



Improving Peer Engagement of Children With Autism on the School Playground: A Randomized Controlled Trial

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This study aimed to test the effects of a psychosocial intervention, *Remaking Recess*, on peer engagement for children with autism spectrum disorder (ASD). Using a randomized, wait-list-controlled design, the intervention was implemented during recess at four elementary schools. The immediate treatment (IT) group consisted of 13 (2 female) elementary school students with ASD and the wait-list (WL) group contained 11 (4 female) students with ASD. All of the children with ASD were fully included in the general education program. Analyses revealed that time spent engaged with peers was significantly increased for the IT group and maintained over the follow-up. School playground staff in the IT group showed increased behaviors aimed at improving peer engagement for children with ASD compared to playground staff at the WL sites. These improvements did not maintain to follow-up. These results suggest that a low dose, brief intervention can be beneficial in increasing peer engagement for children with autism in inclusive settings, but continued support of playground staff is likely needed.

Keywords: peer interactions; schools; inclusion; autism; paraprofessionals

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SOCIAL IMPAIRMENT HAS BEEN identified as the most enduring issue for children with an autism spectrum disorder (ASD), affecting their peer relationships, friendships, and general social interactions with others (Bellini, Peters, Benner, & Hopf, 2007; Rao, Beidel, & Murray, 2008). Interventions developed to address this issue are of high priority, particularly in the child's real-world environments such as school (Kasari & Smith, 2013). Despite the increase in research on social skills interventions over the past several years (Kasari & Lawton, 2010; Reichow & Volkmar, 2010), few of these have been designed for or tested in school settings (Bellini et al., 2007; Kasari & Smith, 2013). The goal of this social skills research generally is to improve relationships and friendships in the child's everyday environments. The goal of the current study was to develop and test a novel intervention, *Remaking Recess*, for improving peer interactions in the school setting for elementary-aged children with ASD.

Most social skill interventions for children with ASD are conducted in clinical settings, and often in groups of other children with ASD (Bellini et al., 2007; Rao et al., 2008; Williams White, Keonig, & Scahill, 2007). While many of the studies improve social skills within the group, there is little evidence of generalization outside the clinical setting. If improvements are found outside this setting, individuals who are not blinded to intervention condition often provide the outcome measure (e.g., parents); thus, potential bias cannot be ruled out. One exception is the study by Frankel, Gorospe, Chang, & Sugar (2011), where a parent-mediated intervention in the clinic taught children how to make and keep friends. Parents who hosted more successful play dates for their children at home had children

who also demonstrated increased peer interactions on their school playground as coded by blinded observers. This is one of the few studies demonstrating generalization from an intervention in a clinical setting to the child's real-world school environment.

Other researchers have attempted to create a school-like environment by creating analog classrooms, often in a summer school program. For example, Lopata, Thomeer, Volker, Nida, and Lee (2008) created summer camp classrooms for children with ASD and delivered social interventions aimed at improving perspective taking and emotion recognition. Although mirroring a classroom context, peers are not the same as in the child's real-world school environment, nor are the expectations consistent with those of a typical classroom. Thus, the generalization of analog contexts to actual contexts is often untested.

Despite the fact that few intervention studies are carried out in real-world school environments (Kasari & Smith, 2013), school personnel do implement social skills programs for children with ASD who are in the general education programs. Often these programs are derived in varying degrees from research paradigms. Three common interventions for children with ASD include psychologist-run lunch-bunch social skills groups, buddy systems where specific peers are assigned to help a target child, and assignment of a one-on-one aide to help a specific child socialize. The first common intervention model utilizes a social skills group, often held weekly at lunchtime. These groups are composed of children who have been identified as having social difficulties, including difficulties making friends at school. Some of these groups consist of all children with social difficulties while others include a mix of children with social difficulties and typical peers. This group model, while common, has rarely undergone rigorous testing at school, but most closely resembles group social skills interventions carried out in nonschool, clinical settings (Williams White et al., 2007).

