



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Research in Developmental Disabilities

journal homepage: www.elsevier.com/locate/redevdis



An Initial Pilot Study Examining Child Social Skills, Caregiver Styles, and Family Functioning in the PEERS® for Preschoolers Program for Young Autistic Children and their Caregivers

Reina S. Factor^{a,b,c,*}, Hannah M. Rea^d, Angela V. Dahiya^{a,b}, Jordan Albright^{a,b}, Thomas H. Ollendick^{a,b}, Elizabeth A. Laugeson^c, Angela Scarpa^{a,b}

^a Department of Psychology, Virginia Tech, 109 Williams Hall, 890 Drillfield, Drive, Blacksburg, VA 24061, United States

^b Virginia Tech Autism Clinic & Center for Autism Research, 3110 Prices Fork Road, Blacksburg, VA 24061, United States

^c Semel Institute for Neuroscience and Human Behavior, University of California Los Angeles, 300 Medical Plaza, Los Angeles, CA 90095, United States

^d Research in Autism and the Brain Lab, University of Washington, CHDD Box 357920, Seattle, WA 98195, United States

ARTICLE INFO

No. of reviews completed is 2

Keywords:

Autism spectrum disorder
Social skills intervention
Caregiver-child relationship
Family functioning

ABSTRACT

Background: Social impairments characteristic of autism spectrum disorder (ASD) are evident in early childhood and worsen as the child matures. Though many interventions for young children exist, few specifically target social skills and involve caregivers.

Aims: This pilot study examined PEERS® for Preschoolers, focusing on temporal change in child social skills, caregiver style, and family functioning in the context of a caregiver-assisted social skills intervention. This extension of the PEERS® program builds on the success of the intervention for older children, presenting skills in a developmentally appropriate manner to young autistic children and their caregivers.

Methods and procedures: The present pilot study used a non-concurrent multiple baseline design to examine the above variables with 15 autistic children ($Mage = 4.87$, $SD = 1.25$; 11 boys). Children and caregivers participated in PEERS® for Preschoolers groups, with each group randomly assigned three different baseline periods (1.5, 2, or 2.5 weeks) before beginning.

Outcomes and results: Simulation Modeling Analysis (SMA) revealed concurrent improvements in social and caregiving skills, with subsequent changes in family functioning occurring over the course of this 16-session intervention.

Conclusions and implications: Future research will need to examine mechanisms of change in PEERS® for Preschoolers for children and caregivers.

What this paper adds: There is a dearth of research that specifically examines social skills interventions for young autistic children that incorporates caregivers and examines family functioning as well. This paper is one of the first to evaluate the PEERS® for Preschoolers (P4P) intervention by: 1) exploring changes in child social skills, caregiver efficacy, and family functioning, and 2) analyzing the sequence of improvements in the aforementioned variables to measure systematic change. This pilot study presents results using appropriate methodology for a small sample size of children and caregivers. Results suggested concurrent improvements in social and caregiving skills and subsequent changes in family functioning. These can be built upon for

* Corresponding author at: 300 Medical Plaza, UCLA Semel Institute for Neuroscience and Human Behavior, Los Angeles, CA 90095, United States.

E-mail address: rfactor@mednet.ucla.edu (R.S. Factor).

<https://doi.org/10.1016/j.ridd.2021.104152>

Received 7 August 2021; Received in revised form 15 November 2021; Accepted 13 December 2021

further research on the PEERS® for Preschoolers intervention. This study supports PEERS® for Preschoolers as a feasible intervention that likely contributes to improvements for the child, caregiver in their relationship with their child and parenting styles in general, as well as functioning of the entire family. In sum, this work is essential to furthering the provision of a much needed service of social skills interventions for young autistic children.

1. Introduction

Autism Spectrum Disorder (ASD) is the fastest-growing developmental disability in the United States and world (Bartley, 2006; Maenner, Shaw, & Baio, 2020), making ASD-specific interventions of utmost importance. Core deficits include social-communication difficulties and restricted and repetitive behaviors (American Psychiatric Association, 2013). These difficulties impede social functioning, peer relationships, and long-term development (Bellini, Peters, Benner, & Hopf, 2007; Dawson, 2008). Few evidence-based interventions explicitly address the development of social skills in young autistic¹ children. Further, while research suggests including caregivers can facilitate generalization of treatment gains, only one social skills treatment for young autistic children, PEERS® for Preschoolers (P4P; Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012; Park et al., in press), actively integrates caregivers (DeRosier, Swick, Davis, McMillen, & Matthews, 2011; Reichow & Volkmar, 2010; Reichow, Steiner, & Volkmar, 2012). P4P has been shown to improve child social skills (Laugeson, Frankel, Mogil, & Dillon, 2009, 2012; Park et al., in press). This pilot study addressed targeted social skills interventions for young autistic children by examining the temporal change and interaction of caregiver and family functioning with the demonstrated improvements in the child's social skills through a group design methodology. Thus, this pilot study examines not only child social skills, but also caregiver and family functioning together, using methodology often used in intervention research with smaller sample sizes.

1.1. Social impairments in autistic children

Early signs of social reciprocity deficits are present pre-verbally in individuals later diagnosed with ASD (Mundy, 2016) and often worsen as the child matures (Rao, Beidel, & Murray, 2008). Specifically, lack of reciprocal actions (e.g., social smiling, eye contact, orienting, facial processing) appear in infancy and may reflect differences or delays in early social-communication skills (Farroni, Csibra, Simion, & Johnson, 2002). In preschool, autistic children show increased difficulties with social conversation (e.g., back-and-forth, pragmatics), and play, compared to their neurotypical (NT) peers (Bauminger-Zviely & Shefer, 2021). Social challenges contribute to difficulties making and maintaining friendships and increase likelihood of bullying, rejection, and to co-occurring mental health problems (e.g., depression; Han, Tomarken, & Gotham, 2019; Mazurek & Kanne, 2010). Therefore, development of social skills requires early intervention as a potential means to mitigate these concerns.

1.2. Social skills interventions

Despite the importance of early interventions (Watkins, Kuhn, Ledbetter-Cho, Gevarter, & O'Reilly, 2017), few evidence-based interventions explicitly address the development of social skills in young autistic children as a *primary* target of change (DeRosier et al., 2011; Reichow & Volkmar, 2010; Tripathi, Estabillio, Moody, & Laugeson, 2021). A number of interventions for young autistic children address social skills as *secondary* intervention targets (e.g., Early Start Denver Model, LEAP, Project ImPACT, JASPER), but most social skill-specific interventions are designed for older autistic children. For example, one review of social skill interventions found only two out of 48 studies included participants younger than 6 years of age (Kaat & Lecavalier, 2014). Further, more research is needed that demonstrates intervention improvements from baseline/pre-treatment and looks at patterns of change during treatment.

The Program for the Education and Enrichment of Relational Skills (PEERS®) is an evidence-based caregiver-assisted social skills treatment for autistic adolescents and young adults (Laugeson et al., 2009; Van Hecke et al., 2015; Yoo et al., 2014). PEERS® is used worldwide and has been translated into over a dozen languages. Social skill improvements and long-term maintenance of treatment gains 1–5 years following intervention have been shown for adolescents and young adults (Mandelberg et al., 2014). More recently, PEERS® was extended to young autistic children (mostly preschoolers, though some in early elementary school) with the PEERS® for Preschoolers (P4P) program (Park et al., in press; Tripathi et al., 2021).

P4P follows a similar structure as PEERS®, including having a structured child group with a separate, but simultaneous parent/caregiver group for discussing psychoeducation, skills their children are learning, and strategies for being a social coach. P4P also highlights similar tenets in a more developmentally appropriate manner, taking age of participants into consideration. Further, a caregiver-coached play piece was added at the end of each session to allow caregivers to receive live coaching from a clinician while practicing skills with their child. Initial findings suggest positive child results as well as long-term outcomes (Laugeson, Park, Bolton, Bolourian, & Sanderson, 2016; Park et al., in press; Tripathi et al., 2021); however, methods that account for sequence of change are

¹ Many self-advocates from the autism community (Bury, Jellett, Spoor, & Hedley, 2020) and current research has indicated both a preference for identify first language (e.g., autistic children) or language describing the individual. Therefore, this language will be utilized throughout the present manuscript.

important next steps to further this work (Watkins et al., 2017).

