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Effects of an Abbreviated and Adapted PEERS® Curriculum as Part of a College Transition Program for Young Adults on the Autism Spectrum

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Abstract

College students on the autism spectrum report the following support needs: interpersonal skills and coping with unexpected change. The purpose of this pilot study was to investigate the effects of an interpersonal skills seminar using elements of the PEERS® curriculum on the acquisition of conversational behaviors by three young adults on the autism spectrum who were attending a summer college transition program designed to help prepare and familiarize individuals with college living. A multiple probe across behaviors design was used. According to visual analysis, a functional relation was not established between participation and acquisition of foundational conversational skills. Our findings provide a model for how state vocational rehabilitation agencies and institutes of higher education can collaborate to provide effective support for college students with autism spectrum disorder.

Keywords

colleges and universities, contexts, autism, disability groups, singlecase experimental, research methodology, social relationships/communication, transition area, state or federal systems, contexts

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by differences in social communication and restricted, repetitive behaviors (American Psychiatric Association, 2013). Each year, approximately 49,000 students diagnosed with ASD complete high school and about 16,000 of those students subsequently pursue higher education (Wei et al., 2016). Once in college, autistic students face daunting interpersonal, emotional, and communication challenges both inside and outside of the classroom (Gobbo & Shmulsky, 2014). National statistics confirm that only 39% of college students with ASD graduate from college, compared with 52% for the general population and 41% for all students with disabilities (Newman et al., 2011).

Currently, traditional accommodations offered by postsecondary institutions (e.g., extended time on tests and note-takers) do not adequately address the needs of college students on the spectrum. Enhancing faculty knowledge, academic supports, and available campus services related to the core features of ASD is essential to promoting success. Very few supports for these social communication challenges are offered at the post-secondary level (Tipton & Blacher, 2014). Just as accommodations for reading are offered to college students with dyslexia due to the defining feature of their disability and associated challenges experienced by those with a dyslexia diagnosis, it is reasonable to make social skill supports available to college students with ASD for the defining feature of their disability.

Social Communication Deficits and Postsecondary Outcomes

Individuals on the autism spectrum may have difficulty joining group conversations, be unaware of appropriate topics for conversation, and misinterpret nonverbal language (Weiss & Rohland, 2015). These social communication deficits often result in rejection and interpersonal isolation during adolescence and young adulthood and have a profound impact on the individual, faculty, classmates, parents, and the community (Simpson & McGinnis-Smith, 2018). Social

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neglect and isolation contribute to internalizing symptomatology in autistic individuals, including anxiety and depression. Beyond being socially isolated, people on the spectrum may be overtly socially rejected as a result of social errors, unsuccessful attempts to engage with others, or reputations for being socially awkward (Jackson et al., 2018; Macleod et al., 2019). Overall, less companionship may lead to greater loneliness, poor academic performance, early withdrawal from school, substance abuse and even suicidal ideation (Bohnert et al., 2019; Han et al., 2019).

Social communication deficits can also affect postsecondary and job-related outcomes for individuals with ASD and no associated intellectual disability. Indeed, in a nationally representative sample, only 33.6% of young adults who had received special education services through the ASD disability category had paid employment at the time of interview (Roux et al., 2014), as compared with 54% of young adults in the general population at a comparable time (Taylor et al., 2012). Likewise, only 53.4% of the young adults with ASD had ever worked for pay since high school (Roux et al., 2014), compared with 91% of young adults with disabilities overall (Newman et al., 2011).

ASD-Specific Disability Support Services

There is little research to guide disability support personnel in postsecondary settings to inform best practice when providing support for students with ASD. University support typically offered to students with disabilities includes tutors, modified testing procedures (e.g., oral examination, testing in another location, extended testing time), and notes from peers or professors (Accardo et al., 2019; Gelbar et al., 2014). Support for students with ASD often include housing accommodations, supervised interpersonal activities, extended deadlines on assignments, peer mentorship programs, parental involvement, interpersonal skills groups, and video modeling (Accardo et al., 2019; Gelbar et al., 2014). However, students with ASD reported that they needed further university support and training in the following areas: (a) interpersonal skills, (b) executive functioning, (c) time management, and (d) strategies to deal with unexpected change (Accardo et al., 2019; Alverson et al., 2019).

As discussed above, interpersonal communication skills have been shown to be an important predictor of postsecondary success for students with ASD (Chiang et al., 2013; Wei et al., 2016). As such, social skills groups are frequently used in the K–12 setting as an evidence-based practice to teach interpersonal skills to adolescents with ASD and have been validated as a research-based intervention for individuals with ASD age 6 to 21 years (Wong et al., 2015). However, interpersonal skills groups are not frequently offered as a postsecondary disability-related service (Elias & White, 2018; Reichow et al., 2013). Therefore, investigations of how best to structure interpersonal skills support on college campuses are needed (Accardo et al., 2019).

