

A Replication and Extension of the PEERS for Young Adults Social Skills Intervention

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A REPLICATION AND EXTENSION OF THE PEERS® FOR YOUNG ADULTS
SOCIAL SKILLS INTERVENTION

by

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ABSTRACT
A REPLICATION AND EXTENSION OF THE PEERS® FOR YOUNG ADULTS
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Marquette University, 2016

The prevalence of autism spectrum disorder (ASD) is on the rise. Due to a lack of efficacious treatments, the number of young adults with ASD is also increasing. Young adults with ASD experience difficulties with empathy, loneliness, and anxiety. Few efficacious social skills intervention for young adults with ASD exist. However, a social skills intervention called *PEERS® for Young Adults* was recently developed and has shown to be effective for improving the experiences of young adults with ASD. The original study has not yet been independently replicated outside of the site of development and has several limitations. The present study sought to replicate and extend the original study by recruiting a larger sample of participants, utilizing a gold standard ASD assessment tool, and examining the effect of the intervention on social anxiety.

Results indicated that young adults with ASD benefit from participating in the *PEERS® for Young Adults* intervention. In particular, we found improvements in social responsiveness, PEERS® knowledge, empathy, direct social interaction, and social anxiety. Unlike the developers, we did not find an improvement in loneliness among our sample.

These findings provide additional support for the *PEERS® for Young Adults* intervention to improve the lives of individuals with ASD. Young adulthood can be a very challenging time for individuals with ASD, resulting in increases in psychological difficulties, challenges obtaining or maintaining employment, and social isolation. Young adults who participate in the *PEERS® for Young Adults* intervention are better able to navigate the social world, and thus, are likely to experience improved outcomes over individuals who do not receive the intervention.

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Introduction

The prevalence of autism spectrum disorder (ASD) continues to rise steadily. According to the Centers for Disease Control and Prevention, about one in 68 children in the United States carries a diagnosis of ASD (Baio, 2012). Although predominantly conceptualized as a childhood disorder, the persistence of deficits and lack of efficacious treatments for ASD lead to striking difficulties that continue well into adulthood (Seltzer, Shattuck, Abbeduto, & Greenberg, 2004; Warren et al., 2011). The prevalence of ASD in adulthood is becoming a more prominent focus in the field (Mandell, 2013), in part because the long-term cost of providing services to adults with ASD has been demonstrated to be monumental (Ganz, 2007). This paper will provide an overview of ASD in young adulthood, focusing specifically on social skills deficits, empathy, loneliness, and social anxiety. The current literature on interventions for young adults will then be described. These issues will be covered in light of the current study, which examined the behavioral effects of a relationship-development intervention for young adults with ASD.

ASD in Young Adulthood

Many of the social skills deficits common to children and adolescents with ASD are, unsurprisingly, also rife among young adults on the spectrum. In particular, individuals with ASD often struggle with social cognition, such as theory of mind, and may have a difficult time initiating or maintaining social interaction and reading social cues (Buitelaar, Van der Wees, Swaab-Barneveld, & Van Der Gaag, 1999). Social skills challenges may also present as limited verbal and nonverbal communication, lack of eye

contact, limited reciprocal speech, and lack of insight (White, Keonig, & Scahill, 2007). Another challenge for such individuals is limited social contact with other young adults. In particular, many high functioning young adults with ASD are no longer in school, often having completed high school but not enrolling in college, which commonly leads to fewer interactions with same-aged peers. If young adults with ASD are in post-secondary education such as college or vocational training, or if they are in the workplace, due to the nature of these settings and a reluctance to seek out friends, young adults with ASD often experience fewer interactions with peers than typically developing young adults (Gantman, Kapp, Orenski, & Laugeson, 2012). Limited interaction with peers further hinders social skills development. Many young adults with ASD continue to be dependent on their parents or primary caregivers (Barnhill, 2007; Farley et al., 2009; Howlin, Goode, Hutton, & Rutter, 2004). In particular, Howlin et al. (2004) found that friendships and general social competence was compromised for adults with ASD between the ages of 21 and 48. Independent living was also impaired; over a third of their sample still lived at home with their parents or primary caregivers (Howlin et al., 2004). It is common for young adults with ASD to rely heavily on their parents or primary caregivers to initiate and carry out the necessary social interactions required for independent living (e.g., grocery shopping, banking, applying for work). Howlin et al. (2004) compiled an “overall social outcome” score, wherein they concluded that 46% of their sample of 68 young adults experienced a “poor” outcome; defined by absence of friendships, work placement, and independent living. Social skills deficits have a negative impact on the development of friendships and romantic relationships, which in

turn, negatively impact the autonomy of individuals with ASD (Barry, Madsen, Nelson, Carroll, & Badger, 2009).

Empathy and Loneliness in ASD

Individuals with ASD face difficulties with broader relational constructs, aside from the nuances of direct social interaction, specifically, empathy and loneliness. Empathy, or the ability to understand the emotional state of others, has long been recognized as a challenge for individuals with ASD (Dziobek et al., 2008; Golan & Baron-Cohen, 2006; Kennett, 2002). Difficulties with empathy among individuals with ASD are often linked to an inability or limited ability to read, comprehend, and produce outward expressions of emotion that may offer insight about another's experience (Golan & Baron-Cohen, 2006). These challenges may limit the likelihood of successful, high quality social relationships in ASD, as has been evidenced among individuals with behavioral disorders in general (Schonert-Reichl, 1993).

Although less studied among young adults with ASD than children and adolescents, feelings of social isolation, or loneliness, also have important implications for the overall impact of ASD on relationships (Bauminger, Shulman, & Agam, 2003; Locke, Ishijima, Kasari, & London, 2010; White & Roberson-Nay, 2009). Among high functioning children, Bauminger et al. (2003) found that those with ASD had higher levels of loneliness than their typically developing peers, and that they were less able to associate that loneliness with the absence of social interactions. This implies that, even as children, individuals with ASD are able to recognize their experiences of loneliness, but may not have insight into the factors that bring about this experience. Similarly, Locke et al. (2010) found that adolescents with ASD experienced higher levels of both social and

emotional loneliness, poorer social relationships, and lower social status than their typically developing peers. Certainly, as individuals with ASD progress from childhood into adolescence, social deficits often become more pronounced as the social environment becomes more complex. Although some research has found that social impairments in individuals with ASD decrease with age, these improvements are modest at best (Seltzer et al., 2004). Friendships that young adults with ASD forge may also be less positive than those among typically developing adults. Baron-Cohen and Wheelwright (2003) found that individuals with ASD who had friends had friendships that were less close, empathetic, supportive, and important than those of typically developing individuals. Loneliness among individuals with ASD may be also moderated by symptoms of anxiety. White and Roberson-Nay (2009) found that children and adolescents with ASD who demonstrated higher levels of loneliness also showed higher levels of anxiety, via self- and parent-report measures. The presence of anxiety among individuals with ASD is an important consideration when evaluating this population, as presence of anxiety may impact many other domains of functioning, beyond loneliness.

Anxiety in ASD

Anxiety may affect symptom presentation and outcome in ASD. Overlap between ASD and anxiety ranges between 11% and 84% in community and clinic-referred samples (White, Oswald, Ollendick, & Scahill, 2009). In recent literature, anxiety has been described as co-occurring simultaneously alongside ASD (Kerns & Kendall, 2012; White et al., 2009) and will be conceptualized as such here. Social anxiety, in particular, may be an important construct to evaluate within populations of individuals with ASD. Kuusikko et al. (2008) found that more than 50% of their sample of 54 children and

adolescents with ASD reported social anxiety at a clinically significant level. Bellini (2006) demonstrated empirical support for a developmental pathways model of social anxiety and ASD that links temperament, physiological arousal, social functioning, and anxiety. This model theorizes that individuals with ASD exhibit a temperament of high physiological arousal. Later in life, this temperament style leads these individuals to be more likely to withdraw from social situations. As a result, social skills go unpracticed and are underdeveloped. As time goes on, social interactions become more challenging and are often more negative due to social skills deficits, which in turn leads to increased symptoms of social anxiety. Social anxiety only perpetuates the cycle by increasing already high levels of social withdrawal. It has been shown that adolescents with ASD demonstrate a pattern of increased social anxiety as they get older, which is the opposite of their typically developing peers, for whom social anxiety peaks in teen years and typically declines thereafter (Sebastian, Blakemore, & Charman, 2009). Assuming this pattern of increased social anxiety and decreased social interaction continues, it is likely, though unknown, that the prevalence of social anxiety among young adults with ASD may be similar to, if not greater than, that of adolescents with ASD.