1.3. Caregiver involvement in interventions

Caregiver-child relationships often serve as an initial model for social learning, which makes caregivers especially salient in child social development. Thus, a family-focused, rather than a professional-driven, model where family members are active treatment participants or administrators has been at the forefront of interventions (Bearss, Burrell, Stewart, & Scahill, 2015; Karst & Van Hecke, 2012). While the focus of many of these interventions is to teach caregivers to implement skills that will improve child outcomes, the focus and target of these interventions is ultimately the *child's* behaviors (Bearss et al., 2015). Nevertheless, interventions that include caregivers have been shown to improve caregiver responsiveness, mental and physical health, and self-efficacy (Roberts & Pickering, 2010; Whittingham, Sofronoff, Sheffield, & Sanders, 2009) and caregiver and family outcomes also impact the maintenance and generalization of child gains (Karst & Van Hecke, 2012). Since it is known that caregivers of autistic children experience more stress than caregivers of other children (Davis & Carter, 2008; Estes et al., 2013), this seems like a necessary target to further study the mechanisms of change in these interventions. Researchers note child-gains must also be compared to effects on the family to truly measure improvements (Lord & Bishop, 2010) and, given the bidirectional relation of caregiver and child functioning, it is important to examine the interrelations of caregiver and child treatment outcomes. A review of caregiver interventions suggested that caregiver involvement is critical, not only for the caregiver-child relationship, but also for ongoing and broader family functioning (Factor et al., 2019). Thus, it seems imperative to focus on caregiver and family functioning as intervention outcomes and in relation to child outcomes.

1.4. Family functioning in autism

Another overlooked factor in autism caregiver-mediated intervention literature is family functioning, conflict, and chaos (Blackledge & Hayes, 2006; Grindle, Kovshoff, Hastings, & Remington, 2009; Rao & Beidel, 2009). There are myriad reasons to examine family functioning in these interventions, even when that is not the primary target of intervention. Families of autistic children experience both increased challenges, such as conflicts and chaos, as well as strengths, compared to other families (Karst et al., 2015). Increased conflict can prevent engagement in preferred activities and interventions, and increase the likelihood of arguments and punishments (Lam, Wong, Leung, Ho, & Au-Yeung, 2010). Family chaos has similarly been linked to problems, including child maladaptive coping behaviors and subsequent risk of conduct and emotional problems (Midouhas, Yogaratnam, Flouri, & Charman, 2013; Osborne, McHugh, Saunders, & Reed, 2008). Thus, while families of autistic children may begin treatment with more barriers, higher rates of psychological and emotional strength, improved communication skills, empathy, and patience may enhance their ability to participate in and benefit from treatments (Cridland, Jones, Magee, & Caputi, 2014). Additionally, while PEERS® for Adolescents resulted in a significant decrease in family chaos, replication with younger children is needed because the presentation of autism and the familial concerns may evolve and vary significantly over time (Karst et al., 2015). Of note, research has not yet been conducted on the temporal and dynamic relations of family and child outcomes in social skills interventions for young autistic children.

In sum, this pilot, group-based study sought to take a more holistic view in evaluating a social skills intervention for young autistic children by: 1) exploring changes in child social skills, caregiver efficacy, and family functioning, and 2) analyzing the sequence of improvements in the aforementioned variables to measure systematic change.

2. Methods

2.1. Participants

Young autistic children diagnosed without intellectual impairment and their caregivers were recruited (i.e., 2–5 children and caregivers in each of four groups). To be eligible, ASD diagnosis and intellectual ability were verified by a research-reliable investigator using the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2) and an Intelligence Quotient (IQ) greater than 70 on the Kaufman Brief Intelligence Test, Second Edition (KBIT-2). Additionally, children and caregivers were required to be fluent in English and children were required to be willing to play preschool games in a group setting. Exclusion criteria included an active medical

Table 1
Descriptive Statistics for Demographic Information and Characterization of Sample.

Measure	n	Minimum	Maximum	M	SD
Demographics					
Caregiver Age (years)	15	27.00	42.00	36.13	5.14
Child Age at Intake (years)	15	3.00	7.00	4.87	1.25
Diagnostic and Screening Measures					
ADOS-2 (comparison Score)	Mod 2 = 5 Mod 3 = 10	4	10	6.80	2.01
KBIT-2 IQ Composite	15	76	127	102.00	15.34

Note. ADOS-2 = Autism Diagnostic Observation Schedule, Second Edition, KBIT-2 IQ Composite = Kaufman Brief Intelligence Test Intelligence Quotient Total Score; Autism Quotient total score; VABS-3 = Vineland Adaptive Behavior Scale – Third Edition.

problem (e.g., unstable seizure disorder), severe mental health problems (e.g., psychosis, bipolar disorder), physical aggression towards adults or children, or inability to maintain current medication over treatment. Those that met eligibility criteria were invited to participate in the 16-session P4P program. Fifteen children (11 boys; 66.7 % Caucasian) from 4 to 7 years of age ($M = 4.87$ years, $SD = 1.25$) at the time of intervention start (i.e., one participant was 3 at time of intake) participated (see Tables 1 and 2 for demographic data). Of the 18 eligible families, one family started the group, but left due to medication changes during group and child physical aggression. Another family did not participate due to time commitment. A third family joined for one session, but was unable to commit due to child health difficulties. Thus, analyses are based on the 15 families who undertook the intervention. Participants were classified as treatment completers if they attended more than 60 % of sessions (most completed more than 75 % of sessions).

2.2. Procedure

Participants were recruited via multiple methods (e.g., university and non-university clinics, registries, local ASD support groups, service agencies, schools) in both a metropolitan and rural area. The same procedure was followed for all four intervention groups. A two-stage eligibility process was used (see Fig. 1). Interested caregivers completed a phone screen to assess eligibility and learn about the study. The 29 caregiver-child dyads who appeared to initially meet eligibility criteria and who were still interested were then scheduled for an assessment appointment to confirm eligibility. All caregivers provided written consent and child verbal assent was

Table 2
Descriptive Statistics for Categorical Variables of Interest.

Variable	Percentage (n)
Child Gender	
Male	73.3 (11)
Female	26.7 (4)
Caregiver Gender (completed interaction task)	
Male	6.67 (1)
Female	93.3 (14)
Number of children in each group	
Group 1	13.3 (2)
Group 2	26.7 (4)
Group 3	26.7 (4)
Group 4	33.3 (5)
Diagnoses (in addition to ASD)	
ADHD	40 (6)
GAD	20 (3)
OCD	20.0 (3)
DD	6.7 (1)
Child Ethnicity	
African American	13.3 (2)
Asian	6.7 (1)
Caucasian	66.7 (10)
Mixed Race	6.7 (1)
Other	6.7 (1)
Number of Siblings	
None	26.7 (4)
One	46.7 (7)
Two	20.0 (3)
Three	6.7 (1)
Other Therapies Child Engaged in During This Intervention	
Occupational Therapy	66.7 (10)
Physical Therapy	6.7 (1)
Music Therapy	6.7 (1)
Individual Therapy	6.7 (1)
Play Therapy	13.3 (2)
Applied Behavior Analysis	20.0 (3)
Approximate Yearly Household Income	
Less than \$10,000	6.7 (1)
\$10,000-\$25,000	6.7 (1)
\$50,000-\$75,000	6.7 (1)
\$100,000-\$200,000	20.0 (3)
\$200,000+	13.3 (2)
Did not report	46.7 (7)
Highest Level of Schooling Completed by caregiver	
Graduated from High School	13.3 (2)
Graduated from Trade School	13.3 (2)
Associate's degree	6.7 (1)
Bachelors/4-year degree	6.7 (1)
Graduate School	53.3 (8)
Did not report	6.7 (1)

