

Evidence-Based Social Skills Training for Adolescents with Autism Spectrum Disorders: The UCLA PEERS Program

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Abstract The present study examines the efficacy and durability of the PEERS Program, a parent-assisted social skills group intervention for high-functioning adolescents with ASD. Results indicate that teens receiving PEERS significantly improved their social skills knowledge, social responsiveness, and overall social skills in the areas of social communication, social cognition, social awareness, social motivation, assertion, cooperation, and responsibility, while decreasing autistic mannerisms and increasing the frequency of peer interactions. Independent teacher ratings revealed significant improvement in social skills and assertion from pre-test to follow-up assessment. Examination of durability of improvement revealed maintenance of gains in nearly all domains with additional treatment gains at a 14-week follow-up assessment.

Keywords Social skills · Autism · Asperger's Disorder · PEERS · Friendship · Adolescents

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Introduction

Autism Spectrum Disorders (ASD) is an umbrella term often used to describe a continuum of diagnoses that include Autistic Disorder, Asperger's Disorder, and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS). Collectively, ASD is characterized by deficits in communication, impairments in social interactions, and restricted and repetitive patterns of behavior (American Psychiatric Association 2000). Although reasonable success has been achieved in the use of behavioral methods to address some of the core features of ASD relating to challenging behavioral manifestations like self-stimulation, and expressive and receptive language (Hanley et al. 2001; Lovaas 1987), social reciprocity and social communication deficits remain prominent issues and maintain a high treatment priority (Weiss and Harris 2001). Given the systemic move for inclusion of adolescents with ASD into regular classrooms (Williams et al. 2005), along with increased recognition and diagnosis of higher functioning individuals with ASD (Croen et al. 2002), this growing population of mainstreamed youth are perhaps more in need of evidence-based social skills treatments than ever before (Williams-White et al. 2007).

Social deficits and poor friendship quality are common areas of impairment for youth with ASD. Laushey and Heflin (2000) have even proposed that the most profound and defining issues for individuals with ASD are those difficulties related to poor social functioning. Specific social deficits among individuals with ASD often include (but are not limited to) poor social communication, impaired social cognition, and lack of understanding of social cues. With regard to poor social communication, deficits often include perseveration on specific topics of interest and difficulty changing conversational topics

(Elder et al. 2006); poor speech prosody, which includes the natural rising and falling of voice pitch and inflection that occurs during speech (Starr et al. 2003); inability to carry out a bidirectional conversation and turn taking in conversations (Church et al. 2000; Klin and Volkmar 2003); being overly verbose in conversations with peers (Elder et al. 2006); and difficulty understanding and using humor (Winter 2003) and other forms of non-literal language like sarcasm, analogies, or metaphors (Starr et al. 2003; Kerbal and Grunwell 1998). Impaired social cognition often includes difficulties in expressing emotions, understanding the feelings of others, and empathizing (Baron-Cohen 1995; Travis and Sigman 1998; Krasny et al. 2003; Frith 2004), as well as an overall lack of understanding of social causality (Baron-Cohen et al. 1985). Lack of understanding of social cues manifests in many ways including difficulty understanding the value and meaning of non-verbal elements of social interaction (Schopler et al. 1998), and inability to interpret social cues, assess the formality of social events, and act accordingly (Griffin et al. 2006).

Possibly due to a rise in complexity of social communication and greater need for the understanding of social cues that accompany developmental maturity, these social deficits often become even more prominent as children enter adolescence (Tantam 2003) and adulthood (Klin and Volkmar 2003) and may lead to significant impairments in daily living and interpersonal relationships (Klin and Volkmar 2003; Klin et al. 2000). These deficits commonly result in peer rejection, poor social support, and isolation; consequently, adolescents with ASD generally report higher levels of loneliness and poor quality of friendships than same aged typically developing peers (Capps et al. 1996; Bauminger and Kasari 2000). Although certain aspects of ASD may improve with time and intervention, social difficulties seem to persist throughout the individual's lifespan and may represent a more chronic deficit (Orsmond et al. 2004). As adults, many individuals with ASD lack community connections and friendships that are taken for granted by typically developing persons (Baxter 1997), which may contribute to higher rates of depression, anxiety, and victimization (Shtayermman 2007). Thus, intervention to improve social functioning prior to adulthood is critical.

Improving social skills among adolescents with ASD is particularly important for a number of reasons. Social skills are an important component of an individual's behavior, affecting multiple areas of functioning. Having one or two close friends may positively impact later adjustment, buffer the impact of stressful life events (Miller and Ingham 1976), improve self-esteem, and decrease anxious and depressive symptoms (Buhrmester 1990). Teaching appropriate friendship skills and improving the quality of friendships for teens with ASD may promote positive social skills, which in

turn will likely impact current and long-term adjustment. Although research indicates that typically developing adolescents often learn basic rules of social etiquette through observation of peers and/or through instruction from parents in nonclinical settings (Gralinski and Kopp 1993; Rubin and Sloman 1984), adolescents with ASD often require additional support and assistance.

