

Social Skills Training for Young Adults with High-Functioning Autism Spectrum Disorders:

A Randomized Controlled Intervention Study

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Abstract

Despite the psychosocial difficulties common among young adults with autism spectrum disorders (ASD), little to no evidence-based social skills interventions exist for this population. Using a randomized controlled trial (RCT) design, the current study tested the effectiveness of an evidence-based, caregiver-assisted social skills intervention known as *PEERS for Young Adults* with high-functioning young adults with ASD (ages 18 to 23) using self- and caregiver-report measures. Results revealed that treated young adults reported significantly less loneliness, more emotional awareness, and improved social skills knowledge, while caregivers reported significant improvements in young adult's social skills, social responsiveness, empathy, and frequency of get-togethers. Results support the effectiveness of using this caregiver-assisted, manualized intervention for young adults with ASD.

Key Words: ASD, autism, adults, social skills, relationships, PEERS

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Autism spectrum disorders (ASD) are lifelong pervasive developmental disabilities that may affect social, emotional, and adaptive functioning. Extensive evidence demonstrates that social skills acquisition and generalization of skills often form the most significant challenges for children and adolescents with high-functioning autism, Asperger's disorder, and pervasive developmental disorder-not otherwise specified (PDD-NOS). A more limited body of literature demonstrates that social skill deficits remain prevalent for young adults with ASD (Barnhill, 2007; Howlin, 2000). While these young adults' intelligence often improves their functioning (Howlin, 2000), it also may also mask their significant challenges (Barnhill, 2007).

Research suggests that social and behavioral symptoms may improve with some consistency in youth with ASD (Shattuck et al., 2007), but this progress tends to slow as these individuals enter adulthood (Taylor & Seltzner, in press). The challenging aspects of ASD appear greatest for those in adolescence and young adulthood, possibly due to the greater salience and complexity of peer relationships; growing drive toward identity exploration; lack of availability and knowledge about appropriate services; and uncertainty about the balance of responsibility between the youth themselves and those who support them (Tantam, 2003). For example, Osmond, Krauss, and Seltzner (2004) found that young adults with ASD who live at home tend to have fewer reciprocal peer relationships and less participation in social and recreational activities, while better social skills, greater functional independence, and maternal involvement in activities predicted higher social engagement.

Like children and youth with ASD, young adults with ASD continue to experience social deficits that impair their ability to develop and maintain friendships. Already challenged by poor social skills in such basic areas as using social cues and entering, engaging in, and exiting two-way conversations, many young adults with ASD further limit their opportunities for social success by making few social initiations or withdrawing from social interactions or settings (Shatyermann, 2007). Social skill deficits and social disengagement weaken friendship quality; Osmond and colleagues (2004) reported that most young adults with ASD in their sample did not participate regularly in social activities and few had any close reciprocal friendships.

Not surprisingly, the presence of poor social skills also appears to impact the development of romantic relationships and further affect the social independence of young adults with ASD. Social deficits in adults with ASD may exacerbate or lead to problems with not only friendships but also romantic relationships, daily living, and vocational success (Barnhill, 2007; Howlin, 2000). Studies suggest that most neurotypical individuals develop close friendships and romantic relationships by young adulthood (Collins & Madsen, 2006), the latter of which correlates positively with independence (Barry, Madsen, Nelson, Carroll, & Badger, 2009). Yet the social and romantic functioning of individuals with ASD compares unfavorably to neurotypical peers, with social skills predicting the ability to form romantic relationships (Stokes, Newton, & Kaur, 2007). Even though both groups report sharing similar interests in forming intimate relationships, those with ASD often lack the social skills knowledge to appropriately pursue and engage in romantic relationships and many recognize that they need more education to do so (Mehzabin & Stokes, in press). For example, these individuals sometimes naively behave in an intrusive manner with potential romantic partners, which may even be perceived as stalking behavior (Stokes et al., 2007). Perhaps for these reasons, romantic

relationships appear to be infrequent (Stokes et al., 2007) and marriages are even more rare (Barnhill, 2007) for adults with ASD.

