on the skills learned during PEERS® in their everyday lives outside of class. They included the parent (all mothers) of five participants, and the sister of the fifth participant. They were taught how to assist the young adult in making and keeping friends and how to provide ongoing feedback to the young adult as they completed weekly homework assignments to practice the skills and generalize the skills to different settings (Laugeson, 2017). Homework assignments included (a) in group phone or video call, (b) practice starting and maintaining a conversation with their social coach, (c) finding a club or social group to join that was associated with their interests, and entering group conversations in that group, (d) entering and exiting group conversations in their social group. No data were collected during the social coaching class for this study. However, social coaches did provide feedback to participants during participant completion of homework assignments, as outlined in the PEERS ® manual (Laugeson, 2017).

Dependent Variables

Behavioral Skills Data

The behavioral mastery of each of the participants was measured via observational data collection using 15-minute observation session intervals during participant role-play scenarios. During the role play portion of each PEERS® for Young Adults session, participants broke up into groups of two to practice the skills learned in each session. At the end of each instructional session, instructors cued the role play was about to begin by saying something similar to: *So, these are the steps for (INSERT starting, entering or exiting) conversations with people. You are going to be practicing this as you trade information and you will continue practicing during your homework assignments with your social coach* (Laugeson, 2017). Observational data collection occurred during these role plays; the last 30 minutes of each session. Figure 1 shows an example behavioral data collection sheet used to assess both the percentage of steps of each skill mastered by each participant, and the level of prompting needed. A score of five indicated that the participant completed the behavioral step 100% independently. Least to most prompting was used for providing feedback during role-plays. A score of four indicated that a verbal prompt was given (i.e., "Remember to…"); a score of three indicated that a gestural model was provided (i.e., pointing to the skill steps written on the board); a score of two indicates that a physical (i.e., hand over hand) prompt was provided to complete the conversational skill step. None of the participants required hand over hand prompting. Specifically, the steps for starting individual conversations involved: a) casually look over, b) use a prop, c) find a common interest (e.g., observed by the student pausing before successfully completing the next step), d) mention the common interest, e) trade verbal information about the common interest, f) assess the interest of the conversational partner (e.g., look at participants' faces), and g) introduce yourself. Thus, a total score of 5 points for each of these steps was possible, with a possible total score of 35 points for the seven steps of starting individual conversation. Steps involved for entering conversations were: a) listen to the conversation (e.g., leans ear towards the conversation), b) watch from a distance (e.g., look at those involved briefly), c) use a prop, d) identify the topic (e.g., "Hey, are you guys talking about___?", e) find the common interest (e.g., says something similar to "I also like___."), f) move closer, g) wait for a pause, h) mention the topic (e.g., "My favorite ___ is___.", i) assess the interest (e.g., look at participants' faces), j) introduce yourself (50 points possible). The final skill taught, exiting conversations, involved the following steps: a) keep your cool (e.g., maintain calm composure and smiles), b) look away, c) turn away, and d) walk away (20 points possible). Thus, for each skill demonstrated, a percentage of the total possible points served as the quantitative measure of mastery. Participants' general knowledge of social skills was measured at pre and posttest using the measures described below. After each class, participants were instructed to complete a related homework assignment (i.e., generalization practice) that was supported by social coaching before and after completion of the task.

The behavioral observation data collection forms were scored by circling Yes or No for each of the steps in the task analysis of the conversational skill being taught, and then circling the level of prompting required if the step was performed by the participant. If the No was circled, the participant did not receive any points for that step. If Yes was circled, the participant received one point, and then an additional sliding scale of points depending on the level of prompting required: four points for independent performance, three points if verbal promoting was required, two points of gestural/modeling was required, and one point if physical prompting was required. Thus, a score of 5-points could only be obtained if the participant completed the step independently. This scoring considers that 100% behavioral accuracy would be 100% independent.

During each session, the total points received by a participant was divided by the total points possible to obtain a percentage. Figure 1 shows an example of the behavioral observation form used to document the proficiency of each participant's role play. During the first week of the 4-weeks of the PEERS® class, participants were introduced to the format of PEERS, the instructors, and each other. Group rules were established and participants generated a list of the characteristics of good friends. At the end of the first class, participants were provided with starter questions for the role-play portion of class. Thus, during this first week of class, baseline data were gathered on starting conversations, entering conversations, and exiting conversations.