Not surprisingly, social skills training has increasingly become a popular method for helping adolescents with ASD adapt to their social environment (Attwood 2000, 2003; Bock 2001; Krasny et al. 2003; Laugeson et al. 2009). Yet a review of the research literature on ASD suggests there are very few evidence-based interventions that are specifically aimed at improving the friendships of adolescents with ASD (Wolfberg and Schuler 1993; Marriage et al. 1995). Among the few social skills intervention studies conducted with this population, most have not been formally tested in terms of their efficacy in improving social competence or the development of close friendships, nor do they examine the maintenance of treatment gains months or years after the intervention has ended. While establishing improvement in social skills following treatment is important and noteworthy, the maintenance of these treatment gains months or years after the intervention is arguably more important, as the latter reflects long-term, sustainable benefits.

Studies investigating the effectiveness of social skills training for individuals with ASD indicate that intervention during childhood and adolescence is critical. However, much of the literature on social skills training for youth with ASD has focused on interventions with younger children in the lower ranges of functioning (Wolfberg and Schuler 1993); thus revealing a gap in the treatment intervention research among adolescents that are less cognitively impaired (Marriage et al. 1995), such as teens with high-functioning autism, Asperger's Disorder, or PDD-NOS. Among the limited social skills intervention studies conducted with high-functioning adolescents with ASD, few have examined improvement in social competence or the development of close friendships beyond the treatment setting (e.g., home or school). In a review of the social skills treatment literature, Williams-White et al. (2007) identified 14 studies that used group-based social skills training for children and adolescents with ASD. Among these studies, only one used a randomized control group design (Provencal 2003), two identified the use of a manualized treatment (Webb et al. 2004; Barnhill 2002), and four focused on adolescents 12 years of age or older (Mesibov 1984; Provencal 2003; Webb et al. 2004; Barnhill 2002). None of these studies examined the maintenance or trajectory of improvement in social competency over time, nor did they use a parent-assisted model of social skills instruction.

Previous research indicates that effective intervention strategies used for teaching social skills to adolescents with high-incidence disabilities include: behavioral modeling; coaching; behavioral rehearsal; and performance feedback, conducted in a small-group setting (Gresham et al. 2001). However, one key feature lacking in most of these social skills programs is structured involvement of parents in the intervention. Parents can have significant effects upon their child's friendships, both in terms of direct instruction and supervision, as well as supporting their child's development of an appropriate peer network (Frankel and Myatt 2003; O'Connor et al. 2006; Laugeson et al. 2009; Wood et al. 2009; Solomon et al. 2004). The use of a parent-assisted model for friendship training was first introduced by Frankel and Myatt (2003) through the Children's Friendship Training Program (CFT). The effectiveness of this evidence-based model in improving friendship skills has been demonstrated for high-functioning elementary-aged children with ASD (Frankel and Myatt 2007; Frankel et al. 2010), as well as children with Attention-Deficit/Hyperactivity Disorder (Frankel et al. 1997) and Fetal Alcohol Spectrum Disorders (O'Connor et al. 2006). Results of these studies further revealed maintenance of treatment gains at least 3-months after treatment ended.

In a previous randomized controlled trial investigating the efficacy of PEERS in improving social competence and friendship skills among high-functioning adolescents with ASD (Laugeson et al. 2009), results revealed that in comparison to a delayed-treatment control condition, adolescents in the treatment condition significantly improved in their knowledge of social skills, increased the frequency of get-togethers with friends, and improved in their overall social skills on the Social Skills Rating System (SSRS; Gresham and Elliott 1990) as reported by parents (Laugeson et al. 2009). The present study reports the treatment outcome of a new sample of teens receiving PEERS, as well as durability of treatment gains after a 14-week follow-up period. For comparison purposes, immediate change in social functioning and maintenance and/or improvement of treatment effects was examined among middle school and high school adolescents with high-functioning ASD following the implementation of the 14-week intervention. Modifications to the original intervention were also tested. The current PEERS program was modified from the original version (Laugeson et al. 2009) to include additional treatment modules necessary toward the advancement of friendship skills. These additional lessons include didactic training in: the appropriate use of electronic communication; online safety; strategies for handling cyber bullying; appropriate use of humor; long-term tactics for changing bad reputations; and strategies for handling rumors and gossip.

Methods

Participants

Twenty-eight middle school and high schools adolescents with ASD ranging from 12 to 17 years of age ($M = 14.6$; $SD = 0.71$) participated in and completed the study with their parents. All of the 23 male and 5 female participants had a previous diagnosis of high-functioning autism, Asperger's Disorder, or PDD-NOS. Within the Treatment Group, seven participants had a diagnosis of Autistic Disorder and seven had Asperger's Disorder, while three teens had a co-morbid diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) and two had Major Depressive Disorder (MDD). Within the Delayed Treatment Control group, seven participants had a diagnosis of Autistic Disorder, six had Asperger's Disorder, and one had PDD-NOS, while four teens had a co-morbid diagnosis of ADHD, two had MDD, one had Adjustment Disorder, and one had Generalized Anxiety Disorder (GAD). Fifteen of the participants identified themselves as Caucasian; three as Hispanic/Latino; one as African American; four as Asian; and five as being from other ethnic groups. Sixteen of the participants were in a regular school setting (Treatment Group = 9; Delayed Treatment Control Group = 7); six were in special education (Treatment Group = 3; Delayed Treatment Control Group = 3); one was in a pull-out program (Treatment Group); and five were attending a nonpublic school (Treatment Group = 1; Delayed Treatment Control Group = 4).