Interventions for Young Adults with ASD

Based on the symptomatic challenges and potential negative trajectory of these individuals, it is clear that social skills development is imperative for young adults with ASD. However, very few social skills programs targeting the skills deficits common in ASD extend beyond adolescence into young adulthood. The Cochrane Collaboration recently conducted a systematic meta-analytic review of the efficacy of social skills groups for individuals with ASD and did not uncover any interventions that met criteria

for evidence-based treatment for individuals over 17 years (Reichow, Steiner, & Volkmar, 2013). In another recent review of the literature, Palmen, Didden, and Lang (2012) identified twenty studies examining social skills training for young adults with ASD, a mere five of which were deemed methodologically sound by the authors. They defined soundness of the studies by level of certainty, the highest level of which (termed “conclusive”) included a true experimental design, high inter-observer reliability, adequate treatment measures, operationalized definitions of dependent variables, detailed description of the intervention, and some control of possible covariates or other explanations for the outcomes (Palmen et al., 2012). The authors subdivided each of the interventions into four categories based on which behaviors were primarily targeted: academic skills, vocational skills, domestic skills, and social interaction skills (Palmen et al., 2012). Of the twenty studies identified, six fell in the academic skills category, five in the vocational skills category, one in the domestic skills category, and eight in the social interaction skills category. Studies targeting academic skills focused on improving homework planning, test performance, management of daily living responsibilities, task engagement, written language performance, and response time (Palmen et al., 2012). In the vocational skills category, interventions were targeted at improving participants’ management of transitions, requesting help, completing tasks accurately, implementing appropriate greetings and farewells, and promoting products (Palmen et al., 2012). For the single study on domestic skills, the intervention focused on completing food recipes (Palmen et al., 2012). Turning to social interaction skills, which are the primary focus of this paper, of the eight studies that fell in this category only two met criteria for the authors’ most rigorous definition of conclusive. These two studies (Dotson, Leaf,

Sheldon, & Sherman, 2010; Palmen, Didden, & Arts, 2008) utilized a small-group format, demonstrations of appropriate skills, and behavioral rehearsals wherein participants practiced the skills and received feedback. Dotson et al. (2010) found that four of their five participants achieved mastery of the three conversation skills taught. Palmen et al. (2008) found that participants demonstrated significant improvements in question asking and response efficiency within their sample. Although of value to the field, these interventions were flawed in a number of ways. Both studies focused exclusively on conversation skills (Dotson et al., 2010; Palmen et al., 2008), even though social interaction involves a great deal more than conversational acuity. Both studies also had very small sample sizes (Dotson et al., 2010; Palmen et al., 2008; $N = 5$ and $N = 9$, respectively). The review by Palmen et al. (2012) highlighted that, while some social skills interventions for young adults with ASD have been developed and examined, the vast majority are not methodologically sound, and those with good methodological rigor are very limited in scope. Given the limitations of these studies, it remains unclear which tactics most efficaciously address the skills deficits unique and inherent to young adults with ASD.

There are, however, three high-impact educational practices (Gantman et al., 2012) that had not been addressed by previous intervention studies. These areas include: tailoring the intervention material to the learning style in ASD; utilizing multimodal, evidence-based instruction strategies; and practicing of newly learned skills outside of the class environment. First, in utilizing a social skills intervention that isolates and concretizes the nuances of social interaction, young adults with ASD may be better able to comprehend the vast array of behaviors integral to appropriate and adaptive social

behavior (Anckarsäter et al., 2006; Bowler, Gaigg, & Gardiner, 2008). Second, combining classroom-like instruction of these social skills, in conjunction with the observation of role-plays, and behavioral practice overseen by the intervention facilitators, may improve social outcomes from treatments (McKenzie, Evans, & Handley, 2010). Third, an intervention with homework assignments that encourages young adults with ASD to further practice newly learned skills outside of the treatment environment may be most efficacious at skill gains, given that additional, external practice may provide for generalization of skills and increase the amount of direct social interaction experienced by the participants (White, Keonig, & Scahill, 2007).

The PEERS® Intervention

One recently developed intervention for individuals with ASD attempts to address these issues. The *Program for the Education and Enrichment of Relational Skills* (PEERS®) is a 14-week social skills intervention for adolescents with ASD that targets making and keeping friends and is delivered in a small-group format. PEERS® was originally developed for individuals with ASD aged 11 to 18 and has been shown to be efficacious for improving social skills and friendships among individuals in this age group (Frankel et al., 2010; Laugeson, Frankel, Mogil, & Dillon, 2009). The intervention focuses on small-group instruction of didactic material, role-plays, behavioral rehearsal, coaching, and weekly homework assignments for social skills practice. Parents receive complementary information delivered in a small-group format simultaneous to, but separate from, the participants (Laugeson et al., 2009). This format allows for parent facilitation of learning and socialization practice, and also group discussion of successes and challenges the parents experience during the implementation of the new skills. The

content of the intervention includes concretized rules for proper social etiquette in important social situations for adolescents (Laugeson et al., 2009). Specific skills include: conversation, peer entry and exit, developing friendship networks, teasing, bullying, arguments, good sportsmanship, host behavior, and changing a bad reputation (Laugeson et al., 2009). PEERS® for adolescents has been replicated outside of its University of California, Los Angeles (UCLA) site of development by two groups (Schohl et al., 2013; Yoo et al., 2014), and its efficacy has been demonstrated at both sites as well.

Importantly, PEERS® has been adapted and manualized for young adults aged 18 to 23 (*PEERS® for Young Adults*; Gantman, Kapp, Orenski, & Laugeson, 2012). Young adulthood is a unique period of development, in particular because as individuals enter young adulthood, they begin to cultivate more autonomy, in the formation and maintenance of social relationships outside of the home. *PEERS® for Young Adults* seeks to promote this development of autonomy within young adults with ASD through the cultivation of social skills. There are two main differences in the young adult version compared with the original, adolescent version of PEERS®. First, the young adult version includes a reconfiguration of the original 14 modules to highlight the varying experiences of young adults. Compared with adolescents, most of whom are in high school, young adults may be in college, vocational training, the workforce, or merely living at home with their parents (Gantman et al., 2012). Second, three additional modules pertaining specifically to dating etiquette were added, as these skills are more commonly relied upon in young adulthood than in adolescence for individuals with ASD. Table 1 presents the *PEERS® for Young Adult* modules, highlighting those that have been added.

Table 1

PEERS® for Young Adults Sessions and Associated Content

Session	Didactic
1	Intro and Conversational Skills I: Trading Information
2	Conversational Skills II: Two-way Conversation
3	Conversational Skills III: Electronic Communication
4	Choosing Appropriate Friends
5	Appropriate Use of Humor
6	Peer Entry I: Entering a Conversation
7	Peer Entry II: Exiting a Conversation
8	Get-togethers and Good Sportsmanship
9	Dating I*
10	Dating II*
11	Dating III*
12	Rejection I
13	Rejection II
14	Handling Disagreements
15	Rumors and Gossip
16	Graduation and Termination

* New content in the *PEERS® for Young Adults* version.

Upon examination of the efficacy of the intervention, the developers have shown *PEERS® for Young Adults* to be efficacious for high functioning young adults with ASD between the ages of 18 and 23 (Gantman et al., 2012). *PEERS® for Young Adults* was found to improve parent-reported social skills behavior and knowledge, while also increasing the number of direct social interactions of young adults with ASD. It was also shown to have a positive impact on empathy and loneliness among this population. Although these findings were recently replicated within the site of development at UCLA (Laugeson, Gantman, Kapp, Orenski, & Ellingsen, 2015), they have not yet been independently replicated outside of that site. Additionally, the data from both the original study and the replication were comprised of small sample sizes ($N = 17$, $N = 22$,

respectively). Furthermore, both Gantman et al. (2012) and Laugeson et al. (2015) did not employ a gold standard ASD assessment, instead utilizing only the Autism Quotient (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001) and a community diagnosis of ASD to confirm the diagnostic status of their participants.

