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ORIGINAL ARTICLE

A Pilot Randomized Controlled Trial of Motivation-Based Social Skills Group Treatment with Parent Training

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Abstract

Despite the popularity of social skills groups, there remains a need for empirical investigation of treatment effects, especially when targeting pivotal aspects of social functioning such as initiations to peers. The goal of the present study was to conduct a randomized controlled trial of a 12-week social intervention (SUCCESS), which combined an inclusive social group with a parent education program. Twenty-five 4- to 6-year-olds with Autism Spectrum Disorder (ASD) were randomized to SUCCESS ($N=11$) or to treatment as usual ($N=14$). Combining a peer group model with a parent training program, the SUCCESS intervention used naturalistic behavioral techniques (e.g., environmental arrangement, natural reinforcement) to increase social initiations to peers. After 12 weeks, children participating in the SUCCESS program made more frequent initiations to peers than children in the treatment-as-usual group, including more prompted and unprompted initiations to request. Additional gains in clinician-rated social functioning were observed in children randomized to SUCCESS, while differential treatment effects were not detected in parent-rated measures. However, lower baseline social motivation was associated with greater parent-reported initiation improvement. This study provides preliminary support for the efficacy of a naturalistic, behavioral social skills intervention to improve peer initiations for children with ASD. The findings suggest that using a motivation-based social skills group was effective in increasing both prompted and spontaneous initiations to peers, and highlights the need for further research into the role of baseline social motivation in predicting social skills treatment response.

Keywords Social skills group · Initiations · Natural reinforcement · Inclusion · Parent training · Social motivation

Social communication and interaction differences are common in youth with autism spectrum disorders (ASD) and are often a focus of intervention efforts. While some children with ASD may exhibit social differences due to intellectual disabilities or minimal language, other children with more complex intellectual and/or language abilities still experience challenges in connecting with their peers (Egilson et al., 2017; Rao et al., 2008). Disrupted peer relationships may persist over development and contribute to negative outcomes, such as lower self-worth, mental health problems, peer rejection, weaker academic performance, and declines in social and occupational functioning (Bellini, 2006; Rao et al., 2008; Welsh et al., 2001). Despite the strong need for social supports, there is relatively limited availability of efficacious intervention approaches for social skills training, particularly those that target pivotal aspects of social functioning such as initiations to peers (Gengoux et al., 2021;

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Williams White et al., 2007). The current study focuses on enhancing the motivation-based social skills program called Social Initiation Motivation Intervention (SIMI; Gengoux et al., 2021) by adding a parent training component.

Naturalistic Behavioral Intervention Approaches to Increase Initiations

Children with ASD often display fewer peer-directed initiations compared to non-autistic children (Birkender & Sparapani, 2023; Koegel et al., 2012). However, verbal initiations yield long-term benefits, enhance social connections, and decrease dependency on peers for social opportunities (Meek, Robinson, & Jahromi, 2012; Gengoux et al., 2021). Initiations hinge upon the child's independent interaction motivation, thus, treatments which focus on enhancing pivotal skills like motivation may be particularly well-suited for increasing initiations in children with ASD.

Autistic children generally exhibit more behavior regulation initiations (e.g., making requests for desired items) relative to social interaction and joint attention initiations (Birkeneder & Sparapani, 2023; Wetherby & Prutting, 1984). This may be related to being more motivated by tangible positive consequences rather than social attention. Importantly, Gengoux and colleagues (2021) demonstrated that when children with ASD participated in a brief (8-week) social skills group specifically targeting behavior regulation initiations to peers, they showed spontaneous behavior regulation initiations during free play, and also showed collateral improvements in other social initiation types (e.g., joint attention, social interaction). Therefore, social skills programs focused on motivating, prompting, and reinforcing children for making behavior regulation initiations to peers may help improve broad aspects of spontaneous social connection as well.

Motivation-based teaching for behavior regulation initiations focuses on setting up motivating conditions, such as frequent opportunities for a child to request desired items and providing direct reinforcement (e.g., giving the child the preferred item that was requested). These strategies incorporate general learning principles from Applied Behavior Analysis (ABA; Lovaas et al., 1987) and naturalistic developmental behavioral interventions (NDBI; Schreibman et al., 2015). Emerging evidence from a broad range of NDBI-informed approaches suggests that these motivation-based strategies enhance social and communicative behaviors such as conversation, play, joint attention, and social engagement (Koegel et al., 2014; Vernon et al., 2012; Waddington et al., 2021; White et al., 2011; Yang et al., 2023). Further research should investigate how this intervention approach can harness motivation to improve social skills with peers.

Inclusive Group-Based Models for Social Skills Treatment

Social Skills Training Groups (SSTGs) are a well-established evidence-based practice for targeting social skills in autistic individuals (Gates et al., 2017; Hotton & Coles, 2016). Using non-autistic peers to teach social skills may be particularly effective because socially skillful children can prompt youth with ASD (Wang et al., 2011), model and reinforce effective social behavior (Chang & Locke, 2016), and enhance generalization of skills (McFadden et al., 2014). While such groups have been shown to lead to improvements, a recent meta-analysis found that many reported changes in SSTGs are attributable to changes in *knowledge* of social interaction, as opposed to being a reflection of actual behavior change (Gates et al., 2017). Thus, groups that promote learning and practicing skills within a dynamic, natural environment may be especially useful for enacting meaningful, lasting changes (Barry et al., 2003). Interactions with peers can also better prepare children with ASD for integration into mainstream classrooms (Koegel et al., 2001; Sutton et al., 2022).

Establishing naturalistic behavioral contingencies designed to motivate social behavior in an inclusive group setting, rather than just teaching skills in a didactic manner or focusing on specific social "rules" (Bottema-Beutel et al., 2018), may be a particularly effective social skills model. Though few studies have directly explored embedding social skill practice into natural interactions (as opposed to decontextualized curriculum-based instruction) while also facilitating direct practice with typically developing peers, preliminary evidence for this motivation-based group approach comes from the SIMI pilot trial, described below (Gengoux et al., 2021).