The difficulties youth with ASD experience in establishing and maintaining social relationships relate to loneliness and other mental health problems. In adolescents with ASD, the common self-perception of social support from peers, friends, and parents positively correlates with loneliness (Lasgaard, Neilsen, Eriksen, & Goossens, 2009). They typically interact in inclusive settings with neurotypical peers, making regular social initiations an inevitability. However this context may actually highlight their differences and often results in unsuccessful social attempts, thus creating loneliness (Bauminger, Shulman, & Agam, 2003). Such loneliness and poor friendship quality positively correlate with depression in this population (Whitehouse et al., 2009), which in turn positively correlates with low social ability, anxiety, and social withdrawal (White & Roberson-Nay, 2009). The social naïveté and oddness, yet eagerness to form social relationships, common to many youth with ASD also renders them vulnerable to peer victimization, such as bullying (Humphrey & Symes, 2010) and sexual manipulation (Sullivan & Caterino, 2008), which may further exacerbate asocial behavior and weaken mental health.

Despite their “high-functioning” label, adults with less “severe” forms of ASD may possibly endure even more abuse than “lower-functioning” and younger individuals with ASD because of harsher social expectations, placement in less protective settings, and higher self-awareness (Sterling et al., 2008). Accordingly, young adults with ASD often present with more depression and anxiety than adolescents (Shtayermann, 2007). Adults with ASD with higher IQ (Sterling et al., 2008) and less ASD symptomology (Shtayermann, 2007) tend to experience more depression (Shtayermann, 2007; Sterling et al., 2008), anxiety, social isolation and withdrawal, and peer victimization (Shtayermann, 2007).

The high prevalence of a cognitive form of alexithymia (Berthoz & Hill, 2005), a condition that weakens the recognition, description, and interpretation of emotional states, presents further obstacles for the ability of young adults with ASD to understand and regulate difficult emotions that impair psychosocial functioning (Hill, Berthoz, & Frith, 2004). Alexithymia positively correlates with depression in adults with ASD (Hill, Berthoz, & Frith, 2004), in part because it limits their ability to dissociate the emotions of others from their own. Adults with ASD have demonstrated a greater personal reaction to others' distress than neurotypical peers (Rogers, Dziobek, Hassenstab, Wolf, & Convit, 2007), which may arise from alexithymia because the two groups' empathic concern (sympathy) otherwise appears comparable (Dziobek et al., 2008; Rogers et al., 2007). While these studies reported a deficit in cognitive empathy in the adults with ASD, new evidence from Bird and colleagues (2010), using a combination of questionnaire, experimental, imaging, and region of interest (subset brain analyses) measures, found that this deficit disappeared after accounting for alexithymia.

All of these findings strongly suggest the need for provision of social skills instruction to improve the social relationships and psychological well being of this vulnerable population. Research suggests that having good social skills and adequate social support relate to better quality of life in adults with ASD (Jennes-Coussens, Magill-Evans, & Koning, 2006; Wing, 1983). Moreover, having at least one or two close friends strengthens mental health outcomes and can buffer the impact of stressful life events (Miller & Ingham, 1976).

Two recent clinical trials (Laugeson, Frankel, Mogil, & Dillon, 2010; Laugeson, Frankel, Mogil, & Dillon, 2009) investigated the efficacy of the UCLA PEERS Program, a parent-assisted, manualized social skills intervention for middle school and high school teens with ASD (Laugeson & Frankel, 2010). Results revealed that in comparison with a delayed treatment

control group, those receiving the PEERS intervention had significantly higher social skills knowledge, greater social contact with peers, and better overall parent-reported social skills and social responsiveness. These studies support the idea that parents can have significant effects upon their adolescent's friendships, both in terms of direct instruction and supervision, as well as supporting their adolescent's development of an appropriate peer network (Laugeson & Frankel, 2010). Thus, parent or caregiver involvement in treatment may also be crucial to help young adults with ASD improve their social skills (Orsmond et al., 2004), most particularly since young adults with ASD are often quite dependent on their parents or other caregivers for support, even at this stage of development. Not unlike most neurotypical college students, who still rank their parents as their primary attachment figures (Fraley & Davis, 1997), young adults with ASD would likely benefit from parent and/or caregiver involvement in treatment.