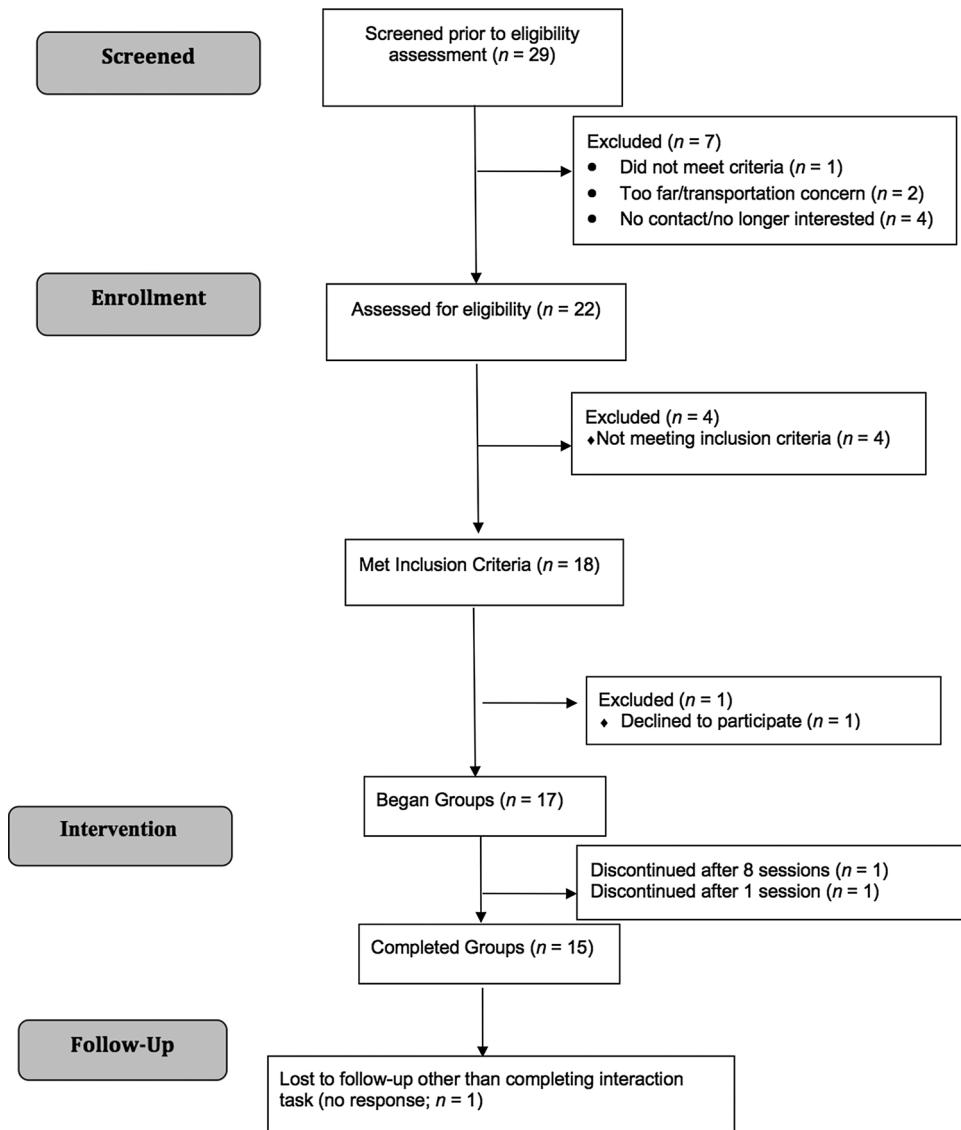


Fig. 1. Consort diagram for participant flow.

obtained whenever possible. Eligibility sessions lasted approximately 1.5 h and included the ADOS-2, KBIT-2, a 5-minute interaction task between the caregiver and child to assess their interaction styles, and caregiver completion of a number of forms to be turned in at the start of the group (entry/pre-treatment forms). Caregivers were also given baseline measures and told they would receive further instruction regarding when to complete these forms (details below). Upon completion of all pre-intervention measures, 18 eligible families were invited to join the group. Most caregivers that participated were mothers, with the exception of one father. Groups were free of charge and no additional incentives were presented to families.

In addition to baseline and weekly measures, data were collected over four timepoints (i.e., entry/pre-treatment, mid-treatment (Session 8), exit/post-treatment, and a 4–6 week follow-up after treatment completion). All measures described below were administered at these four time points as well as during the baseline periods and the weekly intervention sessions. Due to the small sample size of individual groups and the sample overall, results are not presented for each group separately at these timepoints, however the analyses mentioned below capture each group individually. Approval for this research was granted by the Institutional Review Board of participating institutions.

2.2.1. Randomization

Employing a nonconcurrent multiple baseline design, each group was randomized to a baseline condition, consisting of a specific number of weeks before intervention groups began. Baseline conditions included groups maintaining a 1.5 (Group 2), 2 (Group 3), or 2.5 week (Groups 1 and 4) baseline period, with measures completed every half week, before groups began. In other words, families

completed baseline measures either three, four, or five times. This design is a series of A-B replications and was chosen to allow for rolling enrollment (i.e., ongoing enrollment) as well as a smaller sample size (Horner et al., 2005; Morgan & Morgan, 2008). Each group was considered an individual, and thus assigned baselines accordingly. During the baseline period, caregivers completed a measure of social skills, caregiving style, and family functioning. Completed measures were turned in at the first session.

2.2.2. Treatment

The treatment followed the P4P manual, made available from the UCLA PEERS® Clinic. Though there is not yet a published manual, an unpublished manual with instructions and a script for each child and caregiver session was provided across sites and used by all clinicians. Sessions consisted of 16 1.5 h meetings twice per week.

Groups consisted of 2–5 children with 4–7 student clinicians, ranging from undergraduate to doctorate students in clinical psychology. All clinicians were trained on P4P procedures in a one-day intensive training, after which most clinicians were deemed ready to administer treatment and fidelity of administration was monitored each session for both caregiver and child groups. Those who did not meet fidelity were not assigned to lead groups. Groups were supervised by an advanced graduate student (RF) and licensed clinical psychologist (AS).

Each session included a didactic lesson with concrete rules and steps, role play demonstrations, behavioral rehearsals, and socialization assignments. Children were taught fundamental social skills through a live puppet show, followed by activities designed to rehearse and reinforce skill development in a naturalistic setting. Simultaneously, caregivers engaged in an hour-long group in which they were taught specific skills to help their children make and keep friends. The last 30 min included caregiver-coached play, which consisted of in-vivo feedback from the treatment team while caregivers provided social coaching to their children during play-based activities with other group members (e.g., in-group playdates).

No differences in demographic information were present across sites or groups, thus, all demographic information is presented together for parsimony. Feedback was welcomed from caregivers and children (if able), to ensure intervention benefits.

2.3. Measures

2.3.1. Diagnostic and screening Measures (to determine inclusion and exclusion criteria)

2.3.1.1. *Autism Diagnostic Observation Schedule, Second Edition (ADOS-2; Lord et al., 2012)*. The ADOS-2 is a semi-structured, observational assessment of autism characteristics. The ADOS-2 consists of multiple modules, determined by age and language ability. For this study, Modules 2 (individuals demonstrating phrase speech) and 3 (individuals with fluent speech) were employed. The ADOS-2 demonstrates moderate to high levels of internal consistency, moderate test-retest reliability, and acceptable interrater reliability, as well as comparable or higher sensitivity and specificity as compared to the first edition of the ADOS (McCrimmon & Rostad, 2014). For the current study, this assessment was administered at entry/pre-treatment to verify that each child met autism criteria in addition to a prior diagnosis.

2.3.1.2. *Kaufman Brief Intelligence Test (KBIT-2; Kaufman & Kaufman, 2004)*. The KBIT-2 is an abbreviated measure of general intelligence for ages 4–90 years old. The KBIT-2 provides Verbal and Non-Verbal Intelligence scores, as well as a composite Intelligence Quotient (IQ) score and percentile ranks by age. The KBIT-2's IQ Composite internal consistency coefficient was .93 across ages (.89–.96). For the current study, this assessment was administered at entry/pre-treatment to verify that each child met inclusion criteria and the composite IQ score was used.

2.3.1.3. *Demographic questionnaire*. This questionnaire includes general information such as caregiver education, family history, family composition (e.g., number of siblings, structure of family), and the child's developmental and medical history. Also included were other treatments in which the child was participating at intake, other diagnoses, and medications.

2.3.2. Primary outcome measures for hypothesis testing administered during baseline, each session, and at key timepoints

2.3.2.1. *Social skills: Social Skills Monitoring (SSM)*. This form consists of 18 questions in the Social Skill Domain (28 questions total) in which caregivers rate their child's skill acquisition and at-home practice in social-based behaviors taught in sessions on a Likert-scale ranging from 1 to 4 (higher numbers indicating more skillful ability). Cronbach's alphas for the current study were .43 for entry/pre-treatment, .95 for midpoint, .86 for exit/post-treatment, and .87 for follow-up. Since this measure was created for specific use for this study, there are no other psychometric data to report at this time.

2.3.2.2. *Caregiver efficacy and behavior: Parenting Scale (PS; Arnold, O'Leary, Wolff, & Acker, 1993)*. The PS is a 30-item measure of parenting style from which a total score of parenting style can be obtained. It is based on three styles: laxness (permissive, inconsistent), overreactivity (harsh, authoritarian, irritability, displays of anger), and verbosity (over reliance on talking). Caregivers respond on a 7-point Likert scale. The total score was examined for analyses, with higher scores indicating more dysfunctional parenting (reverse scoring involved). Representative items include: "When my child misbehaves I..." and options included 1 = I do something right away, to 7 = I do something about it later and "I am the kind of parent that..." and options included 1 = sets limits on what my child is able to do, to 7 = lets my child do whatever he or she wants. Test-retest reliability, internal validity, and results from

factor analyses have demonstrated this to be a psychometrically sound measure of parenting style (Arnold et al., 1993). In the current study, Cronbach’s alphas for the total score were .87 at entry/pre-treatment, .91 at midpoint, .90 at exit/post-treatment, and .77 at follow-up.

2.3.2.3. *Family functioning: Confusion, Hubbub, and Order Scale (CHAOS; Matheny, Wachs, Ludwig, & Phillips, 1995).* CHAOS is a 15-item, caregiver-report measure assessing environmental confusion in the home. Items are presented on a 4-point Likert scale from “Strongly Agree” to “Strongly Disagree,” with higher scores indicating greater family chaos. Questions include such items as “You are usually able to think in our home” and “There is little commotion in our home,” all on 4 point likert scale. Previous studies have suggested satisfactory internal consistency and test–retest stability for this measure. In the current study, the Cronbach’s alphas were .52 at entry, -.91 at midpoint, .44 at exit/post treatment, and .44 at follow-up. The negative value is likely due to a negative average covariance among items, which is more negative than total values.