Summary and Aims of the Current Study

The purpose of the current study was to directly replicate and extend the findings that the *PEERS® for Young Adults* intervention is efficacious for young adults with ASD. The program was conducted in the manner described by the researchers at UCLA, employing a randomized controlled trial, and utilizing the *PEERS® for Young Adults* manual. Sessions were conducted at the same timing and rate as at the site of development, that is, one 90-minute session per week for 16 weeks. The current study extends the first *PEERS® for Young Adults* study in three important ways. First, a larger sample size was recruited. Specifically, we recruited a total of 57 young adults with ASD, who were randomly assigned to experimental or waitlist groups, in the manner conducted by Gantman et al. (2012). Participants ranged in age from 17 to 28. Second, more stringent diagnostic criteria (i.e., the Autism Diagnostic Observation Schedule, Lord et al., 2000) was used for screening the young adults who were recruited to participate. Third, the current study examined the effects of the social skills intervention on levels of social anxiety and social phobia, which was not examined in the Gantman et al. (2012) or Laugeson et al. (2015) study. The first and primary aim of the present study was to replicate the Gantman et al. (2012) findings, as pertains to *PEERS®*' effects on social skills knowledge, ASD symptoms, empathy, loneliness, and social contacts. Based on the original findings, we predicted that the young adults with ASD in *PEERS®* would

demonstrate improvements in these areas over time. The second aim of the present study was to extend the findings of Gantman et al. (2012) by examining the effect of PEERS® participation on social anxiety and social phobia. We expected the young adults with ASD in the experimental group to report lower levels of social anxiety and social phobia after receiving the intervention. Thus, we hypothesized:

- 1) Parents of the young adults in the EXP ASD group would report improved young adult social skills and social responsiveness on the SSIS-RS and SRS, versus parents of the young adults in the WL control ASD group.
- 2) The young adults in the EXP ASD group would demonstrate significant improvement in their understanding of PEERS® concepts on the TYASSK, versus young adults in the WL control ASD group.
- 3) The young adults in the EXP ASD group would show significant improvement in their self-report of empathy on the EQ, versus young adults in the WL control ASD group.
- 4) The young adults in the EXP ASD group would demonstrate significantly lower self-report of social and emotional loneliness over time on the SELSA, versus the young adults in the WL control ASD group.
- 5) The young adults in the EXP ASD group would report a greater number of direct social interactions with peers over time on the QSQ-YA, versus the young adults in the WL control ASD group.
- 6) The young adults in the EXP ASD group would report lower levels of social phobia on the SPIN and lower social anxiety on the LSAS over time, versus the young adults in the WL control ASD group.

Method

Participants

Fifty-six participants were recruited and enrolled in the current study ($N = 56$). Participants were young adults with high functioning ASD (defined below). They were recruited from local intervention agencies and community ASD support groups in a moderately-sized Midwestern city, as well as an in-house waiting list at an Autism Clinic at a private university. As in the past, existing relationships with these organizations were utilized and Institutional Review Board (IRB) approval was confirmed prior to advertisements and data collection (Schohl et al., 2013). *A priori* power analyses for the omnibus MANOVA were conducted using G*Power 3.1.9.2 (Faul, Erdfelder, Buchner, & Lang, 2009), with a large effect size based on the results of the Gantman et al. (2012) study ($f = .54$ for MANOVA). Results indicated that 29 participants would be needed for power to detect differences among groups at the $\beta = .80$ level. We enrolled a total of 56 individuals with ASD to account for possible attrition, and thus sample size was more than sufficient for adequate power.

Interested families received a telephone-screening interview, administered by a graduate student in a clinical psychology doctoral program, to review inclusion criteria. Inclusion criteria included the following: 1) adult participant with ASD being between the ages of 17 and 28; 2) parent report of social difficulties in the adult participant; 3) English fluency for the adult participant with ASD; 4) English fluency and willingness to participate for the parent/caregiver; 5) negative for a history of a major mental illness (such as bipolar disorder, schizophrenia, or psychosis) in the adult participant with ASD;

6) negative for impairments that preclude intervention participation (such as hearing, visual, or physical impairments) in the adult participant with ASD; and 7) adult participant carrying a previous and current diagnosis of ASD (including High Functioning Autism, Autism Syndrome, or Pervasive Developmental Disorder - NOS). Further, potential adult participants with ASD were screened for the following: 1) meeting ASD criteria on the Autism Diagnostic Observation Schedule – Generic (Lord et al., 2000); 2) having a verbal IQ of 70 or above on the Kaufman Brief Intelligence Test – Second Edition (KBIT-2; Kaufman & Kaufman, 2004); and 3) having a desire to learn about how to make friends, via the Mental Status Checklist (Gantman et al., 2012).

Once adult participants with ASD were screened for inclusion criteria, they were randomly assigned to the experimental (EXP) or waitlist (WL) group. The only exception to randomization was that a group with one female participant needed to have at least one other female participant, as suggested by the PEERS® developers (L. Laugeson, personal communication, 2010). Both groups participated in pre-test data collection within one week of each other, and the EXP group received the *PEERS® for Young Adults* intervention immediately thereafter. WL participants did not enter the PEERS® treatment immediately. Post-test data for the EXP group was collected just prior to the final (16th) session of the PEERS® intervention. Post-test data was collected approximately 15 weeks after pre-test for the WL group. The WL group received the intervention during the following session, typically during the next academic semester. This design allowed for both groups to be examined over a 16-week period. Table 2 shows the intervention timeline. Each EXP and WL group totaled 24 participants (with no more than 10 participants in each cohort/PEERS® provision at a time).

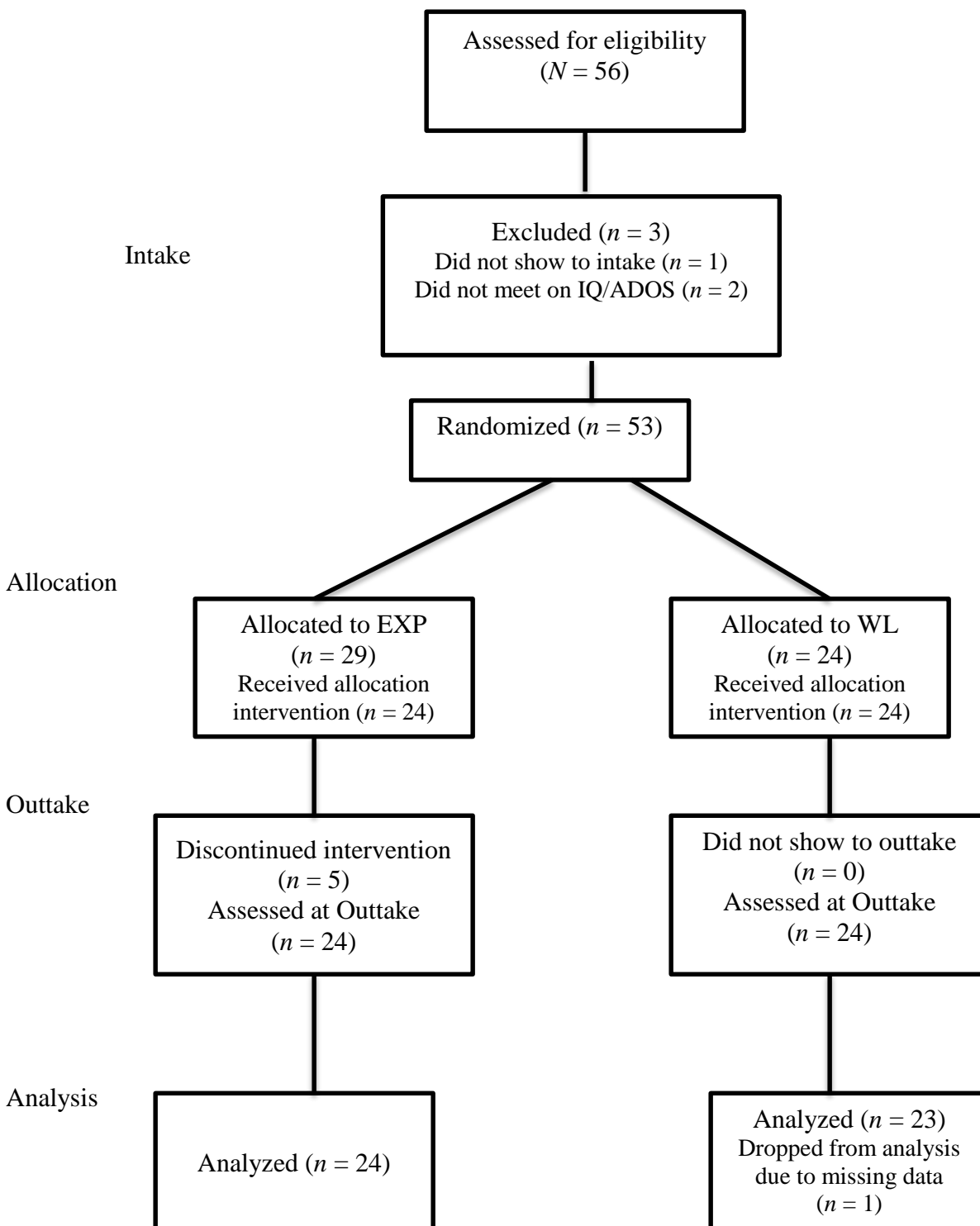
Table 2

Intervention Timeline

Time 1	Time 2 (15 weeks)	Time 3	Time 4
EXP Pre-test	EXP Intervention	EXP Post-test	--
WL Pre-test	No intervention	WL Post-test	WL Intervention

