BRIEF REPORT



Efficacy of Community-Delivered PEERS® for Adolescents: Increases in Social Skills and Decreases in Social Anxiety and Loneliness

China I. Parenteau¹ · Jessica Floyd¹ · Katy Ankenman¹ · Tara Glavin¹ · Julia Charalel¹ · Enjey Lin¹ · Whitney Ence¹ · Young Shin Kim¹ · Somer Bishop¹ · Shuting Zheng¹

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Abstract

Purpose PEERS® for Adolescents is an evidence-based social skills training program developed for individuals with autism spectrum disorder (ASD), which is now widely implemented by community providers in clinics and schools. However, majority of past efficacy studies on PEERS® were conducted in controlled research settings, with limited information about its effectiveness when delivered in the community. We sought to examine the effects of PEERS® on social functioning and mental health outcomes when delivered in an outpatient autism specialty clinic.

Methods Clinical data from 45 adolescents with social challenges (age range: 11–18 years old; 31.1% female assigned at birth) were extracted for secondary analyses. Paired t-tests were performed to examine the pre- to post-intervention changes in social and mental health outcomes. Correlations between pre- and post-change scores of outcome measures were examined.

Results Self-reported social skills knowledge, caregiver-reported social skills (measured by the Social Skills Improvement Systems) and the number of get-togethers hosted, increased significantly from pre- to post-intervention. Additionally, caregiver-reported anxiety and self-reported loneliness significantly decreased from pre- to post-intervention. Exploratory analyses showed that increases in caregiver-reported social skills were associated with decreases in self-reported loneliness. **Conclusions** Our findings provide evidence supporting the efficacy of PEERS® for improving social knowledge and skills of adolescents with social challenges when delivered in the community. The current study also showed the potential benefit of PEERS® for improving adolescent mental health.

Keywords PEERS® for Adolescents · Social skills training · Mental health · Community-delivered intervention

Introduction

Individuals diagnosed with autism spectrum disorder (ASD) and other neurodevelopmental disorders (NDDs) commonly face difficulties in developing and maintaining social relationships (Cresswell et al., 2019). Social difficulties are often especially pronounced during adolescence, as this is a time marked by the emergence of new social contexts and expectations, as well as changes in identity development and independence (Baczewski & Kasari, 2021).

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The Program for the Education and Enrichment of Relational Skills (PEERS®) for Adolescents, is designed to promote social functioning in adolescents who face challenges initiating and maintaining friendships, and it is one of the most widely implemented and empirically supported group-based social skills interventions for individuals with autism (Zheng et al., 2021). Multiple efficacy and replication studies across different countries have shown that participation in PEERS® is associated with improvements in social knowledge and social skills, and frequency of gettogethers (Zheng et al., 2021). Besides its benefit on social functioning for adolescents with autism, emerging evidence suggests that adolescents who participated in PEERS® also report improvements in mental health. For example, studies composed of samples ranging from 5 to 58 autistic adolescents found decreases in feelings of loneliness on the Revised UCLA Loneliness Scale (Matthews et al., 2018),

Shuting Zheng Shuting.zheng@ucsf.edu

¹ Department of Psychiatry and Behavioral Sciences, Weill Institute for Neurosciences, University of California San Francisco, 675 18th St., San Francisco, CA 94107, USA

depressive symptoms on the Children's Depression Inventory-2 (CDI-2; Schiltz et al., 2018; Yoo et al., 2014) and the Social Skills Improvement Scale (SSiS)- Internalizing Subscale (Hill et al., 2017; Marchica & D'Amico, 2016). Additionally, reductions were observed in anxiety on the Social Interaction Anxiety Scale (Schohl et al., 2014), the Screen for Child Anxiety Related Disorders (Hill et al., 2017), and the Social Anxiety Scale (Factor et al., 2022) following participation in PEERS®. These findings raise the possibility that targeting social skills may provide another avenue for decreasing loneliness and promoting psychological wellbeing in adolescents with ASD and other NDDs (Adams et al., 2023).

While multiple studies support the efficacy of PEERS® when delivered in research settings, only one pilot study to our knowledge, with a sample size of five, has examined outcomes of PEERS® when delivered in the community (Hill et al., 2017). Considering the well-known implementation challenges when moving from a highly controlled experimental setting to a community setting (Odom et al., 2020), it is imperative to study the effectiveness of the PEERS® intervention also in a community setting. Therefore, to begin to fill this gap, this secondary data analysis was undertaken to examine the outcomes of the PEERS® intervention delivered as part of clinical care at an outpatient autism specialty clinic. Specifically, we investigated: (1) whether a community-delivered PEERS® program is effective in improving social knowledge and social skills; (2) whether adolescents reported reductions in mental health symptoms after participation in PEERS®; and (3) whether improvements in social skills are associated with reductions in mental health symptoms.

