

A Replication and Extension of the PEERS Intervention: Examining Effects on Social Skills and Social Anxiety in Adolescents with Autism Spectrum Disorders

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Abstract This study aimed to evaluate the Program for the Education and Enrichment of Relational Skills (PEERS; Laugeson et al. in *J Autism Dev Disord* 39(4):596–606, 2009). PEERS focuses on improving friendship quality and social skills among adolescents with higher-functioning ASD. 58 participants aged 11–16 years-old were randomly assigned to either an immediate treatment or waitlist comparison group. Results revealed, in comparison to the waitlist group, that the experimental treatment group significantly improved their knowledge of PEERS concepts and friendship skills, increased in their amount of get-togethers, and decreased in their levels of social anxiety, core autistic symptoms, and problem behaviors from pre- to post-PEERS. This study provides the first independent replication and extension of the empirically-supported PEERS social skills intervention for adolescents with ASD.

Keywords Autism · Asperger's disorder · ASD · Adolescence · PEERS · Intervention · Social skills · Social anxiety · Friendships

Introduction

The number of youth diagnosed with Autism Spectrum Disorder (ASD) has increased dramatically over the past decade and currently affects approximately 1 in 88 children in the U.S. (Centers for Disease Control and Prevention 2012). It has also been suggested by empirical and clinical

evidence that those with Asperger's Syndrome (AS) or High Functioning Autism (HFA), terms which are often used interchangeably, may be the fastest growing segment of the autism population (Rao et al. 2008).

ASD symptoms are pervasive and vary greatly in severity. In general, those with ASD have numerous domains affected, including social and behavioral functioning and language development. They are also distinguished by the presence of a variety of circumscribed interests and stereotyped, repetitive behaviors. While those with AS/HFA usually function within the typical range with regard to language and intelligence, they display impairments in social skills, which is the hallmark feature of AS/HFA (Mitchell et al. 2010).

These marked social deficits are problematic, especially during adolescence, when the demands of peer relationships and social network affiliations become heightened (Mitchell et al. 2010). In addition to these challenges of adolescence, those with AS/HFA are typically self-conscious of their differences in social functioning, and indicate that they experience stronger feelings of loneliness and poorer quality friendships than their typically developing peers (Bauminger and Kasari 2000). As a result, a significant number of adolescents with AS/HFA are at an increased risk for a variety of secondary psychopathology, such as depression and anxiety, in addition to other negative outcomes both in adolescence and adulthood, including isolation, rejection, teasing, bullying, low self-esteem, school dropout, and unemployment (Mitchell et al. 2010).

Unfortunately, there have been very few interventions developed that have focused on improving social adaptation among adolescents with AS/HFA. In response to this need, the Program for the Education and Enrichment of Relational Skills (PEERS) intervention was recently developed, in order to teach adolescents with AS/HFA the skills necessary

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to make and keep friends (Laugeson et al. 2009). Although the intervention has demonstrated positive gains in skills and social contacts for adolescents with ASD who complete the program (Laugeson et al. 2009, 2012), PEERS has not yet been replicated outside of its site of development.

Intervention replication is critical, particularly replication by an independent investigatory team. The requirement of replication helps to protect from drawing erroneous conclusions based on one aberrant finding. Replication by an independent team of investigators also provides some protection against investigator bias or reliance on findings that prove unique to a particular setting, specific characteristics of local samples, health care settings, or group of therapists. Further, replication of randomized clinical trial interventions, at different sites, with different samples, increases the validity and generalizability of data as compared to the data gathered at a single site. Replication of intervention effects in different settings is necessary for an intervention model to be considered as well established (Chambless et al. 1998). Moreover, replication of interventions promotes clinical utility and helps facilitate the dissemination of evidence-based interventions (Drotar 2006). Only when a treatment has been found efficacious in at least two studies by independent research teams do some researchers consider its efficacy to have been established and label it an efficacious treatment (Chambless et al. 1998). Although replication is crucial, it has not been widely practiced in relation to social skills for individuals with ASD. According to a recent Cochrane Review, which investigated current social skills interventions for people ages 6–21 years with ASD, there were no replicated findings reported (Reichow et al. 2012).

This paper will first review core deficits in adolescents with ASD, social anxiety, associated challenges of adolescence, and validated interventions for this developmental period. Then, the current study, which examines whether social skills and social anxiety in adolescents with AS/HFA change due to a Randomized Controlled Trial (RCT) and replication of the PEERS intervention (Laugeson and Frankel 2010), is presented.

Core Deficits in Adolescents with AS/HFA and Associated Challenges

Adolescents with AS/HFA have significant difficulties with their social behavior. These deficits might include inadequate use of eye contact, problems initiating social interactions, and difficulty interpreting both verbal and nonverbal social cues such as tone of voice, facial expression, gesture, gaze, and posture (Weiss and Harris 2001). Those with AS/HFA often have problems with pragmatics, which refers to the ability to use language to communicate effectively in social situations. For example, they display problems in

understanding irony, jokes, lies, deception, or bullying (Grynszpan et al. 2011). Individuals with AS/HFA also experience difficulty with the social rules of conversation, such as taking turns, providing enough information to be clear without being verbose, and selecting information that is relevant to the topic at hand (Krasny et al. 2003).

These initial core deficits displayed in social situations can be exacerbated during adolescence, which is a time when identification with a peer group is common. Further, adolescence can be a distressing phase of life for many adolescents with AS/HFA due to their difficulty engaging socially with peers. Because adolescents with AS/HFA typically have normal to high intelligence and thus greater capacity for insight, they are often painfully aware of the difficulties they experience when interacting with peers (Grynszpan et al. 2011). In a research study, youth with AS/HFA rated themselves on average more than one standard deviation below the mean of typically developing children on social skills, such as joining groups, demonstrating social competence, and developing close friendships (Rao et al. 2008). These findings suggest that adolescents with AS/HFA are, in fact, cognizant of their social inabilities.

In addition to the increased awareness adolescents with AS/HFA may possess, adolescence is a time when “fitting in” with one’s classmates is of prime importance. Since the majority of today’s youth with AS/HFA are placed in regular education classrooms as opposed to special needs classrooms (Sofronoff et al. 2010), presenting with social incompetence may lead to the opposite of “fitting in.” Despite the finding that regular education placement leads to increases in the complexity of interactions and decreases in nonsocial activity, adolescents with AS/HFA often report feeling lonelier and having poorer quality friendships than their typically developing peers (Bauminger and Kasari 2000). It has been suggested that having one or two best friends is of great importance to later adjustment. Specifically, having friends buffers the impact of stressful life events, correlates positively with self-esteem, and correlates negatively with anxious and depressive symptoms (Buhrmester 1990). Unfortunately, these benefits are not possible for many adolescents with AS/HFA, as it has been found that nearly 50 % of adolescents with ASD do not have a friend (Howlin 2000).