Attrition. Attrition was expected to be about 20%, which falls within the expected range of randomized controlled trials (Hewitt, Kumaravel, Dumville, & Torgerson, 2010). Participants who missed three or more sessions or did not have adequate completion of three homework assignments were excused from the intervention and did not complete post-test measures ($n = 7$). Figure 1 shows a flowchart of participant involvement and completion status.

Figure 1

CONSORT Diagram

Treatment

PEERS® for Young Adults was delivered in weekly 90-minute simultaneously occurring young adult and parent/caregiver group sessions for 16 weeks. The intervention was provided during academic semesters, that is, either fall (September through December) or spring (January through May). The manual, provided by the developers at UCLA, was adhered to for the treatment. The primary investigator in the lab, Dr. Van Hecke, received direct instruction via an official PEERS® training in Los Angeles, CA and received certification in PEERS® prior to the start of the study. She then trained graduate students in a clinical psychology doctoral program to lead the young adult and parent/caregiver groups. The six graduate students who served as group leaders had extensive clinical, diagnostic, and research practice in ASD. Three of those leaders ran young adult groups and had obtained at least a Master's degree and had completed coursework in therapy. The leaders received training and supervision directly from the certified leader. The certified leader ran the first young adult group, for training purposes. Subsequently, group leaders were trained in the following manner. First, they began by co-leading a parent group with a trained leader or the certified leader. Second, the trainees co-led a young adult group with a trained leader or the certified leader. Third, they were allowed to lead a young adult group independently. The certified leader conducted weekly supervision with the leaders to ensure quality and accuracy of the intervention and to provide feedback.

Undergraduate research assistants in the lab were trained and overseen directly by the certified leader as behavioral coaches and assistants for the intervention. Coaches' primary responsibilities included enacting behavioral role-plays of appropriate and

inappropriate social behavior, assisting with behavioral rehearsals, and for assistance with behavior management. Coaches were also responsible for following along in the protocol and, when necessary, providing fidelity checks to ensure the manualized intervention was being adhered to properly.

Young adult PEERS® sessions began with a homework review from the previous week, and were followed with a didactic lesson, as shown in Table 1. Role-play exercises with the group leader and coaches were utilized to demonstrate appropriate and inappropriate behaviors based on the social skills targeted in a given week. Young adults then practiced the newly learned skills by engaging in behavioral rehearsals with one another, the group leader, and/or coaches.

Concurrent parent/caregiver sessions consisted of a similar, complementary procedure. Weekly homework assignments were reviewed and troubleshooting for challenging issues was discussed. Then, the didactic lesson occurring in the young adult session was delivered both in a handout and described verbally by the parent leader. Possible difficulties were discussed and parents/caregivers were provided with information on how to help their young adults complete the assigned homework for the upcoming week.

The young adult and parent groups then reunified. Homework for the following week was assigned and leaders provided one-on-one troubleshooting and feedback regarding missed assignments for the past week and previous plans to complete the current assignment. Homework assignments typically corresponded to the didactic provided in that session and usually involved several components (e.g., make a phone call to another young adult group member and join a social group). Group leaders strongly

enforced homework compliance and young adults who missed three homework assignments were dismissed from the intervention. Missing more than two sessions also merited dismissal from the treatment.

Measures

Diagnostic and Screening Measures. During the baseline pre-test visit, parents/caregivers completed a demographic form and a questionnaire about their young adult's health and medication history and current status. Young adults completed the Mental Status Checklist (Gantman et al., 2012) which assesses for young adult motivation to make and keep friends. Diagnoses were confirmed using the Autism Diagnostic Observation Schedule – Generic (ADOS-G: Lord et al., 2000), specifically Module 4, which is indicated for use with verbally fluent adolescents and adults. The ADOS represents the gold standard for ASD evaluation and has been shown to have high inter-rater reliability, high inter-item correlation, and high validity (Lord, Rutter, DiLavore, & Risi, 2002). It is a widely used tool for the diagnostic assessment of ASD in both clinical and research settings. The ADOS-G generates three scores: a Social Interaction Score, a Communication Score, and a Repetitive Behavior Score. The Social Interaction Score and Communication Score are then combined to create the Total Score. For the purposes of this study, the ADOS-G was administered by examiners trained to research-level reliability within the lab. Cut-off scores for inclusion via the ADOS-G consisted of a Total Score of 6 or higher, as these scores indicate the presence of ASD. Young adults' cognitive functioning was assessed with the Kaufman Brief Intelligence Test – Second Edition (KBIT-2; Kaufman & Kaufman, 2004). Cut-off scores for inclusion via the KBIT-2 was a Verbal IQ of 70 or higher. The EXP and WL groups were

statistically examined to ensure comparability on ADOS-G and KBIT-2 scores (see Results).

Experimental Measures: Parent-Report. Experimental measures were self-administered or read to the individual by a research assistant, as needed, based on verbal ability, reading ability, and preference of the individual. All parent-report measures were utilized to examine Aim 1, namely, the replication of the Gantman et al. (2012) study.

Change in social skills was measured using the Social Skills Improvement System – Rating Scales (SSIS-RS; Gresham & Elliott, 2008), formerly the Social Skills Rating Scale (SSRS; Gresham & Elliott, 1990); this measure was administered to parents of young adults at pre- and post-test. Although the SSRS was used by the developers of the *PEERS® for Young Adults* intervention (Gantman et al., 2012), we utilized the SSIS-RS, as it has been shown to be as accurate and is intended for use in intervention research (Gresham, Elliott, Vance, & Cook, 2011). This measure was developed to examine social skills, specifically: communication, cooperation, assertion, responsibility, empathy, engagement, and self-control. It is a 75-item rating scale that utilizes standard scores ($M = 100$; $SD = 15$), where higher scores indicate more of the behavior. The measure provides a Social Skills total score, a Competing Problem Behavior total score, as well as twelve subscale scores: Communication, Cooperation, Assertion, Responsibility, Empathy, Engagement, Self-Control, Externalizing, Bullying, Hyperactivity/Inattention, Internalizing, and Autism Spectrum. We examined the two total scores. An example of a Social Skills scale item is, “Takes turns in conversations.” An example item from the Competing Problem Behavior scale is, “Repeats the same thing over and over” (Gresham, Elliott, & Kettler, 2010). This parent-report measure is typically used with children

between the ages of 13 and 18, however, because the UCLA PEERS® researchers utilized this form beyond this age range (Gantman et al., 2012), the present study did as well, for direct replication purposes. The parent form shows high internal consistency (.94), high test-retest reliability (.84), and high validity (.77) (Gresham et al., 2011). In the current study, internal consistency was acceptable (.77).

Change in ASD symptoms was measured using the Social Responsiveness Scale (SRS; Constantino et al., 2003). The measure was administered to the parents of young adults at pre- and post-test. This measure was developed to examine social impairment in ASD, and asks questions such as, “[Your child] is aware of what others are thinking or feeling.” It is a 65-item rating scale that utilizes T-scores ($M = 50$, $SD = 10$), where higher scores indicate a greater severity of ASD symptoms. The measure provides a Total score and five subscale scores: Social Awareness, Social Information Processing, Social Communication, Social Avoidance, and Autistic Mannerisms. The Total raw score was used for analyses. This measure shows a high test-retest reliability (.88) and good validity (Constantino et al., 2003). Internal consistency for the present study was good (.84).

Experimental Measures: Self-Report. Questionnaires utilized to examine Aim 1 (Replication) included the following: TYASSK (Gantman et al., 2012), QSQ-YA (Gantman et al., 2012), EQ (Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004), and SELSA (DiTommaso & Spinner, 1993).