Methods

Participants and Procedures

Adolescents with ASD or other NDDs who experienced social challenges were referred to an autism specialty clinic for the PEERS® program. Once referred, individuals went through a phone screening and intake process where the clinician followed recommended PEERS® guidelines to determine eligibility (Laugeson et al., 2012): (1) be in middle school or high school; (2) report difficulties making and maintaining friends; (3) have a voluntary interest in consistently attending the program; (4) have a caregiver willing to consistently participate; and (5) have the language and cognitive abilities to understand and participate in the group.

From 2015 to 2022, 92 adolescents with ASD or other NDDs and their primary caregivers participated in the PEERS® program offered at an autism specialty clinic.

As seen in Fig. 1, while all of the 92 adolescents and their caregivers were offered the opportunity to have their data used for research purposes, only 49 adolescents and their caregivers (53.32%) provided assent/consent. Although participants were encouraged to complete all measures, the voluntary nature of data collection in the context of a clinical service led to some missing data. Four of the 49 consented participants did not complete any measure for one of the two timepoints, resulting in 45 participants included in analyses. Furthermore, for each analysis, a participant was only included if they completed the measure at both pre- and post-intervention (i.e., pairwise deletion). Consequently, the number of participants who completed both timepoints ranged from 30 to 43 across measures (see Table 1).

The analytic sample consists of participants from nine PEERS® groups, with six in-person groups (n=34) and three telehealth groups (n=11), who had at least one outcome measure with pre- and post-intervention data as described above. The sample was between the ages of 11–18 years old (M = 14.3, SD = 1.68), with 14 (31.1%) biological females. All biological males identified as male gender during their participation in PEERS®, while 12 of the 14 biological females identified as female gender, and two identified as non-binary. The majority of participants were White (60%) and non-Hispanic (86.67%). The majority (68.9%) of participants had a diagnosis of ASD based on a clinical best estimate. Others in the group presented with primary diagnoses of attention deficit hyperactivity disorder (n=15.6%), anxiety disorder (n=6.7%), communication disorder (n = 4.4%), depressive disorder (n = 2.2%) and other unspecified NDDs (n=2.2%). Participants attended 87.4% of the provided sessions on average (with a range of 50-100%). See Table 2 for sample characteristics.

The Institutional Review Board at the authors' institute approved the clinical research data registry for the research team to obtain informed consent and store clinical data for research, of which the data for this secondary analysis were generated (University of California, San Francisco, IRB # 14-14484). This secondary data analysis study was reviewed and exempted by the IRB.

The PEERS® Program

Adolescents were offered 14 in-person weekly group sessions, or 15 virtual weekly group sessions during the COVID-19 pandemic, each for 90 min (see Table 3 for session topics covered). Adolescents received social skills training through didactic lessons and role-play activities, with homework each week to practice what they learned during group (Laugeson & Frankel, 2011). Caregivers attended separate sessions simultaneously and were coached on how to assist their adolescents in applying social skills.



Fig. 1 PEERS® participation flow. *Note: Percentages were calculated based on total participants in the program

The group leaders consisted of a Board-Certified Behavior Analyst®, a Licensed Clinical Social Worker, Clinical Psychologists, along with behavioral coaches who were bachelor's level research assistants and volunteers.

Measures

Pre-intervention caregiver- and self-report measures were completed at the time of intake before the start of the group, and post-intervention measures were collected within two weeks of the last group session. Measures included in the study were those recommended by the PEERS® developers and commonly used across different studies to show change (Zheng et al., 2021).

Social Knowledge & Skills Measures

Test of Adolescent Social Skills Knowledge (TASSK; Laugeson & Frankel, 2010)

The TASSK is a 26-item, multiple-choice test developed to directly assess the adolescent's knowledge about specific social skills taught during the PEERS® intervention, with higher scores representing a better understanding of the material. Previous studies on PEERS® have all implemented this test to measure social skills understanding (Zheng et al., 2021).