PEERS® for Young Adults

Currently, the PEERS® for Adolescents and PEERS® for Young Adults curricula, developed at the University of California, Los Angeles (UCLA), are the only research-based interpersonal skills curricula specifically designed for adolescents and young adults with ASD, that have been shown to generalize outside of treatment, per parent- and self-report (Laugeson, 2017). PEERS® has been validated by researchers in more than three dozen research studies, across three continents (Bishop-Fitzpatrick et al., 2014; Laugeson et al., 2015; McVey et al., 2017; Reichow et al., 2013; Wyman & Claro, 2019). 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. Adolescent and young adult PEERS® participants attend didactic lessons with role-plays, behavioral rehearsals, and performance feedback. Simultaneously, participants' caregivers attend concurrent social coaching sessions that teach caregivers both the skills and strategies to promote generalization (Laugeson, 2017).

Research investigating PEERS® has demonstrated it as ecologically valid, developmentally appropriate, and generalizable instruction in interpersonal skills; PEERS® for Adolescents and PEERS® for Young Adults manualized curricula have been validated for use with participants ages 12 to 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. Furthermore, little research has been done to examine the use of PEERS® within the context of supports offered (a) by a state Bureau of Rehabilitation Services or Division of Vocational Rehabilitation, (b) as part of an educational transition and Step-Up to College program, or (c) as part of student accessibility services provided by a university. In addition, most research on PEERS® has utilized questionnaire outcomes rather than observational outcomes, such as the demonstration of conversational behaviors. One notable exception is a study conducted by White and colleagues that directly observed conversational behaviors using 3-min role-play conversations with two similar-age, opposite-gender confederates before and after completion of the PEERS® for Young Adults intervention. (White et al., 2015). The current pilot study, described below, adds to the literature by addressing these identified research gaps.

One introductory and three conversation-based lessons selected from the PEERS® interpersonal skills curriculum were taught to three young adults with ASD who were participating in a Step-Up to College pilot program at a northeastern state university. The purpose of this study was to investigate the effects of an *abbreviated and adapted version* of PEERS® for Young Adults manualized curriculum (Laugeson, 2017), without social coaching, on the acquisition of conversational behavioral skills by three young adults with ASD.

The research question investigated in this pilot study was:

> **Research Question 1 (RQ1):** What are the effects of an *abbreviated and adapted version* of PEERS® for Young Adults (Laugeson, 2017) as part of a Step-Up to College program on the conversational skill behaviors of adolescents with ASD?

Method

This program was a collaborative project of the state Bureau of Rehabilitation Services, Division of Vocational Rehabilitation, the state's University Center for Excellence in Developmental Disabilities, the College of Education and Human Development, and the University Student Accessibility Services. Interpersonal skills taught during this pilot included starting conversations, entering group conversations, and exiting group conversations.

Participants

Participants were recruited from those participating in a program for high school juniors and seniors with an ASD diagnosis who were interested in attending college. All participants were clients of the state Division of Vocational Rehabilitation. Initially, there were five teen participants who participated in a university summer Step-Up to College program. However, one of the participants withdrew from the study after 3 weeks due to illness, and another participant was not included in the study as his social skills were at the ceiling/mastery level during baseline probes. Therefore, three participants were included. Included participants were 17 to 19 years of age, one self-identified as transgender female and two were male. The three participants lived in rural areas of the state, with fewer than 11,000 residents in each of their respective towns. All participants were Caucasian with a diagnosis of ASD identified in their academic records, spoke English, and reported having concerns about making and keeping friends during the admission to the program. Further descriptions, by pseudonym:

Robert. Robert was 17 years old and lived in a rural coastal town in a northeastern U.S. state. He attended a public high school and expressed an interest in enlisting in the military after attending a naval college. Robert had Individualized Education Program (IEP) goals for social skills and interpersonal communication.

James. James was 18 years old and lived in a rural town in a northeastern U.S. state. He attended an online public charter school and had IEP goals for social skills and interpersonal communication. He was exploring options for 2- or 4-year college programs to become a software engineer.

Kat. Kat was 19 years old and identified as a transgender female. They lived in a rural college town in a northeastern U.S. state and planned to attend a local community college after high school to study audio engineering. Kat had IEP goals for social skills and executive functioning skills. Kat reported being teased for social awkwardness throughout their schooling.

Written consent was obtained from the parents/guardians of the participants, and assent was obtained from all participants, who were still under their parents' guardianship, during Step-Up orientation.

Step-Up to College Program Setting

The setting for this pilot study was a classroom in a rural northeastern state university. The Step-Up to College program was developed to provide a 5-week residential living and learning experience for high school juniors and seniors with a diagnosis of ASD who were interested in attending a postsecondary education program. In addition, the summer Step-Up to College program was designed to help students gain skills and experience in areas associated with postsecondary education success for persons with disabilities. Participating students lived in dormitory rooms and ate their meals in the dining commons during the 5-week program. As part of the program, the students participated in a 100-level, three-credit psychology course that met synchronously online with neurotypical college students for 90 min, 2 days a week. In addition, they engaged in 90-min face-to-face seminars twice a week to support the development of a personalized college success plan. This success plan included financial literacy skills, scheduling and time management, career exploration, college major exploration, and taking responsibility for one's own health care. During these seminars, participants also learned about how postsecondary disability-related supports might differ from those typically offered through an IEP, and how the supports were oriented toward campus resources (e.g., for recreation and academic support). Orientation toward academic support resources included both disability support (e.g., Student Accessibility Services) and generic support (e.g., Writing Center). Students participated in 15 hr a week of individualized paid work experiences on campus (e.g., at

the library, on the campus farm, at the campus recreation center). The PEERS® classes were the social skills component of this college transition program.