A second model targets intervention with the child's peer group (peer-mediated models). These models often teach peers in the child's classroom strategies for engaging children in joint activities and how to initiate and respond to the target child with ASD behaviors. Peer-mediated models have the greatest support at the preschool-age level but have limited testing in the school-age population with ASD (McConnell, 2002). A third model centers on assigning a child a one-on-one aide or shadow teacher to the child with ASD. This model has been very popular with parents who often want the additional adult support to help their child navigate social situations at school. Although rarely tested,

this model demonstrates substantial drawbacks as voiced by adolescents who experienced a shadow teacher model (Humphrey & Lewis, 2008). These adolescents recall feeling "marked" by the presence of the aide and a general feeling that the aide did not help them with their social relationships. Another study noted that adults assigned to assist children with ASD were often unsure of what to do on playgrounds, frequently blocking interactions between the children and their peers, resulting in more isolation from peers (Anderson et al., 2004). These data are consistent with a recent study in which children who had a one-on-one aide were less engaged on the playground with peers or with the aide than children without an aide (Kasari, Locke, Gulsrud, & Rotheram-Fuller, 2011).

A recent randomized controlled trial conducted at school compared peer- versus adult-mediated interventions for improving peer social networks of children with ASD (Kasari, Rotheram-Fuller, Locke & Gulsrud, 2012). This study applied interventions with some evidence from single-case designs with preschool-aged children with ASD. One model used adult tutoring of the three top problems identified for individual children and utilized self-management strategies with the child (Koegel, Koegel, Hurley, & Frea, 1992). The other model utilized typical peers from the child's classroom to help children interact with their peers on the playground (McConnell, 2002). The peer-mediated intervention was superior in improving the social networks of the children, but these effects had limited impact on peer interactions on the playground. Even children with ASD who had reciprocal friendships and viewed as more popular in their class as reported by peers on the social network measure were not more engaged on the playground than children without friends or who had low social status within the class (Kasari et al., 2012).

Two aspects of the aforementioned study likely limited the changes that could happen on the playground. One is that the interventions only indirectly addressed the playground context. Children were given the interventions at school but away from the playground. Changes may have been greater if the intervention had been delivered directly in the context in which changes were expected. Second, the school staff was not taught the interventions in this study. The study was a partial effectiveness study in which the research staff delivered the interventions. One interpretation of the findings is that while children may have improved their social skills in the one-on-one research context, they may not have been able to generalize their newly learned skills to the unstructured playground environment. Thus, training of the adults on the playground would seem a likely target for future interventions.

The current study aimed to determine if teaching adults how to model interactions and to engage children with ASD on the playground would improve peer interactions during recess and lunch breaks of children with ASD. A unique aspect of this study was the focus on fully included children with ASD, and the implementation of a brief intervention aimed at nonspecialist paraprofessional aides. The study was undertaken as a pragmatic randomized controlled trial (RCT) intervention within the constraints of public school practices (e.g., Howlin, Gordon, Pasco, Wade & Charman, 2007). These constraints included school requests of including all adults on the playground (involving one-on-one aides, classroom aides, part-time playground aides), and adhering to school policies by refraining from the use of external reinforcements (stickers, tokens, points). A randomized controlled, wait-list design was implemented across four schools between 2010 and 2012. The intervention was randomized at the school level because the adults on the playground oversaw all children on the playground, and it would be impossible to randomize by child and keep the intervention separate between individual children on the same yard. We hypothesized that only with direct intervention would adults improve strategies for helping children with ASD socialize on the playground, resulting in improved peer interactions of the children.

Methods

STUDY PROCEDURES

Four elementary schools with fully included children with ASD were recruited to participate in the social skills intervention. All children meeting inclusion criteria were invited to participate in the study, yielding 24 children with ASD who consented and enrolled in the study. Schools were then pair matched into two cohorts. The first cohort received treatment in the first year, and the second cohort in the second year. The paired schools were randomized to immediate or delayed treatment within each cohort. All pretreatment, midtreatment, posttreatment, and follow-up observations were conducted by observers blind to treatment assignment. Randomization was conducted by an independent data-coordinating center.

PARTICIPANTS

Study participants were recruited from four public schools. All participants were identified as having ASD on their official Individualized Education Plans (IEPs) as filed with the school district. Of the 31 initial children recruited, 7 children did not meet diagnostic criteria for the study because they did not have a diagnosis of ASD or were not included in

the general education setting for 80 percent or more of their school day, resulting in 24 participants (see Figure 1). The 24 participants with ASD (8 female) ranged in ages from 6 to 11 (mean age of 8.3; $SD = 1.3$) in grades 1 through 5. All participants were fully included in the general education curriculum; 20 had received a diagnosis of ASD by psychologists or psychiatrists using (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) criteria according to school record review. Four children had no formal diagnosis of ASD and were assessed with the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000) by research reliable psychologists. These 4 children meet criteria for ASD.