2.3.3. *Fidelity of implementation*

Each treatment session was rated by an observer to assess therapist fidelity of treatment implementation. Sessions were evaluated on completion of specific session goals, therapist behavior, and therapeutic relationship. Fidelity was assessed on a Likert scale from 0 to 5 (0 = not at all, 3 = well, 5 = very well). Most sessions were rated as 90–100 % completion of outlined components, with only one session with 75 % of completion due to a late start and therefore shorter session. This was identified as an outlier and not included in analyses ($M_{child\ group} = 99.37, SD_{child\ group} = 2.06; M_{caregiver\ group} = 99.63, SD_{caregiver\ group} = 1.84$). Raters noted success of implementation across all groups (Likert scale from 0 to 5; $M_{child\ group} = 4.89, SD_{child\ group} = .20; M_{caregiver\ group} = 4.92, SD_{caregiver\ group} = .18$). Since this measure was also created for this study, there are no other psychometric results to report; however, similar fidelity ratings have been employed in other intervention studies.

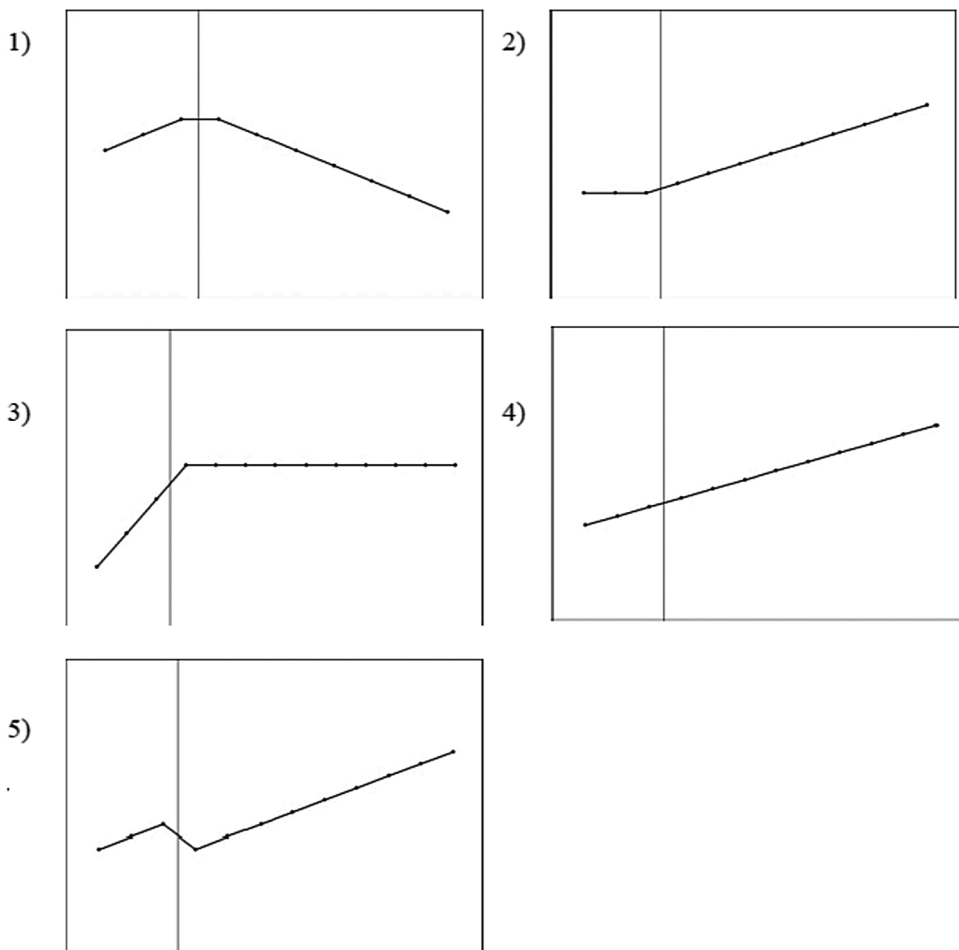


Fig. 2. SMA model vector slopes (1-5, from left to right).

2.4. Analytic plan

A nonconcurrent multiple baseline design allowed the analysis of changes in caregiver and child variables from baseline to post-treatment and follow-up. As mentioned above, values at each of the four timepoints were not addressed in these analyses, which examine the weekly/baseline scores. Simulation Modeling Analysis (SMA; Borckardt et al., 2008) was employed for analysis of single-case data (each treatment group represented as a single-case), which allows examination of small-sample sizes for treatment studies and in this case, for each group. SMA allows examination of changes in the level and slope of symptom change and evaluates the significance of the effect using bootstrapping methods to create simulations that take the phase lengths and autocorrelation of data into account, since repeated measure administration results in subsequent administrations being dependent on the value of the previous administrations. By accounting for autocorrelation, SMA techniques reduce the likelihood of false positive findings. SMA tests the data stream for participants individually against five slope vectors: 1) an increasing baseline and decreasing treatment; 2) a flat baseline and increasing treatment; 3) an increasing baseline and flat treatment; 4) increasing from baseline throughout treatment; and 5) increasing during baseline, return to pre-treatment level at the initiation of treatment, and then increasing throughout treatment. In addition, SMA tests for a significant change between baseline and treatment by evaluating the likelihood that the outcome would occur by chance based on the Pearson correlation between participant data and the dummy coded level change vector. In addition, exit/post-treatment and follow-up data were included in the treatment phase. All slope patterns are presented in Fig. 2. In determining whether a slope of a group’s data is consistent with a particular vector slope, SMA allows for both autocorrelation and calculation of the correlation of the outcome measure and phase vector. The probability of potential effect sizes’ occurrence by chance in null findings is also calculated.

Multivariate process change or the temporal relationship between two variables was also explored. This form of SMA allows for examination of cross-lagged correlations between two variables to determine potential processes of change on variables. Per Borckardt et al. (2008) recommendation that each phase (i.e., baseline and treatment) have between 5–15 data points, the baseline phase for Groups 2 and 3 should be interpreted with caution. All groups had 16 data points for therapy sessions, other than Group 2, which had 15 data points due to severe weather which necessitated two sessions be combined.

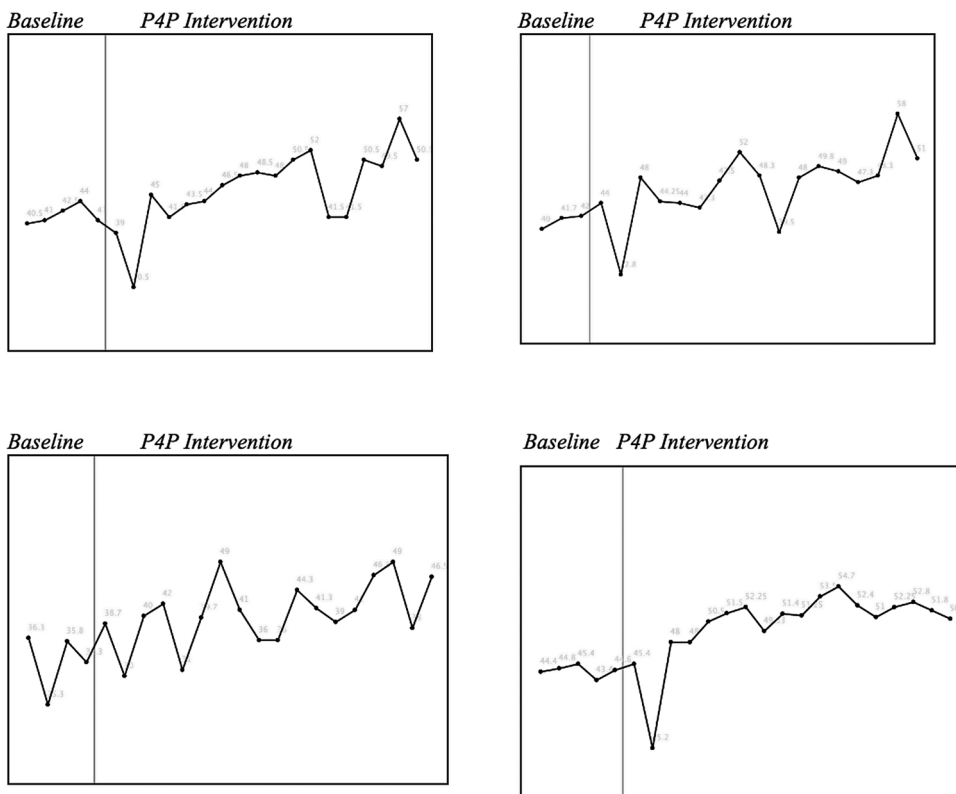


Fig. 3. SSM SMA model slopes (Group 1-4, from left to right).