Intervention

The abbreviated PEERS® intervention was provided in a campus classroom during two 90-min seminars. The classroom contained rectangular tables set up in rows, and chairs for 20 students. A dry-erase board was at the front of the classroom, and a wall of windows was across the back wall of the classroom. Two graduate students with prior experience providing the PEERS® for Young Adults served as the PEERS® instructors for the intervention. They had been trained to implement the PEERS® curriculum by the first author, a doctoral-level board-certified behavior analyst and UCLA PEERS® Certified Provider. The first and second authors attended a 3-day long intensive didactic training at UCLA facilitated by the training director of the UCLA PEERS® Clinic. During the PEERS® intervention sessions, only the three participants, two instructors, and two additional research staff recording data were present in the room.

The first week of the Step-Up program was an orientation week, and no PEERS® sessions occurred during this week. 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 on Jeopardy game topics such as favorite books, movies, weekend activities for the role-play portion of the class; however, other than that, no structure was provided other than to review the format for each PEERS® class (Laugeson, 2017). Thus, during this first week of class, baseline data were gathered on starting conversations, entering conversations, and exiting conversations. The remaining PEERS® classes followed the manual from Sessions 1 and 2 (during Week 2), 6, and 7 from the PEERS® for Young Adults manual (Laugeson, 2017), covering trading information, starting conversations, entering conversations, and exiting conversations when fully accepted skills. However, because the participants resided on campus to attend the Step-Up to College program, the parent social-coaching sessions were omitted. Another adaptation made was each session of instruction was divided across two classes each week (eight total classes or a double dose), and each week was dedicated to a different conversational topic. The format for each 90-min PEERS® session was as follows: 30 min of homework review, 30 min of didactic instruction and instructor role-modeling, 20 min of participant skills practice through behavioral rehearsals, ending with 10 min of reunification and a homework assignment (Laugeson, 2017). An abbreviated and adapted version of PEERS® for Young Adults (Laugeson, 2017) was used, which included 3 weeks of lessons on conversational skills, specifically, starting conversations, entering group conversations, and exiting group conversations. These skills were chosen as they are the foundation for a variety of social interactions and relationships.

One lesson from the manual was utilized to teach each one of the three conversational skills. The same lesson was taught twice each week (Tuesdays and Thursdays). 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).

To ensure intervention fidelity, instructors followed the PEERS® manual as a guide during each session. As instructors completed each step of the manual, they would check it off with a pencil. The first author observed the fidelity of implementation of 100% of the classes: baseline, intervention, and maintenance sessions. To determine inter-rater reliability for fidelity, one of the graduate 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 page XX." Thus, fidelity was determined using point by point comparison to be 100%.

Design

A concurrent multiple probe design (MPD; Horner & Baer, 1978) across behaviors was used to evaluate the efficacy of our intervention. A concurrent MPD uses three or more A (baseline)—B (Intervention) comparisons with each subsequent A condition including a greater number of measurement sessions in the baseline condition and fewer in the intervention condition; each AB comparison is graphed. The MPD does not require the withdrawal of intervention. Thus, prior to introducing the three conversational skill sets, we conducted three 15-min baseline probes across all three behaviors. Subsequently, we introduced one skill at a time (starting, entering, and exiting conversations) for each skill according to the procedures outlined in the manualized PEERS® intervention while continuing to collect baseline data on the skills yet to be taught. Data were on the conversational behaviors demonstrated by each participant during each class's role-play activities.

Specifically, the steps involved in and assessed for starting individual conversations (introduced in Week 2) were: (a) casually look over, (b) use a prop (such as a phone or a book), (c) find a common interest, (d) mention the common interest, (e) trade verbal information about the common interest, (f) assess the interest of the conversational partner, and (g) introduce yourself. The steps involved in and assessed for entering conversations (introduced in Week 3) were: (a) listen to the conversation, (b) watch from a distance, (c) use a prop, (d) identify the topic, (e) find the common interest, (f) move closer, (g) wait for a pause, (h) mention the topic, (i) assess the interest, (j) introduce yourself. The final skill taught, exiting conversations when fully accepted (introduced in Week 4) involved the following steps which were assessed: (a) keeping your cool, (b) looking away, (c) turning away, and (d) walking away (Laugeson, 2017). During instruction, participants were encouraged to use think alouds 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.