PEERS® knowledge was measured using the Test of Young Adult Social Skills Knowledge (TYASSK; Gantman et al., 2012). It was administered to the young adults with ASD at pre- and post-test. This measure was developed to assess knowledge of specific social skills taught during the *PEERS® for Young Adults* intervention. It was

based on the Test of Adolescent Social Skills Knowledge (TASSK; Laugeson et al., 2009) and adapted for young adults of an unspecified age range. This is a 23-item measure that assesses knowledge of PEERS® concepts through questions such as, “The most important part of having a conversation is to: a) Trade information or b) Make sure the other person is laughing and smiling” (Gantman et al., 2012). The psychometric properties of this measure have not yet been examined. The adolescent version, the TASSK, was found to have low internal consistency (.56), however the authors attribute this to the large variance in the questions asked and indicate that the items are not expected to “hang together” (Laugeson et al., 2009; Schohl et al., 2013). Similarly, in the present study, the internal consistency for this measure was very low (.22).

Self-report of socialization was measured with the Quality of Socialization Questionnaire – Young Adult (QSQ-YA; Gantman et al., 2012), which was administered to the young adults with ASD at pre- and post-test. This measure was developed to assess frequency of both hosted and invited get-togethers over the prior month, as well as level of Interpersonal Conflict present during those get-togethers. This is a 12-item self-report measure that Gantman et al. (2012) adapted from the Quality of Play Questionnaire (QPQ) for children with ASD (Frankel et al., 2010) for use with adults of an unspecified age range. Young adults were asked two questions: “How many get-togethers did you organize in the last month?” and “How many get-togethers were you invited to last month?” (Gantman et al., 2012). The psychometric properties of the QSQ-YA have not been formally evaluated, and this study did not evaluate them, because the measure consists solely of summing the frequency of the two items. Consistent with prior research

(Schohl et al., 2013), number of hosted and invited get-togethers was summed to create a single variable encompassing frequency of all get-togethers.

Self-report of social empathy was measured with the Empathy Quotient (EQ; Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004), which was administered to the young adults with ASD at pre- and post-test. This is a 28-item self-report measure of empathy where greater scores indicate more empathic responses. The measure has high internal consistency (.92) and test-retest reliability (.97). An example item is, “I am quick to spot when someone in a group is feeling awkward or uncomfortable” (Lawrence et al., 2004). Internal consistency for the present study was found to be (.63).

Self-report of social and emotional loneliness was measured with the Social and Emotional Loneliness Scale for Adults (SELSA; DiTommaso & Spinner, 1993), which was administered to the young adults with ASD at pre- and post-test. This is a 37-item self-report measure that assesses for romantic, social, and family loneliness, where higher scores indicate greater loneliness. Responses are on a Likert scale from 1 (disagree strongly) to 7 (agree strongly). The measure has high internal consistency (.89-.93) and good validity (DiTommaso & Spinner, 1993). An example item is, “I really belong in my family.” The SELSA was found to have acceptable internal consistency (.71) for the present study.

Self-report questionnaires utilized to examine Aim 2 (Extension) included the LSAS (Heimberg et al., 1999) and the SPIN (Connor et al., 2000). Self-report of social anxiety was measured with the Liebowitz Social Anxiety Scale (LSAS; Heimberg et al., 1999), which was administered to the young adults with ASD at pre- and post-test. This is a 24-item self-report measure that shows high internal consistency (.96) and high

convergent validity with other measures of the same construct (.49-.73) (Heimberg et al., 1999). The questionnaire asks to what degree different situations evoke both fear and avoidance from the respondent, using a Likert scale from 0 (none) to 3 (severe). Higher scores indicate greater severity of impairment. An example item is, “[How anxious or fearful do you feel when/how often do you avoid] meeting strangers?” (Heimberg et al., 1999). The LSAS showed excellent internal consistency in the present study (.97), similar to the developers’ findings.

Self-report of social phobia was measured with the Social Phobia Inventory (SPIN; Connor et al., 2000), which was administered to the young adults with ASD at pre- and post-test. This measure was developed to assess presence of social phobia, where higher scores indicate higher levels of social phobia. It is a 17-item self-report measure that shows high test-retest reliability (.78), high internal consistency (.82-.94), and adequate convergent validity (.57) (Connor et al., 2000). An example question is, “I avoid activities in which I am the center of attention” (Connor et al., 2000). The SPIN has been utilized in clinical research with both adolescent (Ranta et al., 2007) and adult populations (Antony, Coons, McCabe, Ashbaugh, & Swinson, 2006). Internal consistency for this measure was found to be consistent with the developers’ report, and fell in the excellent range (.94).

Our means at pre-test for each of the above scales/subscales were comparable to the means at pre-test in the Gantman et al. (2012) study.

Analytic Approach

All statistical analyses were conducted using SPSS 22.0 (IBM Corp., 2013). An alpha level of .05 was used as the significance criterion for hypothesis tests. T-tests and

chi-square tests were employed to assess for EXP versus WL group differences on demographic variables. We predicted that the EXP and WL groups would not differ significantly on these demographic variables.

In order to evaluate our two aims, an omnibus Group (EXP versus WL) x Time (pre- versus post-intervention) repeated measures, multivariate analysis of variance (MANOVA) approach was used. All dependent variables were entered into the MANOVA, with a significant Group x Time interaction at this level indicating continuation to the set of follow-up analyses, below.

For aim 1, the independent replication of the Gantman et al. (2012) study, univariate follow-up Group (EXP versus WL) x Time (pre- versus post-intervention) repeated measures, analyses of variance (ANOVAs) were used. Scores from experimental measures included in this analysis as dependent variables consisted of the total scores from the SSIS-RS (Social Skills and Competing Problem Behavior Totals), SRS, TYASSK, QSQ-YA (Total Get-togethers), EQ, and SELSA. We hypothesized significant Group x Time interactions at the univariate level, such that: 1) parents of the young adults in the EXP ASD group would report improved young adult social skills and social responsiveness on the SSIS-RS and SRS, versus parents of the young adults in the WL control ASD group; 2) the young adults in the EXP ASD group would demonstrate significant improvement in their understanding of PEERS® concepts on the TYASSK, versus young adults in the WL control ASD group; 3) the young adults in the EXP ASD group would show significant improvement in their self-report of empathy on the EQ, versus young adults in the WL control ASD group; 4) the young adults in the EXP ASD group would demonstrate significantly lower self-report of social and emotional

loneliness over time on the SELSA, versus the young adults in the WL control ASD group; and 5) the young adults in the EXP ASD group would report a greater number of direct social interactions with peers over time on the QSQ-YA, versus the young adults in the WL control ASD group.

For aim 2, that is, the extension of the original study in examining changes in social anxiety and social phobia, we employed two Group (EXP versus WL) x Time (pre-versus post-intervention) repeated measures univariate ANOVAs to analyze the experimental dependent variables concerning social anxiety and social phobia, that is, total scores from the SPIN and the LSAS. We hypothesized significant Group x Time interactions at the univariate level, such that the young adults in the EXP ASD group would report lower levels of social phobia on the SPIN and lower social anxiety on the LSAS over time, versus the young adults in the WL control ASD group.

Results

Data Screening

Data were screened for normality, impossible values, and outliers, and were not found to be within normal limits. Three outliers (.02% percent of the total data) were identified, two in the QSQ-YA pre-test data (both a value of 15) and one in the EQ post-test data (value of 66); these three scores were subsequently Winsorized to the next highest value (11 for the QSQ-YA, 54 for the EQ; Tabachnick & Fidell, 2013). The screening protocol was subsequently re-run and data were found to be within normal limits. Skew and kurtosis were within normal limits. Missing data were found to be missing completely at random. One participant was missing the entirety of his post-test

data and was excluded from analysis (Tabachnick & Fidell, 2013). Multiple imputation (five iterations) was then conducted for any remaining missing items from the outcome measures (Tabachnick & Fidell, 2013). The imputed data points did not exceed the recommendation of no more than 10% of the data (Tabachnick & Fidell, 2013); specifically, they constituted 2% of the total data (there were 21 imputed data points out of a total 1,034 across scales/subscales).