Adult participants included all adults who directly supervised the participating children and their peers during lunch and recess. Across the two cohorts there were 35 adults (3 male) who were observed interacting with children during lunch and recess. Five of these adults were aides assigned by the school district to support specific children (one-on-one aides). Of the 30 adults not assigned to support a specific child, 22 of them were additionally assigned to support general instruction in a classroom. The

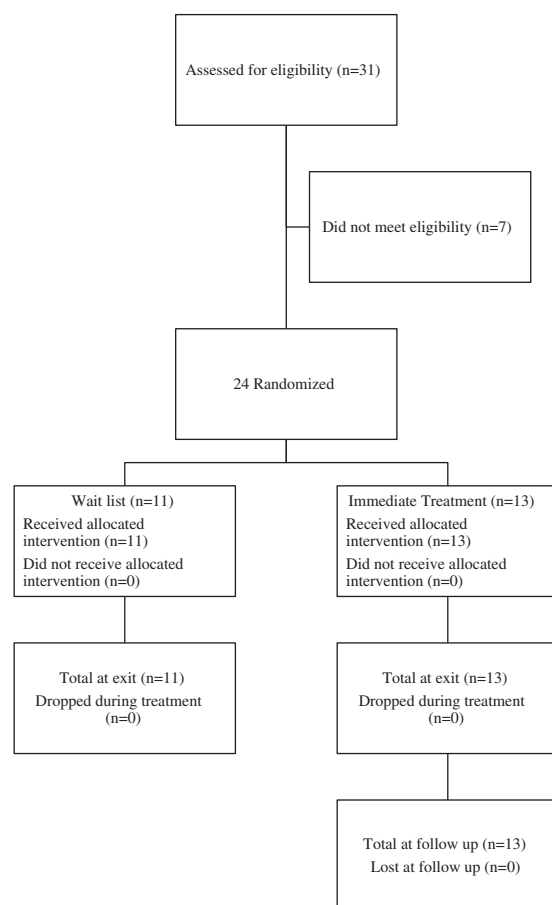


FIGURE 1 Study flow, CONSORT chart.

remaining 8 adults were employed part-time to monitor the playground.

RANDOMIZATION AND DATA COLLECTION

The four participating schools were initially pair-matched according to school demographics as closely as possible (i.e., ethnic diversity, geographic location, percentage of free and reduced lunch). For each pair of matched schools, one school was randomly assigned to receive the treatment immediately (IT group) and the other to the wait-list condition (WL group). A statistician independent of the study team conducted randomization. Randomization resulted in 13 children with ASD at schools receiving immediate intervention, and 11 children with ASD receiving the wait-list condition (see Table 1). Tests for differences in age, gender, and grade were nonsignificant for children between treatment conditions: child gender, $\chi^2(1, N = 24) = 1.399, p = .237$; child age, $t(22) = 0.29, p = 0.786$; child grade, $t(22) = 0.39, p = 0.702$. Tests between paraprofessional demographics in the IT and WL groups showed no significant differences in age, $t(33) = .848, p = .40$, and gender, $\chi^2(1, N = 35) = .19, p = 0.664$. The primary outcome variables of child peer engagement and paraprofessional responsive and strategic behaviors were also compared between IT and WL at entry, revealing no significant differences: peer engagement, $t(22) = 0.15, p = 0.884$; responsive behaviors, $t(33) = 0.08, p = 0.938$; and strategic behaviors, $t(33) = -0.47, p = 0.641$.

Entry, midpoint and exit observations of recess were completed within a 10-week period during the spring semester of the school year for both schools each year. Spring semester was chosen to allow

children and paraprofessionals adequate time to get to know one another and to control for time of year data collection. Follow-up data were collected on the IT group only given the end-of-the-year scheduling.