3. Results

3.1. Multivariate analyses (SMA)

SMA was utilized to detect significant changes in mean scores between the baseline and treatment phases for the SSM Social Skills domain (Fig. 3), PS total score (Fig. 4), and CHAOS total score (Fig. 5). All graphical representations of results are presented in Figs. 3–5, which display results over baseline, treatment, exit/post-treatment, and follow-up. Due to the fact that each group was considered an individual and there are a number of variables explored, each graph is presented separately.

3.1.1. Social skills

Significant mean changes were only observed for Group 3 ($r = .53; p = .035$). All results are indicated in Table 3. Table 4 presents the highest correlation slopes for each group, and Fig. 3 displays data points/slopes for each group. For the SSM Social Skills domain, all groups demonstrated significant slopes for slopes 2 (flat baseline and increasing treatment), 4 (increasing from baseline throughout treatment), and 5 (increasing baseline, return to pre-treatment level at initiation of treatment, then increasing throughout treatment). Groups 1, 2, and 3 demonstrated a significant slope 1 (increasing baseline and decreasing treatment), and only Group 3 demonstrated a significant slope 3 (increasing baseline and flat treatment). All values indicated in Table 4.

3.1.2. Caregiver efficacy and behavior

Significant mean changes were only observed for Group 4 on the PS total score ($r = -0.60; p = .017$). All results are indicated in Table 3. Table 4 presents the highest correlation slopes for each group and Fig. 4 displays all data points/slopes for each group. For the PS, Group 4 demonstrated significant slopes for slope 2 (flat baseline and increasing treatment), 3 (increasing baseline and flat treatment), 4 (increasing from baseline throughout treatment), and 5 (increasing baseline, return to pre-treatment level at initiation of treatment, then increasing throughout treatment). Group 1 demonstrated the closest significant slope to slope 1 (increasing baseline and decreasing treatment); while Groups 2 and 3 demonstrated the closest significant slope to slope 5 (increasing baseline, return to pre-treatment level at initiation of treatment, then increasing throughout treatment).

3.1.3. Family functioning

No mean changes were observed across any groups (see Table 3), and no slopes were identified as significant when tested against the previously mentioned slope vectors (Table 4). Fig. 5 displays all data points/slopes. Group 1 demonstrated the closest significant

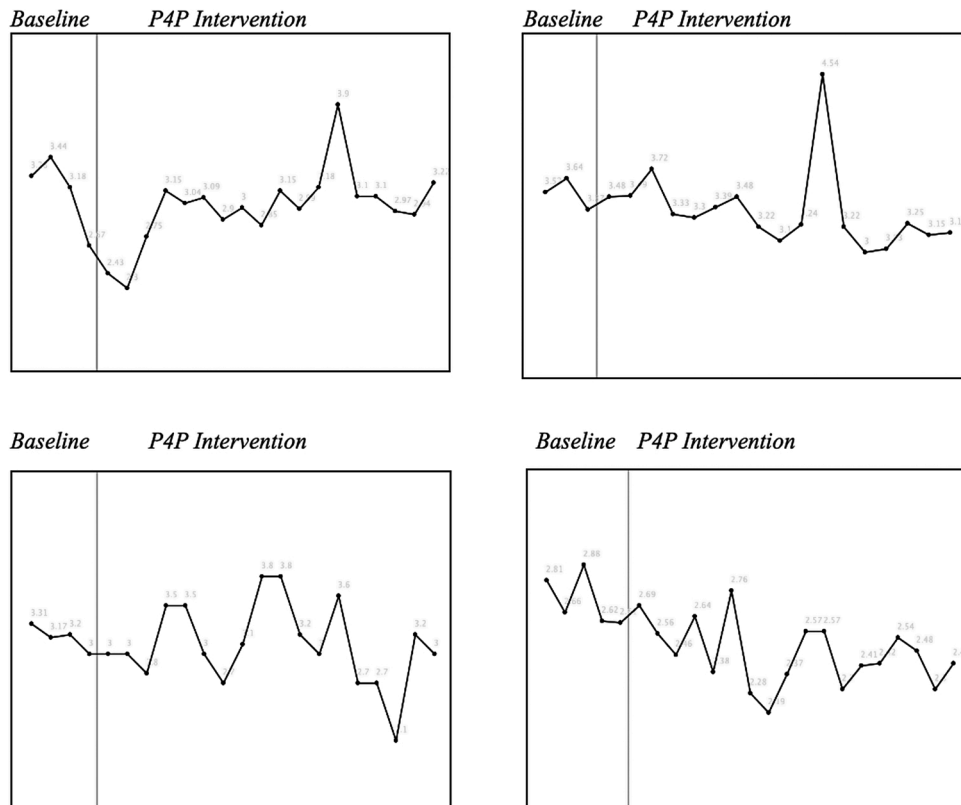


Fig. 4. PS SMA model slopes (Group 1-4, from left to right).

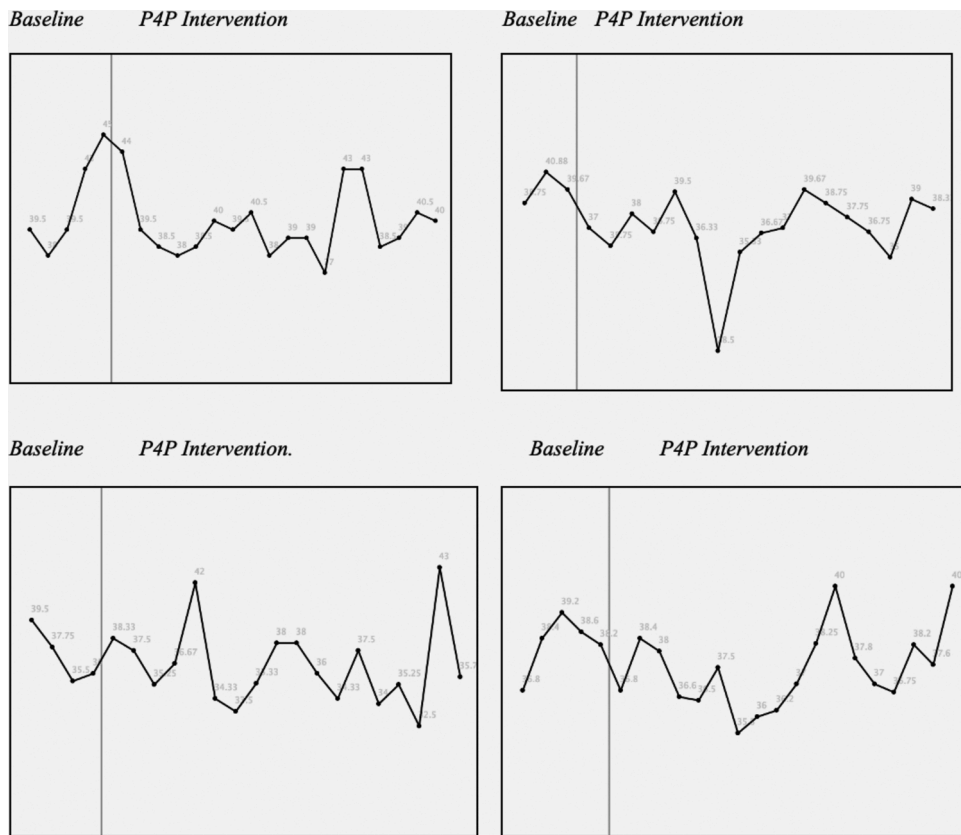


Fig. 5. CHAOS SMA model slopes (Group 1-4, from left to right).

Table 3

Mean Level Changes between Eligibility and Endpoint/Follow-up for SSM, PS, and CHAOS scores.

Group	SSM Social Skills	PS total	CHAOS total
Group 1	.317	.065	-.247
Group 2	.375	.335	-.413
Group 3	.523*	-.076	-.103
Group 4	.526	-.597*	-.363

* p < .05.

** p < .01.

Note. SSM = Social Skills Monitoring Social Skills Questionnaire; PS = Parenting Scale Total Score; CHAOS = Confusion, Hubbub, and Order Scale Total Score.

slope to slope 1 (increasing baseline and decreasing treatment); while Groups 2, 3, and 4 demonstrated the closest significant slope to slope 3 (increasing baseline and flat treatment). Complete values in Table 4.

3.2. Multivariate process analysis

Multivariate process analysis allowed for the temporal analysis of the SSM Social Skills domain, PS total score, and CHAOS total score. Table 5 presents significant lags (e.g., weeks between variable changes). For the analysis of the SSM Social Skills occurring prior to PS total score, Group 1, 2, and 3 had significant positive correlations at Lags -3 and -2 and Group 3 also had significant positive correlations at Lags -1 and 0. The negative number indicates that the second variable, PS, preceded the change in the first variable, social skills. The lag number indicates that PS changed preceded social skill change by 3 and 2 weeks for Groups 1, 2, and 3, and by 1 week for Group 3.