SIMI Treatment Outcomes

In 2021, Gengoux and colleagues published results from their randomized controlled pilot trial of SIMI, a motivation-based social skills intervention for autistic children that targeted social initiations to non-autistic peers in an inclusive setting (see Gengoux et al., 2021 for additional information on SIMI). Findings from this study indicate that autistic children who had been taught to initiate behavior regulation initiations to peers during SIMI social group sessions exhibited greater increases in these initiations during free play than children in the treatment-as-usual control group, suggesting the potential for the generalizability of children's initiations even in situations without adult prompting or reinforcement. Additionally, collateral improvements in other social initiation types, as well as improvements

in broader social domains were also shown on clinician- and parent-rated measures, such as the Clinical Global Impressions, Improvement (CGI-I) scale and the Vineland Adaptive Behavior Scales, Second Edition (VABS-2) Socialization subscale, and maintained three months after treatment. These observations suggest that explicit instruction in behavior regulation initiations for young autistic children can have a cascading effect of improvements in other domains of social interaction.

Given that the goal of social skills training is to teach children with ASD how to independently engage in reciprocal social interactions in their natural environments, it is probable that involving parents could enhance the outcomes from the SIMI model by providing more frequent opportunities for children with ASD to practice social initiations in multiple contexts (e.g., playdates with peers from their own school or neighborhood).

Parent Training in Social Skills Treatment

A meta-analysis by Cheng et al. (2023) found that parent-implemented interventions helped autistic children to improve in positive behaviors/social skills, maladaptive behaviors, and language/communication. Additionally, incorporating parents into the delivery of interventions has been shown to increase generalization and maintenance of skills (Schreibman & Koegel, 2005; Tripathi et al., 2022), as well as reducing parental stress and increasing optimism (Koegel et al., 1996; Schreibman et al., 1991), which may strengthen the likelihood of sustaining their efforts with their child over time (Ingersoll & Dvortcsak, 2006). Parent involvement in social skills groups in particular is paramount for improving social behaviors in children with ASD (Frankel et al., 2011; Tripathi et al., 2022). Parents can play a critical role in promoting the acquisition of new skills for children through direct prompting of social initiations and ensuring contingent reinforcement through cooperative arrangements (i.e., setting up activities so that peers have shared control of desired materials; Fredeen, 2005). Moreover, studies have shown that parent training can help improve children's generalization of social skills to natural settings (Laugeson et al., 2009, 2012) and parental involvement in the practice of social skills has been shown to maintain treatment gains 1–5 years post-treatment (Mandelberg et al., 2014).

Playdates, in particular, can be an important context for friendship development and are therefore a critical context for social skill intervention. With training, parents can learn to utilize cooperative arrangements and set up mutually reinforcing activities during playdates to ensure positive social experiences and promote reciprocal social behaviors (Koegel et al., 2005; Vismara et al., 2006). Adding a parent training component to social skills group interventions could be a promising way to support natural social interactions with peers and generalization of learned skills.

Study Aims

The goal of the present study was to conduct a randomized controlled trial of a 12-week social intervention called Systematic Use of Cooperative Contingencies to Enhance Social Success (SUCCESS). The SUCCESS program included two components: an inclusive social group based on the SIMI model where naturalistic behavioral techniques were used to motivate children with ASD to initiate requests to peers (neurotypical and ASD) and a parent education group where parents learned how to implement these naturalistic behavioral treatment strategies during playdates in home and community settings. Primary goals of the study were to evaluate the effectiveness of SUCCESS compared to the Treatment As Usual group (TAU) in improving: (a) frequency of initiations from children with ASD to peers during parent-facilitated peer interaction (PFPI), (b) frequency of parent prompts and both parent- and peer-delivered reinforcement during PFPI, (c) changes in initiation type, and (d) broad aspects of social functioning, as assessed by parent and clinician ratings. Finally, the association between baseline social motivation and parent-rated initiation progress was explored.

Methods

Study Design

This study examined changes in social behavior with peers amongst 4- to 6-year-olds with ASD. Participants were randomized to participate in a naturalistic behavioral social skills intervention (SUCCESS) or to continue their treatment as usual (TAU). Randomization with stratification based on child sex was conducted by a senior clinical investigator not involved in the study's clinical assessment or treatment. Participants randomized to SUCCESS attended a weekly social group with typically-developing (TD) peers for 12 weeks and their parents participated in a parent training program, whereas the TAU group continued their existing treatments (e.g., special education, ABA, speech therapy). The study was approved by the

Stanford University institutional review board and registered on clinicaltrials.gov (NCT03177525).

Participants

This study recruited participants from the Autism Center at a large academic medical center and from a partnering community agency with an on-site inclusive preschool and active social skills group program. Inclusion criteria included: (a) children 4–6 years old, (b) with ASD diagnosis based on the Autism Diagnostic Observation Schedule (ADOS-2; Lord et al., 2012), Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA 2013), and expert clinical opinion, (c) without intellectual disability (Standard Score ≥ 70 on the Stanford Binet Intelligence Scales-5th edition; SB-5), (d) with stable concomitant community treatments for 1 month prior to study participation and no anticipated changes during the study, and (e) parent and child able to consistently attend treatment sessions. Exclusion criteria included the following: (a) child having a genetic disorder, severe psychiatric diagnosis, or unstable medical problem, (b) severe disruptive behaviors preventing them from safely participating in baseline assessments, or (c) current participation in another social skills group. No changes were made to the inclusion or exclusion criteria during the study.

The TD peers were recruited through teacher referrals from the inclusive preschool of the partnering community agency, and included several children of agency and study staff. Teachers were requested to refer children with strong social and collaborative play skills. The TD group consisted of children: (a) 4–8 years old, (b) without a diagnosis of ASD or other mental health disorder, and (c) willing and available to participate in social groups and peer play assessments. Peers were allowed to join as many or as few group sessions as they wanted, therefore the children with ASD were exposed to a range of peers throughout their 12-week enrollment.

Participant Characterization

Participants' social communication, cognitive functioning, and social motivation was assessed through a battery of assessments including the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2; Lord et al., 2012), Stanford-Binet Intelligence Scale, Fifth Edition (SB-5; Roid, 2003), and Stanford Social Dimensions Scale (SSDS; Phillips et al., 2019).