Reviewed literature also emphasizes the need to provide formal instruction to young adults with ASD on dating and resistance to social pressures. Young adults with ASD often lack successful romantic relationships, even though many identify this area as a critical need. Engaging in unfamiliar social interactions in pursuit of romantic relationships, may greatly increase the risk for victimization. Young adults must have the skills to respond to these new social situations so they do not become exploited and have the courage to continue to build social experience.

In spite of the wide use of social skills training as a treatment tool for children and adolescents with ASD (Williams White, Keonig, & Scahill, 2007), few studies have focused on social skills treatment for young adults with ASD. To date, only two published studies appear to have tested the effectiveness of a social skills intervention. Turner-Brown and colleagues (2008) implemented a program developed for adults with psychotic disorders (Roberts, Penn, & Combs, 2004) to perform social cognition and interaction training with a group of adults with ASD. The

intervention improved participants' social cognition but not social functioning. In addition, Hiller and colleagues (2007) reported that only empathy improved after an eight-week social and vocational program for young adults with ASD. It appears that no intervention study has significantly improved the overall social and psychosocial functioning of young adults with ASD, and certainly no such studies have utilized a randomized controlled trial (RCT) design.

The purpose of this study was to adapt, further develop, and test the effectiveness and feasibility of a manualized evidence-based adolescent social skills training program (PEERS; Laugeson & Frankel, 2010) for use with young adults with ASD. It was hypothesized that participants would acquire and generalize social skills, develop social relationships, and improve psychosocial functioning as a result of this caregiver-assisted treatment.

## Methods

### *Participants*

Nineteen young adult participants ranging from 18-23 years of age ( $M = 20.2$ ;  $SD = 1.64$ ) participated in and completed the study with their caregivers. All of the 13 male and 6 female participants had a previous diagnosis of autism, Asperger's disorder, or PDD-NOS. Twelve participants identified themselves as Caucasian, five as Asian, and two as Hispanic/Latino. All but one resided with their caregivers and all were attending college at least part-time. Caregiver groups consisted primarily of parents, with only one grandparent, one aunt, and one adult sibling.

### *Procedures*

The study was conducted under the auspices of The Help Group – UCLA Autism Research Alliance, a collaborative partnership between the UCLA Semel Institute for Neuroscience and Human Behavior and The Help Group, a community mental health agency with specialized day school programs for youth with ASD.



Participants were recruited from The Help Group, Regional Centers, colleges and universities throughout Southern California, community support groups, and online research announcements. Eligibility requirements were that the young adult: (a) was between 18-23 years of age; (b) had a previous ASD diagnosis by a qualified mental health professional; (c) had social problems as reported by the caregiver; (d) was motivated to participate in the treatment; (e) was fluent in English; (f) had a family member who was fluent in English and willing to participate in the study; (g) had a composite IQ score of at least 70 on the KBIT-2; and (h) had no history of major mental illness (e.g., bipolar disorder, schizophrenia, or psychosis). All participants received the intervention at no cost and could withdraw from it at any time without penalty.

Following randomization and baseline assessment, ten participants immediately began treatment and nine participants received treatment after a 14-week wait period. Treatment participants were assessed a second time during the last session of the intervention, while participants in the delayed treatment control group were assessed a second time during the first session of the intervention (after the 14-week wait period). One treatment group participant dropped out due to prohibitively severe behavioral problems in the group.

The *UCLA PEERS for Young Adults Program* consisted of 14 weekly 90-minute sessions, delivered in the community. Young adults and caregivers attended separate concurrent sessions at The Help Group led by a licensed clinical psychologist and a post-doctoral psychology fellow, respectively. Research assistants, who were either graduate or undergraduate psychology students, monitored treatment fidelity, assisted with role-playing demonstrations, and provided social coaching with performance feedback during behavioral rehearsal exercises. All research assistants were trained and supervised throughout the intervention.