Unfortunately, the idea that those with AS/HFA will simply “outgrow” their social skill deficits after adolescence is not supported by research. Instead, these difficulties persist into adulthood, where they continue to negatively impact social and occupational functioning. It has been found that adults with AS/HFA are more likely than the general population to be unemployed or underemployed, as well as less likely to have satisfying social relationships and community connections (Rao et al. 2008). As this research demonstrates, understanding and being

connected to the social world is essential for those with AS/HFA to function properly and gain autonomy.

Social Anxiety in Adolescents with AS/HFA

In addition to displaying social skill deficits and dealing with the heightened social demands of adolescence, adolescents with AS/HFA may also present with anxiety, especially during social situations. Anxiety-related concerns are among the most common presenting problems for school-age children and adolescents with ASD, as 11–84 % experience some degree of impairing anxiety (White et al. 2010). Furthermore, research indicates that anxiety may be somewhat universally comorbid with ASD. There is evidence to suggest that anxiety difficulties occur more frequently in ASD populations, as compared to children with severe mental retardation, epilepsy, conduct disorder, and children who have a language disorder (Chalfant et al. 2007).

Regarding social anxiety in particular, those with AS/HFA report significantly more social anxiety symptoms than their typically developing peers, and these symptoms increase as they get older, in contrast to the decreasing pattern of anxiety symptoms often displayed in typically developing adolescents (Sebastian et al. 2009). Moreover, one research study found that from a sample of 41 high-functioning adolescents with AS/HFA, 49 % of the sample scored above the clinically significant level of social anxiety on a self-report measure (Bellini 2004).

There are different theories as to why social anxiety is so common among the AS/HFA population. Most of the theories, however, are encompassed in Bellini's (2006) developmental pathway to social anxiety. According to Bellini, there is a feedback loop between physiological arousal, social anxiety, and social interaction. The pathway begins with the notion that individuals with AS/HFA present with a temperament that is marked by a high degree of physiological arousal. This physiological arousal may make it more likely that the individual will become overwhelmed by interactions with others and avoid later social interactions. This social withdrawal then limits the opportunity for the individual to develop and practice effective social skills by reducing interactions with peers. The impairment in social skill functioning then significantly increases the chances for negative peer interactions and social failure. To complete the pathway, the presence of physiological hyperarousal makes it more likely that the individual will be adversely conditioned by these negative social experiences, thus leading to increased social anxiety. To intensify the problem, the presence of social anxiety may lead to further social withdrawal, thus beginning the cycle again (Bellini 2006). Thus, it is critical that interventions be implemented in order to break this cycle of social anxiety.

Social Skills Interventions for Adolescents with AS/HFA

Interventions that aim to improve social skills are essential for individuals with AS/HFA. Given the pervasive impact and long-term nature of social skill deficits in AS/HFA, social skills training programs aimed at adolescents may prevent or at least lessen subsequent social dysfunction (Goldstein and McGinnis 2000). Although there have been a minimal number of interventions developed and implemented for adolescents with AS/HFA, there are a few programs that prove important and should be mentioned.

Ozonoff and Miller (1995) developed a 14-week social skills intervention, which focused on teaching adolescents basic interactional and conversational skills and how to infer the mental states of others, otherwise called Theory of Mind (ToM). The participants included five high-functioning adolescent boys with ASD. Post-treatment ratings completed by adolescents' parents and teachers, however, suggested that there were no improvements of adolescents' social competence skills or adolescents' generalization of skills to other settings. Tse et al. (2007) conducted a social skills intervention for 46, 13–18-year-old adolescents for 12 weekly sessions. Many of the exercises used to teach new skills were adapted from the book, *Skillstreaming the Adolescent* (Goldstein and McGinnis 2000). There was no control group utilized, although they did find that parent report measures showed gains in adolescent social competence and decreases in problem behaviors following the intervention. Another study (Mitchell et al. 2010) focused on the generalization effects of a group social skills training program with parent training for three adolescents with AS/HFA. The social skills curriculum was adapted from "Navigating the Social World" (McAfee 2002) and included topics such as privacy circles, offering and asking for help, giving and receiving compliments, resolving conflicts, and basic rules for initiating conversations. This study was limited, as it had a very small sample size, however, the utilization of parent sessions and focus on generalization of skills are two vital components that were incorporated (Mitchell et al. 2010).

The majority of programs reviewed here reported null findings for generalization and flexible use of the skills in the naturalistic setting (White et al. 2007). Fortunately, one new social skills treatment directly addresses the problems with generalization of social skills into naturalistic settings.

PEERS

The Program for the Education and Enrichment of Relational Skills (PEERS: Laugeson et al. 2009) incorporates and builds upon many of the elements integral for social skills teaching success. PEERS content, as well as the lesson

format, was adapted from Children's Friendship Training (CFT), an evidence-based parent-assisted social skills curriculum (Frankel and Myatt 2003). The PEERS intervention modified the curriculum and methods of instruction, and added new modules, in order to be more applicable for adolescents with AS/HFA (Laugeson et al. 2009).

The most important aspects of the PEERS intervention are that it is empirically supported, is based on a large sample (compared to prior studies), and is a manualized treatment, which promotes replication. There are three other critical features of this intervention that should be mentioned, as each adds to the distinctiveness of the PEERS program.

First, teaching of social skills is conducted in a small group format, as this allows for a more personal experience for the adolescents. PEERS also utilizes many evidence-based strategies for teaching social skills to adolescents with AS/HFA, which include brief didactic instruction, role-playing, modeling, behavioral rehearsal, coaching with performance feedback, and weekly socialization assignments with consistent homework review (Gresham et al. 2001; Laugeson et al. 2009).

Second, PEERS allows the parents of the adolescent participants to play an integral part in the treatment process, as parents are required to engage in separate, concomitant sessions. Many previous programs have not incorporated parents into the treatment process. Research, however, suggests that parents can have a profound impact on their child's friendships (Frankel and Myatt 2003). This may be through direct instruction, modeling appropriate social behavior, and supervision. By supporting their child's development of an appropriate peer network, learning to act as social coaches, and encouraging them to engage in social situations despite their struggles, parents can be critical components of their adolescents' social development and retention of newly learned skills once the program has ended (Frankel and Myatt 2003; Laugeson et al. 2009).

Third, PEERS focuses on teaching rules of social etiquette through the identification of common social situations using accompanying concrete rules and steps of appropriate social etiquette. This style of learning complements those with AS/HFA, as they thrive on structure and concrete presentation of information (Carnahan et al. 2009). Skills covered in PEERS include conversational skills, peer entry and exiting skills, expanding and developing friendship networks, how to handle teasing, bullying, and arguments with peers, practicing good sportsmanship, changing bad reputations, and good host behavior during get-togethers (Laugeson et al. 2009) (see Table 1).