A key component of the behavioral observation data collection form was the level of prompting provided as part of the manualized intervention that was required for the participant to demonstrate the correct response. A system of least to most prompts was utilized during the manualized PEERS® lessons. An example of a verbal prompt would be the facilitator verbally saying the step "mention the topic" before the participant demonstrated this verbal behavior. An example of a gestural prompt would be the facilitator placing their hand up to their ear to prompt the participant to "listen to the conversation" or had to point to the behavioral steps written on the board. Likewise, an example of a physical prompt would be the facilitator physically guiding a participant to move closer to their conversational partner (i.e., another participant).

The behavioral observation data collection form was 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 five points could only be obtained if the participant completed the step independently. This scoring considers that 100% behavioral accuracy would be 100% independent. Steps performed, prompts required and points received 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 (Laugeson, 2017). During each session, the total points received by a participant for each of the three conversational skills were divided by the total points possible to obtain a percentage.

In each of eight sessions probes for each skill were obtained and evaluated during participant role-plays leading to a total of 11 data points.

Baseline. During baseline data collection, a researcher collected data during the role-plays that followed the introductory classes during Week 1. 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. Data were collected on the steps of each interpersonal skill that were completed by each participant, in the absence of prompting. Three baseline data were collected for starting conversations, three probes for entering group conversations when fully accepted during participant role-plays at the end of each lesson during each of the two classes during Week 1. An additional baseline probe was gathered for each of entering and exiting conversations when fully accepted during participant role-plays during the second week of PEERS® (topic: starting conversations). The last three baseline probes were gathered for exiting conversations when fully accepted during participant role-plays during the third week of PEERS®.

Intervention and maintenance. During PEERS® classes, a researcher collected data during the role-plays that followed the classes in Weeks 2 through 4 (e.g., for entering a conversation, group leaders facilitated a conversation in which participants were instructed to enter a conversation between two other participants about a topic such as their favorite movie). Two intervention probes were gathered during the second week of PEERS® for the skills of starting conversations. Two more intervention probes were gathered during the third week of PEERS® for the skills of starting conversations and also three probes for entering conversations. During the fourth week of PEERS®, one more probe was gathered for entering conversations and three more probes for exiting conversations. During the third and fourth weeks of PEERS® classes, three maintenance probes were gathered each for starting and 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

Figure 1. Example behavioral observation data collection for entering conversations.
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.

The first author collected behavioral outcome data according to the process described above. During one of the two (50%) baseline classes and three of the eight intervention classes (30%), the second author collected behavioral outcome data to determine inter-observer agreement (IOA). The behavioral data collection sheets of each were compared, and IOA was determined using point by point comparison to be 95%.

Data Analysis

Visual analyses of differences in mean, level, trend and percent of non-overlapping data (PND) were used, as well as the improvement rate difference (IRD) and 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). Effect sizes of performance (PND and Tau-*U*) differences between baseline phase and intervention phase were calculated (using the Tau-*U* calculator on http://www.singlecaseresearch.org/calculators/tau-u) for each participant's performance of the steps involved in starting, entering and exiting conversations.

There is much debate regarding the best measure of effect to use for single case research designs. PND is most commonly used, but more and more researchers are looking to Tau-*U* as a single case measure of effect. Parker et al. (2010) note that the reason is that Tau-*U* is also a method for measuring data non-overlap between two phases. It is a nonparametric technique, with somewhat lower statistical power than linear regression (Pitman asymptotic relative efficiency of 91% to 95%) when data conform to basic parametric assumptions. When data are non-conforming (as in this small sample size of three participants), then the power of Tau-*U* can exceed the parametric techniques (Pitman efficiency to 115%). 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 et al., 1999; Kendall & Gibbons, 1990). Improvement Rate Difference was calculated using the IRD calculator found at http://singlecaseresearch.org/calculators/ird. IRD is a nonparametric measure of nonoverlap for comparing two phases, typically Baseline and Treatment phases. IRD equals the difference between the two "improvement rates" for a Baseline and a Treatment phase (Parker et al., 2009).

Results

Results indicated that, as a whole, the group of participants improved their conversational skills. Individual results in the percentage of behaviors observed for each of the three separate conversational skill sets: starting a conversation, entering a conversation, and exiting a conversation varied for each of the participants. These individual results and overall group results are described below. Individual results are reported in Figure 2, and Group results are reported in Figure 3.

Robert

Robert demonstrated low levels of accuracy during baseline (range = 0%–29%, M = 19%) for starting conversations during baseline (see Figure 2). An extended baseline would have been necessary for prediction purposes. Based on these baseline data, it is not entirely clear where the fourth data point would fall. However, due to the strict schedule of the Step-Up to College program extending the baseline was not possible. Following the introduction of the adapted and abbreviated PEERS® intervention during the classes on starting conversations, immediate therapeutic improvements of skill accuracy (range = 69%–71%, M = 71%) were observed. Although there was an increase in level from baseline to intervention and intervention data were stable, the extent to which one can claim a demonstration of effect is limited due to the prediction requirement not having been met. Similarly, he demonstrated low levels of accuracy during baseline (range = 0%–40%, M = 15%) for entering conversations during baseline. Following the introduction of the adapted and abbreviated PEERS® intervention during the classes on entering conversations, immediate therapeutic improvements of skill accuracy (range = 60%–80%, M = 70%) were observed. Robert also demonstrated low levels of accuracy during baseline (range = 0%–25%, M = 17%) for exiting conversations during baseline. Following the introduction of the adapted and abbreviated PEERS® intervention during the classes on exiting conversations, immediate therapeutic improvements of skill accuracy (range = 40%–100%, M = 73%) were observed. However, the exiting intervention data have a clear descending trend that ends up almost as low as baseline data. Based on the data path, it is unclear where the data would continue. Therefore, although there were therapeutic demonstrations of effect in Robert's data do not indicate a functional relation (Maggin et al., 2013).