The purpose of the lessons was to provide instruction and rehearsal of social skills related to building close relationships. Didactic lessons included: (a) conversational skills; (b) electronic forms of communication; (c) developing friendship networks and finding sources of friends; (d) appropriate use of humor; (e) peer entry strategies; (f) peer exit strategies; (g) organizing get-togethers with friends; (h) handling teasing and embarrassing feedback; (i) dating etiquette; (j) handling peer pressure and avoiding exploitation; and (k) resolving arguments with friends.

The core features of the *UCLA PEERS Program for Adolescents* were adapted toward the development of the young adult program. These features included (a) relevant portions of the social skills curriculum, (b) the use of caregiver assistance in the treatment, and (c) structural elements of the lesson format including didactic lessons, role-playing demonstrations, behavioral rehearsal exercises, performance feedback, and weekly socialization homework assignments.

The adolescent program was adapted to fit the adult treatment model through modifications to the caregivers' level of involvement with social coaching of young adults outside of the groups, further emphasizing the need for the young adults' social independence with adequately graded support. The PEERS Program was also modified to remove certain elements that were not developmentally appropriate for young adults, and to include both additional treatment modules on dating etiquette and peer resistance strategies, and the use of young adults' self-derived social goals to increase intrinsic motivation for treatment compliance.

*PEERS for Young Adults* provided instruction on social etiquette through the use of concrete rules and steps, as young adults with ASD often have a high ability to take in information, particularly a selective attention to more systematic information (Johnson, Blaha, Houpt, & Townsend, 2010; Remington, Swettenham, Campbell, & Coleman, 2009). These rules and steps of social etiquette were derived from evidence of ecologically valid social skills based

on the behaviors of socially accepted peers. This method of instruction intuitively appeals to adults with ASD, as they often prefer and have a higher ability to remember facts (Bowler, Gaigg, & Gardner, 2008). The presentation of rules was conducted in the form of Socratic questioning, intending to drive participation in a population that often exhibits low self-directed behavior (Anckarsäter et al., 2006). Further raising motivation, instruction of social skills was conducted in a small-group format (i.e., 9-10 group members), matching the self-reported needs and preferences of young adults with ASD (Müller, Schuler, & Yates, 2008). Role-playing exercises with modeling and structured practice followed and provided context to didactic lessons, during which time participants received feedback on their performance. This design enhances generalization of didactic content, since individuals with ASD often struggle to apply prior knowledge in context (McKenzie, Evans, & Handley, 2010).

Due to the need to practice newly learned skills in a natural setting (Williams White et al., 2007), group leaders provided socialization homework assignments. Homework review took place in both group sessions the following week, and individualized the program to each participant by allowing sufficient time to troubleshoot any problems that may have arisen. Caregivers received specific instructions on how to provide assistance with social coaching to their young adults, while promoting or maintaining their social independence. Caregivers learned that managing this balance partially involves addressing the anxious behaviors, characterized by low novelty- and reward-seeking and high harm avoidance, that many adults with ASD possess (Anckarsäter et al., 2006). During reunification at the end of every session, group leaders ensured that families had a plan to complete the assignments. Such immediate assistance with planning and organization allows for further skill mastery, as it may help the young adults to manage their difficulties with executive functioning (Cederlund et al., 2010; Hill, 2004).

### *Measures*

Few validated and normed measures assess young adults with ASD psychosocial functioning. Lack of age-appropriate comparable standardized assessment tools led to the use of certain measures designed for the adolescent ASD or neurotypical adult populations.

*Autism Spectrum Quotient (AQ; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001)*. The AQ is a 50-item self- and parent-report scale that measures autistic traits along five subscales: social skills, attention shifting, attention to detail, communication, and imagination. The AQ was administered to caregivers and young adults at baseline only to confirm diagnosis.

*Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004)* DERS is a 36-item self-report measure of emotion dysregulation along six categories: non-acceptance, difficulties, goals, impulse control, lack of awareness, strategies, and clarity. The DERS was administered to young adults at pre- and post-test.

*Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004)*. The EQ is a self- and parent-report measure of empathy in the ASD population. The EQ was administered to caregivers and young adults at pre- and post-test.