The PEERS program was empirically supported with 33 adolescents, ages 13–17 years with AS/HFA (Laugeson et al. 2009). Results revealed that in comparison with the waitlist control group, the treatment group significantly

Table 1 PEERS sessions and associated content

Session	Didactic
1	Introduction and conversational skills I: trading information
2	Conversational skills II: Two-way conversations
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
9	Good sportsmanship
10	Rejection I: teasing and embarrassing feedback
11	Rejection II: bullying and bad reputations
12	Handling disagreements
13	Rumors and gossip
14	Graduation and termination

improved their knowledge of social skills, increased frequency of hosted get-togethers, and improved overall social skills as reported by parents. Moreover, in two long term follow-up studies of the PEERS participants, researchers found that the improvements made from baseline to post-intervention were maintained at 14-weeks post-intervention and between 1 to 5 years after treatment (respectively, Laugeson et al. 2012; Mandelberg et al. 2011). Although PEERS has shown evidence of success in both the short and long term (Laugeson et al. 2009, 2012; Mandelberg et al. 2011), it has not been replicated outside of its site of development.

Aims of the Current Study

Thus, the current study was an independent replication and extension of the PEERS intervention in order to evaluate the effectiveness of the program for improving social skills and social anxiety. This PEERS extension was distinctive from the first PEERS trial (Laugeson et al. 2009) in several ways. First, it addressed and resolved one of the shortcomings of the first implementation of PEERS, as it used more “gold-standard” diagnostic screening. Second, another shortcoming of the first study was the low teacher measure return rate, which was improved upon in this study. Third, this study was conducted within a medium-sized Midwestern city, potentially resulting in a different demographic than the Los Angeles, California, location where the first PEERS study was conducted, and which provided an opportunity for independent replication. Lastly, this study investigated the effect PEERS may have on social anxiety with the addition of an adolescent self-report measure. These questions were

addressed utilizing a randomized controlled trial (RCT) design.

First, it was hypothesized that adolescents in PEERS would show evidence of PEERS' efficacy, by gaining knowledge of PEERS concepts and friendship skills, increasing in their amount of get-togethers, and having better quality friendships. Secondly, it was hypothesized that adolescents in PEERS would decrease in their levels of social anxiety. Thirdly, it was hypothesized that adolescents in PEERS would significantly decrease in their levels of autistic symptoms per parent and teacher report. Lastly, it was hypothesized that adolescents in PEERS would significantly decrease in their problem behaviors and increase in their social skills per parent and teacher report.

Methods

Participants

There were 58 adolescents between 11 and 16 years of age with ASD who participated in and completed this study with their parents. All participants had a previous and current diagnosis of ASD. 47 participants were male and 11 were female. The average age of participants was 13.65-years-old ($SD = 1.50$). 52 of the participants identified themselves as Caucasian; 3 as African American; 1 as Asian; and 2 chose not to communicate this information (see Table 2, Demographics; see Fig. 1, Consort diagram, for details by group assignment).

Procedure

Recruitment and Eligibility

Participants were recruited from local intervention agencies, autism support groups, and an in-house waiting list for PEERS treatment, over a period of 2 years. Relationships were established with local organizations, and permission from the Institutional Review Board (IRB) was gained to advertise at these sites. Families were provided with an informational letter, which included a phone number and email address for the study. Interested families were then contacted by a graduate research assistant in order to conduct a phone screening. Phone screenings consisted of telling the family about the program, gauging if the adolescent met the inclusion criteria (see below), and gaining a sense of the adolescent's interest in participating in the program. If the family passed the phone screening, then the graduate research assistant scheduled an approximately 2.5 h-long intake with the family.

Inclusion criteria for adolescents were: (a) chronological age between 11 and 16 years; (b) social problems as reported

Table 2 Means and SD for demographic variables for experimental treatment and waitlist control groups

	Group ($n = 58$)		<i>p</i>
	Experimental ($n = 29$) Pre <i>M</i> (<i>SD</i>)	Waitlist control ($n = 29$) Pre <i>M</i> (<i>SD</i>)	
Age (years)	14.00 (1.28)	13.31 (1.65)	ns
Gender (% male)	82.8	79.3	ns
Race (% Caucasian)	96.3	89.7	ns
Income (%)			ns
Under 25 K	3.6	7.4	
25–50 K	14.3	14.8	
50–75 K	32.1	14.8	
75–100 K	14.3	11.1	
Over 100 K	35.7	51.9	
Parent education (%)— primary caregiver			ns
High school	3.4	6.9	
Some college	17.2	3.4	
B.A./B.S.	51.7	58.6	
M.A./M.S.	17.2	6.9	
Ph.D/M.D./J.D.	3.4	10.3	
KBIT-2 Verbal IQ	102.17 (16.16)	98.45 (15.85)	ns
ADOS Total Score	10.90 (3.46)	10.97 (3.25)	ns
School type (% public school)	82.8	89.7	ns
Medication (% current usage)	62.1	65.5	ns
Vineland-communication	74.86 (11.70)	79.77 (11.67)	ns
Vineland-socialization	70.14 (11.70)	73.58 (15.81)	ns
Vineland-composite	72.71 (14.04)	79.42 (11.84)	ns

The following measures had different *n*-values: Experimental Vineland-communication ($n = 29$); Waitlist Vineland-communication ($n = 27$); Experimental Vineland-socialization ($n = 29$); Waitlist Vineland-socialization ($n = 26$); Experimental Vineland-composite ($n = 28$); Waitlist Vineland-composite ($n = 26$); Income experimental ($n = 28$); Income waitlist ($n = 27$)

KBIT-2 Kaufman Brief Intelligence Test-Second Edition, ADOS Autism Diagnostic Observation Schedule, *ns* nonsignificant

by the parent; (c) English fluency for the adolescent; (d) parent or family member was a fluent English speaker and was willing to participate in the study; (e) no history of adolescent major mental illness, such as bipolar disorder, schizophrenia, or psychosis; (f) no history of hearing, visual, or physical impairments which precluded the adolescent from participating in PEERS activities; (g) a previous and current diagnosis of either HFA, AS, or Pervasive Developmental Disorder—NOS, with current as assessed via the Autism Diagnostic Observation Schedule (ADOS: Lord