Procedures

Following completion of screening and baseline measures, eligible participants were randomized 1:1 (with stratification by sex) to either immediate treatment group (SUCCESS) or TAU using an online random number generator (random.org) by a senior investigator not involved in the study implementation (AH). New families were enrolled each month on a rolling basis. Families assigned to the TAU continued their existing treatments. They completed measures at week 12 and were invited to receive the treatment at the end of the controlled phase of the trial. Of note, recruitment was discontinued during the COVID-19 pandemic due to restrictions on in-person gatherings at the collaborating agencies.

SUCCESS Program

The SUCCESS program consisted of two 90-minute intervention sessions each week for 12 weeks, including a weekly social group session and a weekly parent training session.

Social Group Sessions

Group sessions were held in an available preschool classroom at the community agency. While group size varied slightly from week to week due to rolling admission, an effort was made to recruit approximately equal numbers of autistic children and non-autistic peers. Total group size ranged from six to a maximum of 10 children over the course of the study, with approximately three to five autistic children and three to five non-autistic peers participating in each group. Social group session format and intervention techniques were similar to the procedures in the previously published SIMI study (see Gengoux et al., 2021). In brief, each 90-min group session involved a series of age-appropriate play activities facilitated by group leaders, as well as a group snack time. Activities were planned to incorporate the interests of the participating children with ASD. Group leaders repeatedly distributed activity materials to establish cooperative arrangements between the children with ASD and peers so that children with ASD would be motivated to request necessary items and actions from peers. The goal of the cooperative arrangements procedure is to make initiating to peers more motivating, by repeatedly establishing play situations where peers have materials of interest to the child with ASD. Once cooperative arrangements were in place, leaders prompted children with ASD to make behavior regulation initiations to peers and encouraged peers to reinforce these requests.

Parent Training

In addition to the 12-week social group described above, participating parents attended an additional weekly 90-min parent training group. Up to five parents participated at a time. The overall goal of parent training was to encourage

parents to increase opportunities for positive peer interactions in community settings and teach them to utilize evidence-based social facilitation techniques such as environmental arrangement, hierarchal prompting, and natural reinforcement, as outlined in the manual *Facilitating Play Dates for Children with Autism and Typically Developing Peers in Natural Settings* (Vismara et al., 2006).

The parent training curriculum, which was developed for the purpose of this study, is outlined in Table 1. The program covered four general themes: how to expand the child's network of potential playmates (Friendship Foundations), selecting activities of interest to both children (Fun or Forget It), establishing cooperative arrangements to encourage interaction (Cooperation Culture) and planning for future independent social connections (Spreading Success). Each of the four general themes was discussed in a monthly rotation, with a different teaching focus on each subsequent presentation (Table 1). Parents were also encouraged to arrange play dates and get-togethers with peers at least weekly during study enrollment and to share their experiences during parent training sessions for feedback. Each parent training session included didactic presentation of the weekly theme and teaching focus, review of plans for upcoming play dates with peers, and discussion of peer social facilitation challenges and troubleshooting. Video examples of participants and intervention techniques were reviewed when available.

A secondary focus of parent training was to familiarize parents with the procedures used by group leaders in the social group sessions. Parents took turns observing social group sessions (1–2 parents at a time) and, in the final month of the child's participation, each participating parent had several opportunities to practice the prompting and reinforcement procedures during the snack or another group play activity. Additional information regarding the overall approach taught to parents for facilitating peer interactions is outlined in the chapter titled "*Expanding Friendship Opportunities for Children with ASD*" (Gengoux & Vismara, 2019).

Dependent Measures

Parent-Facilitated Peer Interaction (PFPI)

The Parent-Facilitated Peer Interaction (PFPI) was a 10 min videotaped interaction between the target child with ASD and two to three TD peers, with the child's parent present as a facilitator. The PFPI was conducted in order to allow naturalistic observation of changes in child social behaviors with TD peers as well as changes in parent facilitation behaviors over the course of the trial. The children had access to a variety of age-appropriate toys in the preschool classroom. Parents were instructed to encourage their children

Table 1 Parent training curriculum for the SUCCESS program

Session	General Theme	Teaching Focus	Description
Week 1	Friendship Foundations	Helping Helps	Importance of peer relationships. Parents that provide help for their children help them have successful peer relationships.
Week 2	Fun or Forget It	Enjoyment is the Point	Working only on improving peer interactions during activities that your child is enjoying. The activity is the "glue" that is motivating and holds interaction together.
Week 3	Cooperation Culture	Making Grass Greener	Introducing initiation types: behavior regulation, social interaction, and joint attention.
Week 4	Spreading SUCCESS	Better Next Time	Review and troubleshooting to improve future opportunities for social interactions.
Week 5	Friendship Foundations	Picking Peers	Pick peers who demonstrate interest in their child. Build deliberate relationships with other families of children in their child's class.
Week 6	Fun or Forget It	Familiar is Fun	Priming: Parents should show their child the materials or activity in advance so they're familiar with the activity.
Week 7	Cooperation Culture	Taking Turns	Teaching reciprocity and curiosity to express interests in what other children are doing or saying.
Week 8	Spreading SUCCESS	Planning to Let Go	Self-management: Fading prompts and promoting independence.
Week 9	Friendship Foundations	Opening Up Opportunities	How to look out for and be the most effective facilitator for ongoing opportunities for social interactions with child's peers.
Week 10	Fun or Forget It	Rewards	Assuring effective reinforcement for social behavior. Effective rewards are fun, immediate, and natural.
Week 11	Cooperation Culture	Engineering Cooperation	Learn to arrange an environment that strategically fosters cooperation between child and peers.
Week 12	Spreading SUCCESS	Share What You Know	Teaching others who work with your child how to promote social success.

to talk and play with peers as much as possible throughout the 10 min period. Participants in both the SUCCESS and TAU group completed PFPI at baseline and at week 12. Videos were analyzed for frequency of initiations to peers, including prompted and unprompted initiations, as well as frequency of parent prompts and parent- and peer-delivered reinforcement. Initiation type (i.e., behavior regulation vs. social initiations) were also coded using established operational definitions as described below.