		Pre-Intervention	Post-Intervention	Т	df	*P (<0.05)	
		Mean (SD)	Mean (SD)				
Social Outcomes	SSiS (<i>n</i> =33)	77.52 (11.86)	82.61 (9.66)	2.24	32	0.032*	
	QSQ Caregiver Hosted $(n=32)$	0.59 (1.04)	2.38 (2.37)	4.39	31	< 0.001*	
	QSQ Caregiver Invited $(n=30)$	0.7 (1.18)	0.97 (1.07)	1.35	29	0.187	
	QSQ-A Hosted $(n=37)$	1.54 (2.58)	2.65 (3.04)	1.98	36	0.056	
	QSQ-A Invited $(n=35)$	1.4 (4.24)	1.31 (1.68)	-0.11	34	0.913	
	TASSK $(n=43)$	13.81 (3.28)	19.47 (3.63)	9.55	42	< 0.001*	
Mental Health Symptoms	CDI-2 (<i>n</i> =33)	57.33 (10.63)	54.94 (10.48)	-1.30	32	0.203	
	LSDQ (n=34)	40.06 (13.85)	36.06 (12.07)	-2.64	33	0.013*	
	SAS-A (<i>n</i> =37)	48.7 (13.78)	46.97 (14.15)	-0.89	36	0.376	
	SAS-A Caregiver $(n=36)$	53.44 (12.19)	51.03 (11.08)	-1.04	35	0.037*	

Table 1 Descriptive statistics and paired t-test results on social skills and mental health measures

Note: SSiS = Social Skills Improvement Scale (Gresham & Elliot, 2008); QSQ = Quality of Socialization Questionnaire for Adolescents (Frankel & Mintz, 2008); TASSK = Test of Adolescent Social Skills Knowledge (Laugeson & Frankel, 2010); CDI-2 = Child Depression Inventory-2 (Kovacs, 2011); LSDQ = Loneliness and Social Dissatisfaction Questionnaire (Asher et al., 1984); SAS-A = Social Anxiety Scale for Adolescents (La Greca, 1999)

Table 2 Sample characteristics

	Frequency	%
Primary Diagnosis		
ASD	31	68.9%
ADHD	7	15.6%
Anxiety Disorder	3	6.7%
Communication Disorder	2	4.4%
Depressive Disorder	1	2.2%
NDD - Unspecified	1	2.2%
Race		
White	27	60%
Asian	9	20%
Two or More	6	13.3%
Black or African American	1	2.2%
Native Hawaiian or Other Pacific Islander	1	2.2%
American Indian or Alaskan Native	1	2.2%
Ethnicity		
Non-Hispanic	39	86.7%
Hispanic/Latinx	6	13.3%
Biological Sex		
Male	31	68.9%
Female	14	31.1%
Gender		
Male	31	68.9%
Female	12	26.7%
Non-binary	2	4.4%
	Mean (SD)	Range
Age	14.3	11-18
Sessions attended	87.35%	50-100%

Social Skills Improvement Scale (SSiS; Gresham & Elliot, 2008)

The SSiS is a 52-item caregiver report measure designed to assess individuals' social skills, along with problem behaviors and academic competence, where higher scores indicate better social skills. This measure showed good reliability (Gresham & Elliot, 2008) and concurrent validity with the Vineland Adaptive Behavior Scales, Second Edition (Sparrow et al., 2005), and the Behavior Assessment System for Children, Second Edition (Reynolds & Kamphaus, 2004) in samples of neurotypical children (Crosby, 2011; Flanagan et al., 1996). Psychometric analyses of the SSiS in an autistic sample found that the measure showed similar factor structure to the original proposed structure and good internal validity of the subscales and the total scale (Cronbach's Alpha ranging from 0.87 to 0.96; Nader et al., 2023). The social skills standard score was included in the current analyses.

Quality of Socialization Questionnaire (QSQ; Frankel & Mintz, 2008)

The QSQ is a 12-item measure that targets how well the teen got along with friends at the most recent get-together and assesses the frequency of hosted and invited get-togethers over the previous month. Both self- and caregiver-report of get-togethers hosted and invited were included in the analyses.

Table 3	List of social	l skills topics	covered in	PEERS®	programs	in-person	versus virtual	

Session	Clinic-Based PEERS® Program	Virtual PEERS® Program	Differences Between In-Person and Virtual Curriculum
1	Introduction and Trading Information	Introduction and Trading Information	
2	Two-way Conversations	Two-way Conversations	
3	Electronic Communication	Electronic Communication I	
4	Choosing Appropriate Friends	Electronic Communication II + Han- dling Cyber Bullying	Additional guidance on rules of social media and minimizing cyberbullying.
5	Appropriate Use of Humor	Choosing Appropriate Friends	
6	Entering a Conversation	Appropriate Use of Humor	
7	Exiting a Conversation	Entering Conversations	
8	Get-togethers	Exiting Conversations	
9	Good Sportsmanship	Get-togethers/Good Sportsmanship	Additional Guidance on how to conduct get- togethers online.
10	Teasing and Embarrassing Feedback	Handling Teasing & Embarrassing Feedback	
11	Bullying and Bad Reputations	Handling Disagreements (Responding)	Focus on verbal disagreements rather than physical, as that is instead covered week 13.
12	Handling Disagreements	Handling Disagreements (Bringing Up)	Focus on verbal disagreements rather than physical, as that is instead covered week 13. Additional guidance on how to <i>bring up</i> disagreements.
13	Rumors and Gossip	Physical Bullying/Bad Reputations	
14	Graduation and Termination	Minimizing Gossip & Rumors	
15		Graduation Party and Ceremony	