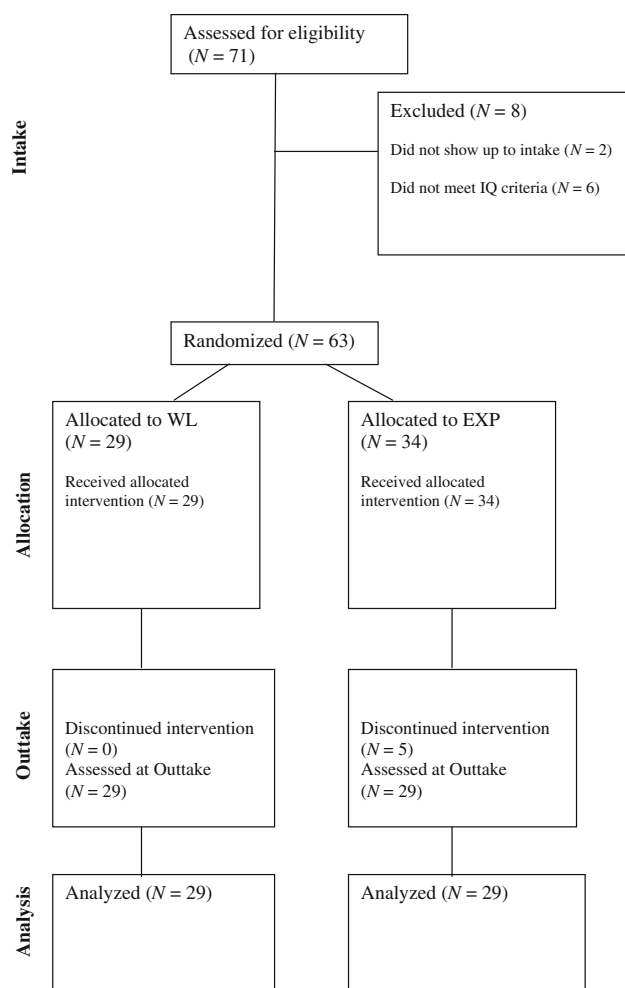


Fig. 1 CONSORT recruitment diagram

et al. 2001); and (h) a adolescent verbal IQ of 70 or above assessed via the Kaufman Brief Intelligence Test-Second Edition (Kaufman and Kaufman 2005; Laugeson et al. 2009). In order to gauge the adolescents' motivation for participating in the intervention, the study only included adolescents who verbally expressed an interest in learning how to make and keep friends. Further, adolescents completed a screening questionnaire in which they were asked explicitly if they were interested in the group (Adolescent Mental Status Checklist: Laugeson and Frankel 2010). Adolescents who came to the intake visit and did not meet inclusion criteria were compensated with a \$30 gift card. Adolescents who met criteria were provided with a \$30 incentive prize at the completion of PEERS. PEERS intervention was provided free of charge to families.

Participant Assignment and Data Collection

Prior to the intake, eligible participants were randomly assigned to one of two conditions, either the experimental

treatment group (EXP) or the waitlist control group (WL). EXP families completed the intake and entered a PEERS group immediately, after which they completed the outtake appointment. WL families completed the intake, did not enter PEERS, and completed the outtake appointment approximately 13 weeks later. WL families then entered the next available PEERS group, no more than 14 weeks later. Pre- and post-assessments were compared at week 1 and week 14 for both groups. This design allowed an examination of differences between these two groups over a 14-week period, in which the EXP group received the intervention, while the WL group had not yet received the intervention. PEERS group sizes were maintained at 10 or fewer adolescents, and consisted entirely of either EXP or WL families (i.e., EXP families did not participate in intervention groups containing WL families).

There were two events of the data collection process, including (1) the intake that occurred before PEERS treatment and (2) the outtake that occurred after PEERS treatment (EXP) or after the 14-week delay (WL). At the intake visit, written informed consent and assent were obtained, adolescent interest was confirmed via the Mental Status Checklist (Laugeson and Frankel 2010), adolescent language skill, ASD diagnosis, and IQ were confirmed, and research measures were completed (see “Measures”, below). Adolescents and parents completed the measures in the presence of the research team, while teachers were given the measures by the adolescent or parent in order to complete and mail back to the research team. Teachers were blind to the condition assigned to the subject. Once the PEERS intervention was complete, the outtake was scheduled. During the outtake, all of the same measures, excluding the diagnostic test, cognitive test, and interest checklist, were conducted.

Treatment

The PEERS intervention consisted of 90-min sessions, delivered once a week, over the course of 14-weeks. PEERS was provided in either a fall (August–December) or spring (January–May) session. Treatment followed the commercially-available PEERS manual (Laugeson and Frankel 2010). Parents and adolescents attended separate, concurrent sessions where they learned how to make and maintain friends and implement the rules taught. Prior to study initiation, one of the study authors (Van Hecke) attended an official PEERS training workshop in Los Angeles, CA, and was certified in providing PEERS. She then returned to the site of the current study and trained graduate students in a clinical psychology Ph.D. program to assist with and co-lead the PEERS adolescent and caregiver groups, and undergraduate students to serve as coaches/assistants for the PEERS groups. All graduate students had extensive experience in research, diagnostic,

and clinical practice in ASD, and all adolescent group leaders had at least a Master's degree in clinical psychology and had completed formal coursework in general aspects of group therapy. There were five graduate students involved in the study as group leaders, with three students leading the adolescent groups included in this analysis. Adolescent and parent graduate group leaders received training via observing the certified author (Van Hecke) conducting sessions. The certified author conducted the first adolescent group, in order for the first, most senior graduate student to train with her. The senior graduate student then led an adolescent group in the next cohort, with the next most senior graduate student training with her, and another graduate student co-leading the parent group with the certified author. This pattern was repeated, such that group leaders typically co-led a parent group first. Then, they co-led an adolescent group with a more experienced interventionist or the certified interventionist. In subsequent cohorts, they were then allowed to lead an adolescent group independently. When leading teen sessions independently, leaders and the certified author reviewed video of their own sessions with her and received feedback and supervision weekly. During each semester, the certified author observed the adolescent group's first, midpoint, and final sessions in order to check treatment provision accuracy.

Undergraduate research assistants acted as "coaches" in the adolescent sessions with at least one coach in each session. Coaches helped with role-play activities, behavioral rehearsal, and behavioral management. These coaches were undergraduate students in psychology and health sciences and were trained in all aspects of the PEERS intervention. Undergraduates also monitored the treatment protocol for adherence in the adolescent sessions through completion of weekly fidelity check sheets covering all elements of the intervention. Their role was to view the session outline and follow along with the group leader. Further, if the group leader missed a main point of the session, the research assistant would politely interrupt the leader and remind them to discuss a missed point.

The PEERS adolescent group always began with a homework review of the assignment from the previous week. Adolescents were then taught specific social skills for the week. Regarding the adolescent group's didactic lessons, they were enhanced by demonstrations in which the group leaders modeled the appropriate social skill being taught through role-play exercises. The newly learned skills and rules for that week were then rehearsed by the adolescents in the session, while receiving feedback from the group leader and coaches.