Test of Young Adult Social Skills Knowledge (TYASSK)

General knowledge of conversational skills was measured by the TYASSK (Gantman et al., 2012), a 23-item criterion-referenced measure based on the Test of Adolescent Social Skills Knowledge (TASSK; Laugeson et al. 2009) used to assess young adults' knowledge about the specific social skills taught during the intervention. It is a criterion referenced assessment of the skills taught within the PEERS® curriculum (Laugeson et al., 2009; Laugeson et al., 2012; Laugeson, 2017). The TYASSK is a criterion-referenced measure based on the PEERS® curriculum. An increase is indicated by the number of questions out of 30 that the participant answered correctly based on the content of the PEERS® curriculum. It is a way of measuring content understanding. The closer the mean percent correct is to 100%, the greater the understanding of the PEERS® content. It was administered to the young adult participants at pre- and post-intervention sessions (Gantman et al., 2012).

Design

MBL across behaviors design was used to evaluate the effect of instruction in the PEERS® for Young Adults curriculum on the conversational behavioral skills acquisition of young adults with ASD. Baseline, intervention and maintenance data were collected in a staggered fashion during the behavioral practice parts of some of the classes, as outlined in Table 2. In each of the classes, 15- minute sessions probes for each skill were obtained and evaluated during participant role-plays leading to a total of 21 data points.

Baseline

During the first week of the 16-weeks of the PEERS® class, participants were introduced to the format of PEERS®. Lesson one from the manualized program (Laugeson & Frankel, 2011) was conducted. According to the manualized program, this class focused on the importance of identifying one's interests and hobbies. It also focused on the group rules and characteristics of friendship. At the end of the first class, participants were provided with starter questions for the role-play portion of class. Thus, during this first class, baseline data were gathered on starting conversations, entering conversations, and exiting conversations. Data were collected on the conversational behaviors demonstrated by each participant during each class session's role play activities. Percentage of steps performed, and level of prompting required were noted on behavioral observation data collection forms (see Figure 1 for an example) created specifically for this study based on the steps of each PEERS® skill.

Data were collected on participants' behaviors that demonstrated the skill steps for starting, entering and exiting conversations. See Figure 1 for an example of the operational definitions of behaviors observed. During baseline data collection, a researcher observed the role-plays that followed the didactic skills instruction of each lesson. Data were collected on the steps of each interpersonal skill that were completed by each participant, and the level of prompting required. Figure 1 shows an example of the behavioral observation form used to document the proficiency of each participant's role play. During instruction, participants were encouraged to use think-aloud in their role-plays such as asking out loud "What is the topic? Oh, it's…" so that these processes could be observed by instructors, and data collected on them. Participants were instructed in the lesson not to start or join conversations on topics that they do not have knowledge of. Thus, for finding a common interest, participants were scored as demonstrating the skill if they were able to meaningfully engage in a back-and-forth conversation on the conversational topic. For identifying the topic, they were scored as demonstrating the skill if their comment on "Mention the Topic" was relevant and contingent.

Baseline data for starting, entering and exiting conversations were collected during class one three using 15-minute observation session intervals during participant role-play scenarios of the initial class on how to trade information During class two (topic: starting conversations), baseline data for entering and exiting conversations continued to be collected using four 15-minute observation session intervals during participant role-play scenarios. During class three (topic: entering conversations), baseline data for exiting conversations continued to be collected; using four 15-minute observation session intervals during participant role-play scenarios.

Figure 1

Example Behavioral Observation Data Collection for Entering Conversations

Steps		Level of Prompting				Total Points
Listen to the conversation: While not speaking, listen to what the people are talking about (Participants were observed briefly looking at the person then looking back at their "prop").	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Watch from a distance: Participants were observed standing more than an arm's length away and briefly looking at the person then back at your prop once or twice only.	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Use a prop: Participants were observed looking at their phone, a book or another item while they were thinking of what to say	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Identify the topic: While listening, think and determine what the topic of the conversation is. Participants were observed quietly verbalizing the topic.	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Find a common interest: Participants were observed quietly verbalizing statements such as Ask yourself, is this something I know about? Am I interested? Can I trade verbal information about this topic?	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Move Closer: Participants were observed moving so that they were within an arm's length of the people talking (do not measure by holding out your arm).	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Wait for a pause: If participants were observed interrupting, this was scored as not happening. Participants only spoke when others stopped speaking for a moment.	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Mention the topic: Participants were observed making statements such as "Are you all talking about (insert topic)?	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Assess the interest: Participants were observed to look to see if others are looking at them, body is facing them, and are talking to them).	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
Introduce Yourself: Participants were observed to tell their name.	Yes (1) No (0)	Ind. 4	Verbal 3	Model 2	Physical 1	___/5
					TOTAL	___/50