James

James demonstrated low levels of accuracy during baseline (range = 0%–43%, M = 19%) for starting conversations during baseline (see Figure 2). Following introduction of the adapted and abbreviated PEERS® intervention during the classes on starting conversations, therapeutic improvements of skill accuracy (range = 49%–86%, M = 68%) were observed. An extended baseline would have been necessary for prediction purposes. Based on these baseline data, it's not entirely clear where the fourth data point would fall. However, due to the strict schedule of the Step-Up to College program extending the baseline was not possible. When entering into intervention, there is not an immediacy of effect, and the last data point in the intervention is decreasing. Similarly, he demonstrated low levels of accuracy during baseline (range = 0%–40%, M = 23%) for entering conversations during baseline. Following introduction of the adapted and abbreviated PEERS® intervention during the classes on entering conversations, immediate therapeutic improvements of skill accuracy (range = 54%–90%, M = 76%) were observed. Although there was an immediacy of effect and an increase in level from baseline to intervention, the data path has a descending trend that go back at a similar score to the highest baseline data point. Therefore, no demonstration of effect is present due to the verification requirement not having been met. James also demonstrated low levels of accuracy during baseline (range = 0%–50%, M = 25%) for exiting conversations during baseline. Demonstration of an effect is questionable because there is an increasing trend across the last two baseline data points. However, due to the strict schedule of the Step-Up to College program extending the baseline was not possible. Following introduction of the adapted and abbreviated PEERS® intervention during the classes on exiting conversations, immediate therapeutic improvements of skill accuracy (range = 85%–100%, M = 95%) were observed. Therefore, three therapeutic demonstrations of effect in James's data (Gast et al., 2014; Maggin et al., 2013).

Kat

Kat demonstrated low levels of accuracy during baseline, but with an increasing (therapeutic) trend (range = 14%–43%, M = 24%) for starting conversations during baseline (see Figure 2). An extended baseline would have been necessary for prediction purposes. Based on these baseline data, it's not entirely clear where the fourth data point would fall. However, due to the strict schedule of the Step-Up to College program extending the baseline was not possible.