In the parent session, time was devoted to troubleshooting any problems that may have occurred due to the incompleteness of homework. Next, a didactic lesson, which

was outlined in a handout given in the parent group, was conducted (see Table 1). Parents were given instruction on ways in which they could help their adolescent overcome hindrances to weekly socialization homework assignments.

At the end of group, either parent or adolescent, homework was assigned for the coming week, allowing time to troubleshoot potential obstacles to homework completion. Multiple homework assignments were given on a weekly basis, and typically corresponded to the current didactic lesson. The sessions concluded with parents and adolescents reuniting in the same room, where the adolescents provided a brief review of the lesson for parents, and homework assignments were finalized. In order to minimize parent-adolescent conflict during the completion of these assignments, the level of parental involvement as well as adolescent refusal to do the homework was individually negotiated at the end of the session with the help of group leaders (Laugeson et al. 2009). Homework compliance was strongly enforced, and failure to attempt more than two homework assignments resulted in dismissal from the group. In addition, families were allowed two absences to sessions, and, if exceeded, families were dismissed from the group.

Measures

Descriptive Measures

At the intake visit, caregivers were asked to complete a demographic questionnaire and a questionnaire concerning their adolescent's health and medication status. Diagnoses were confirmed using the Autism Diagnostic Observation Schedule Modules 3 and 4 (ADOS-G; Lord et al. 1999), given by examiners trained to research-level reliability. Adolescents' cognitive abilities were assessed via the Kaufman Brief Intelligence Test-Second Edition (Kaufman and Kaufman 2005).

Kaufman Brief Intelligence Test-Second Edition

Adolescent verbal intellectual functioning was assessed using the verbal subscale of the Kaufman Brief Intelligence Test-Second Edition (KBIT-2; Kaufman and Kaufman 2005), which takes approximately 25 min to administer. Normative data is available and expressed as standard scores with a mean of 100 and a standard deviation of 15. The KBIT-2 demonstrates good psychometric estimates, including an internal reliability for the IQ composite of 0.93, a test-retest reliability range of 0.88–0.89, and a standard error of the measurement of 4.3 points (Kaufman and Kaufman 2005). The KBIT-2 has also been shown to be comparable to the Wechsler Intelligence Scale for Children-fourth edition (WISC-IV), in terms of acceptable

correlations with the WISC-IV for diverse populations (Walters and Weaver 2003).

Autism Diagnostic Observation Schedule-Generic

The Autism Diagnostic Observation Schedule-Generic (ADOS-G; Lord et al. 1999), Modules 3 or 4, is a structured, interview-based observational assessment conducted with the adolescent. The adolescent is presented with activities and questions which aim to elicit communicative and social behaviors that are typically difficult for individuals with ASD. Algorithm scores for communication and socialization are calculated to support the likelihood, or lack thereof, of ASD diagnosis. The ADOS-G typically takes 30–45 min to complete and has excellent test–retest reliability (0.82) and inter-rater reliability (0.92) (Lord et al. 2001). All participants enrolled in the study obtained combined scores (Communication and Social Interaction) above the algorithm diagnostic threshold for ASD, thus confirming their previous ASD diagnosis.

Vineland Adaptive Behavior Scales-Second Edition

The Vineland Adaptive Behavior Scales-Second Edition (Vineland II—Survey Form; Sparrow et al. 2005) is a measure of adaptive behavior skills needed for everyday living for individuals and provides an assessment of adolescent functioning within the domains of communication, daily living skills, and socialization. The Vineland-II took parents approximately 30 min to complete. Only the communication, socialization, and composite scores were reported in this study. Parents rated the degree to which their adolescent exhibited each behavior item as either “Never,” “Sometimes/Partially,” or “Usually.” Domain and Adaptive Behavior Composite scores are presented as standard scores with a mean of 100 and a standard deviation of 15. Higher scores represented better adaptive functioning. Reliability coefficients for the Adaptive Behavior Composite score are in the mid-90’s. Content validity has been established for each domain of the Vineland-II (Sparrow et al. 2005).

Questionnaire Measures

Test of Adolescent Social Skills Knowledge

In order to assess PEERS efficacy, the Test of Adolescent Social Skills Knowledge (TASSK; Laugeson and Frankel 2010) was completed by adolescents. The TASSK consists of 26-items that assess the adolescent’s knowledge about the specific social skills taught during the intervention. Two items are included from each of the 13 didactic lessons. The TASSK is comprised of sentence stems and two possible answers. Total scores range from 0 to 26, with

higher scores reflecting greater knowledge of the taught social skills. According to Laugeson et al. (2009), coefficient alpha for the TASSK was 0.56. However, they asserted that this was acceptable, given the large domain of questions on the scale. In the current study, the TASSK coefficient alpha was similarly very low, as the questions on the TASSK were not expected to cohere with one another.

Quality of Socialization Questionnaire

In order to assess PEERS efficacy, the Quality of Socialization Questionnaire (QSQ; Frankel and Mintz 2008) was used. The QSQ is comprised of 12 items that are administered to parents (QSQ-P-R) and adolescents (QSQ-A-R) independently to assess the frequency of adolescent get-togethers with peers, number of friends involved, and the level of conflict during these get-togethers. Two items ask for an estimate of the number of hosted and invited get-togethers the adolescent has had over the previous month. The QSQ was developed through factor analysis of 175 boys and girls (Laugeson et al. 2009). Given that the total get-togethers variable consists of only two question items, coefficient alpha was not provided by the developer of the instrument and was not calculated in the current study.

Friendship Qualities Scale

In order to assess PEERS efficacy, the Friendship Qualities Scale (FQS; Bukowski et al. 1994) was completed by adolescents. The FQS assesses the adolescent’s perceptions of the quality of his/her best friendships. It has 23 items, each on a scale from 1 to 5, where 1 means not true and 5 means really true. It takes approximately 10 min to complete. Adolescents are instructed to identify their best friend and keep this friendship in mind when completing this measure. An example of an item is, “My friend and I spend all of our free time together.” The Total score ranges from 23 to 115, with higher scores reflecting better quality friendships. Previous research has noted that confirmatory factor analysis supported the structure of the measure, and comparisons between ratings by reciprocated versus non-reciprocated friends supported the discriminant validity of the measure (Bukowski et al. 1994). In the current study, the coefficient alpha for the Total score was acceptable at 0.89.