Internalizing Symptoms Measures

Loneliness and Social Dissatisfaction Questionnaire (LSDQ; Asher & Wheeler, 1985)

The LSDQ is a 24-item self-report measure containing 16 items assessing feelings of loneliness and social dissatisfaction as well as 8 items which ask about hobbies, interests, and school subject preferences. Higher raw total scores indicate higher levels of loneliness. The LSDQ has been validated in samples of autistic adolescents (Koukouriki et al., 2022; Zeedyk et al., 2016).

Child Depression Inventory-2 (CDI-2; Kovacs & MHS Staff, 2011)

The CDI-2 is a 28-item self-report assessment of depressive symptoms designed for children and adolescents aged 7 to 17 years. T-scores, where higher scores indicate higher levels of depression, were used in the analyses. In a systematic review conducted in 2020, the CDI-2 was frequently utilized as a measure to evaluate the treatment of depression for autistic individuals and has commonly been used in studies on autistic adolescents (Menezes et al., 2020).

Social Anxiety Scale (SAS; La Greca & Lopez, 1998)

The SAS is a 22-item measure of social anxiety, where higher raw total scores indicate higher levels of social

Table 4 Missing data per measure

	Number of participants miss-	Num-
	ing responses	ber of
		items
		missing
TASSK	6	1–2
SAS-A	1	1
SAS-A Caregiver	1	2
(<i>n</i> =36)		
LSDQ	4	1-10

Note: TASSK = Test of Adolescent Social Skills Knowledge (Laugeson & Frankel, 2010); SAS-A = Social Anxiety Scale for Adolescents (La Greca, 1999); LSDQ=Loneliness and Social Dissatisfaction Questionnaire (Asher et al., 1984)

anxiety. Both the self-report and the caregiver-report were included in the current study. A psychometric analysis of the SAS showed moderate convergent validity with the Social Interaction Anxiety Scale (Mattick & Clarke, 1998) and divergent validity in a sample of adolescents with ASD (Schiltz et al., 2021).

Handling of Missing Data

Based on recommendations from authors of the measures, for the SAS and LSDQ, mean substitution was applied to the missing items when the measure was at least half complete (see Table 4); for the TASSK, no credit was given for missed items. One participant missed 19 out 24 items on the LSDQ and thus was excluded from analyses that involved the LSDQ.

Analysis

Descriptive statistics on the social knowledge and skills measures and mental health symptoms were generated from the sample to describe the average levels of social functioning and mental health at both pre- and post-intervention. We conducted paired t-tests to examine changes in social outcomes and mental health symptoms from pre- to postintervention. To explore the possible associations between the changes in social functioning and mental health symptoms, we calculated bivariate correlations between change scores (post-intervention – pre-intervention score) of the social outcomes and mental health variables.

Results

Adolescents showed significant positive improvements in caregiver-reported social skills (SSiS), caregiver-reported number of get-togethers hosted (QSQ), and self-reported social skills knowledge (TASSK). Additionally, significant decreases in self-reported feelings of loneliness (LSDQ) and caregiver-reported anxiety (SAS) were observed (see Table 1 for descriptive statistics and paired t-test results). Furthermore, increases in caregiver-reported social skills (SSiS) were moderately associated with decreases in self-reported loneliness (r=-0.41, p=0.04; see Table 5 for correlation matrix).

Discussion

Results from the current study add to the existing literature that PEERS® for Adolescents is effective in improving social skills (i.e., SSiS) and knowledge (i.e., TASSK) when delivered in the community, with comparable effect sizes to

 Table 5 Correlations amongst change scores

the PEERS® randomized control trials. As for social gettogethers (QSQ), only the parent-reported number of gettogethers hosted increased significantly. These results are consistent with the past PEERS® efficacy studies that also found varying results for parent- and self-report get-togethers, where the caregiver-reported get-togethers showed the most consistent positive outcome (Schohl et al., 2014; Marchica & D'Amico, 2016; Matthews et al., 2018; Shum et al., 2019; Yoo et al., 2014). The one prior community-based pilot study on PEERS efficacy included only five autistic adolescents and found significant improvements in social skills knowledge (TASSK), but not social skills as measured by the SSiS (Hill et al., 2017). Our sample of 45 adolescents provides further preliminary evidence that PEERS® delivered through an outpatient specialty clinic appears to achieve the interventions' primary objective of improving social skills and knowledge for adolescents with social challenges.