Child initiations were verbal statements made by the child with ASD towards peers (Wetherby et al., 1988), categorized as either behavior regulation or social initiations. Behavior regulation initiations were operationally defined as verbalizations used to regulate the behavior of peers to obtain a goal, such as requests for a desired item or action. Social initiations were defined as verbalizations for social interaction (e.g., attracting peer's attention to oneself by greeting or starting a topic of conversation) or joint attention function (e.g., directing peer's attention to an object or action for the purpose of sharing). Each initiation type was categorized as prompted (following parental models or cues) or unprompted (spontaneous). Videos were separately scored for parent use of targeted techniques as a measure of treatment implementation. Scoring of parent implementation specifically included parent prompt frequency, as well as the frequency of parent reinforcement (if necessary) and peer reinforcement (desired outcome).

All raters were trained research assistants who were required to reach inter-rater reliability of 80% or higher before independently scoring randomly selected videos. Raters were naïve to group assignment and treatment phase during the scoring process. Intraclass correlation coefficients (ICC) indicated good agreement between raters for total initiations to peers (0.89), and excellent agreement for prompted initiations (0.94) and unprompted initiations (0.96). Reliability for initiation type was also calculated indicating good agreement for behavior regulation initiations (0.88) and social initiations (0.87). For parent prompting behaviors and peer reinforcement, reliability was also strong (average interobserver agreement 95%).

Clinical Global Impressions, Improvement Subscale

The Clinical Global Impressions – Improvement (CGI-I; Guy, 1976) is a rating of child improvement completed by a clinician that was not involved in other aspects of the study and naïve to group assignment. The clinician reviewed baseline and week 12 videos and discussed with the participant parents any changes observed over the 12 week period (parents were instructed not to reveal their child's treatment assignment). The clinician then gave ratings for social communication improvement on a 7-point Likert scale, ranging from 1 ("very much improved") to 7 ("very much worse").

Parent-Rated Initiation Improvement

Parent-rated initiation improvement was measured using a continuous visual analog scale (VAS) created specifically for this study. VAS methodology has been commonly used in research and clinical settings for rapid, sensitive, and quantifiable measurement of subjective phenomena (Marsh-Richard et al., 2009; Berghmans et al., 2017). Specifically, at baseline and week 12, parents in both groups were asked to respond to the question "When playing with a peer, how often did your child initiate to ask for things your child wanted?" by drawing an "X" along a 100 mm dotted line between "Never" and "Always". The score was then determined by measuring the distance in millimeters from the left-hand extreme to the marked point.

Standardized Parent Questionnaires

Parent survey responses on the Social Responsiveness Scale, Second Edition (SRS-2; Constantino & Gruber, 2012), Social Skills Improvement System (SSIS; Gresham & Elliott, 2008), and Vineland Adaptive Behavior Scales, 3rd Edition (Vineland-III; Sparrow et al., 2016) were also collected at baseline and week 12.

Statistical Analyses

Demographic characteristics were compared at the baseline timepoint to check for significant group differences. In order to assess the treatment effect between SUCCESS and TAU from baseline to week 12, our overall analytic approach employed mixed-effects regression models with treatment group (SUCCESS versus TAU), time (baseline and week 12), and their interaction as fixed effects covariates. Type 1 error rate of 0.05 was used for all analyses and multiple comparison correction was not performed, as the primary purpose of this exploratory study was to inform planning of future research investigations and the sample size was small. All analysis was performed using IBM SPSS Statistics version 27 (IBM SPSS Statistics, IBM Corporation, Arnonk, NY).

Specifically, repeated measures analysis was first used to examine group differences in change between baseline and week 12 in total frequency of child initiations directed toward peers during PFPI, as well as differences in frequency of prompted initiations and unprompted initiations. A similar analytic strategy was used to examine group differences over time in frequency of parent prompts, parent

and peer reinforcement, as well as group differences in child initiation type.

Between-group comparison of CGI-I scores, which were rated at the week 12 timepoint only, was completed via Mann-Whitney U-Test. We further evaluated between-group (SUCCESS vs. TAU) differences in treatment effect on the remaining standardized ratings of social abilities taken at baseline and week 12 (e.g., SRS-2, Vineland Socialization Scale, SSIS), as well as on the parent rated initiation improvement. Finally, we employed a Pearson correlational analysis to explore the relationship between baseline social motivation (SSDS) and parent-rated initiation improvement for children in the SUCCESS group.

Results

Fifty-nine potential participants were assessed for eligibility and 28 were randomized to participate in the controlled trial (Fig. 1). Three children were unable to complete the trial due to COVID-19 shelter-in-place orders and were not included in the final analysis. The final sample included 25 participants with ASD (7 females). Mean age of the sample was 62 months (SD = 8.2). Online Resource 1 displays a comparison of participant demographic and clinical characteristics between groups at baseline. A large proportion of children identified as Asian, including all but one child in the SUCCESS group. There were no other significant baseline differences between the two groups on child demographic or standardized measures ($p > 0.05$).

Parent-Facilitated Peer Interaction (PFPI)

Repeated measures analysis of child initiations during PFPI indicated that by week 12, children in SUCCESS showed significantly greater increase in total initiations to peers compared to children in TAU (F (1, 21) = 8.11; $p = 0.010$). Analysis of effect size using partial eta squared indicated a large effect ($\eta_p^2 = 0.28$). The group difference in increase for prompted initiations was statistically significant (F (1, 21) = 4.41; $p = 0.048$; $\eta_p^2 = 0.17$; Table 2) indicating that children in SUCCESS improved more in their frequency of prompted initiations. Of note, the change in unprompted initiations was not statistically different between groups (F (1, 21) = 2.86; $p = 0.106$), though the effect size was in the medium range ($\eta_p^2 = 0.12$).