Note: Please see the *PEERS for Young Adults* manual (Laugeson, 2017) for further details and definitions of these steps. Permission to reprint PEERS® steps granted by Dr. Elizabeth Laugeson.

Table 2

Data Collection

	Class 1: Qualities of a good friend	Class 2: Starting Conversations	Class 3: Entering Conversations	Class 4: Exiting Conversations
Starting a Conversation	Baseline XXX	Intervention XXXX	Maintenance XXXXXXX	Maintenance XXXXXXX
Entering a Conversation	Baseline XXX	Baseline XXX	Intervention XXXX	Maintenance XXXXXXX
Exiting a Conversation	Baseline XXX	Baseline XXX	Baseline XXX	Intervention XXXX

Note. Each X indicates a 15-minute data collection interval

PEERS® Intervention

The class topics (e.g., starting, entering, and exiting conversations) were taught according to the manualized program protocol without the social coaching component, as participants did not have social coaches available (Laugeson, 2017). See Figure 1 above for operational definitions of each of these skills. These skills were chosen as they are the foundational skills for future interpersonal skill development. Every conversational skill taught consisted of a series of steps that participants demonstrated via behavioral modeling that followed explicit skills instruction as part of the interpersonal skills groups. The instructor would list each step and ask the participants perspective, taking questions such as: "Why would it be important to 'Watch from a Distance'?" for each step. Then, the instructors demonstrated via role models non-examples and examples the participants observed. After each role play, the following perspective taking questions were asked: "Do you think that person would want to continue to talk to me?", "Why or Why not?", and finally, "Which steps did we include or leave out?"

During PEERS® class two, four intervention probes were gathered using 15-minute observation session intervals during participant role-play scenarios. During PEERS® class three, four intervention probes were gathered on starting and entering conversations, and finally, in PEERS® class five intervention probes were gathered or exiting conversations were collected; all using15-minute observation session intervals during participant role-play scenarios. Thus, the steps for each skill were introduced and measured in a staggered fashion. In order to evaluate the effects of participation in the PEERS® for Young Adults curriculum on the general knowledge of social skills, a pretest-posttest analysis of mean scores occurred using the Test of Young Adult Social Skills Knowledge (TYASSK; Gantman et al., 2012).

Maintenance

Maintenance data were collected using the same behavioral data collection sheets that were used during baseline and intervention for starting conversations during the participant role play portion of the classes where skills for entering and exiting conversations were taught. Likewise, maintenance data for Starting and entering conversations were collected during the class where skills for exiting conversations were taught. Thus, data for all three groups of skills were collected during each role play in 15-minute intervals.

Reliability and Fidelity

During (100%) baseline classes, and all of the PEERS® intervention classes (100%) the undergraduate research assistants collected behavioral outcome data to determine inter-observer agreement (IOA) after first being trained to observe the skills outlined in Table 2 to 100% accuracy using the videos found on the UCLA PEERS® Program. The behavioral data collection sheets of each were compared, and IOA was determined using point by point comparison to be 95%. During all sessions (100%) a second undergraduate research assistant collected behavioral outcome data to determine inter-observer agreement (IOA). The TYASSK were scored by the first author, and then 100% of them were checked by the undergraduate and graduate student research assistants for consistency. IOA was calculated using point-by-point comparison; IOA = smaller count / larger count multiplied by 100.