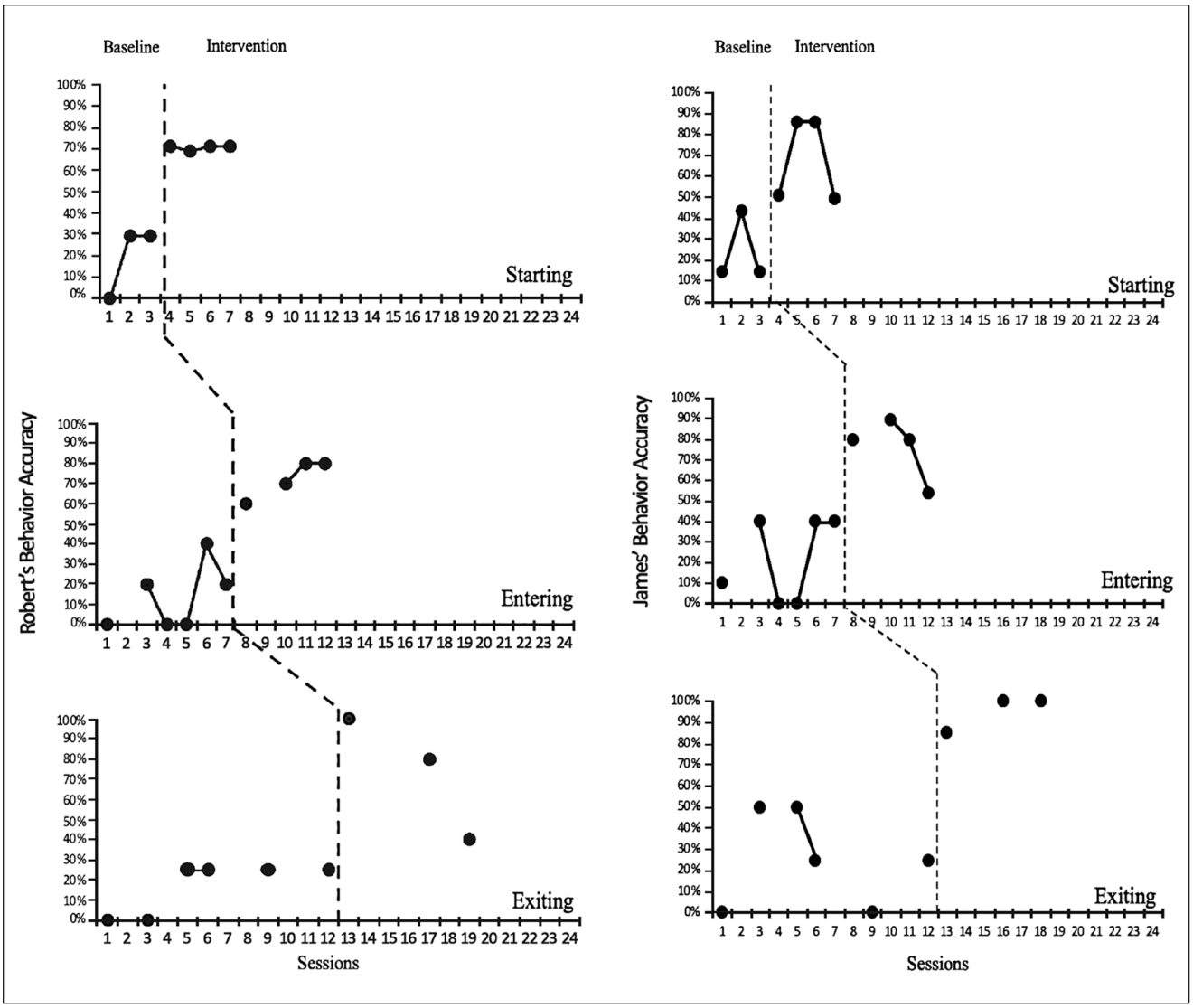

Figure 2. Conversational skills.

Following introduction of the adapted and abbreviated PEERS® intervention during the classes on starting conversations, therapeutic improvements of skill accuracy continued (range = 71%–86%, *M* = 79%) were observed. Similarly, they demonstrated low levels of accuracy during baseline (range = 0%–40%, *M* = 20%) for entering conversations during baseline. Following introduction of the adapted and abbreviated PEERS® intervention during the classes on entering conversations, immediate therapeutic improvements of skill accuracy (range = 30%–90%, *M* = 70%) were observed. Kat also demonstrated low levels of accuracy during baseline (range = 0%–25%, *M* = 4%) for exiting conversations during baseline. The data in the baseline are ascending before entering intervention, which causes a problem with documenting a demonstration of the effect. Following introduction of the adapted and abbreviated PEERS® intervention during the classes on exiting conversations, immediate therapeutic improvements of skill accuracy (range = 100%–100%, *M* = 100%) were observed. However, only two therapeutic demonstrations of effect in Kat's data do not indicate a functional relation, a demonstration of effect is limited due to the verification requirement not having been met. (Gast et al., 2014; Maggin et al., 2013). Although there was an increase in level from baseline to intervention and intervention data were stable, the extent to which one can claim a demonstration of effect is limited due to the replication requirement not having been met.

Measures of effect. According to PND and Tau-*U* measures of effect, there was no overlap in behavioral outcome data collected between baseline and intervention for Starting,