Social Interaction Anxiety Scale

In order to assess social anxiety, the SIAS (Mattick and Clarke 1998) was completed by adolescents. The SIAS was designed to measure feelings of anxiety in social interactions, with the main concerns relating to “being

inarticulate, boring, sounding stupid, not knowing what to say or how to respond within social interaction, and of being ignored.” The SIAS is comprised of 20 items, and participants’ rate each item on a 0 (not at all) to 4 (extremely) scale based on how characteristic they believe each statement is of them. Total scores are computed, and they range from 0 to 80, with higher scores indicating more anxiety. Internal consistency for the items on this measure is excellent, with a Cronbach’s alpha of 0.94 in a large sample. The test–retest reliability for up to a 12-week period between tests is excellent ($r = 0.90$; Mattick and Clarke 1998). In the current study, the coefficient alpha was acceptable (Total Score = 0.89).

Social Responsiveness Scale

In order to assess adolescents’ core autistic symptomatology, the Social Responsiveness Scale (SRS; Constantino 2005) was used. The parent (SRS-P) and teacher (SRS-T) forms of this measure were used in this study. The SRS is a 65-item rating scale that measures the severity of autism spectrum symptoms as they occur in natural social settings and takes approximately 15–20 min to complete. It is appropriate for use with children through adolescents from 4 to 18 years of age. Each item is rated on a scale from “0” (never true) to “3” (almost always true). Of interest to this study, the SRS generates a Total raw score that serves as an index of severity of social deficits in the autism spectrum, whereupon higher scores indicate higher severity of autism symptoms. Other subscales of this measure were not used in this particular study due to the multitude of variables and analyses. The psychometric properties of the SRS have been previously tested in studies involving over 1,900 children ages 4–15 years and have yielded good reliability and have demonstrated good validity. Specifically, previous research has found that the test–retest reliability coefficient was 0.88 for the Total scaled score (Constantino and Todd 2000; Constantino and Todd 2003). In the current study, the coefficient alpha for the Total score was acceptable at 0.84.

Social Skills Rating System

The Social Skills Rating System (SSRS; Gresham and Elliott 1990) consists of 38-items and took approximately 10 min to complete. Questionnaires were completed independently by the adolescent’s parent (SSRS-P) and teacher (SSRS-T). For example, items included “Starts conversations rather than waiting for someone to talk first.” The items were rated as either “Never,” “Sometimes,” or “Very Often.” The Social Skills and Problem Behaviors scales were derived from factor analysis. Gresham and Elliott (1990) reported the psychometric properties of the parent and teacher forms for

adolescents. Social Skills scale coefficient alphas were 0.93 for teacher and 0.90 for parent forms and for the Problems Behavior scale they were 0.86 and 0.81, respectively. Correlations between teacher and parent forms were low (Social Skills and Problem Behavior scales r ’s = 0.36) but statistically significant. Both scales were transformed into standard scores with a mean of 100 and standard deviation of 15. Higher scores on the Social Skills scale indicated better social functioning and lower scores on the Problem Behavior scale indicated better behavioral functioning. In the current study, the coefficient alphas were acceptable (Social Skills-Parent = 0.91, Problem Behavior-Parent = 0.91, Social Skills-Teacher = 0.88, Problem Behavior-Teacher = 0.81).

Results

Table 2 presents the mean demographic variables for each group. Chi square analyses for gender, race, income, parent education, school type, and medication use between the groups were not significant (p ’s > 0.22). T-tests for group differences on age, grade, KBIT-2 Verbal IQ, Vineland Communication and Socialization subscales, Vineland Composite scale, and intake questionnaire scores all failed to reach significance, (p ’s > 0.05). In addition, all baseline variables were not significantly different amongst groups at the pre-PEERS assessment point (p ’s > 0.05). Potential group leader effects were analyzed, and it was found that outcome variables did not vary due to differences in group leader assignment. Another preliminary analysis of attendance rates was conducted, and results indicated that outcome variables did not vary due to the number of sessions attended, which was never more than two absences. Examination of distributions, separately by group, time, and in total, revealed no significant underlying problems with the assumptions of normality, homogeneity of variance, or outlying values in all measures, except for the QSQ-A-R. For this measure, seven significant outliers were noted over the pre- and post-test QSQ-A-R adolescent and parent scores. More specifically, five adolescent outliers (2 host pre, 1 invite pre, 1 host post, 1 invite post) and two parent outliers (1 host pre and 1 invite pre) were found. These values were replaced with the next most extreme value in the distribution (Winsorization: Howell 2012).

Due to the large number of parent and adolescent dependent variables, a Group (EXP vs. WL) \times Time (pre vs. post) repeated measures multivariate analysis of variance (MANOVA) approach was used to analyze the data. In order to appropriately run the MANOVA, multiple imputation was conducted for any missing items/questions (Howell 2012). For each scale, the missing data was less than 10.34 %. Regarding the teacher data, multiple imputation was not conducted, as there was a larger amount of

missing data. Therefore, for the teacher data three, separate 2×2 repeated measures analyses of variance (ANOVAs) were conducted for each teacher outcome variable. All statistical tests were analyzed at $p < 0.05$ in SPSS 19.0 (SPSS for Windows 2011).

Results of the repeated measures MANOVA revealed that the main effect of Group was significant for combined adolescent and parent outcome variables, Wilks' Lambda = 0.41; $F(1, 56) = 4.39$, $p < 0.001$. The main effect for Time was also significant, Wilks' Lambda = 0.17, $F(1, 56) = 16.68$, $p < 0.001$. However, both of these main effects were qualified by a significant Group by Time interaction, Wilks' Lambda = 0.19; $F(1, 56) = 13.54$, $p < 0.001$ (see Table 3). Moreover, the Group X Time interaction reached significance for four adolescent outcome measures at the univariate level: TASSK, $F(1, 56) = 146.45$, $p < 0.001$, partial $\eta^2 = 0.72$; QSA-A-R (hosted get-togethers), $F(1, 56) = 10.02$, $p < 0.005$, partial $\eta^2 = 0.15$; QSA-A-R (invited get-togethers), $F(1, 56) = 7.50$, $p < 0.01$, partial $\eta^2 = 0.12$; SIAS, $F(1, 56) = 6.78$, $p < 0.01$, partial $\eta^2 = 0.12$; and two parent outcome measures: SRS (Total), $F(1, 56) = 9.38$, $p < 0.01$, partial $\eta^2 = 0.14$; SSRS Problem Behaviors, $F(1, 56) = 3.75$, $p < 0.05$, partial $\eta^2 = 0.06$.