INTERVENTION

The intervention consisted of information sharing, active coaching on the playground, and systematic support fading. Paraprofessionals were trained with an hour-long group presentation on the social challenges of children with autism at school and overview of the Remaking Recess intervention and then provided daily active coaching on the playground for 2 weeks (range of 8 to 10 sessions). The researcher provided consultation for 6 to 8 more sessions over the next 6 weeks (target of 16 sessions overall), and completely faded consultation and coaching for the last 2 weeks. Consultation and coaching included the following components (see Table 2): (a) researcher helped assistants in identifying children who were unengaged on the playground or who were having difficulty interacting with peers; (b) researcher modeled strategies to help children engage with each other, e.g., teaching strategies for starting games and activities on the playground that were age-appropriate for the population; and (c) researcher helped assistants in knowing when to facilitate and when to fade support to help children begin and maintain interactions with each other.

After data collection for the entry time point, paraprofessional aides on the playground were coached in the treatment model by the researcher who followed the manualized intervention. The main researcher, working with a research assistant, was present during recess to coach 4 to 5 days per week for the beginning 2 weeks; thereafter, the

Table 1
School and Participant Demographics

School (Initial Treatment or Wait-list)	1 (IT)	2 (WL)	3 (IT)	4 (WL)
Student Population	709	655	290	497
Ethnicity of Student Population	.75 White .08 Hispanic .03 Asian .04 Black	.70 White .09 Asian .08 Hispanic .01 Black	.51 White .26 Hispanic .11 Black .09 Asian	.50 White .20 Hispanic .14 Black .10 Asian
Receiving Free or Reduced Lunch	0	0	.25	.25
Gender of Participants with ASD	5 M, 1 F	2 M, 1 F	6 M, 1 F	5 M, 3 F
Grade Range of Participants (mean grade)	1-5 (2.6)	K-5 (2)	1-5 (2.8)	K-5 (2.9)
Ethnicity of Child Participants	5 White 1 Hispanic	3 White	6 White 1 Hispanic	5 White 2 Hispanic 1 Black
Gender of Participating Adults	1 M, 10 F	0 M, 5 F	2 M, 8 F	1 M, 8 F
Age Range of Adults (mean)	24-52 (37.2)	33-61 (44.4)	25-48 (36.2)	21-58 (36.5)
Ethnicity of Adults	8 White 2 Hispanic 1 Other	5 White	6 White 3 Hispanic 1 Other	6 White 2 Hispanic 1 Black

main researcher's presence reduced to 6 to 8 sessions distributed over the next 6 weeks. Support was completely faded during the last 2 weeks for a target total of 16 sessions per school. Coaching sessions included modeling how to set up the playground environment with activities to engage groups of children (i.e., a list of potential games appropriate to school and age group were provided). For example, if children in one age group had to stay in certain areas of the playground, then the paraprofessional was supported in finding activities that would fit that area of the yard (e.g., basketball, or games without props, such as "What Time Is It, Mr. Wolf?"). The researchers supported the paraprofessionals through modeling specific strategies for how to engage a child who was unengaged, how to motivate children to play games with each other, and how to facilitate positive, nonaggressive interactions. See Table 2 for the scope, sequence, and pacing of intervention sessions.

Fidelity checklists on treatment components were assessed on each paraprofessional twice within 1 week at baseline to determine current use of any of the strategies in the intervention, at midtreatment after active coaching on the intervention, at end of treatment (during consultation and fade out phase), and at follow-up time points. Researchers blind to treatment assignment rated paraprofessional fidelity and were present on the playground when the interventionist was not present to maintain the blind.

MEASURES

Testers, independent of intervention and blind to study hypotheses, administered all measures.

Playground Observation of Peer Engagement (POPE; Kasari, Rotheram-Fuller, & Locke, 2005)

The POPE is a behaviorally based timed interval behavior coding system that measures peer engagement in natural environments. Observers code at least 10 minutes of recess time by observing for 40 seconds and coding behaviors for 20 seconds for each minute of observation. Variables coded include different states of peer engagement from engagement in games and conversations, parallel play, observing others, and solitary play. The main variable derived from the POPE for this study was the duration of peer engagement (amount of time actively engaged in games, conversations, interactions with peers). Coders were trained to reliability criteria of .80 or greater on playground observations. To maintain coding consistency, two raters randomly and independently coded 20% of all sessions over the course of intervention. Using Cohen's kappa, interrater reliability for engagement variable was .92 (range .80 to .97).