Comparing the SSM Social Skills domain to the CHAOS total score, Group 1 and 2 demonstrated significant positive correlations at Lags -3 and -2 and Group 3 demonstrated significant positive correlations at Lags -3, -2, -1, 0, and 1.

CHAOS total score and SSM Social Skills revealed Group 1 demonstrating significant negative lags at -3, -2, and -1. Additionally, Group 2 indicated a significant negative lag at 0. This indicates that an increase or decrease in the CHAOS total score and SSM Social

Table 4
SMA: Best-fitting slopes (in parentheses) for SSM, PS, and CHAOS scores.

Group	SSM Social Skills	PS total	CHAOS total
Group 1	-.711 (1)*	-.440 (1)	.177 (1)
	.701 (2)*		
	.682 (4)*		
	.723 (5)**		
Group 2	-.686 (1)**	-.338 (2)	-.335 (3)
	.692 (2)**		
	.692 (4)**		
	.693 (5)**		
Group 3	-.597 (1)*	-.222 (5)	-.199 (3)
	.628 (2)**		
	.464 (3)*		
	.636 (4)**		
Group 4	.594 (5)*	-.593 (2)*	-.232 (3)
	.741 (2)*		
	.738 (4)*		
	.711 (5)*		
		-.605 (3)**	
		-.630 (4)**	
		-.551 (5)*	

Note. SSM = Social Skills Monitoring Social Skills Questionnaire; PS = Parenting Scale Total Score; CHAOS = Confusion, Hubbub, and Order Scale Total Score; Number in parentheses indicates the best-fitting slope vector based on being significant at p .

* $p < .05$.

** $p < .01$.

Table 5
Multivariate Process Change Analysis for SMA for SSM, PS, and CHAOS scores.

Group	SSM Social Skills, PS Total Score	SSM Social Skills, CHAOS Total Score	PS Total Score, SSM Social Skills	PS Total Score, CHAOS Total Score	CHAOS Total Score, SSM Social Skills	CHAOS Total Score, PS Total Score
Group 1	.55 (-3)**	.55 (-3)**	.57 (-3)**	.57 (-3)**	-.47 (-3)*	-.47 (-3)*
	.58 (-2)**	.58 (-2)**	.57 (-2)**	.57 (-2)**	-.52 (-2)*	-.52 (-2)*
Group 2	.40 (-3)*	.40 (-3)*	.26 (-3)	-.26 (-3)	-.47 (-1)*	-.47 (-1)*
	.55 (-2)**	.55 (-2)**			-.41 (0)*	-.41 (0)*
Group 3	.37 (-3)*	.37 (-3)*	.17 (-3)	.17 (-3)		
	.44 (-2)*	.44 (-2)**			-.23 (2)	-.23 (2)
	.49 (-1)**	.49 (-1)**				
	.52 (0)**	.52 (0)**				
Group 4	-.37 (-2)	-.37 (-2)	-.37 (-2)*	-.37 (-2)	-.37 (-2)	-.37 (-2)*

Note. Number in parenthesis = significant lag, SSM = Social Skills domain on Social Skills Monitoring Questionnaire; PS = Parenting Scale Total Score; CHAOS = Confusion, Hubbub, and Order Scale Total Score.

* $p < .05$ with Bonferroni correction.

** $p < .01$ with Bonferroni correction.

Skills domain occurred concurrently at one of the lags.

Analysis of PS total to CHAOS total score, revealed only Group 1 demonstrated a significant positive lag at -3 and -2. For the analysis of CHAOS total score to PS total score, Group 1 demonstrated significant negative lags at -3, -2, and -1, Group 2 demonstrated a positive correlation at Lag 0, and Group 4 showed a negative correlation at Lag -2.

4. Discussion

The current study examined the relationship between social skill acquisition and caregiver and family improvement over the course of P4P treatment and at follow-up for young autistic children. Herein, we examined these three domains and illustrated their interconnection and provided initial results for future studies to explore more robustly the intersectionality of areas critical to all early social skill interventions for autistic children. To our knowledge, this is the first study to examine temporal changes of child, caregiver, and family outcomes in a social skills intervention for young autistic children. Additionally, the nature of single subject design, here where each group was viewed as a single subject, is novel in examining this intervention and adds to the methodological rigor of results (Hawkins, Sanson-Fisher, Shakeshaft, D'Este, & Green, 2007).

This study supports the P4P intervention as feasible to administer. As indicated by the fidelity measures, groups were implemented

with fidelity following training by a lead clinician, pre-session conferences, and review of the intervention manual. Clinicians reported ease of following scripts and implementing the treatment after the training, as well as flexibility to change roles (e.g., lead different activities). Enrollment (58.6 % from screening) and retention (88.2 %) rates also support feasibility. Further, modification from 1 session per week to 2 sessions proved feasible and acceptable to families. Additional details regarding feasibility of implementation are presented in another paper (Factor et al., under review).

Since social difficulties are a core feature of autism, often evident in early childhood (Rao et al., 2008), early social skill intervention may be key to giving autistic individuals foundational skills to navigate the social world as they continue to mature, form friendships, and utilize social communication (Watkins et al., 2017). These concerns are specifically addressed in P4P and intervening earlier may mitigate some adverse outcomes (Tripathi et al., 2021).

Analysis using SMA examining social skills suggests mean changes in one group (Group 3) from baseline to treatment, indicating a significant increase in social skills as a result of the intervention. Further, all groups demonstrated an increased slope over the course of treatment (slopes 2 and 4). Though some results suggested no change or a return to baseline, these positive findings are promising. Findings may suggest the need for booster sessions to maintain gains after formal treatment completion to prevent a return to baseline scores.

Another critical study component, which directly responds to the field incorporating more caregiver involvement in interventions, was the analysis of changes in caregiver and family functioning and the interplay of these changes with child treatment outcomes. SMA analyses indicated mean changes in parenting style in one group (Group 4) from baseline to treatment, suggesting a significant increase in positive parenting style. Though mean changes were only significant in one group, results also suggest slope changes over treatment for all groups (slopes 2, 3, 4, and 5). While some groups showed minimal change or a return to baseline, findings are promising that the caregiver-coaching component of P4P sessions might also benefit parenting style. Engaging in an intervention where both child and caregiver are involved may have positive impacts on both parties and on their relationship (Granger, des Rivières-Pigeon, Sabourin, & Forget, 2012).

Though family functioning remained largely unchanged, lack of significant results might suggest other family members may need to be involved in the intervention. For example, only one father was the target caregiver, and mothers and fathers have been indicated to respond differently to certain child behavior and PSE (Hastings & Brown, 2002). The current findings contradict other research that show caregiver training leads to positive familial outcomes (Factor et al., 2019) and changes in one relationship may impact the dynamics of the larger family unit (Minuchin, 1985). Thus, research should further explore family functioning in interventions.

Overall, positive findings were indicated in the domains of social and parenting styles, shown through improvement from baseline to intervention, establishing change between P4P and behavior change (Kazdin, 1998; Watson & Workman, 1981). However, considering other interventions (indicated in Table 2) that each individual engaged in during their time in P4P should be examined in future research to ensure the results are related to P4P.

Cross-lag analyses looking at these domains using the SSM Social Skills domain score, PS total score, and CHAOS total score further suggest a temporal connection between social skills, caregiving style, and family functioning. In particular, there appears to be a connection between social skills and caregiving style as well as social skills and family functioning, though all three were not tested together. While some of these changes occurred at different times (e.g., social skill progress occurring before improvements in the other domains), results support the intersectionality of these domains in a treatment context. A clear pattern did not emerge in terms of temporality of the changes, thus further examination is needed with a larger sample to better understand the mechanisms of change in this treatment.

Previous work highlighted that multiple baseline studies exhibit methodological rigor by 1) demonstrating change in the targeted behavior (i.e., social skills, caregiver and family functioning), 2) indicating the change is likely due to the intervention, and 3) revealing clinically significant and practical changes (Hawkins et al., 2007). The current study meets these criteria. This work is a first step in employing social skills for this age group and in continuing to expand research focusing on caregivers and the family, in addition to specific child outcomes.

4.1. Limitations

A number of limitations should be noted. The small sample size, missing data, and short baseline periods may have affected our results and some findings should be interpreted with caution. To ensure the accuracy as well as to expand on the generalizability of results, the specified results should be tested in a larger and more sociodemographically diverse sample. If differences based on these factors are present, any necessary adaptations to the intervention (e.g., changes in information provided, timing of groups, etc.) should also be explored.