Post hoc paired *t*-tests with a Bonferroni corrected alpha level were performed on the adolescent and parent outcome variables to further examine the univariate interactions. Regarding the adolescent measures, analyses confirmed that the EXP group significantly improved in knowledge of PEERS concepts and friendship skills on the TASSK, $t(27) = -17.91$, $p < 0.001$, $M_{pre} = 13.34$, $SD_{pre} = 2.72$, $M_{post} = 21.90$, $SD_{post} = 3.05$, while the WL group did not, $t(27) = -1.47$, *ns*, $M_{pre} = 13.38$, $SD_{pre} = 2.98$, $M_{post} = 14.03$, $SD_{post} = 2.77$. The EXP group showed a significant increase in hosted get-togethers on the QSQ-A-R, $t(27) = -3.60$, $p < 0.001$, $M_{pre} = 1.41$, $SD_{pre} = 3.32$, $M_{post} = 3.69$, $SD_{post} = 3.24$, while the WL group did not, $t(27) = 1.36$, *ns*, $M_{pre} = 2.77$, $SD_{pre} = 4.76$, $M_{post} = 1.52$, $SD_{post} = 3.10$. The EXP group showed a significant increase in invited get-togethers on the QSQ-A-R, $t(27) = -3.44$, $p < 0.005$, $M_{pre} = 0.41$, $SD_{pre} = 0.87$, $M_{post} = 1.39$, $SD_{post} = 1.73$, while the WL group did not, $t(27) = 0.58$, *ns*, $M_{pre} = 1.08$, $SD_{pre} = 2.10$, $M_{post} = 0.90$, $SD_{post} = 1.42$. The EXP group showed a significant decrease in social anxiety on the SIAS, $t(27) = 3.19$, $p < 0.005$, $M_{pre} = 32.28$, $SD_{pre} = 14.39$, $M_{post} = 24.72$, $SD_{post} = 9.67$, while the WL group did not, $t(27) = -0.04$, *ns*, $M_{pre} = 26.83$, $SD_{pre} = 13.44$, $M_{post} = 26.90$, $SD_{post} = 16.03$. Regarding the parent measures, analyses revealed that the EXP group significantly decreased in core autistic symptoms on the SRS (Total score), $t(27) = 6.24$, $p < 0.001$, $M_{pre} = 101.17$, $SD_{pre} = 23.08$, $M_{post} = 79.12$, $SD_{post} = 20.21$, in addition to the WL group also showing a smaller decrease in core autistic symptoms, $t(27) = 2.52$,

$p < 0.05$, $M_{pre} = 106.28$, $SD_{pre} = 21.62$, $M_{post} = 98.55$, $SD_{post} = 22.53$. Further, the EXP group showed a significant decrease in problem behaviors on the SSRS-P, $t(27) = 2.10$, $p < 0.05$, $M_{pre} = 154.79$, $SD_{pre} = 7.49$, $M_{post} = 150.59$, $SD_{post} = 10.21$, while the WL group did not, $t(27) = -0.37$, *ns*, $M_{pre} = 153.21$, $SD_{pre} = 10.57$, $M_{post} = 153.72$, $SD_{post} = 7.69$.

To examine the teacher data, three separate 2×2 mixed model repeated measures ANOVAs were conducted, for the SRS Total score, SSRS-T social skills, and SSRS-T problem behaviors scales. There were no significant findings for the SRS and SSRS social skills scales, however, it was found that the teacher-rated SSRS problem behaviors scale yielded significant results. There was a significant main effect for time, Wilks' Lambda = 0.84, $F(1, 39) = 7.41$, $p < 0.01$. However, there was a significant Group X Time interaction, Wilks' Lambda = 0.91, $F(1, 39) = 3.93$, $p < 0.05$. A post hoc paired *t* test with a Bonferroni corrected alpha level was performed to further examine this interaction. The analysis confirmed that the EXP group significantly decreased in problem behaviors on the SSRS-T, $t(19) = 2.82$, $p < 0.01$, $M_{pre} = 135.19$, $SD_{pre} = 8.64$, $M_{post} = 130.43$, $SD_{post} = 7.99$, while the WL group did not, $t(18) = 0.70$, *ns*, $M_{pre} = 135.45$, $SD_{pre} = 6.92$, $M_{post} = 134.70$, $SD_{post} = 7.45$.

Discussion

The current study presented the results of a randomized controlled replication of PEERS, a manualized, parent-assisted intervention to improve friendships for 58 adolescents with ASD, the second largest number of participants reported in the ASD treatment outcome literature for individuals 6–21 years-old (Reichow et al. 2012). The results of this replication and extension of the PEERS intervention were encouraging, as improvement was demonstrated on 7 of 14 outcome measures.

Most hypotheses were supported in this study and were also a replication of similar results found in the original PEERS study (Laugeson et al. 2009). In the current study, the experimental treatment group showed evidence of PEERS efficacy, by gaining knowledge of PEERS concepts and friendship skills. Although it is not completely unexpected that adolescents displayed retention of learned information, this finding does point to the effectiveness of PEERS in teaching the targeted social skills. Further, the experimental treatment group showed an increase in hosted and invited get-togethers. In the original PEERS study, a significant increase in hosted get-togethers was found as well, however, they did not find a significant increase in invited get-togethers. It seems that adolescents are cultivating reciprocal relationships during the intervention, as

Table 3 Means and SD for outcome variables for experimental treatment and waitlist control groups

	Group (<i>n</i> = 58)				<i>p</i>
	Experimental (<i>n</i> = 29)		Waitlist control (<i>n</i> = 29)		
	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>Adolescent</i>					
TASSK	13.34 (2.72)	21.90 (3.05)	13.38 (2.98)	14.03 (2.77)	0.001
QSQ-A-R (host)	1.41 (3.32)	3.69 (3.24)	2.77 (4.76)	1.52 (3.10)	0.005
QSQ-A-R (invite)	0.41 (0.87)	1.39 (1.73)	1.08 (2.10)	0.90 (1.42)	0.01
SIAS	32.28 (14.39)	24.72 (9.67)	26.83 (13.44)	26.90 (16.03)	0.01
QSQ-A-R (conflict)	1.62 (2.97)	2.79 (3.29)	3.83 (5.28)	3.03 (6.65)	ns
FQS	83.71 (14.88)	82.45 (15.41)	86.64 (15.04)	82.65 (19.42)	ns
<i>Parent</i>					
SRS	101.17 (23.08)	79.12 (20.21)	106.28 (21.62)	98.55 (22.53)	0.005
SSRS problem behaviors	154.79 (7.49)	150.59 (10.21)	153.21 (10.57)	153.72 (7.69)	0.05
QSQ-P-R (host)	0.57 (1.20)	2.11 (2.06)	1.05 (1.46)	1.51 (1.69)	ns
QSQ-P-R (invite)	0.91 (2.02)	1.50 (2.09)	0.86 (1.94)	0.63 (0.82)	ns
QSQ-P-R (conflict)	2.52 (5.00)	2.44 (3.40)	5.52 (7.82)	1.97 (3.94)	ns
SSRS social skills	112.79 (10.34)	119.76 (9.23)	110.41 (13.96)	114.28 (14.60)	ns
<i>Teacher^a</i>					
SSRS problem behaviors	135.19 (8.64)	130.43 (7.99)	135.45 (6.92)	134.70 (7.45)	0.05
SSRS social skills	124.19 (8.45)	127.14 (6.30)	124.30 (8.09)	123.75 (11.77)	ns
SRS	77.90 (29.94)	67.95 (27.46)	90.35 (17.95)	82.75 (27.38)	ns

TASSK = Test of Adolescent Social Skills Knowledge; QSQ-P-R = Quality of Socialization Questionnaire—Parent; QSQ-A-R = Quality of Socialization Questionnaire—Adolescent; SIAS = Social Interaction Anxiety Scale; FQS = Friendship Qualities Scale; SRS = Social Responsiveness Scale; SSRS = Social Skills Rating Scale; *p* = probability, *p* = interaction *p* value

^a *n*'s are 21 for experimental and 20 for waitlist control groups

they are also being invited to get-togethers. This overall finding is important, as get-togethers provide an opportunity for adolescents to practice their social skills and develop meaningful friendships.