To ensure fidelity, instructors followed the PEERS® manual (Laugeson et al., 2015) as a guide during each class. As instructors completed each step of the manual, they would check it off with a pencil. A graduate social work student observed the fidelity of implementation of 100% of the social coaching classes, and an undergraduate research assistant observed the fidelity of implementation in 100% of the young adult PEERS® classes. To determine inter-rater reliability for fidelity, research assistants who had been certified to implement the PEERS® served as a second observer who followed silently along in the PEERS® manual. If something from the manualized program was missed, this second observer pointed it out by saying something like "Don't forget the section on page XX". Thus, fidelity was compared and IOA was determined using point by point comparison to be 100%.

Data Analysis

Visual analyses of differences in level and trend of data between baseline and intervention conditions, as well as NAP and the TAU-U index of overall effect for single case design were used to evaluate the behavioral skill acquisition results of this intervention (Parker et al., 2011; Scruggs & Mastropieri, 1998). TAU-U is a method for measuring data nonoverlap between two phases (Parker et al., 2010)

NAP is a measure of the percentage of all pairwise comparisons of data between phases that show improvement. Put simply, it is the percentage of data that have improved across phases (Parker et al., 2011). NAP is a nonparametric technique for measuring nonoverlap or "dominance" for two phases. It does not include data trends. NAP is appropriate for nearly all data types and distributions, including dichotomous data. NAP has good power efficiency–about 91-94% that of linear regression for "conforming" data, and greater than 100% for highly skewed, multimodal data. Alternatively, it can be derived from a Mann-Whitney U test. Strengths of NAP are its simplicity, its reflection of visual nonoverlap, and its statistical power. In many cases it is a better solution than tests of Mean or even Median differences across phases (Parker & Vannest, 2009).

In contrast, TAU-U follows the same "S" sampling distribution as Mann-Whitney U and Kendall's Rank Correlation, so p-values and confidence intervals can be provided (Hollander & Wolfe, 1999; Kendall & Gibbons, 1990). It is also a nonparametric technique, with the statistical power of 91% to 95% of (OLS) linear regression when data conform to basic parametric assumptions. When data are nonconforming (as in this small sample size of five participants), then the power of TAU-U can exceed the parametric techniques to 115% (Parker et al., 2010).

Results

Results indicated that the group of five participants improved their conversational behavioral skills (See Figure 2). As a whole, the group had an increase in the percentage of behaviors demonstrated for each of the three separate conversational skill sets: starting a conversation, entering a conversation, and exiting a conversation. The percentage of total points possible for each of the conversational skill sets was calculated using the behavioral observation data collection forms for each participant, and the percent demonstrated independently was graphed. As a group, participants demonstrated a marked and immediate improvement in their behavioral mastery of the steps of starting a conversation during the first class of intervention.

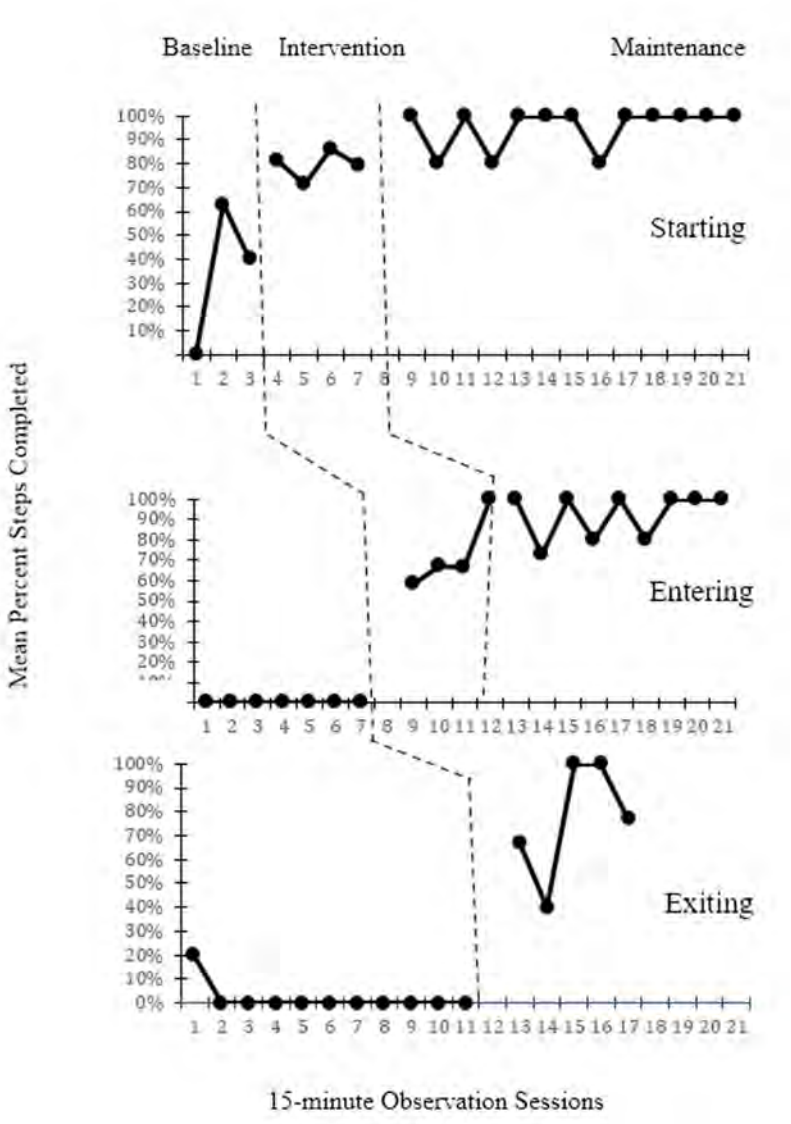
The research questions investigated were (a) What are the effects of the manualized PEERS® for Young Adults curriculum on the conversational skills demonstrated during in class role plays by young adults with ASD who attend college? (b) What are the effects of participation in manualized PEERS® for Young Adults curriculum-based class on participants' general knowledge of conversational skills?