Analysis of parent behavior during PFPI did not reveal significant group differences in frequency of parent prompting between baseline and week 12 (F (1, 21) = 1.63; $p = 0.215$; $\eta_p^2 = 0.07$; Table 2) or in frequency of parent reinforcement

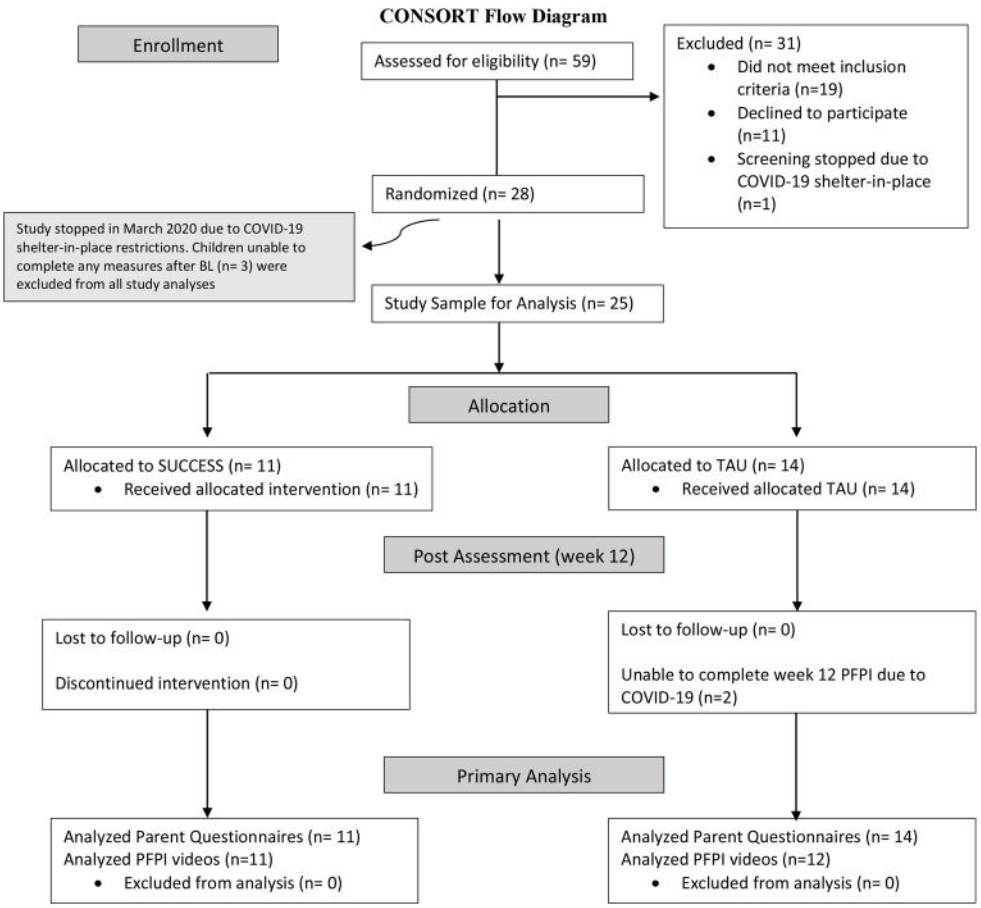

Fig. 1 CONSORT flow diagram for participants in SUCCESS versus treatment as usual (TAU)

Table 2 Mean frequency of social interaction initiations and parent prompts during 10-min parent-facilitated peer interaction (PFPI) at baseline and week 12 for participants with ASD in the SUCCESS program or treatment as usual (TAU).

	SUCCESS ($n=11$)		TAU ($n=12$)*		Treatment Effect		
	Baseline†	Wk 12	Baseline	Wk 12	F	P Value	Partial Eta Squared
Total Child Initiation Frequency	15.09 (10.08)	22.45 (7.67)	12.17 (10.04)	9.50 (7.26)	8.11	0.010	0.28
Child Prompted Initiations	6.45 (4.44)	9.55 (5.85)	6.75 (7.50)	5.25 (5.63)	4.41	0.048	0.17
Child Unprompted Initiations	8.64 (11.09)	12.91 (6.06)	5.42 (4.85)	4.25 (3.08)	2.86	0.106	0.12
Parent Prompt Frequency	9.64 (5.89)	14.64 (7.55)	11.00 (7.48)	12.17 (6.86)	1.63	0.215	0.07
Parent Reinforcement Frequency	0.45 (0.69)	0.91 (1.51)	0.50 (0.90)	0.50 (0.90)	0.53	0.473	0.03
Peer Reinforcement Frequency	1.18 (1.47)	3.55 (2.07)	1.50 (2.07)	2.00 (2.17)	4.57	0.044	0.18

*Two participants in TAU group had missing PFPI due to COVID-19 shelter-in-place restrictions

†Baseline differences were not statistically significant ($p>0.05$) for any of the variables

Table 3 Mean frequency of behavior regulation and social initiations during PFPI at baseline and week 12 for participants with ASD in SUCCESS and TAU

Initiation Type	SUCCESS ($n=11$)		TAU ($n=12$)*		Treatment Effect		Partial Eta Squared
	Baseline†	Wk 12	Baseline	Wk 12	F	P Value	
Behavior Regulation (Prompted)	1.91 (2.30)	4.27 (2.76)	2.75 (2.86)	2.50 (2.68)	4.32	0.050	0.17
Behavior Regulation (Unprompted)	0.55 (0.93)	5.73 (4.88)	2.33 (3.17)	1.50 (1.62)	12.48	0.002	0.37
Social Initiation (Prompted)	4.55 (4.20)	5.27 (4.54)	4.00 (6.34)	2.75 (3.84)	1.13	0.301	0.05
Social Initiation (Unprompted)	8.09 (10.29)	7.18 (4.51)	3.08 (3.63)	2.75 (2.42)	0.03	0.857	<0.01

*Two participants in TAU group had missing PFPI due to COVID-19 shelter-in-place restrictions

†Baseline differences were not statistically significant ($p > 0.05$) for any of the variables

(F (1, 21) = 0.53; $p = 0.473$; $\eta_p^2 = 0.03$), suggesting that the observed increase in prompted initiations by children in the SUCCESS group cannot be solely attributed to more frequent parent prompting or parent-delivered reinforcement. However, peer reinforcement during parent-facilitated play improved more between baseline and week 12 for children in the SUCCESS group when compared to children participating in TAU (F (1, 21) = 4.57; $p = 0.044$; $\eta_p^2 = 0.18$). This pattern of results indicates that while parents who received SUCCESS parent training prompted a similar number of initiations compared with parents in TAU, the prompted initiations were more likely to be completed by their children and more likely to be reinforced by peers.