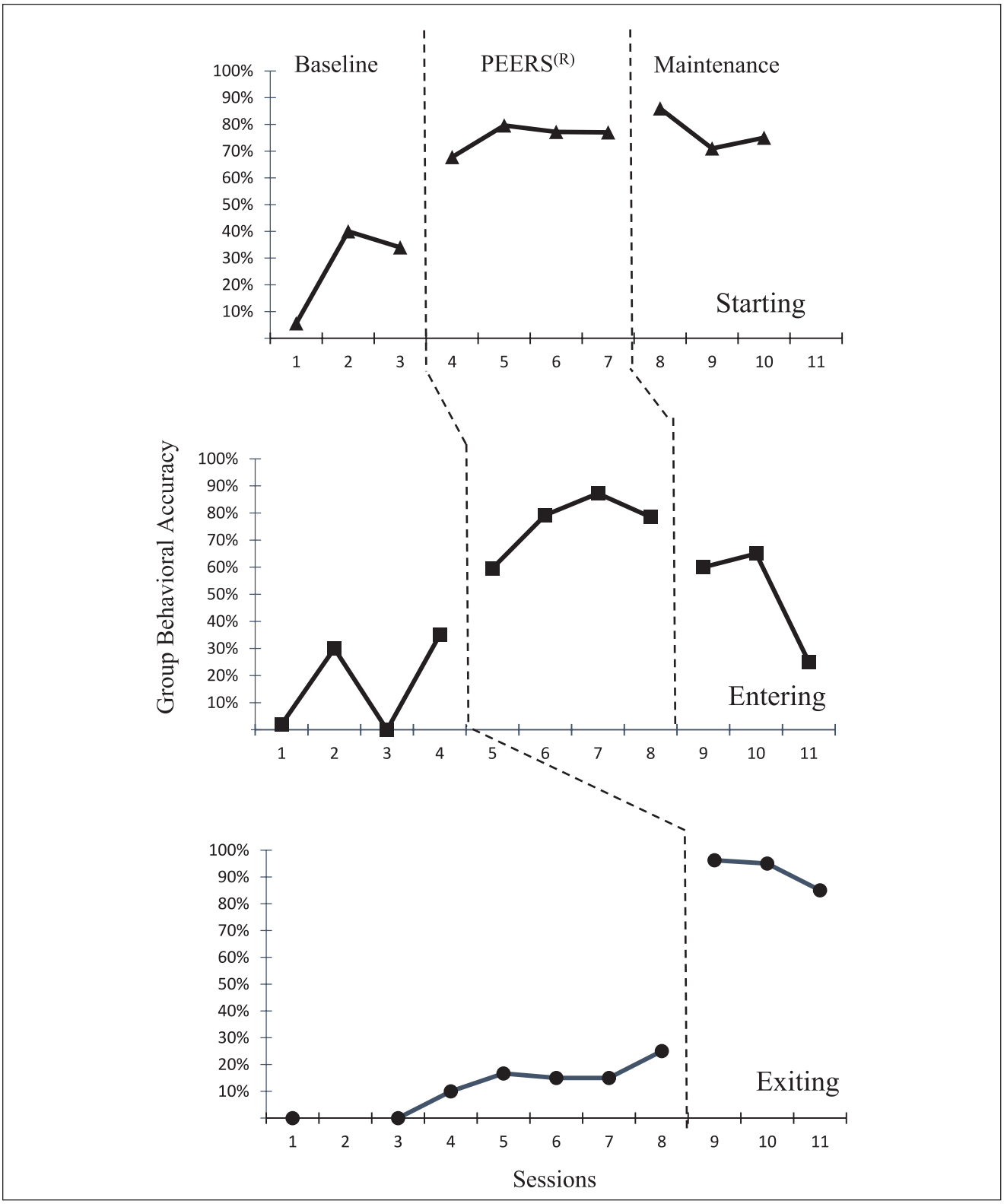

Figure 3. Group performance on conversational skills.

Entering and Exiting Conversations for Robert or James (PND = 100%; Tau-*U* = 1.0), demonstrating that a strong measure of effect for the PEERS® curriculum on the acquisition of these skills (Parker et al., 2010; Scruggs & Mastropieri, 1998). Finally, there was no overlap in the behavioral data for starting or exiting conversations for Kat

(PND = 100%, strong effect; Tau-U = 1.0). However, the behavioral data for Entering Conversations for Kat indicated a low effect with 25 % PND; Tau-U = .58 (Parker et al., 2010; Scruggs & Mastropieri, 1998). IRD was 1.0 for all three conditions and was calculated using the IRD calculator found at http://singlecaseresearch.org/calculators/ird.

Discussion

The purpose of this pilot study was to investigate the effects of an interpersonal skills training using an *abbreviated and adapted version* of PEERS® for Adolescents manualized curriculum (Laugeson & Frankel, 2010), without social coaching, on the acquisition of conversational behavioral skills by three young adults with ASD. Results of this study indicated that interpersonal skills training using an adapted and abbreviated version of PEERS® could be successfully used in a college setting to improve conversation skills. However, a functional relation was not established. The reasons for the lack of a functional relation warrant further investigation. The use of more baseline sessions as well as maintenance and generalization phases may be helpful in future research. These were unable to be extended for this pilot study due to the strict schedule of the Step Up to College program.

Our study extends the research base showing the therapeutic treatment effectiveness of an *abbreviated and adapted version* of PEERS® to promote social skills for college students with ASD. That is, results of this study furthered previous research investigations of the PEERS® intervention by showing therapeutic, but not a functional relationship between PEERS® instruction and subsequent observable behavioral skill acquisition, that is, participants demonstrated an overall increase in demonstration of conversational skills, but not in a reliable or predictive way. Previous studies of PEERS® have focused on the self-report of knowledge of skills and informant-report of generalized social skills via questionnaire measures (Laugeson et al., 2009, 2015). Results of this pilot study confirm that participants in the PEERS® intervention can demonstrate and maintain specific conversational skills within the context of the seminar. This pilot study examined the acquisition and demonstration of behavioral skills by participants, yet additional research is warranted to examine how the demonstration of these skills generalizes to other contexts. Despite this need for further study, current results suggest that an adapted and abbreviated version of PEERS®, when used as a support in the transition to college, may be a viable ASD-specific support that would help prospective or early college students with ASD to develop the interpersonal skills needed to be successful in both college and career environments.

Furthermore, our findings provide a model for how state vocational rehabilitation (VR) agencies and institutes of higher education can collaborate to provide effective support for college students with ASD. Results of this study have clear implications for future research, policy, and practice, which we will briefly summarize. However, certain limitations should first be noted in interpreting these findings with a degree of caution.