Starting Conversations. Overall, participants' improved their performance of the skills for starting a conversation. After an initially variable baseline level and trend (*M*=21%; range = 0% to 63%), the starting conversations part of the PEERS® intervention was implemented due to the need to adhere to the manualized curriculum with fidelity. Once instruction on the steps to start a conversation began, the group increased their ability to demonstrate the behavioral skills needed for starting a conversation immediately and markedly after the introduction of the PEERS® intervention (*M*=80%; range = 71% to 86%). The data level was higher than baseline, more stable, with no overlap. The group mean level during the 13 maintenance sessions was variable, yet still markedly higher than baseline (*M*= 95%; range 80%-100%).

Entering Conversations. Overall, participants' improved their performance for entering a conversation. After a very stable and low-level during baseline; *M*= 0% of steps completed independently during the seven baseline observation sessions. Instruction on the steps to enter a conversation began. The group increased their ability to demonstrate the behavioral skills needed for entering a conversation immediately and markedly after the introduction of the PEERS® intervention (*M*=80%; range = 58% to 67%). The level and trend were increasing yet stable, and markedly higher than baseline. The group mean level during the nine maintenance sessions was variable, yet still markedly higher (*M*= 93%; range 73%-100%).

Figure 2

Conversational Steps Completed per Session



Exiting Conversations. Overall, participants' improved their performance for exiting a conversation. After a very stable and low level during the eleven baseline observation sessions (*M*=1%; range = 0% to 20%). Once instruction on the steps to exit a conversation began, the group increased their ability to demonstrate the behavioral skills needed for exiting conversations immediately and markedly after the introduction of the PEERS® intervention (*M*=77%; range = 40% to 100%). The level and trend were increasing yet variable, and markedly higher than baseline. No group maintenance data were collected as the undergraduate students who served as data collectors left for their winter break.

Measures of Effect

Visual analyses of differences in data overlap between baseline and intervention phases, as well as the TAU-U index of overall effect for single case design were used to evaluate the results of this intervention (Parker et al., 2010; Scruggs, & Mastropieri, 1998). According to NAP and TAU-U measures of effect, there was no overlap in behavioral outcome data collected between baseline and intervention for starting conversations NAP=100%; TAU-U=0.917 (*Z*=1.94, *p*=0.5*) demonstrating that a strong measure of effect for the PEERS® curriculum on the acquisition of these skills. There was also no overlap in behavioral outcome data collected between baseline and

intervention for all participants for entering conversations; NAP=1.0; TAU-U=1.0 (Z=2.65, p=0.008**) demonstrating that a strong measure of effect for the PEERS® curriculum on the acquisition of these skills. There was also no overlap in behavioral outcome data collected between baseline and intervention for all participants for exiting conversations; NAP=1.0; TAU-U=1.0(Z=3.12, p=0.001**) demonstrating a strong effect of the PEERS® intervention on exiting (Parker et al., 2010; Scruggs & Mastropieri, 1998).