*Kaufman Brief Intelligence Test - Second Edition (KBIT-2; Kaufman & Kaufman, 2005)*. Administered to young adult participants at baseline only, the KBIT-2 is a brief screening tool used to assess cognitive functioning. It generates Verbal, Nonverbal, and Composite IQ standard scores ( $M = 100$ ,  $SD = 15$ ). The KBIT-2 has very strong convergent validity with Wechsler Adult Intelligence Scale-Third Edition test scores (Walters & Weaver, 2003).

*Quality of Socialization Questionnaire (QSQ; adapted from Frankel et al., 2010)*. The QSQ is a 12-item self- and parent-report measure adapted from the Quality of Play Questionnaire (QPQ; Frankel et al., 2010) that assessed the young adults' frequency of hosted and invited get-

together over the previous month. It was administered to caregivers and young adults at pre- and post-test.

*Social and Emotional Loneliness Scale for Adults (SELSA; DiTommaso & Spinner, 1993).* The SELSA is a 37-item self-report measure of romantic, social, and family loneliness. The SELSA was administered to young adults at pre- and post-test.

*Social Skills Inventory (SSI; Riggio, 1989).* The SSI is a 90-item self-report measure of social skills for adults. It yields a total score and six sub-scales scores related to emotional expressivity, emotional sensitivity, emotional control, social expressivity, social sensitivity, and social control. The SSI was administered to young adults at pre- and post-test.

*Social Responsiveness Scale (SRS; Constantino, 2005).* The SRS is a 65-item rating scale of the severity of ASD symptoms as they occur in natural social settings. It provides a clinical representation of an individual's social impairments, assessing social awareness, social information processing, capacity for reciprocal social communication, social avoidance, and autistic mannerisms. The SRS was administered to caregivers at pre- and post-test.

*Social Skills Rating System (SSRS; Gresham & Elliott, 1990).* The SSRS is a 52- and 39-item, respectively, parent- and self-report questionnaire. It assesses social competence in cooperation, assertion, responsibility, and self-control in interactions with age-mates, performance on household and classroom tasks, use of free time, and academic competence. The SSRS was administered to caregivers and young adults at pre- and post-test.

*Test of Young Adult Social Skills Knowledge (TYASSK; adapted from Laugeson et al., 2009).* The TYASSK is a 23-item criterion-referenced measure based on the Test of Adolescent Social Skills Knowledge (TASSK; Laugeson, et al., 2009) and modified for this study to assess the young adults' knowledge about the specific social skills taught during the intervention. The

TYASSK was administered to young adults at pre- and post-test.

*Vineland Adaptive Behavior Scales - Second Edition, Survey Form (Vineland-II; Sparrow, Balla, & Cicchetti, 2005).* The Vineland-II measures adaptive behavioral skills and functioning within the domains of communication, daily living skills, and socialization. The Vineland-II was administered to caregivers at baseline only.

### Results

Table 1 presents the mean demographic and baseline variables for both groups. T-tests for age, KBIT-2 IQ, Vineland-II Composite scale, AQ, and outcome variable baseline scores all failed to reach significance.

[place Table 1 about here]

Outcome measures scores were converted to difference scores (DSs; Post-test – Baseline). Negative DSs indicated improvement for the SRS, and SELSA scales, and positive DSs showed improvement for TYASSK, QSQ, EQ, and SSRS. Table 2 presents the results.

[place Table 2 about here]

Results of the MANOVA revealed that the Treatment group (TX) improved significantly more than the Delayed Treatment Control group (DTC) in knowledge of social skills taught in the current treatment [TYASSK;  $F(1, 17) = 18.78, p < .001$ ]. Caregivers in the TX group also reported greater improvement in overall young adult social skills [SSRS Social Skills;  $F(1, 17) = 12.79, p < .003$ ]. Further analysis of SSRS subscales revealed significant improvements in scores for the TX group on Cooperation [ $F(1, 17) = 9.03, p < .008$ ], Assertiveness [ $F(1, 17) = 5.42, p < .033$ ], and Self Control [ $F(1, 17) = 5.57, p < .031$ ]. A significantly greater reduction in ASD symptoms relating to social responsiveness was found in the TX group [SRS Total;  $F(1, 17) = 6.35, p < .023$ ] in comparison to the DTC group. Further analysis of SRS subscales