Measures

Social Skills Rating System (SSRS; Gresham and Elliott 1990)

The SSRS is a 52-item (secondary level parent form) and 51-item (secondary level teacher form) questionnaire assessing adolescent cooperation, assertion, responsibility, and self-control. The measure is commonly used to assess treatment outcome in social skills training interventions and has been shown to be sensitive to change in social functioning among high-functioning youth with ASD (Laugeson et al. 2009; Frankel et al. 2010). The SSRS took approximately 10 min to complete and taps into social competence through inquiry about interactions with age-mates, performance on household/classroom tasks, use of free time, and academic competence. Items include "Starts conversations rather than waiting for someone to talk first," for example. Parents and teachers rated items as either "Never," "Sometimes," or "Very Often." Derived by factor analysis, the SSRS provides standards scores along the dimensions of Social Skills and Problem Behaviors

with a mean of 100 and a standard deviation of 15. Higher score on the Social Skills Scale reflect better social functioning, whereas lower scores on the Problem Behaviors Scale suggest better behavioral functioning. Correlations between parent and teacher forms are low (r 's = .36) but statistically significant (p 's < 0.0001).

Social Responsiveness Scale (SRS; Constantino 2005)

The SRS is a 65-item rating scale measuring the severity of autism spectrum symptoms as they occur in natural social settings. Completed by parents and teachers, the SRS provides a clear picture of a child's social impairments, assessing social awareness, social information processing, capacity for reciprocal social communication, social anxiety/avoidance, and autistic preoccupations and traits. While the SRS is primarily used as an autism diagnostic screening tool, it has been shown to be sensitive to changes in social functioning among children with ASD (Wood et al. 2009), and was therefore used as a treatment outcome measure for the current study. It is appropriate for use with children from 4 to 18 years of age and takes approximately 15 min to complete. Due to delays in Institutional Review Board (IRB) approval for the use of the SRS, data collection for this scale began after 7 participants were already enrolled in the study. All of these participants were in the Delayed Treatment Control condition. Thus, baseline data were not available for a portion of the sample. However, data were collected for the remaining 21 participants.

The Quality of Play Questionnaire (QPQ; Frankel and Mintz, in press)

The QPQ consists of 12-items administered to parents and adolescents to assess the frequency of hosted and invited get-togethers over the previous month and to assess the level of conflict during the last hosted get-together. The 10-items which comprise the Conflict Scale include "We/They criticized or teased each other" for instance. Parents and teens rated items as either "Not At All," "Just a Little True," "Pretty Much True," or "Very Much True." Higher scores reflect more conflict, while lower scores reflect less conflict. The QPQ was developed through factor analysis on 175 boys and girls. Coefficient alpha was 0.87 for the Conflict scale. This scale has been used as an outcome measure in previous studies testing the effectiveness of social skills training (Laugeson et al. 2009; Frankel et al. 2010). It has demonstrated convergent validity with the SSRS Problem Behaviors scale ($r = 0.35$, $p < 0.05$), and significantly discriminated community from clinic-referred samples ($p < 0.05$).

Test of Adolescent Social Skills Knowledge-Revised (TASSK-R; Laugeson and Frankel, unpublished)

The TASSK-R is a 26-item criterion-referenced measure developed for this study to assess treatment changes related to the adolescent's knowledge about the specific social skills taught during the intervention. Completed by the adolescent, the test took approximately 5 min to complete, and included sentence stems related to the didactic lessons in which adolescents were asked to choose the best option from two possible answers. Two items were derived from key elements of each of the 13 didactic lessons. Scores range from 0 to 26, with higher scores reflecting greater knowledge of adolescent social skills. The TASSK-R is based upon the original TASSK (Laugeson et al. 2009), which was shown to be sensitive to treatment effects, and has a coefficient alpha of 0.56. This moderate level of internal consistency was found to be acceptable, given the large domain of questions on the scale.

Kaufman Brief Intelligence Test-Second Edition (KBIT-2; Kaufman and Kaufman 2005)

Intellectual functioning was assessed using the KBIT-2, which is a brief screening tool used to assess cognitive functioning along verbal and nonverbal domains. The KBIT-2 took approximately 25 min to administer to adolescent participants at baseline and provided Verbal, Nonverbal, and Composite IQ standard scores with a mean of 100 and a standard deviation of 15. Higher scores represented better intellectual functioning, while lower scores represented poorer intellectual functioning. The KBIT-2 has been demonstrated to have good convergent validity with a number of intelligence tests, including the Wechsler Intelligence Test for Children-Fourth Edition (WISC-IV; Wechsler 2003) and is comparable to the WISC-IV in terms of its reliability and validity (Kaufman and Kaufman 2005).

Vineland Adaptive Behavior Scales-Second Edition, Survey Form (Vineland-II; Sparrow et al. 2005)

Adaptive functioning was assessed using the Vineland-II, which is a measure of adaptive behavior skills needed for everyday living and provides assessment of functioning within the domains of communication, daily living skills, and socialization. The Vineland-II took approximately 30 min to complete at baseline and included items such as, "Refrains from entering a group when nonverbal cues indicate the he or she is not welcome." Parents rated the degree to which the adolescent exhibited the behavior described by rating the item as either "Never," "Sometimes or 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 represent better adaptive functioning, while lower scores represent poorer adaptive functioning. Content validity has been established for the subdomain and domain structure of the Vineland-II (Sparrow et al. 2005). Reliability coefficients for the domain scores are in the upper .80's to low .90's. Reliability coefficients for the Adaptive Behavior Composite score are in the mid .90's.