Paraprofessional Intervention Fidelity

Specific intervention behaviors were coded on a checklist of presence/absence. Staff behaviors were observed for 10-minute observation periods on two separate days for both the IT and WL groups at the

Table 2
Remaking Recess Intervention Session Sequence, Pacing, and Scope

Session	Week	Session Content
1	1	A one-hour staff meeting was held where paraprofessionals who are regularly on the playground during recess were given a brief overview of the importance of peer engagement to social development. ^a
2	1	The researcher spent approximately 10 minutes with each adult on the playground observing target children, discussing their current states of engagement with peers, and potential strategies to improve peer engagement.
3	1	The researcher modeled priming children for engagement during transitions to recess.
4	1	Paraprofessionals practiced priming children for engagement during transitions to recess with support from the researchers.
5	2	The researcher modeled facilitating peer conversations for target children.
6	2	With researcher support, paraprofessionals practiced facilitating peer conversations for target children.
7	2	The researcher and paraprofessionals worked together to identify school appropriate games and activities that could be added to recess to meet common developmental needs of target children and their peers to increase engagement.
8	2	The researcher modeled starting and maintaining the game in such a way as to maximize balanced, nonstigmatizing engagement between target children and their peers.
9	3	Paraprofessionals practiced selecting and starting engaging games with support from the researcher.
10	3	The researcher and paraprofessionals identified behavioral strategies for addressing problematic behavior of target children or peers.
11	3	The researcher and paraprofessionals discussed the importance of teamwork and communication amongst playground staff to maximize results of their intervention efforts.
12-16	4-10	Remaining sessions were flexible in content and were used to further support paraprofessionals as they added intervention strategies into their workflow.

^a All sessions were delivered at regular recess except for session one.

following time points: entry, midpoint, exit, and follow-up. All paraprofessionals were observed for an equal number of times: twice at each time point for a total of eight observations of each paraprofessional over the course of the study. Coders began their coding for paraprofessional fidelity if the observed paraprofessional was supervising participant children during normal recess times. Fidelity ratings were recorded for the entire 10-minute period and if recess ended before the 10-minute interval was complete the observation was rescheduled for the next possible opportunity. The fidelity checklist for paraprofessional responsive behaviors included the following items: noticing/observing a poorly engaged child, initiating to a poorly engaged child, following a child's lead, expanding on a child's actions, using contingent language with a child, displaying complementary affect to a child. The fidelity checklist for paraprofessional strategic behaviors included the following items: circulating the playground (change areas at least three times during observation), scanning the playground/actively looking around the area, facilitating play/introducing children to game or playmate, supporting engagement and/or play/managing conflict, fading out of self-sustaining child-to-child social interactions, employing peers to engage isolated/underengaged peers. The total proportions of responsive and strategic behaviors were used in this study. Coders were trained to greater than .80 agreement on the paraprofessional fidelity measurement prior to beginning the study. To insure consistency over the course of the study, two raters randomly and independently coded 20% of all sessions. Using Cohen's kappa, interrater reliability for intervention fidelity was .90 (range .81 to .95).

STATISTICAL ANALYSES

The primary analyses evaluating the effect of the treatment included the measurements from the baseline, midpoint, and end of the treatment for both treatment groups (IT vs. WL) and included the main effects of treatment and time, Treatment \times Time interactions, and subject level random intercepts. Treatment effect was defined as a significant interaction effect between the treatment groups and time during the treatment phase (start of treatment to end of treatment). The secondary analysis evaluating maintenance effect only included a time parameter to evaluate whether there was significant improvement for the IT group only from baseline to the 10 weeks follow-up.

Both the primary and secondary analyses utilized linear mixed models SAS MIXED procedure. Furthermore, we normalized the POPE engagement variable by using a "logit" transformation since the

variable was measured as a proportion. Although both the responsive strategies and the strategic behaviors were also proportions, we left the measures in their original units rather than using a "logit" transformation since the transformed measures deviate further from normality. Separate models were fit for each longitudinal outcome.

Linear mixed models were used to model the longitudinal trajectories of the outcome (peer engagement, responsive strategies, and strategic behaviors). Time was modeled linearly such that the rate of improvement (estimated slope) during the treatment phase (start of treatment to end of treatment) was constant. Mixed models account for correlations between repeated measures within subjects, easily allow for both fixed and time-varying covariates and automatically handle missing data, producing unbiased estimates as long as observations are missing at random. Hence, all available observations from each subject were utilized in modeling. In the current study, there are no missing data. All measures were completed for all participants at each time point.