revealed significant improvements in Social Communication [ $F(1,17) = 5.94, p < .027$ ] and Autistic Mannerisms [ $F(1,17) = 9.33, p < .008$ ], and approached significance on Social Awareness [ $F(1,17) = 4.46, p < .051$ ]. In line with these findings, caregivers in the TX group reported a significant increase in parent-reported empathy on the EQ [ $F(1, 17) = 5.24, p < .036$ ] in comparison to the DTC. Furthermore, young adults in the TX group reported significant decreases in loneliness [SELSA;  $F(1, 17) = 5.11, p < .038$ ] and significant improvement in emotional awareness [DERS Emotional Awareness;  $F(1, 17) = 5.00, p < .040$ ] following the intervention, as compared to those in the DTC group. Finally, due to a violation of the normal distribution assumption, a non-parametric Mann Whitney U Test of significance was used to assess change in frequency of get-togethers in both groups. The TX group showed a significantly greater increase in caregiver-reported invited get-togethers (QSQ-C Invited;  $z = -2.42, p < .015$ ), and an increase in caregiver-reported hosted get-togethers (QSQ-C Hosted;  $z = -2.11, p < .035$ ).

### Discussion

Findings support the effectiveness of the *PEERS for Young Adults* program, a caregiver-assisted manualized social skills intervention, for promoting the development of close relationships and improving the social and psychosocial functioning of young adults with ASD.

The SSRS results revealed an overall improvement in social skills as reported by caregivers in the Treatment group in comparison to the Delayed Treatment Control group. This included increases in cooperative social behavior with peers and caregivers, social assertiveness (possibly due to the encouragement of independence in social functioning), and self-control, which would likely lead to more appropriate social behaviors and thus social acceptance.

SRS results also demonstrated significant improvements in social responsiveness. The program's attention to receptive and expressive social communication skills may respectively

explain the rise in social awareness and social communication. Similarly, the change on the autistic mannerisms subscale, which measures repetitive behavior and restricted interests (e.g., “Thinks or talks about the same thing over and over”), may stem from the intervention’s focus on skills for bidirectional social interactions. Such progress has highly important implications for people with ASD. The SRS, a diagnostic screening instrument for ASD, measures core areas of deficits, which ultimately affect social functioning. Gains in these domains may change clinical presentation, which itself can be a treatment goal.

Similarly, the EQ can function as a marker of ASD presentation (Spek, Scholte, & Van Berckelaer-Onnes., 2010). Caregivers reported that their young adults significantly improved by the end of the treatment on the measure. One may have to differentiate between affective and cognitive empathy; they respectively relate to the abilities to experience the emotions of others and to recognize that those feelings reflect the other person’s emotional state (Bird et al., 2010). Individuals with ASD tend to demonstrate at least typical levels of affective empathy but have more difficulty with cognitive empathy (Dziobek et al., 2008; Rogers et al., 2007), which may be explained by the reduction in awareness of emotional states posed by alexithymia in adults with ASD (Bird et al., 2010). Therefore, the significant improvement on the Emotional Awareness subscale of the DERS may relate to the reported rise in empathy. Bird and colleagues also suggested a distinction between cognitive empathy and theory of mind, or the ability to attribute mental states to other people to make sense of and predict their behavior, presenting evidence that they operate from different neural circuits. They reported that adults with ASD but without alexithymia showed intact empathy, or cognitive awareness of shared emotions with others, yet worse performance on a measure of cognitive perspective taking. As the EQ does not differentiate between empathy and theory of mind (Baron-Cohen & Wheelwright, 2004), the



current intervention also may have raised participants' broader social cognitive abilities by having them learn, attend to, and assess verbal and non-verbal social cues, through in-session role plays that demonstrated new social skills and required participants to take another person's perspective in a social situation.