Procedures

Participants were recruited from the UCLA Parenting and Children's Friendship Program, the UCLA Autism Evaluation Clinic, and Regional Centers and schools throughout Southern California. Eligibility requirements were that the adolescent: (a) was in middle school or high school; (b) had a previous diagnosis of Autistic Disorder, Asperger's Disorder, or PDD-NOS from a reliable mental health professional (i.e., licensed psychologist, psychiatrist, pediatrician, school district, or Regional Center); (c) had social problems as reported by the parent; (d) was willing to participate in the treatment; (e) was fluent in English; (f) had a parent or family member who was fluent in English and willing to participate in the study; (g) had a verbal IQ of >70 on the Kaufman Brief Intelligence Test-Second Edition (KBIT-2); (h) had no history of major mental illness (e.g., bipolar disorder, schizophrenia, or psychosis) as reported by parent; and (i) had no hearing, visual, or physical impairments that would prevent participation in outdoor sports activities. Participants were required to attend at least 11 of the 14 group sessions in order to be included in the study. All participants received the intervention free of charge and were free to withdraw from the study at anytime with no penalty to the family.

Fourteen participants were given the PEERS intervention immediately following baseline assessment (Treatment Group), while 14 participants were given treatment after a 14-week wait period (Delayed Treatment Control Group). Participants were recruited over a 13 month period, from January 2007 to February 2008. The first half of the sample was placed in the Delayed Treatment Control group and the second half was placed in the Treatment group. Groups were comprised of 8 to 10 adolescent participants, with 3 cohorts in total. All 3 cohorts were facilitated by the same study therapists across conditions. Participants in the Treatment Group were assessed at baseline (T1, week 1), received the 14-week intervention immediately, were assessed the last night of the group (T2, week 14), and returned 14-weeks after the end of the intervention for a follow-up assessment (T3, week 28). Participants in the Delayed Treatment Control Group were assessed at baseline (T1, week 1), waited for 14-weeks

before receiving the intervention, were assessed the first night of the group (T2, week 14), and were assessed again the last night of the group (T3, week 28). Participants in the Delayed Treatment Control group did not participate in follow-up assessment as all participants were in the study for a maximum of 28 weeks. Teachers were mailed assessment measures at each of the testing periods, and were blind to the condition under investigation.

The UCLA PEERS Program consists of fourteen 90-min sessions, delivered once a week over the course of 14-weeks (Laugeson and Frankel 2010). Parents and teens attend separate concurrent sessions that instruct them on key elements about making and keeping friends. Three separate groups of approximately 8–10 adolescent participants were run over the course of 1 year. At least one pre-identified parent attended the group on a consistent weekly basis, although all parents were welcome to attend the parent groups. The pre-identified parent was responsible for assisting the teen with weekly socialization homework assignments, providing social coaching when necessary, and completing all pre- and post-test parent measures.

Parent and teen group leaders were licensed clinical psychologists with previous experience conducting social skills groups for adolescents and expertise in working with youth with ASD. Two coaches assisted the group leaders throughout the duration of the study, both of whom were psychology graduate students with experience working with children and adolescents. Coaches were fully trained and supervised in all aspects of the intervention and were responsible for assisting with role-playing exercises, providing performance feedback to adolescents during behavioral rehearsal exercises, and monitoring treatment fidelity to ensure that all aspects of the intervention were conducted.

The PEERS treatment curriculum is an upward extension of Children's Friendship Training (CFT; Frankel and Myatt 2003). Core features of PEERS were adapted from CFT for treatment with high-functioning adolescents with ASD and included: (a) relevant portions of the social skills curriculum; (b) the use of parent-assistance in the treatment; and (c) structural elements of the lesson format (for a detailed review of the program adaptations see Laugeson et al. 2009).

Two additional sessions were added to an earlier 12-week version of the PEERS intervention (Laugeson et al. 2009), based on a needs assessment conducted with parent participants who identified additional topic areas requiring instruction. Additional topics requested by parents included appropriate use of humor, handling embarrassing feedback, changing a bad reputation, and handling rumors and gossip. Topics of instruction from the original 12-week curriculum were chosen based on a comprehensive review of the literature revealing common social

deficits among adolescents with ASD and core social skills needed to make and keep friends. Didactic lessons include: (a) conversational skills, including verbal and nonverbal forms of communication; (b) electronic forms of communication, including phone calls, text messaging, instant messaging, emailing, and online safety; (c) developing friendship networks, including identifying relevant peer groups and extra-curricular activities in which to find sources of potential friends; (d) appropriate use of humor, including learning to pay attention to humor feedback from others; (e) peer entry strategies, including how to join conversations with other adolescents; (f) peer exiting strategies, including how to assess receptiveness during peer entry and what to do when these attempts fail; (g) how to have successful get-togethers, including how to organize and execute a gathering with friends; (h) good sportsmanship, including how to appropriately behave during games and sports; (i) handling teasing, including distinguishing teasing from embarrassing feedback and handling verbal teasing through the use of appropriate behavioral responses; (j) handling bullying, including identifying strategies for handling cyber bullying and physical threats from others; (k) changing reputations, including long-term strategies for altering a bad reputation; (l) resolving arguments with friends, including specific steps for problem solving disagreements; and (m) handling rumors and gossip, including behavioral strategies for minimizing the damage caused by gossip. Table 1 provides an overview of the 14-session intervention along with key socialization homework assignments.