The second research question was: What are the effects of participation in PEERS® for Young Adults curriculum on participants' general knowledge of conversational skills? Participants' mean score on the TYASSK at pretest was 14.9 out of 30 (49%; SD = 3.89). Average participant score on the TYASSK at posttest was 21.1 out of 30 (70%; SD = 6.47). This increase in mean scores indicates that young adults' knowledge about the specific social skills taught during the intervention increased markedly. The increase indicated the number of questions out of 30 that the participant answered correctly based on the content of the PEERS® curriculum. It is a way of measuring content understanding. The closer the mean percent correct is to 100%, the greater the understanding of the PEERS® content.

Discussion

The purpose of this study was to investigate the effects of PEERS® for Young Adults curriculum the conversational skills demonstrated during in class role plays by young adults on the autism spectrum who attend college, and to determine the effects of participation in a conversational skills group class using PEERS® for Young Adults curriculum on participants' general knowledge of conversational skills. Results of this study indicated that interpersonal skills training using PEERS® could be successfully used in a college setting to improve conversation skills, and that the young adults who participated were able to demonstrate an increased understanding of the social skills taught through the PEERS® manualized curriculum.

This study expands the previous research by demonstrating a functional relationship on observable conversational skill acquisition in addition to self-report measures. Namely, a key contribution of this study is that it required some level of mastery to be demonstrated by participants during instruction. The results of this study also extend previous research investigations of the PEERS® intervention by showing a functional relationship between PEERS® instruction and subsequent observable behavioral skill acquisition, whereas previous studies focused on the self-report of knowledge of skills and informant-report of generalized social skills via questionnaire measures (Laugeson et al., 2009; Laugeson et al., 2015). Although this study examined the acquisition and demonstration of behavioral skills by participants, additional research is still warranted to investigate how these skills generalize to other contexts. In particular, results of this study lead to further questions regarding use of PEERS® as a support in the transition to college to help alleviate challenges faced by students on the autism spectrum. Group outcomes indicated a functional relationship the PEERS® intervention and behavioral skills demonstrated for starting, entering and exiting conversations.

These results provide a basis for an ASD specific support that would help early college students with ASD to develop the interpersonal skills needed to be successful in both college and career environments. Tantam (2003) suggested that the young adult years appear to be the most socially difficult period in the lives of individuals with ASD. Findings from this study have implications for the provision of accommodations and formal support for students with ASD offered by institutes of higher education. Furthermore, there exists extensive research documenting that social deficits lie at the root of many of the education, mental health, employment, and independent living challenges faced by young adults with ASD. Due to the campus environment containing all of these areas (Barnhill, 2007; Farley et al., 2009), perhaps the provision of access to the PEERS® curriculum via a separate course, student accessibility services, or campus counseling centers may be a way to provide these accommodations.

Within a higher education institution, graduate assistants, professors, or mental health practitioners could serve as facilitators, and peers could provide social coaching. Individuals with ASD experience challenges in interpersonal skills such as making and keeping friends (Sigman et al., 1999). The results of this study suggests that PEERS®, when used at the college level may help alleviate some of these challenges. Social clubs and recreational activity participation is often limited for college students with ASD college communities, which may hinder opportunities for the development of friendships and interpersonal skills (Rigles et al, 2011). Participation in PEERS® at the postsecondary level may help to bridge this opportunity deficit.

This study contributes to and extends the existing literature by using an established and validated curriculum developed to support the interpersonal skills of college-age young adults with ASD. The largest

difference between the above cited studies and this study is that this study used an established and validated curriculum with embedded BST. Using a well validated and manualized curriculum like PEERS® helps practitioners to maintain fidelity of the intervention. Programs for individuals on the autism spectrum that are implemented with higher fidelity have been associated with larger positive outcomes (Locke et al., 2015; Mandell et al, 2013).