Limitations

Although these findings are encouraging, some limitations should be mentioned in interpreting these results. First, it should be noted that while single-subject research is an effective method of investigating interventions in situations where larger group designs like randomized controlled trials are impractical or inhumane, certain limitations of the design should be noted in interpreting results. Namely, 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 values) among the tiers of this multiple probe design. Based on the number of components listed per tier (7 for starting, 10 for entering, 4 for exiting), therefore, 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 for exiting conversations might explain the increased variability in that tier. Also, when looking at individual participant data, downward trends in intervention were associated with a decrease in skills by Robert and James during entering conversations. More research is needed to determine the reasons for this deterioration in skills. One possibility is that the focus of the role-play activities shifted in the PEERS® curriculum, which may have affected successful maintenance. That also is consistent with difficulties generalizing the characteristic of ASD (e.g., even in the same context but without the same structured activity they are less able to utilize skills). Another limitation of this study was that no prompting was provided during baseline probes, yet prompting was embedded in the PEERS® curriculum intervention probes. More research is needed to determine mastery of skills post-PEERS® without prompting.

Furthermore, while this study and its findings focus solely on conversational skills, the impact of PEERS® in other interpersonal skill areas for college students with ASD is outside the scope of our study. Replication is needed across both settings and with other specific skill areas. Related to this need for replication, it is difficult to say with certainty if these skills would generalize to other campus social settings. In fact, it will be crucial to investigate if the skills demonstrated in these sessions are able to 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 our study provide several important considerations and implications for future research. First, additional research is needed investigating the actual interpersonal skills demonstrated across settings. Use of the PEERS® curriculum as part of an actual postsecondary college program for students with ASD during the semester when social events are occurring on campus would allow for generalization data to be observed. Specifically, replication of these findings with a larger, diverse, and more rigorously characterized sample (e.g., assessment verification of ASD diagnosis, IQ) is warranted. In addition, the use of a randomized controlled trial with active treatment and a control group, and inclusion of underrepresented minority groups should be considered in future research. Further research is also needed to investigate the behavioral accuracy for starting, entering, and exiting conversations in everyday settings for participants *after* the PEERS® curriculum is completed to determine if these skills are maintained and generalized. This brief pilot study demonstrates that when intervention is withdrawn, these skills may deteriorate. Thus, future researchers are encouraged to repeat role-plays until participants demonstrate 100% accuracy independently (Murphy et al., 2018).

In addition, more research is needed to investigate if the behavioral skills acquired in the PEERS® seminars can generalize and be maintained in other campuses, communities, and job-related settings. Future research should also investigate the effects of this intervention over a longer period of time, and with more participants as an accommodation in higher education to investigate the impact of the curriculum on participants' relationships with roommates, faculty, and career supervisors. In particular, longitudinal outcomes of how these skills are demonstrated in college and early career settings, and the impact on peer relationships and career stability would be beneficial. Also, more research is needed to see which components of the PEERS® curriculum are most effective. This study used only a portion of the PEERS® and did not use social coaching. A comparison of the full PEERS® program with and without social coaching may yield different results.

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, 2014, 2015). Research that combines pretest and posttest measures of anxiety and depression, with interviews with participants on how PEERS® participation affects their relationships would be informative, and benefit from the inclusion of the perspective of individuals with ASD about their own experiences. 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 have not been collected in those studies in generalized settings.

At the postsecondary level, in the absence of caregivers, another suggestion for future research would be to include peer coaches in the intervention (e.g., undergraduate or graduate students as social coaches outside of the treatment setting). 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 also allow for authentic friendships based on common interests, and involvement in campus-based social clubs. Expansion of interpersonal skills interventions for college students with ASD with other curricula is merited to investigate how these supports may address persistent poor retention and graduation rates. Finally, there is also a need for studies examining systems change efforts to train college disability services offices to provide support with interpersonal skills and other non-academic domains.

Implications for Practice

This study also has several key implications for various practitioners in college, transition, 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. 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.

Our findings also provide a model of collaboration between a university and state agencies to work toward meaningful outcomes and measurable skill gains. The

intervention was conducted in collaboration with a state VR agency and a university in a rural northeastern state. Previous research on the PEERS® for Young Adults curriculum has only been conducted in outpatient and clinical psychiatric settings (Laugeson et al., 2009, 2015). This study, and its investigation of the PEERS® curriculum as an educational transition service, adds new information on how PEERS® may be used. This is essential given suggestions that the teen and young adult years appear to be the most socially difficult period in the lives of individuals with ASD (Tantam, 2003), highlighting a need for additional and layered support during these developmental stages. Indeed, previous research has noted that college students with ASD have indicated that they needed more specific university support and training in interpersonal skills (Accardo et al., 2019; Alverson et al., 2019).

This study investigated the effects of an interpersonal skills seminar using the PEERS® curriculum on the acquisition of conversational behaviors by three teenagers with ASD who were attending a postsecondary education program. Findings of this study show that participation in the PEERS® curriculum led to increased skill for starting, entering, and exiting conversation. These findings also highlight the viability and importance of providing tailored support to college students with ASD on campus related to interpersonal and socioemotional skills faced inside and outside of the classroom. Social communication difficulties related to ASD can have a dramatic impact on individuals' social engagement, participation in postsecondary education, and ultimately, their quality of life. Thus, there is a clear need for greater consideration for interventions and supports that can address interpersonal and social skills while also promoting inclusion in meaningful activities in real-world settings.

Declaration of Conflicting Interests

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