Both parent and teen groups occurred simultaneously, but in separate rooms, and utilized psychoeducational and cognitive-behavioral treatment techniques. Groups were structured such that each session began with a review of the homework assignment from the previous week. In order to individualize the program to suit the specific needs of each family, sufficient time was allotted to troubleshoot any homework problems in both parent and teen groups. This portion of the session was followed by a didactic lesson, which included a role-playing demonstration and behavioral rehearsal exercises for the teen group and review of a parent handout in the parent group. Homework was then assigned for the coming week in both parent and teen groups, allowing time to troubleshoot potential barriers to homework completion. The session concluded with parents and teens reuniting in the same room, at which time the adolescents provided a brief review of the lesson for parents, and homework assignments were given and negotiated.

Based on the fundamental structural components of CFT, key elements of the PEERS intervention were taught didactically through instruction of simple rules of social etiquette (i.e., rules of behavior enforced by the peer

group). Rules of social etiquette were derived in part from CFT when appropriate and further enhanced and developed from evidence of ecologically valid social skills for adolescents. Essentially, adolescents were instructed how to behave in social situations based on the norm established by socially accepted teens. Didactic lessons were followed by role-playing exercises in which the group leaders modeled the appropriate social skill being taught. When possible, each rule and/or step of a particular social skill was acted out through a role-play demonstration so that adolescents could better comprehend its meaning. For example, when teaching appropriate conversational skills, the group leader might introduce a new rule by saying, "Watch this and tell me what I'm doing wrong." Then the group leader might demonstrate being a "conversation hog" by not allowing the other person to speak during the conversation. The group leader would then ask the adolescents what she did wrong. Typically the teens would respond by saying that the group leader failed to let the other person speak. The group leader would agree and then present the related rule of social etiquette for conversations, which is "Don't be a conversation hog." This method of teaching the rules and/or steps to social etiquette was particularly effective in that it allowed the adolescents to imagine that they and their peers were generating the rules on their own; thereby making it more likely that they would retain the information and actually believe what they were being taught. In an effort to improve social cognition, role-playing demonstrations were typically followed by questions such as, "What do you think that conversation was like for her? What do you think she thought of me? And do you think she would want to talk to me again?" After teens answered these questions, the teen group leader would then query the coach in question by asking, "What was that conversation like for you? What did you think of me? And would you want to talk to me again?"

Teaching social etiquette through the use of role-play demonstrations and rules and/or steps of social behavior is a simple and concrete way for adolescents to understand social context. However, because utilizing rules of social etiquette may be more difficult for teens with ASD, providing behavioral rehearsal opportunities with performance feedback were essential to the PEERS intervention. Newly learned skills were rehearsed by adolescents in session through structured socialization activities, during which they received performance feedback from the group leader and coaches. Repetition and rehearsal of these skills was further promoted through parent-supervised homework assignments. Implementation of newly learned social skills in a natural setting with the use of parent coaching was also an essential element of the PEERS intervention, and was thought to promote generalization of skills. Parents were instructed on ways in which they could help their teen

Table 1 Overview of the PEERS intervention

Session	Didactic lesson	Description of the lesson	Homework
1	Introduction and trading information	Parents and teens are taught how to trade information during conversations with peers in order to find common interests.	Teens practice trading information on the phone with a group member.
2	Conversational skills	Parents and teens are instructed on key elements of having a two-way conversation with peers. Parents begin to identify teen activities which could lead to potential sources for friendships.	Teens practice trading information on the phone with a non-group member.
3	Electronic communication	Parents and teens learn about the appropriate use of voicemail, email, text messaging, instant messaging, and the Internet in developing pre-existing friendships. Parents are introduced to the social hierarchy of peer groups in schools.	Parents identify extra-curricular activities for their teens. Teens practice using electronic forms of social communication.
4	Choosing appropriate friends	Teens are introduced to the social hierarchy of peer groups in schools and begin to identify groups they might fit in with. Parents and teens identify extra-curricular activities based on the teen's interests, which might lead to new sources of friends with common interests.	Parents and teens begin to pursue extra-curricular activities for teens. Teens identify a potential peer group and begin trading information with members of this group.
5	Appropriate use of humor	Parents and teens learn the basic rules around appropriate use of humor. Teens learn to pay attention to their humor feedback and with the help of parents, begin to determine if they are more of a joke-teller or a joke-receiver.	Teens pay attention to their humor feedback to determine if people are laughing at them or laughing with them.
6	Peer entry strategies	Parents and teens are given instruction about the precise steps involved in joining conversations with peers.	Teens practice entering conversations with peers.
7	Peer exit strategies	Parents and teens are taught how to assess receptiveness during peer entry and how to gracefully exit conversations when you are not accepted.	Teens practice entering and exiting conversations with peers.
8	Get-togethers	Parents and teens are given instructions about how to plan and implement successful get-togethers with friends. Parents are given specific strategies for monitoring and appropriately intervening during teen get-togethers.	Teens organize and host a get-together with potential friends not affiliated with PEERS.
9	Good sportsmanship	Parents and teens are taught the rules of good sportsmanship.	Teens practice good sportsmanship while playing videogames, board/card games, and sports.
10	Handling teasing	Parents and teens are taught how to appropriately respond to teasing from peers. Teens learn to differentiate between teasing (i.e., verbal attacks) and embarrassing feedback and how to alter their behavior in response to the latter.	Teens practice handling teasing appropriately when relevant.
11	Handling bullying and bad reputations	Parents and teens are given strategies for handling bullying (i.e., physical attacks) and how to change a bad reputation.	Teens implement new strategies for handling bullying and physical threats from peers when relevant.
12	Handling arguments and disagreements	Parents and teens are given instruction about the important elements necessary to resolving arguments and disagreements with peers.	Teens practice handling arguments through role-playing exercises with parents and with peers when relevant.
13	Handling rumors and gossip	Parents and teens are given concrete strategies for minimizing the effects of rumors and gossip.	Teens practice handling rumors and gossip appropriately when relevant.
14	Graduation party and ceremony	Teens are rewarded with a graduation party. Parents are instructed on strategies to maintain gains in teen social skills after termination. Parents and teens participate in a graduation ceremony.	