Another limitation is the type of outcome measures utilized, specifically, caregiver-report (Whittingham et al., 2009). Caregiver involvement may bias post-treatment assessment of their child's social functioning (White, Keonig, & Scahill, 2007) and reports of family or relationship outcomes, especially if caregivers believe they should respond a certain way. Thus, observational data could add to the robustness of the findings. Further, another measure of caregiving style might be administered in future studies, other than the PS, which has more subscales. Further, low Cronbach alpha values for some measures used are a limitation. Additionally, the short follow-up period might reveal immediate intervention effects, and more long-term follow-ups could explore maintenance skills effects.

4.2. Future directions

This study presents a significant step in intervention research that focuses on a social skills intervention for young autistic children

and emphasizes the experience of the caregiver and family unit. The results and feasibility of implementation illustrated could serve as the basis for larger scale intervention studies examining P4P. This work is particularly vital as caregivers have shifted to becoming active participants or primary administrators (Bearss et al., 2015; Factor et al., 2019; Karst & Van Hecke, 2012). Evaluating family and relationship outcomes will help identify potential barriers to family involvement in interventions (Karst & Van Hecke, 2012). Furthermore, behavioral observations, not just caregiver-report, will be essential in assessing the effectiveness of this intervention. Finally, examining if there is a mechanistic role of caregiver involvement through mediation analyses could elucidate how improvements in these interventions occur.

Further exploration of caregiver traits, including stress or the broader autism phenotype (BAP), could also be an important future direction in determining how to tailor interventions. Caregivers with high rigidity on BAP measures may benefit from learning emotion regulation strategies and pragmatic difficulties can interfere with positive caregiver-child interactions and impact social coaching (e.g., decreased positivity; Ingersoll & Hambrick, 2011; Rea, Factor, Swain, & Scarpa, 2019). Studying BAP in the context of these interventions may elucidate facets of the caregiver-child relationship that may be necessary treatment targets.

4.3. Conclusions

This study allowed for the examination of caregiver, child, and family outcomes within the context of a social skills intervention for young autistic children. To our knowledge, this study is a novel demonstration of the potential efficacy of using caregiver-assistance in social skills training for young autistic children, and how these domains are inter-related. Results directly address one of the core features and challenges of young autistic children and support the use of the P4P program (DeRosier et al., 2011; Reichow & Volkmar, 2010). Applying study findings will allow for a deeper understanding of specific effectiveness of caregiver-assisted social skills on treatment implementation and the intersection of child social skills, caregiver styles, and family functioning. Future work will allow further understanding of specific effectiveness of caregiver-assisted social skills implementation.

Compliance with ethical standard

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Funding

The work was supported by the Virginia Tech Center for Autism Research under the SEED Student Grant (RF) as well as the Psi Chi Honor Society under the Mamie Phipps Clark Diversity Research Grant (RF; neither funding sources had specific grant numbers).

Competing interest statement

The authors do not report any financial interests or benefits from this research.

CRedit authorship contribution statement

RF conceived of the study, trained clinicians, finalized its design, completed all analyses, and coordination and drafted the manuscript; HR helped draft the manuscript; AD helped draft the manuscript; JA helped draft the manuscript; TO participated in the design of the study, assisted with analyses, and drafted the manuscript; EL consulted on and created the intervention; AS participated in the design and coordination of the study and statistical manuscript and reviewed the manuscript.

Data statement

Research data is currently not part of a repository. However, the authors are happy to provide data upon request.

Declaration of Competing Interest

None.

Acknowledgements

The authors would like to thank the Virginia Tech Autism Clinic & Center for Autism Research, the Georgia Autism Center, and the Emory Autism Clinic for assistance with recruitment for this study and in running the groups, as well as all group leaders and research assistants. Finally, we are especially grateful to the families and children who participated in the intervention groups.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Association.

- Arnold, D. S., O'Leary, S. G., Wolff, L. S., & Acker, M. M. (1993). The Parenting Scale: A measure of dysfunctional parenting in discipline situations. *Psychological Assessment*. <https://doi.org/10.1037/1040-3590.5.2.137>
- Bartley, J. J. (2006). An update on autism: Science, gender, and the law. *Gender Medicine*, 373–378. [https://doi.org/10.1016/S1550-8579\(06\)80197-X](https://doi.org/10.1016/S1550-8579(06)80197-X)
- Bauminger-Zviely, N., & Shefer, A. (2021). Naturalistic evaluation of preschoolers' spontaneous interactions: The autism peer interaction observation scale. *Autism*, 25(6), 1520–1535. <https://doi.org/10.1177/1362361321989919>
- Bearss, K., Burrell, T. L., Stewart, L., & Scahill, L. (2015). Parent training in autism spectrum disorder: What's in a name? *Clinical Child and Family Psychology Review*, 18(2), 170–182.
- Bellini, S., Peters, J. K., Benner, L., & Hopf, A. (2007). A meta-analysis of school-based social skills interventions for children with autism spectrum disorders. *Remedial and Special Education*. <https://doi.org/10.1177/07419325070280030401>
- Blackledge, J. T., & Hayes, S. C. (2006). Using acceptance and commitment training in the support of parents of children diagnosed with autism. *Child & Family Behavior Therapy*. https://doi.org/10.1300/J019v28n01_01
- Borckardt, J. J., Nash, M. R., Murphy, M. D., Moore, M., Shaw, D., & O'Neil, P. (2008). Clinical practice as natural laboratory for psychotherapy research. *The American Psychologist*. <https://doi.org/10.1037/0003-066X.63.2.77>
- Bury, S. M., Jellet, R., Spoor, J. R., & Hedley, D. (2020). "It defines who I am" or "it's something I have": What language do [autistic] Australian adults [on the autism spectrum] prefer? *Journal of Autism and Developmental Disorders*, 1–11.
- Cridland, E. K., Jones, S. C., Magee, C. A., & Caputi, P. (2014). Family-focused autism spectrum disorder research: A review of the utility of family systems approaches. *Autism*. <https://doi.org/10.1177/1362361312472261>
- Davis, N. O., & Carter, A. S. (2008). Parenting stress in mothers and fathers of toddlers with autism spectrum disorders: Associations with child characteristics. *Journal of Autism and Developmental Disorders*, 38(7), 1278–1291.
- Dawson, G. (2008). Early behavioral intervention, brain plasticity, and the prevention of autism spectrum disorder. *Development and Psychopathology*, 20(3), 775–803.
- DeRosier, M. E., Swick, D. C., Davis, N. O., McMillen, J. S., & Matthews, R. (2011). The efficacy of a social skills group intervention for improving social behaviors in children with high functioning autism spectrum disorders. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-010-1128-2>
- Estes, A., Olson, E., Sullivan, K., Greenon, J., Winter, J., Dawson, G., & Munson, J. (2013). Parenting-related stress and psychological distress in mothers of toddlers with autism spectrum disorders. *Brain & Development*, 35(2), 133–138.
- Factor, R. S., Ollendick, T. H., Cooper, L. D., Dunsmore, J. C., Rea, H. M., & Scarpa, A. (2019). All in the Family: A systematic review of the effect of caregiver-administered Autism Spectrum disorder interventions on family functioning and relationships. *Clinical Child and Family Psychology Review*. <https://doi.org/10.1007/s10567-019-00297-x>
- Factor, R.S., Rea, H. M., Laugeson, E.A., & Scarpa, A. (under review). Examining Social Skills in the PEERS® for Preschoolers Program for Preschoolers with Autism Spectrum Disorder.
- Farroni, T., Csibra, G., Simion, F., & Johnson, M. H. (2002). Eye contact detection in humans from birth. *Proceedings of the National Academy of Sciences*. <https://doi.org/10.1073/pnas.152159999>
- Granger, S., des Rivières-Pigeon, C., Sabourin, G., & Forget, J. (2012). Mothers' reports of their involvement in early intensive behavioral intervention. *Topics in Early Childhood Special Education*. <https://doi.org/10.1177/0271121410393285>
- Grindle, C. F., Kovshoff, H., Hastings, R. P., & Remington, B. (2009). Parents' experiences of applied behaviour analysis (ABA)-based interventions for children diagnosed with autistic spectrum disorder. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-008-0597-z>
- Han, G. T., Tomarken, A. J., & Gotham, K. O. (2019). Social and nonsocial reward moderate relation between autism symptoms and loneliness in adults with ASD, depression, and controls. *Autism Research*, 12(6), 884–896. <https://doi.org/10.1002/aur.2088>
- Hastings, R., & Brown, T. (2002). Behavior problems of children with autism, parental self-efficacy, and mental health. *American Journal on Mental Retardation*. <https://doi.org/10.1007/s10803-018-3605-y>
- Hawkins, N. G., Sanson-Fisher, R. W., Shakeshaft, A., D'Este, C., & Green, L. W. (2007). The multiple baseline design for evaluating population-based research. *American Journal of Preventive Medicine*, 33(2), 162–168. <https://doi.org/10.1016/j.amepre.2007.03.020>
- Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children*. <https://doi.org/10.1177/001440290507100203>
- Ingersoll, B., & Hambrick, D. Z. (2011). The relationship between the broader autism phenotype, child severity, and stress and depression in parents of children with autism spectrum disorders. *Research in Autism Spectrum Disorders*. <https://doi.org/10.1016/j.rasd.2010.04.017>
- Kaat, A. J., & Lecavalier, L. (2014). Group-based social skills treatment: A methodological review. *Research in Autism Spectrum Disorders*. <https://doi.org/10.1016/j.rasd.2013.10.007>
- Karst, J. S., & Van Hecke, A. V. (2012). Parent and family impact of autism spectrum disorders: A review and proposed model for intervention evaluation. *Clinical Child and Family Psychology Review*. <https://doi.org/10.1007/s10567-012-0119-6>
- Karst, J. S., Van Hecke, A. V., Carson, A. M., Stevens, S., Schohl, K., & Dolan, B. (2015). Parent and family outcomes of PEERS: A social skills intervention for adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-014-2231-2236>
- Kaufman, A. S., & Kaufman, N. L. (2004). *Kaufman brief intelligence test*. John Wiley & Sons, Inc.
- Kazdin, A. E. (1998). *Research design in clinical psychology* (3rd ed.). Needham Heights, MA: Allyn & Bacon.
- Lam, S. F., Wong, B. P., Leung, D., Ho, D., & Au-Yeung, P. (2010). How parents perceive and feel about participation in community activities: The comparison between parents of preschoolers with and without autism spectrum disorders. *Autism*. <https://doi.org/10.1177/1362361309346558>
- Laugeson, E. A., Frankel, F., Mogil, C., & Dillon, A. R. (2009). Parent-assisted social skills training to improve friendships in teens with autism spectrum disorders. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-008-0664-0665>
- Laugeson, E. A., Frankel, F., Gantman, A., Dillon, A. R., & Mogil, C. (2012). Evidence-based social skills training for adolescents with autism spectrum disorders: The UCLA PEERS program. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-011-1339-1>
- Laugeson, Park, Bolton, Bolourian, & Sanderson. (2016). A randomized controlled trial of a parent-assisted social skills treatment: The UCLA PEERS® for preschoolers program. *Abstract Presented at the International Meeting for Autism Research*.
- Lord, C., & Bishop, S. L. (2010). Autism Spectrum disorders: Diagnosis, prevalence, and services for children and families. Social policy report. Volume 24, number 2. *Society for Research in Child Development*, 24(2).
- Lord, C., Rutter, M., DiLavore, P. C., Risi, S., Gotham, K., & Bishop, S. (2012). *Autism diagnostic observation schedule* (second edition). Torrance, CA: Western Psychological Services.
- Maenner, M. J., Shaw, K. A., & Baio, J. (2020). Prevalence of autism spectrum disorder among children aged 8 years—Autism and developmental disabilities monitoring network, 11 sites, United States, 2016. *MMWR Surveillance Summaries*, 69(4). <https://doi.org/10.15585/mmwr.ss6904a1>
- Mandelberg, J., Laugeson, E. A., Cunningham, T. D., Ellingsen, R., Bates, S., & Frankel, F. (2014). Long-term treatment outcomes for parent-assisted social skills training for adolescents with autism spectrum disorders: The UCLA PEERS program. *Journal of Mental Health Research in Intellectual Disabilities*. <https://doi.org/10.1080/19315864.2012.730600>
- Matheny, A. P., Wachs, T. D., Ludwig, J. L., & Phillips, K. (1995). Bringing order out of chaos: Psychometric characteristics of the confusion, hubbub, and order scale. *Journal of Applied Developmental Psychology*. [https://doi.org/10.1016/0193-3973\(95\)90028-4](https://doi.org/10.1016/0193-3973(95)90028-4)
- Mazurek, M. O., & Kanne, S. M. (2010). Friendship and internalizing symptoms among children and adolescents with ASD. *Journal of Autism and Developmental Disorders*, 40, 1512–1520. <https://doi.org/10.1007/s10803-010-1014-y>
- Midouhas, E., Yogaratnam, A., Flouri, E., & Charman, T. (2013). Psychopathology trajectories of children with autism spectrum disorder: The role of family poverty and parenting. *Journal of the American Academy of Child and Adolescent Psychiatry*. <https://doi.org/10.1016/j.jaac.2013.07.011>
- Minuchin, P. (1985). Families and individual development: Provocations from the field of family therapy. *Child Development*, 56, 289–302. <https://www.jstor.org/stable/1129720>
- Morgan, D. L., & Morgan, R. K. (2008). *Single-case research methods for the behavioral and health sciences*. Thousand Oaks, CA: Sage publications.