Nesting effects were taken into consideration while modeling. However, models that incorporated the nesting effect did not produce different results as compared to the models that did not include the nesting effect. Hence, the final results presented are based on the simpler models. Finally, we report effect sizes using Cohen's *d* for the exit measurement in the results section where effect sizes of 0.20, 0.5, and 0.80 are generally regarded as small, moderate, and large, respectively (Cohen, 1988).

Results

TREATMENT EFFECTS ON PEER ENGAGEMENT

There was a significant Treatment \times Time effect with children in the IT group rated as more engaged on the playground than children in the WL groups from entry to end of treatment, $F(1, 108) = 10.68$, $p = 0.002$. The difference in peer engagement by the end of treatment more than doubled for the IT group and corresponded to a strong treatment effect of 1.27. In a separate analysis, the effect of treatment for the IT group was maintained at the follow-up, $F(1, 35) = 6.76$, $p = 0.014$. See Figure 2.

PARAPROFESSIONAL FIDELITY

Because 5 of the paraprofessionals were one-on-one aides assigned to a single child, and the other 30 were assigned to the general population of children, we tested differences in behaviors. The rate of improvements during the treatment phase were not statistically significant across groups for responsive, $F(1, 229) = 0.5$, $p = 0.48$, or strategic behaviors, $F(1, 229) = 1.97$, $p = 0.16$. Thus, we collapsed across aide role in subsequent analyses.

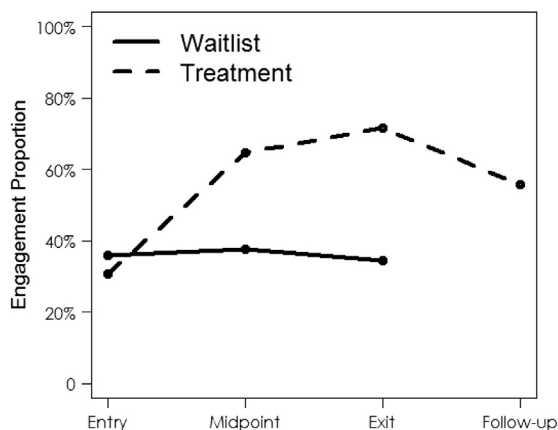


FIGURE 2 Peer engagement at entry, midtreatment, and exit for IT and WL groups, and follow-up over 10 weeks for the IT group.

Overall responsive strategy use scores were significantly improved over time for paraprofessionals in the IT group compared to the WL group, $F(1, 173) = 14.88, p < 0.001$, with a strong treatment effect of 1.05. The treatment effect was not maintained as the IT group did not maintain significant gains at follow-up compared to entry, $F(1, 139) = 1.86, p = 0.1743$. See Figure 3.

Similarly, the specific strategy use scores were significantly improved over time for paraprofessionals in the IT group compared to the WL group, $F(1, 173) = 6.04, p = 0.01$, with a moderate treatment effect 0.65. The intervention strategies did not maintain during the follow-up, $F(1, 139) = 1.38, p = 0.24$. See Figure 4.

Discussion

Improving peer relationships at school is a top priority for children with ASD as well as their families. This study demonstrates that improvements in peer engagement for children with ASD

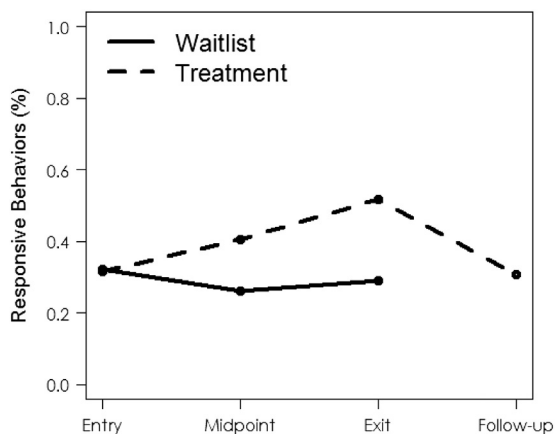


FIGURE 3 Paraprofessional scores on responsive behaviors collected by blinded observers at entry, midtreatment, and exit for IT and WL groups, and follow-up over 10 weeks for the IT group.