overcome obstacles to weekly socialization homework assignments through coaching. In order to minimize parent-teen conflict during the completion of these

assignments, the level of parental involvement was individually negotiated each week with the help of group leaders during group reunification.

Treatment fidelity was in part established by the use of treatment manuals by the parent and teen group leaders. Adherence to treatment protocol was monitored by trained research assistants in both parent and teen groups through weekly fidelity sheets outlining the manualized intervention, ensuring that each participant received the same instruction regardless of group assignment.

Results

Groups were equivalent across conditions. Table 2 presents the mean demographic and baseline variables for each group. *T* tests for age, grade, KBIT-2 Verbal IQ, Vineland-II Composite scale, and outcome variable baseline scores all failed to reach significance (p 's > .11).

Immediate outcome measures were converted to difference scores (DS), where positive DSs indicated improvement (DS for the SRS was calculated by Baseline—Post-test; DS for the TASSK-R, QPQ, and SSRS Social Skills scales was calculated by Post-test—Baseline). Results are presented in Table 3.

A MANOVA was used to evaluate treatment outcome data (see Table 3). Results revealed that parents in the Treatment Group reported greater improvement in overall teen social skills on the SSRS-P Social Skills Scale (mean DS = 11.77) in comparison to parents in the Delayed Treatment Control Group [mean DS = .71; $F(1,26) = 3.40$, $p < .01$]. Further analysis of subscales revealed

Table 2 Mean demographic and baseline variables for treatment and delayed treatment control groups (standard deviations are in parentheses)

Variable	Group		<i>p</i>
	Treatment <i>n</i> = 14	Delayed treatment <i>n</i> = 14	
Age (years)	15.0 (1.0)	14.3 (1.4)	ns
Grade	9.4 (1.2)	8.8 (1.3)	ns
Percent male	85.7	78.6	ns
Percent Caucasian	57.1	42.9	ns
Percent mainstreamed	64.3	50.0	ns
KBIT composite	94.1 (20.2)	104.5 (18.8)	ns
Vineland composite	72.0 (10.6)	75.4 (9.2)	ns
Teen measures			
TASSK	13.1 (3.5)	14.0 (2.9)	ns
QPQ-A host	0.8 (1.1)	0.4 (0.9)	ns
Parent measures			
QPQ-P host	0.8 (1.1)	0.4 (0.8)	ns
SSRS-P social skills	39.2 (8.3)	39.9 (11.6)	ns
SRS-P	80.86 (9.3)	76.0 (10.2) ^a	ns

^a *n* = 7

Table 3 Mean difference scores for outcome variables for treatment and delayed treatment control groups (standard deviations are in parentheses)

Variable	Group		<i>p</i>
	Treatment <i>n</i> = 14	Delayed treatment <i>n</i> = 14	
Teen measures			
TASSK-R	9.14 (2.07)	0.71 (3.05)	<.01
QPQ-A host	4.43 (6.90)	0.29 (0.83)	<.03
Parent measures			
QPQ-P host	1.57 (1.83)	0.21 (0.70)	<.01
SSRS-P social skills total	11.77 (5.86)	0.71 (10.25)	<.01
SSRS-P cooperation	2.69 (2.02)	0.07 (2.50)	<.01
SSRS-P assertion	3.31 (2.18)	0.64 (3.00)	<.01
SSRS-P responsibility	2.54 (1.98)	−0.36 (3.71)	<.02
SRS-P total	11.54 (6.96)	1.43 (7.74) ^a	<.01
SRS-P social awareness	18.38(9.53)	6.14 (10.3) ^a	<.02
SRS-P social cognition	9.00 (7.53)	−0.14 (8.55) ^a	<.02
SRS-P social communication	12.92 (7.74)	0.29 (9.55) ^a	<.01
SRS-P social motivation	8.08 (8.70)	−1.14(10.70) ^a	<.05
SRS-P autistic mannerisms	10.69 (8.95)	2.71(6.70) ^a	<.05