Examination of Group and Cohort Differences

T-tests and chi-square tests for independence were employed to assess for EXP versus WL group differences on demographic variables. As predicted, no significant differences were uncovered for young adult gender ($\chi^2 = 1.40, p = .237$, Cramer's $V = .173$), primary parent/caregiver education ($\chi^2 = 7.743, p = .171$, Cramer's $V = .406$), young adult race ($\chi^2 = 1.333, p = .721$, Cramer's $V = .170$), young adult ethnicity ($\chi^2 = 1.831, p = .176$, Cramer's $V = .202$), socioeconomic status ($\chi^2 = 7.305, p = .121$, Cramer's $V = .399$), KBIT-2 Verbal IQ ($t(45) = .387, p = .701$, two tailed, 95% CI [-10.937, 16.133]), or ADOS-G total score ($t(44) = -.045, p = .965$, two tailed, 95% CI [-2.002, 1.916]). A significant difference was found between the groups on young adult age ($t(32.393) = 2.047, p = .050$, two-tailed, 95% CI [.099, 3.162] and was therefore held constant in the following analyses. Table 3 presents the mean demographic variables for both groups. Furthermore, participants who chose to withdraw or were excused from the intervention did not differ from the participants in the EXP group who completed the study, based on young adult age ($t(27) = .241, p = .811$, two tailed, 95% CI [-2.832, 3.586]), young adult race ($t(27) = .070, p = .945$, two tailed, 95% CI [-.824, .882]), household income ($t(26) = .949, p = .351$, two tailed, 95% CI [-.635, 1.726]), ADOS-G

Table 3

Means and standard deviations for experimental and waitlist control groups at pre-test

	Group ($N = 47$)		p
	Experimental ($n = 23$) M (SD)	Waitlist control ($n = 24$) M (SD)	
Age (years)	21.04 (3.32)	19.46 (1.69)	.05
Sex (% female)	26.1	12.5	<i>ns</i>
Race (% Caucasian)	87	83.3	<i>ns</i>
Ethnicity (% Non-Hispanic)	91.3	91.7	<i>ns</i>
Household Income (%)			<i>ns</i>
Under 25K	4.3	8.3	
25-50K	4.3	25.0	
50-75K	26.1	8.3	
75-100K	13.0	25.0	
Over 100K	47.8	33.3	
Primary Parent Education (%)			<i>ns</i>
High school completion	0.0	20.8	
Voc/tech training	13.0	4.2	
Some college	13.0	20.8	
Bachelor's degree	56.5	37.5	
Master's degree	13.0	8.3	
Doctoral degree	4.3	8.3	
KBIT-2 Verbal IQ	93.35 (23.47)	90.75 (22.60)	<i>ns</i>
ADOS Total Score	11.65 (2.67)	11.70 (3.82)	<i>ns</i>

The following variables had different n -values: Waitlist race ($n = 23$), Experimental ethnicity ($n = 21$), and Experimental household income ($n = 22$). *KBIT-2* Kaufman Brief Intelligence Test – Second Edition, *ADOS* Autism Diagnostic Observation Schedule, *ns* not significant.

Total Score ($t(27) = -1.127$, $p = .270$, two tailed, 95% CI [-4.272, 1.243]), KBIT-2 Verbal IQ ($t(28) = .574$, $p = .571$, two tailed, 95% CI [-14.105, 25.087]), or measures of anxiety (LSAS, $t(25) = -.389$, $p = .701$, two tailed, 95% CI [-46.050, 31.419]; or SPIN, $t(26) = -$

.251, $p = .804$, two tailed, 95% CI [-20.082, 15.717]) at pre-test. Potential differences between cohorts were examined and no differences in a robust outcome measure were uncovered ($F(4, 22) = .292, p = .879$).

Omnibus MANOVA

In order to evaluate the large number of outcome measures, all dependent variables were entered into an omnibus Group (EXP versus WL) by Time (pre- versus post-intervention) repeated measures, multivariate analysis of covariance (MANCOVA). Age was evaluated and did not significantly impact results, thus it was dropped from further analysis. A repeated measures MANOVA was subsequently run. Results of the repeated measures MANOVA indicated that the main effect of Group was significant for the combined outcome variables, Wilks' Lambda = .461; $F(11, 35) = 3.715, p = .001$. The main effect of Time was also significant, Wilks' Lambda = .278; $F(11, 35) = 8.263, p = .001$. Both of these main effects were further qualified by a significant multivariate Group by Time interaction, Wilks' Lambda = .256; $F(11, 35) = 9.254, p = .001$. Table 4 shows the means, standard deviations, and p -values for the omnibus Group by Time interaction for the experimental measures. An intent-to-treat analysis (Wright & Sim, 2003) utilizing last observation carried forward imputation was subsequently run and no differences were uncovered at the multivariate or univariate level. Overall, our effect sizes were generally smaller than those observed in the Gantman et al. (2012) results at the ANOVA interaction-level.

Aim 1: Univariate ANOVAs and Simple Effects for the Replication

Further evaluation of the replication outcome measures at the univariate level using Group (EXP versus WL) by Time (pre- versus post-intervention) repeated measures analyses of variance (ANOVAs) revealed that four Aim 1 (Replication) measures reached significance, and one reached a marginal level of significance. Following these univariate interaction effects, *post hoc* simple effects tests at the univariate level were conducted using one-way repeated measures ANOVAs separately by group; *F*-values were corrected using the mean square error and degrees of freedom from the omnibus test.

Hypothesis 1: Social Skills and Social Responsiveness. Our first hypothesis was partially supported. We hypothesized that parents of the young adults in the EXP ASD group would report improved young adult social skills and social responsiveness on the SSIS-RS and SRS, versus parents of the young adults in the WL control ASD group. We found a significant Group by Time interaction at the univariate level for the SSIS-RS Competing Problem Behavior scale, $F(1, 45) = 11.952, p = .001, \text{partial } \eta^2 = .210$. Simple effects tests indicated that the EXP group demonstrated significant improvement in Competing Problem Behavior (SSIS-RS CPB) ($F(1, 45) = 9.57, p = .010, \text{partial } \eta^2 = .267$) while the WL group did not ($F(1, 45) = 3.17, p = .061, \text{partial } \eta^2 = .145$). Exploratory paired samples *t*-tests also indicated that the EXP group demonstrated significant improvement in Social Skills (SSIS-RS SS) ($t(22) = -3.088, p = .005$), while the WL group did not ($t(23) = -1.962, p = .062$); however, this was not significant at the multivariate level. Further, we found a significant Group by Time interaction at the univariate level on the SRS, $F(1, 45) = 7.651, p = .008, \text{partial } \eta^2 = .145$. Simple effects

tests indicated that the EXP group demonstrated significant improvement in social responsiveness (SRS) ($F(1, 45) = 12.70, p = .005, \text{partial } \eta^2 = .310$) while the WL group did not ($F(1, 45) = .005, p = .716, \text{partial } \eta^2 = .006$).

Hypothesis 2: Social Skills Knowledge. Our second hypothesis was supported. We hypothesized that the young adults in the EXP ASD group would demonstrate significant improvement in their understanding of PEERS® concepts on the TYASSK, versus young adults in the WL control ASD group. We found a significant Group by Time interaction at the univariate level for the TYASSK, $F(1, 45) = 92.010, p = .0001, \text{partial } \eta^2 = .672$. Simple effects tests indicated that the EXP group demonstrated significant improvement in social skills knowledge (TYASSK) ($F(1, 45) = 166.73, p = .001, \text{partial } \eta^2 = .853$) while the WL group did not ($F(1, 45) = .27, p = .541, \text{partial } \eta^2 = .016$).

Hypothesis 3: Empathy. Our third hypothesis was supported. We hypothesized that the young adults in the EXP ASD group would show significant improvement in their self-report of empathy on the EQ, versus young adults in the WL control ASD group. We found a significant Group by Time interaction at the univariate level for the EQ, $F(1, 45) = 6.960, p = .011, \text{partial } \eta^2 = .134$. Simple effects tests indicated that the EXP group demonstrated significant improvement in empathy (EQ) ($F(1, 45) = 6.17, p = .044, \text{partial } \eta^2 = .172$) while the WL group did not ($F(1, 45) = 1.52, p = .144, \text{partial } \eta^2 = .090$).