Loneliness also decreased as a result of the intervention, as shown by the young adults' SELSA scores. Young adults' greater participation in social activities and development of friendships may have caused social loneliness to decline. More frequent, appropriate attempts toward romantic interests may have reduced romantic loneliness. Caregivers' trained assistance with their young adult's social functioning may also have led family loneliness to decline.

Furthermore, frequency of invited get-togethers (i.e., social invitations extended to the participant from non-PEERS friends) increased greatly according to caregiver report. Although hosted get-togethers (i.e., social invitations extended to non-PEERS friends by the participant) were also significantly improved, the frequency of invited get-togethers may better indicate treatment success, as it signifies social reciprocity in the relationship.

The subjective nature of the measures and difficulties surrounding self-perception and self-awareness common among individuals with ASD may explain why no other self-report measures attained overall significance. While adults with ASD can capably report their emotion regulation abilities (Berthoz & Hill, 2005; Hill, Berthoz, & Frith, 2004), the presence of alexithymia reduces the ability to verbalize emotions. Furthermore, while not unaware of their challenges, individuals with ASD tend to rate their psychosocial functioning as better than their parent's report. Yet those who have fewer ASD symptoms over time often rate themselves more harshly than their parents do, possibly reflecting greater insight into their overall functioning (Cederlund et al., 2010). Therefore, the intervention may have raised participants' awareness

about their psychosocial difficulties, as suggested by the self-report of improved emotional awareness on the DERS (complemented by caregivers' report of improvement on the EQ and social awareness on the SRS), but the lack of self-reported improvement of social skills on the SSI and SSRS and empathizing on the EQ. The young adults' post-treatment scores may thus represent a more realistic, less favorable observation of their psychosocial functioning. Conversely, young adults with ASD may simply view the world differently (Mesibov & Stephens, 1990).

Despite the significantly positive results reported here, a few limitations warrant attention. One is the lack of use of standardized measures like the Autism Diagnostic Interview—Revised (ADI-R; Le Couteur, Lord, & Rutter, 2003) or the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 2001) to corroborate diagnoses. Similarly, assessment tools specifically designed or adapted for adults with ASD would improve the specificity of the findings, such as the SRS -Adult Version (in development; see Constantino & Todd, 2005). Another limitation to the current study is the lack of third party assessments for primary outcome measures, since the caregivers' active participation in the intervention may have biased their report. The current study attempted to include independent rater reports of social functioning, but most participants and their families failed to find such individuals. Finally, larger clinical trials may strengthen external validity and guide future treatment adaptation and development, including follow-up studies to assess outcomes over time.

The current study found the *PEERS for Young Adults* program a feasible and effective intervention for the acquisition and generalization of social skills, as well as the development of social relationships, in young adults with ASD. It serves as an example of a community-based effectiveness study using a randomized controlled trial design to meet the clinical needs of a

highly underserved and arguably understudied population (Williams White et al., 2007).

Additional trials are needed to provide further support for these findings, as well as follow-up data to assess the treatment's durability over time.

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The authors would like to thank Connie Kasari, Fred Frankel, Andrew Leuchter, Robert Lieberman, Jennifer Sanderson, Dana Lieberman, Sebastián Torres, Laura Knoll, Chloe Koeffler, Kristine McGeleennen, and Siena Whitham 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 NIH Training Grant #T32-MH17140, Andrew Leuchter, Principal Investigator. The writing of this paper was partially supported by Organization for Autism Research Grant #20093336, Alexander Gantman, Project Principal Investigator. The second author also gratefully acknowledges the generous support of the Philip & Aida Siff Educational Foundation toward work on this study and paper.

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Table 1.  
Mean differences between parent-child reports

Variable	Rater		<i>p</i>
	Young adult <i>n</i> = 9	Parent <i>n</i> = 9	
AQ	25.64 (7.2)	33.42 (6.9)	<.001
AQ – Attention Shifting	6.14 (2.0)	7.64 (1.7)	<.001
AQ – Communication	4.97 (2.1)	7.42 (1.7)	<.001
AQ – Imagination	4.19 (2.1)	5.69 (2.2)	<.001
AQ – Social Skills	6.14 (2.5)	7.53 (2.0)	<.001
EQ	28.86 (11.6)	17.47 (8.7)	<.001
EQ – Cognitive Empathy	7.78 (5.2)	1.94 (2.5)	<.001
EQ – Emotional Reactivity	9.39 (5.0)	5.69 (4.9)	<.001
SSRS (Standard Score)	95.71 (15.2)	84.53 (11.6)	<.003
SSRS – Cooperation	14.80 (2.7)	10.31 (3.8)	<.001