In contrast to the original PEERS study, the current study did not find that friendship quality significantly improved in the experimental treatment group. Upon closer examination, in the original PEERS study, the significant friendship quality finding was due to the waitlist control group demonstrating worse friendship quality over time (Laugeson et al. 2009). Therefore, it not yet known if PEERS positively affects friendship quality, or this may be a domain that requires more than 14 weeks to develop.

The original PEERS study found a significant increase in adolescent social skills per parent report (specifically, on the SSRS social skills scale). In the current study, parents' ratings of adolescent social skills on the SSRS increased from pre- to post-PEERS for the experimental treatment group, although this change failed to reach traditional levels of statistical significance (see Table 3). It was also found that teachers' scores of adolescents' social skills on the SSRS increased from pre- to post-PEERS for the experimental treatment group and decreased for the waitlist

control group, although these changes also failed to reach traditional levels of significance (see Table 3). This demonstrates that with both parent and teacher ratings of adolescents' social skills, scores moved in the predicted direction, although a larger sample might be needed to reach statistical significance. It will also be illuminating to examine parent and teacher ratings of adolescent' social skills at a longer-term follow-up appointment. This trend of continued or later improvement was previously found by the UCLA group at 14-weeks post-PEERS (Laugeson et al. 2012).

This study aimed to extend current findings relating to PEERS in several ways. With the addition of a new measure, it was found that the experimental treatment group significantly decreased in their social anxiety symptoms as compared to the waitlist control group from pre- to post-PEERS. Social anxiety reduction is not targeted in the PEERS intervention, which makes this finding even more significant. Further, this finding is of great importance as it suggests that by teaching adolescents with ASD social skills and thus increasing the likelihood of more positive peer interactions, the common trajectory of heightened social anxiety in ASD (Bellini 2006) is altered. Instead,

learning and practicing social skills may create a sense of confidence and comfort for adolescents with ASD in social situations, perhaps counteracting their social anxiety.

Another extension of previous findings was that the experimental treatment group significantly decreased in their levels of autistic symptoms per parent report (specifically, on the SRS scales), as compared to the waitlist control group, from pre- to post-PEERS. It should be noted that, for the waitlist control group, autistic symptoms changed for the better from pre- to post-PEERS (an 8 point mean difference), however, the decrease from pre- to post-PEERS was not as large as the experimental treatment group's difference (22 point mean difference). This suggests that PEERS had a more profound effect on parents' rating of adolescent core autistic symptoms. This decrease in core autistic symptoms might allow adolescents who participated in PEERS to better function in day to day life in addition to being more successful in social interactions. The fact that PEERS led to a drop in autistic symptomatology from the "severe" level to the "moderate" severity level gives additional support to utilization of the PEERS intervention with adolescents with ASD (Aldridge et al. 2012).

A new finding relating to PEERS was that the experimental treatment group significantly decreased in their problem behaviors per parent and teacher report. These problem behaviors included items relating to aggressive acts, poor temper control, sadness, anxiety, fidgeting and impulsive acts. This finding is extremely robust as both parents and teachers similarly agreed upon ratings. This suggests that teaching social skills may positively affect other domains of behavior. Further, it may be that adolescents substitute problematic behavior with more positive social behavior. Overall, these findings indicate that PEERS is effective at other sites, in addition to its site of development, and that a reduction in social anxiety is another potential outcome for adolescents with ASD who complete the program.

Limitations of the Present Study

There were some limitations to the present study. The sample included mostly males who were Caucasian. This lack of diversity in the sample causes the findings to be less generalizable to a larger, more diverse population. Another limitation was that the parent ratings may have been biased due to the parent involvement in the intervention. The absence of behavioral ratings of social skills is another limitation of this study, as paper-and-pencil rating scales were used. Future studies should include in vivo measures of adolescents' social skills in naturalistic interactions.

Additionally, more attention should be paid to capturing teacher report, as teachers not only provide another informant, but would also not be subject to the same biases in reporting outcome as parents, since they are not directly involved in treatment. Although this study had a better return rate of teacher data as compared to the original PEERS study, there was still a large amount of missing teacher data, which may have decreased power in analyses.

Future Directions and Conclusions

One future direction of the current study includes gathering data, especially on social anxiety and friendship development, at a long-term follow-up. This would yield useful information toward determining the durability of the findings as well as assess for any changes that occur during the months following PEERS. For example, perhaps once adolescents have had some time outside of PEERS, their friendship quality may improve as they gain confidence and practice the skills they have learned in meaningful relationships. Recent report by the PEERS developer indicate that 14 weeks after PEERS, there was maintenance of social skills knowledge, social responsiveness, and overall improvements in social skills (Laugeson et al. 2012), and that some of these improvements continued to be evident one to 5 years later (Mandelberg et al. 2011). Lastly, it might also be helpful to gain a physiological measure of anxiety that is not dependent on self-report, and a behavioral measure of social skills, as discussed above.

Social anxiety and social skills are likely related to one another (Bellini 2004). In addition, those with AS/HFA have been found to significantly report more social anxiety symptoms than their typically developing peers (Sebastian et al. 2009). Thus, it is highly important to focus on social anxiety in treatment with individuals with AS/HFA. Future social skills interventions, including PEERS, should aim to teach adolescents with AS/HFA how to handle social anxiety in addition to providing social skills training.

The present study was a replication and extension of the PEERS intervention and greatly adds to the minimal literature regarding social skill interventions for adolescents with AS/HFA. This study provides the first independent replication of a social skills treatment for adolescents with ASD, and thus greatly augments knowledge on treatment efficacy. In addition, the current study supported previously noted positive outcomes of participation in PEERS, as well as found that involvement in PEERS decreased social anxiety, core autistic symptoms, and problematic behaviors. These findings suggest that PEERS is an appropriate intervention for widespread national use.

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