- Mundy, P. (2016). *Autism and joint attention: Developmental, neuroscience, and clinical fundamentals*. New York: Guilford Pub. Inc.
- Osborne, L. A., McHugh, L., Saunders, J., & Reed, P. (2008). The effect of parenting behaviors on subsequent child behavior problems in autistic spectrum conditions. *Research in Autism Spectrum Disorders*. <https://doi.org/10.1016/j.rasd.2007.06.004>
- Park, M. N., Moulton, E., & Laugeson, E. A. (in press). Parent-assisted social skills training for children with autism spectrum disorder: PEERS® for preschoolers. Focus on Autism and Other Developmental Disabilities.
- Rao, P. A., & Beidel, D. C. (2009). The impact of children with high functioning autism on parental stress, sibling adjustment, and family functioning. *Behavior Modification*. <https://doi.org/10.1177/0145445509336427>
- Rao, P. A., Beidel, D. C., & Murray, M. J. (2008). Social skills interventions for children with Asperger's syndrome or high-functioning autism: A review and recommendations. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-007-0402-4>
- Rea, H. M., Factor, R. S., Swain, D. M., & Scarpa, A. (2019). The association of the broader autism phenotype with emotion-related behaviors in mothers of children with and without autism Spectrum traits. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-018-3785-5>
- Reichow, B., & Volkmar, F. R. (2010). Social skills interventions for individuals with autism: Evaluation for evidence-based practices within a best evidence synthesis framework. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-009-0842-0>
- Reichow, B., Steiner, A. M., & Volkmar, F. (2012). Social skills groups for people aged 6 to 21 with autism spectrum disorders (ASD). *The COCHRANE DATABASE OF SYSTEMATIC REVIEWS*, 7(7), CD008511. <https://doi.org/10.1002/14651858.CD008511.pub2>
- Roberts, D., & Pickering, N. (2010). Parent training programme for autism Spectrum disorders: An evaluation. *Community Practitioner: the Journal of the Community Practitioners' & Health Visitors' Association*. [https://doi.org/10.1016/S1056-4993\(02\)00047-0](https://doi.org/10.1016/S1056-4993(02)00047-0)
- Tripathi, I., Estabillo, J. A., Moody, C. T., & Laugeson, E. A. (2021). Long-term treatment outcomes of PEERS® for preschoolers: A parent-mediated social skills training program for children with autism Spectrum disorder. *Journal of Autism and Developmental Disorders*, 1–17.
- Van Hecke, A. V., Stevens, S., Carson, A. M., Karst, J. S., Dolan, B., Schohl, K., ... Brockman, S. (2015). Measuring the plasticity of social approach: A randomized controlled trial of the effects of the PEERS intervention on EEG asymmetry in adolescents with autism spectrum disorders. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-013-1883-y>
- Watkins, L., Kuhn, M., Ledbetter-Cho, K., Gevarter, C., & O'Reilly, M. (2017). Evidence-based social communication interventions for children with autism spectrum disorder. *Indian Journal of Pediatrics*. <https://doi.org/10.1007/s12098-015-1938-5>
- Watson, P. J., & Workman, E. A. (1981). The non-concurrent multiple baseline across-individuals design: An extension of the traditional multiple baseline design. *Journal of Behavior Therapy and Experimental Psychiatry*, 12(3), 257–259. [https://doi.org/10.1016/0005-7916\(81\)90055-0](https://doi.org/10.1016/0005-7916(81)90055-0)
- White, S. W., Keonig, K., & Scahill, L. (2007). Social skills development in children with autism spectrum disorders: A review of the intervention research. *Journal of Autism and Developmental Disorders*, 37(10), 1858–1868.
- Whittingham, K., Sofronoff, K., Sheffield, J., & Sanders, M. R. (2009). Stepping Stones Triple P: An RCT of a parenting program with parents of a child diagnosed with an autism spectrum disorder. *Journal of Abnormal Child Psychology*, 37(4), 469–480.
- Yoo, H. J., Bahn, G., Cho, I. H., Kim, E. K., Kim, J. H., Min, J. W., ... Cho, S. (2014). A randomized controlled trial of the Korean version of the PEERS® parent-assisted social skills training program for teens with ASD. *Autism Research*. <https://doi.org/10.1002/aur.1354>