Analysis of child initiation type indicated that the frequency of prompted behavior regulation initiations increased more between baseline and week 12 for children in SUCCESS compared to TAU (F (1, 21) = 4.32; $p = 0.050$; $\eta_p^2 = 0.17$; Table 3). Children in SUCCESS also made significantly greater improvement in frequency of unprompted behavior regulation initiations to peers by week 12, with a large effect size (F (1, 21) = 12.48, $p = 0.002$, $\eta_p^2 = 0.37$; Fig. 2). No significant group differences were observed between baseline and week 12 on social initiations (prompted or unprompted).

Clinical Global Impressions, Improvement Subscale

On the clinician-rating of social communication improvement (CGI-I), participants in the SUCCESS group were rated as more improved on social communication following the 12-week treatment compared to participants in TAU ($U = 23$, $p = 0.013$). Specifically, the majority of participants in the SUCCESS group were scored by the clinician who was naïve to group assignment as *much improved* (64%, $n = 7$) after 12 weeks, with a few participants rated as *minimally improved* (18%, $n = 2$) or *no change* (18%, $n = 2$). The participants in TAU were scored by the naïve clinician as either *minimally improved* (55%, $n = 6$) or as *no change* (45%, $n = 5$), with zero TAU participants rated as *much improved* (Fig. 3).

Parent-Rated Improvement

No significant group differences in change between baseline and week 12 were observed on the SRS Total or subscale scores, Vineland Socialization Scale, or on the SSIS (Online Resource 2). Analysis of parent-rated initiation improvement on the visual analog scale also indicated no significant group differences in reported initiation frequency between baseline and week 12 (F (1, 21) = 1.84; $p = 0.19$; $\eta_p^2 = 0.07$). However, for children in the SUCCESS group, a significant

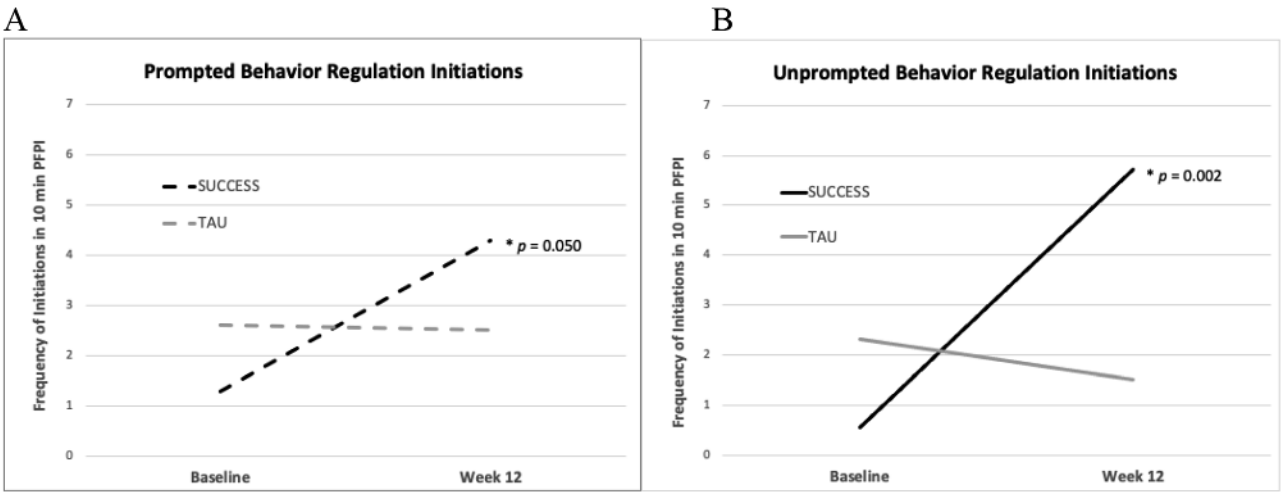

Fig. 2 Change in number of prompted (**A**) and unprompted (**B**) behavior regulation initiations from baseline to week 12 in the SUCCESS and TAU participants

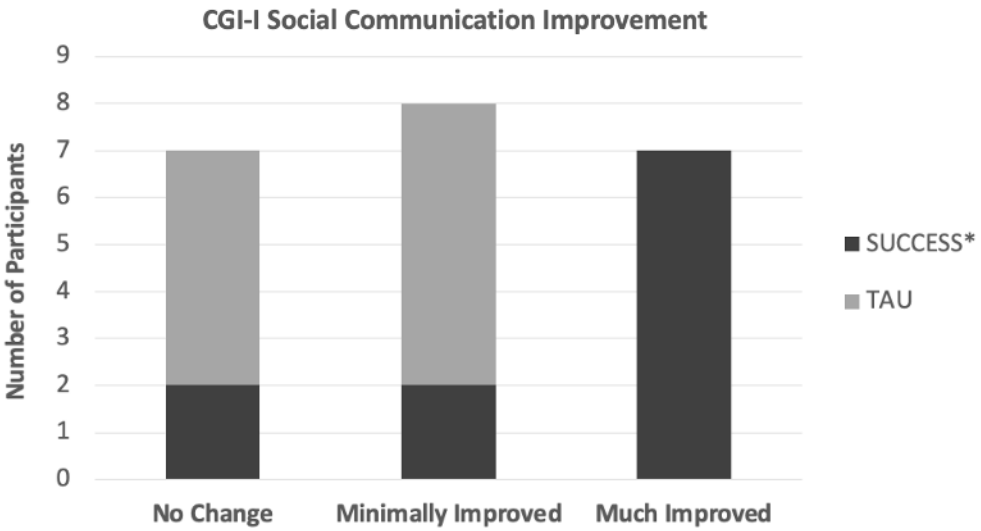

Fig. 3 Comparison of social communication improvement on the clinical global impression, improvement (CGI-I) scale between SUCCESS and TAU participants. * $U = 23$, $p = 0.013$; *Note* One participant in TAU had missing CGI at Week 12

negative correlation was observed between baseline social motivation on the SSDS and parent-rated initiation improvement ($r[9] = -0.78$; $p = 0.005$). That is, lower baseline social motivation scores were associated with greater improvement in initiation frequency between baseline and week 12 (Fig. 4).