Table 4

Means and Standard Deviations for Group by Time Interaction of the Outcome Measures for Experimental and Waitlist Control Groups at Pre- and Post-test

	Group (<i>N</i> = 47)		<i>p</i>		
	Experimental (<i>n</i> = 23)			Waitlist control (<i>n</i> = 24)	
	Pre <i>M</i> (<i>SD</i>)	Post <i>M</i> (<i>SD</i>)		Pre <i>M</i> (<i>SD</i>)	Post <i>M</i> (<i>SD</i>)
<i>Young Adult</i>					
TYASSK	17.43 (2.67)	24.30 (2.95)	17.61 (3.47)	17.33 (3.66)	.001
QSQ-YA	2.04 (3.05)	3.22 (2.71)	1.94 (3.25)	1.63 (2.79)	.070
EQ	30.00 (9.58)	33.83 (11.99)	28.58 (7.43)	26.72 (7.74)	.011
SELSA-ER	57.96 (13.47)	56.43 (11.96)	56.22 (13.98)	57.69 (14.18)	.298
SELSA-FL	22.09 (8.55)	22.70 (9.69)	26.78 (16.15)	27.71 (15.64)	.878
SELSA-SL	43.43 (21.38)	43.57 (20.13)	57.60 (17.08)	51.69 (16.38)	.122
LSAS	55.45 (32.59)	48.70 (30.68)	69.41 (24.27)	67.14 (25.24)	.006*
SPIN	26.22 (16.27)	23.91 (15.46)	32.67 (14.57)	32.40 (14.67)	.283*
<i>Parent</i>					
SSIS-RS SS	114.09 (15.32)	124.17 (21.15)	110.42 (15.55)	114.86 (12.96)	.005*
SSIS-RS CPB	62.78 (13.15)	57.35 (12.61)	70.29 (9.21)	73.35 (10.06)	.001
SRS	94.57 (25.54)	80.17 (21.29)	106.58 (23.69)	107.83 (21.63)	.008

TYASSK = Test of Young Adult Social Skills Knowledge; QSQ-YA = Quality of Socialization Questionnaire, Young Adult; EQ = Empathy Quotient; SELSA-ER = Social and Emotional Loneliness Scale for Adults, Emotion/Romantic; SELSA-FL = Social and Emotional Loneliness Scale for Adults, Family Loneliness; SELSA-SL = Social and Emotional Loneliness Scale for Adults, Social Loneliness; LSAS = Liebowitz Social Anxiety Scale; SPIN = Social Phobia Inventory; SSIS-RS SS = Social Skills Improvement System, Revised Scales, Social Skills; SSIS-RS CPB = Social Skills Improvement System, Revised Scales, Competing Problem Behaviors; SRS = Social Responsiveness Scale; *p* = probability, Group by Time interaction *p* value; * = *p*-values obtained from exploratory univariate analyses.

Hypothesis 4: Loneliness. Our fourth hypothesis was not supported. We hypothesized that the young adults in the EXP ASD group would demonstrate significantly lower self-report of social and emotional loneliness over time on the SELSA, versus the young adults in the WL control ASD group. The SELSA showed no significant change for the EXP group for any of the three subscales.

Hypothesis 5: Direct Social Interaction. Our fifth hypothesis was not supported. We hypothesized that the young adults in the EXP ASD group would report a greater number of direct social interactions with peers over time on the QSQ-YA, versus the young adults in the WL control ASD group. The QSQ was not significant at the Group by Time interaction level, $F(1, 45) = 3.449, p = .070, \text{partial } \eta^2 = .071$. Simple effects tests indicated that the EXP group demonstrated improvement in quality of socialization (QSQ) ($F(1, 45) = 4.20, p = .077, \text{partial } \eta^2 = .135$) while the WL group did not ($F(1, 45) = .31, p = .533, \text{partial } \eta^2 = .017$), though this difference was not statistically significant.

Aim 2: Univariate ANOVAs and Simple Effects for the Extension

Hypothesis 6: Social Anxiety. Our sixth hypothesis was partially supported. We hypothesized that the young adults in the EXP ASD group would report lower levels of social phobia on the SPIN and lower social anxiety on the LSAS over time, versus the young adults in the WL control ASD group. Both Aim 2 (Extension) measures, namely the LSAS and the SPIN, failed to reach significance upon follow-up from the MANOVA at the Group by Time univariate level. However, observed power for these measures was found to be very low (.113 and .218, respectively). *A posteriori* power analyses were conducted with obtained power; results indicated a small effect size for both measures and over 800 participants would be needed for adequate power. Exploratory analyses

were conducted to investigate whether effects might be more robust using paired-samples *t*-tests separately by group, versus the more demanding multivariate model. Results from these univariate analyses revealed that the EXP group demonstrated significant improvement in social anxiety (LSAS) over time ($t(22) = 3.050, p = .006$) while the WL group did not ($t(23) = .766, p = .452$). Social phobia (SPIN) decreased in the EXP group over time, while the WL group showed no change; however, these differences were not statistically significant in the exploratory analyses.

Discussion

The current study sought to examine the impact of a friendship-development based social skills intervention for young adults with ASD. Although existing research has demonstrated the efficacy of this intervention (Gantman et al., 2012), and the developers have recently replicated their findings (Laugeson et al., 2015), this is, to our knowledge, the first independent replication outside of the site of development. Our results demonstrate further support for the efficacy of the *PEERS® for Young Adults* intervention, in that five out of eleven outcome measures showed significant improvement for the young adults in the experimental group.

The majority of the Aim 1, that is, the independent replication of the Gantman et al. (2012) study, hypotheses were supported and align with the results from that original study. First, this study found that the parents of the young adults in the experimental ASD group reported improvement in young adult social skills, specifically fewer problem behaviors and better social responsiveness. Second, young adults in the experimental ASD group demonstrated significant improvement in their understanding of *PEERS®* concepts. Taken together, these findings suggest not only a strong retention of the skills

taught, but also implies that these skills are important and relevant to young adults with ASD. Isolating and targeting social skills knowledge has been found to be an important component of successful treatment of young adults with ASD. Because individuals with ASD show a marked rigidity and limited understanding of the nuances of social interaction (Anckarsäter et al., 2006; Bowler, Gaigg, & Gardiner, 2008), the manner in which social skills are concretized in PEERS® is likely a strong predictor of success in gaining and utilizing social skills knowledge.

Third, individuals in the experimental ASD group significantly improved in their self-report of empathy. This implies that, through the development of social skills, young adults were able to gain further insight into the experiences of others, and thus, demonstrate improvements in empathy. These findings have strong implications for how the young adults interact with others in the real world after the intervention concludes. Because the PEERS® intervention emphasizes outside-of-session homework assignments with the intention of fostering generalization of the social skills learned in the intervention (Gantman et al., 2012), young adults are likely gaining a greater empathic understanding, both in and out of session. Gaining empathy, specifically perspective taking, or insight into what another person may be thinking or feeling, is a strong predictor of relationship satisfaction (Davis & Oathout, 1987). Empathy is considered a prosocial behavior, and as such is an important factor for obtaining and maintaining a job, as well as job satisfaction (McNeely & Meglino, 1994). Further, the development of empathy in adolescence has been found to predict overall social competence in young adulthood (Mathias, 2014), so targeting these behaviors as soon as possible in young adulthood may have important implications for later adulthood, as well.

Fourth, the young adults in the experimental ASD group reported a greater number of direct social interactions with peers over time, though this finding was only marginally significant. This implies, nonetheless, that young adults are having more encounters with peers, as evidenced by the number of hosted and invited get-togethers they reported. Based on the theory posited by Bellini (2006), individuals with ASD lack the necessary social skills to adequately interact in social situations with peers. This deficit then, often leads to anxiety, or a general uncertainty when in social situations, which in turn results in avoidance of such situations. Although not all young adults in our sample exhibited high levels of social anxiety at pre-test, many did (10 individuals in the EXP group exhibited social anxiety as probable to very probable [score of 60 or higher], via the LSAS; 9 individuals in the EXP group exhibited social phobia in the range of moderate to very severe, via the SPIN [score of 31 or higher]). Results that direct social interaction generally increased, albeit not to a statistically significant level, has strong implications that these young adults developed and are implementing the necessary social skills to engage with peers. This, in turn, may function to break the cycle of social skills deficits, anxiety, and avoidance, as evidenced by decreased avoidance.