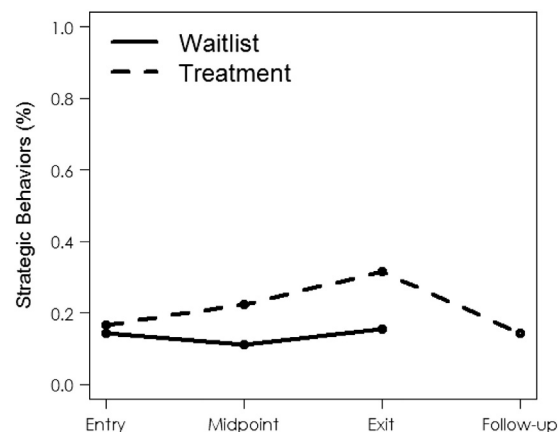


FIGURE 4 Paraprofessional scores on strategic behaviors collected by blinded observers at entry, midtreatment, and exit for IT and WL groups, and follow-up over 10 weeks for IT group.

can be made with a brief dose of intervention that is delivered through adult paraprofessionals on the playground, most of whom were nonspecialist playground staff members. These changes in children were noted with significant but clinically small to moderate observed changes in the paraprofessionals by blinded coders using structured observations. The findings raise several issues for school-based interventions aimed at improving social skills for children with ASD.

First, as our primary outcome, children demonstrated greater peer engagement in the IT groups compared to the wait-listed groups who did not change without intervention. These data are significant for two reasons. One is that joint engagement is considered a core developmental issue for children with ASD. Several studies have noted that children with ASD are often isolated and unengaged on playgrounds; they may rarely engage with their age mates and often report few friends (Anderson et al., 2004; Bauminger & Kasari, 2000). These reports are persistent, noted across ages and ability levels (Howlin, Goode, Hutton & Rutter, 2004; Orsmond, Krauss, & Seltzer, 2004).

Another reason is that while several studies have provided children with social skill improvement through didactically delivered social skills interventions, these interventions rarely generalize to the child's natural environment (Bellini et al., 2007; Frankel et al., 2011). Indeed, in a previous study contrasting adult- versus peer-mediated interventions, the peer intervention resulted in less solitary play but did not increase peer engagement (Kasari et al., 2011; Kasari et al., 2012). Thus, delivering an intervention directly in the context in which you expect changes may be necessary in order to improve engagement. To date there have been few if any group studies directed at the playground aide

during recess for children with ASD in real-world environments.

Second, the adults on the playground improved in general responsiveness to the children with ASD and in their specific strategy use at treatment end. These data are encouraging given the briefness of the intervention, and the number of demands on the paraprofessionals' time during recess in which the children with ASD were a small minority in the general population of children. Despite these positive changes, the paraprofessionals did not maintain their level of responsiveness and strategy use over the follow-up period. There could be many reasons for the lack of sustainability of the intervention. It is possible the paraprofessionals needed ongoing support for longer periods of time to completely uptake the intervention. Or they may have been less inclined to maintain the intervention once they had little contact with the researchers. Indeed, fidelity to the model by the researchers who developed the intervention and delivered it in the schools was not measured separately; thus, we cannot be sure of the extent to which they delivered the entire dose of the treatment to all of the paraprofessionals. Finally, the paraprofessionals may not have completely bought into the intervention in general, or they received too little reinforcement when they did engage in the intervention. These issues regarding paraprofessionals' motivation should be investigated further.

Another possibility, however, is that the paraprofessionals decreased many of their responsive and strategic behaviors because they had faded out of intervening and did not need to intervene further. It may have taken little effort to get children with ASD engaged with their peers (as simple as starting a game, or having materials available).

This study has a number of limitations that should be addressed in future studies. One concerns the small sample size. To study a larger sample of children with ASD who are fully included in general education, multisite studies may be needed. Larger sample sizes, and including more adults with varying levels of investment for children with ASD (one-on-one aides versus general school aides), would help to address moderators of treatment outcomes. Additionally, other measures would be useful in determining the extent to which children with ASD are viewed by their peers as socially engaged. Social network measures are useful in this regard but notoriously difficult to administer in school settings (Kasari & Smith, 2013).

Conclusions

This study of a novel school-wide intervention applied to the playground yielded encouraging

improvements in peer engagement of children with ASD. Paraprofessional aides significantly improved their responsiveness and strategies for engaging children. While treatment effects on peer engagement remained significant at follow-up, paraprofessional behaviors did not maintain. These findings have implications for aide training and potential needs for ongoing support. These data are important to consider as more children are entering inclusive settings and peer relationships remain a top priority for children with ASD and their families.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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