Limitations

Although these findings are promising, some limitations should be considered when interpreting these results. Single subject research is an effective method of investigating interventions in situations where larger group designs like randomized controlled trials are impractical or inhumane. However, certain limitations of the design should be noted in interpreting results. The purpose of single subject research is not to directly generalize findings to a larger population without subsequent replication. It should be pointed out that there were differences in sensitivity (or range of possible percentage values for each conversational topic) among the tiers of this multiple probe design based on the number of components listed per tier (seven for starting, ten for entering, four for exiting). The total possible points varied by tier (35 points for starting, 50 points for entering, 20 points for exiting). Authors converted the points to percentages to equate the y axis across tiers, but each scale still varies in sensitivity. This smaller range of possible values might explain the variability tiers.

Furthermore, while this study and its findings focus solely on conversational skills, the impact of PEERS® in all of the interpersonal skills demonstrated throughout the 16-week manualized program for college students with ASD is outside the scope of our study. Replication is needed across both settings and with all PEERS® skills. Related to this need for replication, it is difficult to say with certainty if these skills would generalize to other campus settings such as clubs, residence halls, or dining halls. It will be critical to investigate if the skills demonstrated in these sessions can be generalized to typical social settings in colleges. These limitations point to the need for further research in this area to further inform the initial findings presented from this study.

Implications for Research

Findings of this study provide important considerations and implications for future research. First, more research is needed to investigate the actual interpersonal skills demonstrated across more settings. A study investigating the use of the PEERS® curriculum as part of a college program for students on the autism spectrum during the semester and while campus social events occur would allow for more generalization data to be observed. Furthermore, replication of these findings with a larger, more diverse, and more rigorously characterized sample (e.g., assessment verification of ASD diagnosis, IQ) is warranted. More research is also needed to investigate if the behavioral skills acquired in the PEERS® classes generalize and are maintained in other campus communities, and job-related settings. Future research might also investigate the effects of this intervention over a longer period of time, and with more participants as an accommodation in higher education to evaluate the impact of the curriculum on participants' relationships with roommates, faculty, and career supervisors.

Previous research investigating PEERS® has focused on the mental health benefits, and associated decrease in anxiety, depression as well as increase in social get togethers (Laugeson et al., 2009; Laugeson et al., 2014; Laugeson et al., 2015). The association of participation in PEERS® with an increase in social get-togethers has been identified in previous research studies (Schohl et al., 2014); thus, future research investigating the longitudinal effects of participation in PEERS® with average number of social get-togethers throughout college, likelihood of attending college, college completion rates, and employment rates would be critical to investigation of long-term outcomes. Although previous research on the PEERS® curriculum indicates that its results are generalizable for anxiety and interpersonal knowledge, behavioral performance and behavioral accuracy data had not been collected in those studies in generalized settings. Future researchers are also encouraged to repeat role-plays until participants demonstrate 100% accuracy independently (Murphy et al., 2018).

At college level, in the absence of caregivers, future research to include peer coaches in the intervention (e.g., undergraduate or graduate students as social coaches outside of the treatment setting) instead of family members may be more socially valid. Involving parents or caregivers at the campus level as a support would not be socially appropriate, as other college age students do not take classes with their parents or caregivers. Using peer mentors would allow for authentic friendships to possibly develop based on common interests, and involvement in campus-based social clubs. It will also be important to investigate how these supports may address persistent poor retention and graduation rates.

Implications for Practice

This study has several implications for practitioners in both postsecondary and K-12 settings. For college support service professionals, this study's findings provide insight into effective programming for college students with ASD. PEERS® should be considered as an option for extending support beyond academic services and accommodations to address critical skill areas for students with ASD such as interpersonal skills, executive functioning skills, time management, and coping with unexpected change. For K-12 transition professionals, these findings show that postsecondary education is a viable option for transition-age youth with ASD who may require additional support with social skills. However, providing a service such as PEERS®, while potentially very helpful, and perhaps something that universities should seriously consider offering to aid the success of their students with autism, is not necessarily an "accommodation". It could therefore be difficult for the typical disability services office to offer such a labor-intensive program (as many such offices are already taxed and sometimes under-staffed to be able to provide even the legally mandated accommodations for its college's students). Thus, transition teams should examine and identify institutes of higher education that may offer PEERS® groups and other specialized support services aligned with student needs and share information with youth and families to inform transition decision making related to postsecondary education. Finally, post intervention outcome interviews would be beneficial to evaluate the social validity of the intervention for all participants.

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