Discussion

This randomized controlled pilot trial investigated the effectiveness of combining a parent training curriculum with a naturalistic behavioral social intervention for young children with ASD for improving initiations towards typically developing peers. Following the 12-week treatment, children with ASD made more overall initiations to peers, including both prompted and *unprompted* behavior regulation initiations (i.e., requests), showing promise for enhancing social motivation for peer interactions through parent training and inclusive social groups. Ratings of social functioning improvement from a clinician naïve to treatment assignment further supports the positive global effects of this motivation-based treatment. While group differences were not detected in standardized parent-rated measures, those children with lower baseline social motivation were rated by their parents as having made more initiation progress by the end of the treatment, suggesting that the SUCCESS model may be particularly useful for children with low baseline social motivation.

To our knowledge this is the first randomized controlled trial of a naturalistic, parent-mediated social skills group focused on improving initiations and using both observational coding and standardized measures of social functioning to evaluate outcomes. One important goal of this study

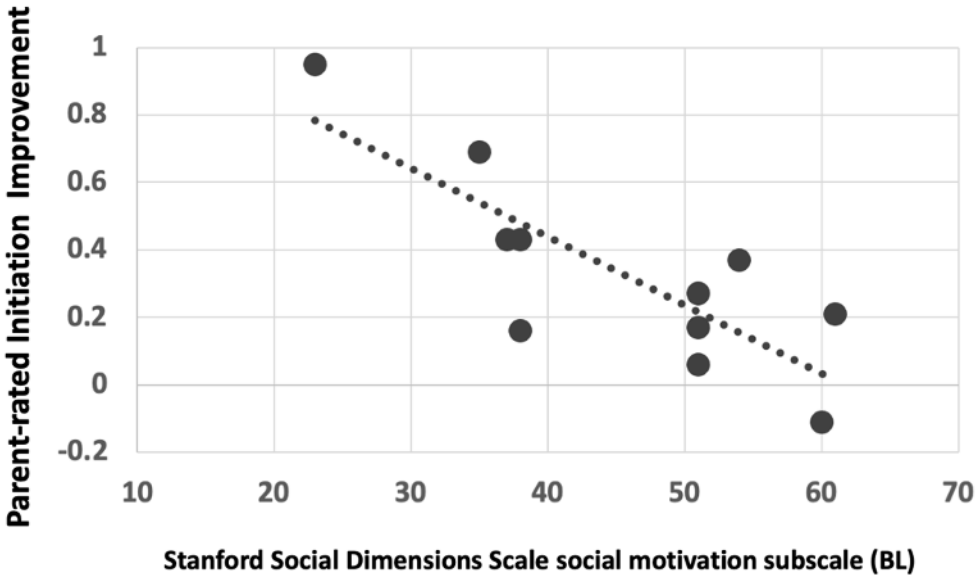

Fig. 4 Association between baseline Stanford social dimensions scale (SSDS) social motivation subscale and parent-rated initiation improvement at week 12 in SUCCESS participants

was to evaluate the effects of adding a parent training component to an established social group program; however, in many ways the results of this study are quite similar to the initial 8-week Social Initiation Motivation Intervention (SIMI) which documented improvement and generalization in social initiations without parent mediation (Gengoux et al., 2021). Interestingly, children in SUCCESS did receive more consistent reinforcement from peers in response to their requests, a variable that was not measured in the original study. This is consistent with previous research documenting favorable effects of parent-based training and parent facilitation in social skills interventions for children with ASD (Park et al., 2022).

While changes in parent behavior during the SUCCESS treatment likely contributed to the favorable outcomes in the present study, it is difficult with our study design to isolate the effects of the parent training component. More comprehensive measures of parent skill acquisition, as well as other supportive parent behaviors (e.g., arranging regular play dates outside social group sessions), will be important in future research in order to more fully evaluate the additive effects of parent training for social skills interventions. Although this small pilot study will need replication, these preliminary results suggest that parent social coaching frameworks such as the parent training curriculum developed for this study may be critical in facilitating successful social interactions and helping sustain improvements in social skills.

Improvement in Initiations to Peers

Behavioral coding by naïve raters is a particularly robust unit of analysis and the observed treatment gains in initiation frequency reflect improved attempts to connect with peers following the SUCCESS treatment. More specifically, these results suggest that using naturalistic behavioral techniques (e.g., mutually reinforcing activities, cooperative arrangements, prompting, peer-delivery of contingent reinforcement) can contribute to significant improvements in both prompted and unprompted initiations within 12 weeks.

The fact that parents in both TAU and SUCCESS groups prompted initiations with similar frequency, but that children in the SUCCESS group showed greater improvement in their frequency of initiations to peers over time may indicate that parents in SUCCESS became more effective in getting their children to respond to prompts. It is also noteworthy that parents did not differ in the frequency of parent-delivered reinforcement but that children in SUCCESS received more frequent peer-delivered reinforcement at post-treatment. This suggests that parent training may have been associated with qualitative changes in how and when parents were prompting child initiations, which will be critical to explore more deeply in future studies. The improvement in spontaneous (unprompted) behavior regulation initiations observed in the SUCCESS group further suggests that repeated exposure to positive reinforcement in social situations with peers may have motivated these children to generalize this social skill even when not directly prompted to do so. The finding is consistent with prior literature that demonstrates the importance of delivering positive reinforcement (Chung et al., 2007; Strain et al., 1979) to improve social communication skills. This finding also partially replicates the SIMI study, which found increases in both behavior regulation and social initiations during free play with peers following a similar social group program (Gengoux et al., 2021). Together, these results further support the efficacy of using naturalistic child-preferred activities for positive treatment outcomes in social skill

interventions for children with ASD (Dunst et al., 2012; Koegel et al., 2009).