Similar to past findings in research settings (Factor et al., 2022; Matthews et al., 2018), adolescents in the current study showed a reduction in self-reported feelings of loneliness and caregiver-reported anxiety after participating in the PEERS® program. The significant improvements in loneliness and anxiety observed in our sample may suggest that the PEERS® intervention could elicit a positive downstream effect on mental health symptoms. However, unlike prior studies (e.g., Schiltz et al., 2018; Yoo et al., 2014), self-reported depression and anxiety did not significantly decrease. Interestingly, Hill's et al., (2017) community-based study also did not detect significant changes in self-reported anxiety (as measured by the Screen for Child Anxiety Related Disorders (Birmaher et al., 1997). While it is possible that caregivers might have interpreted increased social understanding and social participation as signs of reduced social anxiety, adolescents might have not communicated their internal experiences of anxiety with their caregivers (Rasmussen et al., 2022).

Our exploratory finding of an association between improvements in social skills and reductions in feelings of

Table 5 Correlations amongst change scores										
Variable	1	2	3	4	5	6	7	8	9	10
1. SSiS	_									
2. QSQ Caregiver Hosted	-0.11	_								
3. QSQ Caregiver Invited	-0.25	0.05	_							
4. QSQ-A Hosted	-0.33	0.3	0.19	-						
5. QSQ-A Invited	-0.4*	0.28	0.08	0.49*	-					
6. TASSK	0.1	-0.05	0.01	-0.13	-0.23	_				
7. CDI-2	-0.21	-0.35	0.09	-0.06	-0.12	-0.17	-			
8. LSDQ	-0.41*	-0.22	-0.03	-0.01	-0.05	-0.27	0.66*	-		
9. SAS-A	-0.11	-0.19	-0.21	-0.37*	-0.23	-0.13	0.56*	0.55*	_	
10. SAS-A Caregiver	-0.03	-0.5*	-0.13	-0.3	-0.34	0.24	0.3	0.3	0.32	_
* .0.05										

p < 0.05

loneliness may suggest a potential buffering effect of positive social experience on social isolation. We also observed small but significant associations between the increases in the number of get-togethers hosted and the decreases in social anxiety; this is possibly due to increased social exposures at the social gatherings mitigating the levels of social anxiety. Future studies should examine whether the gains in social knowledge and the applications of social skills affect mental health symptoms with longitudinal follow-ups in a larger sample to further assess the ecological validity of the PEERS® program.

Unlike the previous treatment efficacy studies of the PEERS® program, this sample attended the PEERS® program for the primary purpose of receiving clinical services rather than participating in a research study. There are clear limitations of the current study design using clinical registry data: (1) no control condition, (2) only half of those participating in the groups provided research consent, (3) high rates of missed sessions, and (4) a large amount of missing data on the outcome measures. Moreover, limited by the reach of the outpatient clinic, our sample has limited diversity with a majority of White participants from high socio-economic backgrounds. We also did not have a comprehensive characterization of the participants (e.g., adaptive behavior skills, concurrent treatments received), limiting our ability to examine possible correlates of differential treatment responses. Additionally, three of the cohorts (n = 11) completed the intervention virtually via Zoom during the COVID-19 pandemic, altering the modality of intervention delivery and the social context for the adolescents to learn and practice social knowledge and skills. Recent studies, however, found that the effectiveness of PEERS® on social outcomes delivered via telehealth was comparable to when delivered in person (Estabillo et al., 2022). Future research could consider aggregating data from multiple clinics to gather a larger and more diverse sample for more generalizable findings beyond that from one clinic and understand factors associated with treatment responses.

This study adds to the literature with evidence that the PEERS® program is effective in improving social knowledge and skills of adolescents with ASD and other NDDs and mitigating their feelings of loneliness and anxiety when delivered by community providers at an outpatient autism specialty clinic. Additionally, the associations between social skills improvements and reductions in feelings of loneliness provide preliminary evidence for investigating the potential mechanism to promote psychological wellbeing by improving social functioning and experiences.

Author Contributions KA, TG, JC, CEL, WE delivered the PEERS® intervention as a part of clinical services. The authors declare no conflict of interest related to the current study.

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