In contrast to the original study, the current study did not uncover a significant change in self-report of social and emotional loneliness over time among the young adults in the experimental group. This was thought to be due to potential cohort differences amongst this sample compared with that of the Gantman et al. (2012) study. Potential differences were therefore examined and the findings are described here. First, the present sample did not have comparable levels of social and emotional loneliness at pre-test as in the original study (Gantman et al. (2012) SELSA total means/SDs at pre-

test: EXP, 132.6 (33.7); WL, 133.2 (30.2); Present study at pre-test: EXP, 123.48 (33.05); WL, 140.60 (39.46)), specifically, our experimental group exhibited lower levels of loneliness than that of the Gantman et al. (2012) group. This may have limited the amount of improvement participants in that group were able to make. Second, the present sample was found to show a smaller decline in loneliness than the original sample (Gantman et al. (2012) SELSA difference scores from pre- to post-test: EXP, -12.67; WL, 4.50; Present study: EXP, -0.78; WL, -3.5). Finally, the present sample may not have been as competent at reporting their experiences of loneliness as the original sample, however we were unable to directly examine these differences.

Although our replication findings are predominantly in accordance with the Gantman et al. (2012) study, our data showed smaller effect sizes than the original study for all measures except the SSIS-SS. The original study showed large effect sizes for all measures. The majority of our data, on the other hand, demonstrated between small and medium effect sizes. There are several potential explanations for these differences. First, we utilized a repeated measures MANOVA, rather than a one-way MANOVA with difference scores used in the Gantman et al. (2012). Second, we predominantly used total scores for our assessments, rather than total and subscale scores, as done in the original study. Finally, given that this was a trial outside of the site of development, smaller effect sizes might be expected since the present study represents a more stringent test of the efficacy of the intervention.

Aim 2 proposed to extend the original Gantman et al. (2012) study by examining changes in social anxiety and social phobia in the young adults with ASD in PEERS®. In exploratory analyses, results indicated a significant decrease in self-report of social

anxiety from pre- to post-intervention among the young adults with ASD in the experimental group. Although the results for level of social phobia did not reach traditional levels of significance, the current study also uncovered a decrease in self-report of these symptoms over time in the experimental group. These results indicate that the *PEERS® for Young Adults* intervention may improve symptoms of anxiety, specifically social anxiety. The mechanism through which this decrease in social anxiety occurs may be due to a number of factors within the intervention. First, it is possible that the development of social skills, as discussed above, functions to break the cycle of fear and avoidance of social interaction, as posited by Bellini (2006). Second, it is possible that the in-session component of the intervention, including exposure to and direct interaction with same-aged peers, may function similarly to an exposure-based treatment of the disorder, which, when combined with cognitive therapy, is considered an efficacious treatment for social anxiety (Norton & Price, 2007). Third, young adults with ASD engaged in behavioral rehearsals in-session, both with trained social coaches and other group members, all of whom were same-aged. These behavioral rehearsals were observed and commented upon by PEERS® group leaders, social coaches, and other in-session peers. Engaging in these, likely stressful, *in vivo* interactions on a weekly basis may have contributed to an exposure effect. Further, receiving immediate and direct feedback on appropriate and inappropriate behaviors likely functioned to shape appropriate social behavior in a manner that felt safe, further lowering anxious responses. Finally, a core component of the PEERS® intervention was weekly homework assignments wherein young adults practiced newly learned social skills with peers outside of session. This has strong implications for generalization of the social skills, and

offered yet another opportunity for exposure to same-aged peers, which likely became more comfortable both because of the young adult's confidence in practiced and efficacious social skills and, over time, as they faced the fearful social stimulus in the real world.

In addition to the above, because this study was conducted using clinical psychology graduate student leaders, nonspecific factors may have played a role. Nonspecific therapy factors include components of the client-therapist relationship and have been found to account for a significant portion (about 40%) of the variance in psychotherapy outcomes (Wampold et al., 2011). Although the present study did not examine these factors, future work examining the dissemination of PEERS® into other settings where leaders have various training backgrounds, such as in a school setting (Laugeson, 2015) may provide some insight into the role of these factors.

In sum, the findings of the present study provide further support for the efficacy of the *PEERS® for Young Adults* intervention at improving social skills behavior, social responsiveness, social skills knowledge, empathy, and social anxiety among young adults with ASD. This has important implications, especially because there are so few efficacious options for young adults with ASD to develop these crucial skills (Palmen et al., 2012). The PEERS® intervention overcomes many of the limitations of other young adult social skills interventions, in that it utilizes well-established techniques for efficaciously teaching social skills to individuals with ASD, that is: tailoring the material to the learning style in ASD; utilizing multimodal, evidence-based instruction strategies; and practicing of newly learned skills outside of the intervention environment (Gantman et al., 2012).

The *PEERS® for Young Adults* intervention, admittedly, does not address all social skills that are necessary for independent functioning. Not included in the intervention are skills for life circumstances that inherently rely on social interactions. Such skills include: job obtainment (including interviewing) or maintenance (though some PEERS® skills, such as handling disagreements, may translate to the workplace), nor general adaptive functioning skills such as making purchases, navigating public transit, or making appointments, the latter of which have been demonstrated to be especially important for long-term positive outcomes (Farley et al., 2009). However, young adults with ASD who receive the PEERS® intervention may be better primed to learn such skills than those who do not, as they may experience greater self-efficacy in social situations, and may be able to build on the foundational social interaction knowledge provided by PEERS®.

Young adults with ASD who do not receive the PEERS® intervention are likely to continue to be reliant on their parents or caregivers for long-term support (Howlin et al., 2004), to experience increased mental health issues such as anxiety, depression, and loneliness (Barnhill, 2007; White & Roberson-Nay, 2009), and to lack friendships or other social supports (Eaves & Ho, 2008).

This is the first known independent replication of these results, and as such, the present findings provide evidence to the successful translation of the *PEERS® for Young Adults* content outside of the site of development. This has important implications for the accessibility of this efficacious intervention. Few resources are needed to effectively conduct the intervention, and as such it shows exceptional promise for general use. The

PEERS® for Young Adults intervention should be implemented whenever possible to promote positive outcomes for this underserved population of young adults with ASD.

Limitations and Future Directions

One major limitation of the present study was the lack of diversity within the sample. The sample studied here was comprised of primarily male young adults who were Caucasian. In order to generalize research findings more broadly, future studies should seek to enroll a more diverse participant sample. A second limitation to the current study was the lack of third-party observation of changes in behavior for the young adults. Future studies could employ the use of a third party reporter such as a teacher or other relative of the young adult, a blinded third party graduate student who did not serve as a group leader, or video recordings to facilitate a blinded coding of young adult behavior from pre- to post-intervention, or at various time-points throughout the intervention. This could provide further insight into the behavioral changes that have been reported at post-intervention, both in terms of social skills behaviors, but also to measure levels of anxiety. Another option for observing possible behavioral changes may be with the use of electrophysiological instruments such as galvanic skin response, heart rate, and electroencephalogram. The use of such measures could provide further insight into biological changes, which may be more reliable than self- and parent-report. A third limitation was the use of only self-report questionnaires to examine anxiety. Although anxiety, as an internalizing disorder, may be difficult for parents/caregivers to accurately assess, especially as children get older (Achenbach, McConaughy, & Howell, 1987), assessing anxiety via parent report may be useful. Research suggests that individuals with ASD may lack the necessary insight to appropriately report their symptoms of anxiety

(Baron-Cohen, Leslie, & Frith, 1985; Capps, Yirmiya, & Sigman, 1992; Gillott, Furniss, & Walter, 2001), furthering the importance of gaining parent report of symptoms.

Obtaining report from both parent and young adult would be pertinent, as parent- and self- report of internalizing symptoms may not always demonstrate ideal agreement (Achenbach et al., 1987; Stanger & Lewis, 1993). Utilizing an interview format would also likely improve the sensitivity and specificity of changes in anxiety symptoms over the course of the intervention. Furthermore, anxiety among individuals with ASD may differ from typically developing individuals (Hadwin, Howlin, Baron-Cohen, Rutter, & Lewis, 1998; Kerns & Kendall, 2012). Thus, future studies should employ a more rigorous evaluation of anxiety symptoms, perhaps by conducting a parent-report interview, in particular the Anxiety Disorders Interview Schedule, Adult (Brown, Barlow, & Di Nardo, 1994) in conjunction with the ADIS Addendum for ASD that is currently in development (Kerns et al., 2014). A fourth limitation to the current study is the lack of a longer-term follow-up. Future studies should utilize a six- or twelve-month follow up to elicit further evaluation of the long-term efficaciousness of the *PEERS® for Young Adults* intervention.

In conclusion, our findings demonstrate strong support for the *PEERS® for Young Adults* social skills intervention as a viable tool for improving deficits common to young adults with ASD.

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