The motivation-based approach may be a key factor to the increase in unprompted initiations observed among participants randomized to SUCCESS. As part of the SUCCESS intervention and parent training, cooperative arrangements are established in each activity and children are only prompted to initiate when motivated to obtain or exchange an item with a peer. Pre-established shared control of materials between children means that peers are more consistently able to deliver a requested item, so participants with ASD have higher likelihood of their requests being reinforced, likely encouraging them to make more spontaneous initiations. While further research should be conducted to investigate additional strategies for encouraging all social initiation types, this preliminary finding is encouraging as higher rates of spontaneous initiations have been associated with more favorable treatment outcomes for children with ASD, including increased joint attention, decreased behavioral problems, increased pragmatic abilities, and improvement in social communicative language (Koegel et al., 1999; Meek et al., 2012; Morrison et al., 2001). In addition, using each individual child's own motivation as a core component of the intervention design could be particularly important in addressing concerns raised by neurodivergent individuals and other stakeholders about social validity and acceptability of early intervention practices (Leadbitter et al., 2021).

Global Social Improvements

The improvements in global ratings of social functioning by an expert clinician unaware of group assignment provide further demonstration of the promising gains in social communication following the SUCCESS treatment. The use of multiple units of analysis is rigorous and a best-practice for evaluating effects of behavioral treatments. However, we found no significant group differences in standardized parent questionnaires at the end of this 12-week study. Though some studies related to social skills treatments have shown significant parent-reported gains in their child's social skills through parent questionnaires (Beaumont et al., 2021; Dekker et al., 2019; Laugeson et al., 2015), other studies have similarly failed to find statistically significant group differences in parent report of global improvement following short-term social skills treatments. For example, in a meta-analysis of group-based social skills interventions, researchers found that effect sizes were small across 16 studies that used parent-reports as measures of social skills (Gates et al., 2017). In another study that looked at group-based social skills training for children with ASD, although the teacher-report found significant increases, the parent-report found no significant increase in social skills (Chester et al., 2019).

Similar to the results of the current study, many of these studies documented numerical increase in scores related to social skills and social communication, but not statistically significant group differences in standardized scores over time. This is not particularly surprising given that global measures of social functioning are unlikely to be sensitive enough to detect changes due to an intervention targeting a specific social skill. While the current study findings demonstrate proximal effects on the targeted initiations, it may be difficult to produce effects on parent-rated global social functioning after a short-term, targeted intervention. Instead, it will be important to consider how these effective motivational behavioral intervention practices might be applied as part of a comprehensive social skills intervention program to teach a full range of developmentally-appropriate social behaviors. In addition, children with particular characteristics may be more likely to benefit from a given social skills treatment; however, these differential patterns of treatment response across subgroups are difficult to detect in a very small sample.

Preliminary evidence of a potential predictor of treatment response was observed in the significant negative correlation between the baseline social motivation subscale scores on the SSDS and parent-rated initiation improvement. Specifically, children with lower baseline social motivation had greater gains in parent-reported initiation frequency at week 12. Although the present study's results might initially appear to be contrary to established literature documenting the negative impact of low social motivation on social skill acquisition (Itskovich et al., 2021), the new findings suggest that the motivational components of the SUCCESS treatment (e.g., cooperative contingencies designed to motivate and reinforce requests from peers) may be particularly beneficial for children with low baseline social motivation. The social motivation theory of ASD maintains that low social motivation plays a role in decreased attention to social information and induces a cascading effect of poor social learning (Chevallier et al., 2012). It may be that children in the present study with low social motivation were making few social initiations at baseline; however, with preferred activities to increase engagement in the social group, prompting of behavior regulation initiations, and contingent positive reinforcement from peers, they were observed by parents to make positive change at the end of treatment. As children with more severe motivational and skill challenges at baseline remain some of the most difficult children to help with autism interventions, this finding will be particularly important to explore in future rigorous studies. In particular, replication of this finding will be critical to further document

which subgroup characteristics are associated with favorable response to inclusive, naturalistic behavioral social group intervention and to determine how to best support the most impaired individuals with ASD.

Limitations

A significant limitation of this study was the discontinuation of recruitment due to restrictions on in-person gatherings at the collaborating agencies associated with the COVID-19 pandemic. The resulting small sample size may have resulted in limited power to detect differences between groups. Additionally, children in SUCCESS had greater exposure to the social group context than children in TAU; therefore, their improved performance during PFPI video probes could be due in part to their greater familiarity with the location, materials, and available peers in the preschool classroom setting. While the current study collected measures through a variety of methods, such as observational measures, parent surveys, and clinician ratings, additional measures of treatment effect could also be informative (e.g., teacher report and/or data collected in home or school). The current study also only analyzed treatment effects between baseline and week 12. Future studies could analyze data collected at multiple timepoints throughout and following the intervention to identify any trends in social behaviors during the course of treatment and to assess the degree to which gains are maintained once treatment stops.

Conclusions and Future Directions

The present study investigated the efficacy of a naturalistic, behavioral, inclusive social skills group intervention combined with a parent training curriculum, in comparison with treatment as usual. Measures of treatment response were collected using observational assessments and clinician- and parent-rated measures to better understand treatment response. The findings suggest that using a motivation-based social skills group was effective in increasing both prompted and spontaneous initiations to peers. Additional gains in social communication were also found in clinician ratings. Differential treatment effects were not detected in parent questionnaire responses. It is possible that more comprehensive social skills intervention would be necessary to produce treatment gains that would be reflected in global parent reports. The current study also found that low social motivation at baseline was correlated with more significant parent-reported initiation improvement, demonstrating a need for further research into the role of baseline social motivation in predicting social skills treatment response. This study provides preliminary support for the effectiveness of using a naturalistic, behavioral social skills intervention with parent training to improve peer initiations for children with ASD.

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Declarations

Conflict of Interest The authors have declared that they have no competing or potential conflicts of interest.

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