^a *n* = 7

significant improvements in the Treatment Group vs. Delayed Treatment Control Group in the areas of Cooperation [$F(1,26) = 2.99$, $p < .01$], Assertion [$F(1,26) = 2.62$, $p < .01$], and Responsibility [$F(1,26) = 2.50$, $p < .02$]. Parents in the Treatment Group also reported significantly greater reduction in ASD symptoms relating to social responsiveness on the SRS-P (mean DS = 11.54) than parents in the Delayed Treatment Control Group [mean DS = 1.43; $F(1,18) = 2.98$, $p < .01$]. SRS-P subscale analyses revealed significant improvements in the areas of Social Awareness [$F(1,18) = 2.67$, $p < .02$], Social Cognition [$F(1,18) = 2.47$, $p < .02$], Social Communication [$F(1,18) = 3.21$, $p < .01$], Social Motivation [$F(1,18) = 2.09$, $p < .05$], and decreased Autistic Mannerisms [$F(1,18) = 2.06$, $p < .05$]. The Treatment Group showed a significantly greater increase in parent-reported hosted get-togethers on the QPQ-P (mean DS = 1.57) than the Delayed Treatment Control Group [mean DS = 0.21, $F(1,26) = 2.60$, $p < .01$]. Teen-reported hosted get-togethers on the QPQ-A also showed greater improvements in the Treatment Group (mean DS = 4.43) in comparison to the Delayed Treatment Control Group (mean DS = 0.29, $t(26) = 2.23$, $p < .03$). Significant improvement in knowledge of social skills on the TASSK-R was also observed in the Treatment Group (mean DS = 9.14) versus the Delayed Treatment Control Group [mean DS = .71; $F(1,26) = 8.56$, $p < .01$].

The effect of treatment on outcome variables at a 14-week follow-up assessment was evaluated with two-tailed paired samples *t* tests (T1 – T3) for 12 of the 14 participants in the Treatment Group (participants in the Delayed Treatment Control Group did not receive a 14-week follow-up assessment as all participants were enrolled in the study for a maximum of 28-weeks). Two Treatment Group subjects were missing T3 data and were not included in the follow-up analysis.

Results of the follow-up analyses indicate that treatment gains were maintained for the Treatment Group at T3 for all outcome measures except for the SRS-P Social Cognition subscale (see Table 4). Parent-reports of overall social functioning on the SSRS-P reveal significant improvements on the Social Skills Scale between T1 and T3 [$F(1,11) = -4.02, p < .01$]. Analyses of Social Skills subscales on the SSRS-P show significant improvements in the areas of Cooperation [$F(1,11) = 3.95, p < .01$], Assertion [$F(1,11) = 3.12, p < .01$], Responsibility [$F(1,11) = 3.21, p < .01$], and

Self-Control [$F(1,11) = 2.78, p < .02$]. Additional outcomes not initially observed on the SSRS-P at T2 post-testing for the Treatment Group included significant decreases in Problem Behaviors [$F(1,11) = -2.28, p < .04$] and Externalizing Behaviors [$F(1,11) = -3.19, p < .01$]. Decreases in autistic symptomology on the SRS-P also significantly improved from T1 to T3 [$F(1,11) = 3.25, p < .01$], with improvement in the areas of Social Communication [$F(1,11) = 3.74, p < .01$] and decreased Autistic Mannerisms [$F(1,11) = 2.67, p < .02$]. An additional outcome between T1 and T3 not initially found on the SRS-P at T2 post-test for the Treatment Group included significant improvement in Social Awareness [$F(1,11) = 2.77, p < .02$]. Teen social skills knowledge was maintained on the TASSK-R [$F(1,11) = 13.6, p < .01$] and the parent and teen reports of frequency of hosted get-togethers on the QPQ-P [$F(1,11) = 2.86, p < .01$] and QPQ-A [$F(1,11) = 2.17, p < .05$] were also significant.

Due to poor response rate from teachers, limited teacher data was available for analysis ($n = 11$). While no group

Table 4 Means for outcome variables for the treatment group (standard deviations are in parentheses) at pre-test, post-test, and follow-up assessments ($n = 14$)

Variable	Time			<i>p</i>	
	Pre-test T1	Post-test T2	Follow-up T3	T1 – T2	T1 – T3
Teen measures					
TASSK	13.0 (3.1)	22.2 (2.7)	22.7 (2.2)	<.0001	<.01
QPQ-A host	0.6 (0.9)	4.0 (4.0)	1.6 (1.6)	<.015	<.05
Parent measures					
QPQ-P host	0.58 (0.9)	2.9 (1.8)	1.67 (1.4)	<.001	<.01
SSRS-P social skills	78.3 (8.2)	91.2 (8.3)	89.5 (9.3)	<.0001	<.01
SSRS-P problem behaviors	113.8 (8.2)	110.7 (7.4)	106.3 (9.0)	ns	<.04 ^a
SSRS-P cooperation	9.4 (3.5)	12.4 (4.3)	11.6 (4.2)	<.001	<.01
SSRS-P assertion	5.9 (2.9)	9.2 (3.7)	8.4 (3.2)	<.001	<.01
SSRS-P response	11.9 (2.4)	14.6 (2.9)	14.3 (2.6)	<.002	<.01
SSRS-P self-control	10.6 (3.2)	13.0 (2.4)	13.1 (3.0)	<.02	<.02
SSRS-P extern	4.0 (1.5)	3.9 (1.9)	2.8 (1.6)	ns	<.01 ^a
SRS-P total	81.6 (8.4)	63.3 (22.0)	71.2 (11.3)	<.02	<.01
SRS-P awareness	63.8 (11.9)	50.0 (17.7)	52.3 (9.9)	ns	<.02 ^a
SRS-P cognition	74.7 (10.0)	58.3 (20.2)	67.5 (9.6)	<.029 ^b	ns
SRS-P communications	82.6 (9.7)	63.1 (21.4)	70.4 (12.2)	<.013	<.01
SRS-P motivation	79.4 (10.4)	66.8 (25.3)	72.6 (14.4)	ns	ns
SRS-P autistic mannerisms	80.7 (10.2)	62.3 (22.7)	71.8 (10.0)	<.023	<.02
Teacher measures					
SSRS-T soc skills	92.2 (12.2)	106 (7.5)	108.6 (7.7)	ns	<.03 ^c
SSRS-T assertion	4.8 (2.4)	7.5 (0.7)	12.0 (4.5)	ns	<.02 ^c
SRS-T total	70.7 (9.7)	39.0 (33)	59.0 (9.6)	ns	ns