Table 2.  
Predictors of parent-child differences

Predictor	Dependent variable	<i>p</i>	Pearson's <i>r</i>
AQ	25.64 (7.2)	33.42 (6.9)	<.001
AQ – Attention Shifting	6.14 (2.0)	7.64 (1.7)	<.001
AQ – Communication	4.97 (2.1)	7.42 (1.7)	<.001
AQ – Imagination	4.19 (2.1)	5.69 (2.2)	<.001
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SSRS (Standard Score)	95.71 (15.2)	84.53 (11.6)	<.003
SSRS – Cooperation	14.80 (2.7)	10.31 (3.8)	<.001
Percent Caucasian	55.6	78.0	ns
KBIT Composite	96.7 (11.8)	109.22 (16.4)	ns
Vineland Composite	69.6 (7.5)	65.9 (7.7)	ns
<i>Young adult measures</i>			
TYASSK	12.7 (2.2)	12.0 (2.3)	ns
QSQ Hosted	1.00 (1.3)	0.78 (1.3)	ns
QSQ Invited	2.22 (4.9)	1.00 (1.7)	ns

SSI Total Score	237.4 (31.2)	244.2 (38.4)	ns
SELSA	132.56 (33.7)	131.0 (29.1)	ns
DERS Emotional Awareness	17.3 (3.2)	16.3 (3.5)	ns
<i>Caregiver measures</i>			
QSQ Hosted	0.78 (1.1)	0.67 (1.1)	ns
QSQ Invited	2.22 (5.2)	0.78 (0.9)	ns
SSRS Social Skills Total	78.7 (11.4)	84.3 (10.3)	ns
SRS Total Score	110.8 (22.6)	89.6 (21.0)	ns
AQ	35.9 (5.2)	30.8 (7.5)	ns
EQ	17.0 (8.4)	19.0 (9.1)	ns

Table 2.

Mean Difference Scores, Standard Deviations and Significance for Outcome Variables

Variable	Group		<i>p</i>
	Treatment <i>n</i> = 9	Delayed Treatment <i>n</i> = 9	
<i>Young adult measures</i>			
TYASSK	6.33 (2.0)	0.33 (2.79)	<.0001
SELSA Total Score	-12.67 (17.59)	4.11 (13.67)	<.038
DERS Emotional Awareness	-0.22 (2.22)	2.11 (2.21)	<.040
<i>Caregiver measures</i>			
SSRS Social Skills Total <sup>a</sup>	6.33 (9.01)	-6.22 (5.45)	<.003
SSRS Cooperation	2.56 (3.05)	-1.22 (2.22)	<.008
SSRS Assertiveness	2.00 (2.50)	-0.22 (1.39)	<.033
SSRS Self-Control	1.22 (3.99)	-2.44 (2.40)	<.031

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SRS Total Score <sup>a</sup>	-18.7 (23.7)	5.22 (20.0)	<.023
SRS Social Awareness <sup>a</sup>	-1.33 (2.35)	1.22 (2.77)	<.051*
SRS Social Communication <sup>a</sup>	-6.11 (7.75)	2.44 (7.13)	<.027
SRS Autistic Mannerisms <sup>a</sup>	- 3.22 (4.32)	2.44 (3.50)	<.008
EQ	7.00 (9.75)	-0.89 (3.44)	<.036
QSQ Invited Get-Togethers <sup>b</sup>	0.89 (0.93)	-0.22 (0.67)	<.015
QSQ Hosted Get-Togethers <sup>b</sup>	1.00 (1.41)	0.00 (0.71)	<.035

<sup>a</sup> Standard Scores

<sup>b</sup> Mann Whitney U Test of Significance (2-tailed)

\*Approached Statistical Significance