T1 – T2 measures immediate treatment effect and T1 – T3 measures long-term effect after follow-up period

^a Additional gains at follow-up

^b Gains not maintained at follow-up

^c $n = 5$

differences were found between the Treatment and Delayed Treatment Control Groups between T1 and T2, significant findings were observed with regard to improved overall social functioning on the SSRS-T between T1 pre-test and T3 follow-up assessment on the Social Skills Scale [$F(1,4) = -3.25, p < .03$] and Assertion subscale [$F(1,4) = -3.6, p < .02$] for the Treatment Group.

Discussion

The current findings suggest that the use of PEERS, a parent-assisted manualized social skills group intervention, is efficacious in improving the friendship skills of high-functioning teens with ASD, with most improvements maintained at a 14-week follow-up assessment and in some cases improved even further. Findings indicate that the intervention resulted in overall improvement in social skills as reported by parents and teachers on a standardized measure of social skills (SSRS). Results from parent reports also suggest that teens significantly decreased ASD symptoms relating to social responsiveness by the end of the 14-week intervention (SRS-P). In addition, social skills knowledge improved as a result of the intervention (TASSK-R), as did the frequency of hosted get-togethers (QPQ). Independent teacher ratings of social functioning by educators who were blind to the conditions under investigation reveal significant improvements in social functioning from pre-test to follow-up assessment (SSRS-T). Most treatment gains were maintained at a 14-week follow-up assessment, with the exception of social cognition (SRS), which is considered to be a core feature of ASD. Additional treatment gains were observed at follow-up in relation to decreased problem behaviors (SSRS). Continuation of treatment gains months following the intervention may be attributed to continued parent involvement in social coaching post-treatment; thus, promoting the use of parent-assistance in social skills generalization and maintenance.

Findings from the current study are very encouraging. Studies investigating the effectiveness of social skills training for individuals with ASD indicate that intervention during childhood and adolescence is critical; however, very few evidence-based interventions focus on improving the social competence of teens with ASD, which make the present findings unique and important for a number of reasons. First, the current study demonstrates the use of an efficacious treatment for an underserved population, high-functioning adolescents with ASD, with core deficits in social skills. Second, unlike most of the existing social skills training interventions, the current study utilized a parent-assisted manualized intervention designed to improve the friendship skills of adolescents with ASD,

thereby promoting continued generalization of newly learned skills. Third, unlike many previous studies, the current study assessed change in social competence at a 14-week follow-up assessment, in order to establish successful maintenance of treatment gains.

Although the current study was successful in improving and maintaining overall social skills and social responsiveness in teens with high-functioning ASD, there are a few limitations to these findings worthy of note. One limitation is the lack of comprehensive diagnostic assessment. Although all participants had a previous diagnosis of an ASD from a reliable mental health professional, due to the financial constraints of the researchers, a comprehensive diagnostic evaluation verifying these diagnoses was not possible. In future, it would be beneficial to conduct a comprehensive diagnostic assessment using standardized measures like the Autism Diagnostic Interview-Revised (ADI-R; Le Couteur et al. 2003) or the Autism Diagnostic Observation Schedule (ADOS; Lord et al. 2001) to corroborate diagnoses. Additionally, the current study utilized parent rating scales as primary outcome measures. Given the fact that parents are active participants in the intervention and might be susceptible to bias, additional third party assessments (like those obtained with the SSRS-T) and behavioral observations would be beneficial toward establishing the validity of the findings. The current study collected independent ratings of behavior through teacher reports of social functioning; however, poor response rate resulted in less than half the sample obtaining complete teacher data. Although findings from teacher-reports on the SSRS-T were significant from pre-test to follow-up assessment, the generalizability of these findings is questionable given the small sample size. Finally, long-term follow-up assessment of social skills would yield useful information toward determining the durability of the findings, including understanding the failure to maintain improved social cognition at a 14-week follow-up. One such follow-up study is currently underway, assessing the long range treatment gains 1-5 years post-treatment for 53 PEERS participants. Preliminary analyses are encouraging and have established the maintenance of treatment gains over time. This new study is anticipated to not only yield useful data regarding the developmental trajectory of socialization among treated adolescents with ASD, but will likely guide future enhancements of the treatment intervention.

Acknowledgments The authors would like to thank Clare Gorospe, Jilly Chang, Jennifer Sanderson, Ruth Ellingsen, Shannon Bates, Martha Wang, Jin Lee, Bobbie Celaya, Anett Abrahamian, Amanda Lenvin, Cordelia Ross, and Jennifer McNamara for their valuable assistance on this study. The authors also gratefully acknowledge the hard work and dedication of the families who participated in this study. This research was supported by NIMH Grant U54-MH-068172,

Marian Sigman, Principal Investigator. The writing of this paper was partially supported by NIMH Grant #1U54MH068172, Fred Frankel, Project Principal Investigator. The contents of this publication are solely the responsibility of the authors and do not necessarily represent the official views of the NIH.

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