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**Effectiveness of Peer-Implemented Intervention on the Social
Engagement of Children with Autism**

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of Children with Autism**

by

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Abstract

Effectiveness of Peer-Implemented Intervention on the Social Engagement of Children with Autism

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Deficits in social skills are considered as one of the fundamental characteristics of individuals with ASD. These skill deficits may hinder the benefits of play activities with peers for children with ASD. Children's social and emotional developments occur with interacting with others and practicing social skills. Recess and planned-play activities, therefore, are invaluable times when a great deal of opportunities are offered all children to interact with each other and practice essential social skills. However, because of the social and communication skill deficits, children with ASD usually do not take the advantage of recess and planned play as much as their typically developing peers. Peer-implemented interventions are among the evidence-based practices and commonly used to address social skill deficits of children with ASD. This study evaluated the effects of peer-implemented play strategies on engagement of two children with autism with peers during planned play and recess. The results of the study demonstrated that both participants increased their engagement with peers during planned play after

implementation of the intervention. However, generalization of treatment outcomes did not occur across settings.

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Chapter 1: Introduction

Interventions addressing deficits in social interactions, academics and communication are frequently used as part of the educational curriculum with individuals with autism spectrum disorders (ASD). Peer-mediated interventions (PMI) are procedures which involve training peers (e.g., classmates) to implement behavioral interventions to promote social interactions (e.g. Chung et al., 2007; Mason et al., 2014; Schmidt & Stichter, 2012; McFadden, Kamps, & Heitzman-Powell, 2014; Radley, Dart, Furlow, & Ness, 2015). When implementing peer-mediated interventions, peers can take use a wide variety of procedures including modeling appropriate behavior, prompting procedures, and reinforcement of target behaviors. The National Professional Development Center on Autism Spectrum Disorders (<http://autismpdc.fpg.unc.edu/>) and the National Standards Project (<http://www.nationalautismcenter.org>) both have recognized PMI as an evidence-based practice. Despite the evidence suggesting that PMI is an effective intervention approach, PMI is not commonly practiced in school settings (McFadden et al., 2014).

Using readily available intervention agents (i.e., classmates) in schools might be an advantageous and feasible strategy to increase the number of individuals with ASD who have access to effective special education services while decreasing the load on teachers and professionals (Bass & Mulick, 2007; DiSalvio & Oswald, 2002). Within restricted classrooms in which the majority of educational programming is conducted, and where access to typically developing peers may be limited, peer-mediated interventions may still be applied by providing individualized training for peers, peers

who implement the procedures, and peers who are the target participants of the intervention, (Lorah, Gilroy, & Hineline, 2014).

Direct interaction between students with ASD and their typically developing peers is the primary component of peer-mediated intervention. Light (1988) described four primary social purposes that are served during including (a) “the expression of needs and wants”, (b) “information transfer”, (3) “social closeness”, and (4) “social etiquette” (as cited in McFadden et al., 2014; p. 1699). A positive inclusion environment in school settings may also be promoted by providing more opportunities for direct interactions with various social partners. As a result, students with ASD can acquire new skills and have access to different environments through their relationships with typically developing peers (Carr & Darcy, 1990; Chan et al., 2009; Stokes, Doud, Rouwburry, & Baer, 1978).

Despite potential advantages of peer-mediated interventions, there may be risks associated with the approach. For example, Chang et al. (2009) described four concerns related to implementation of peer-mediated interventions. First, an unintentional emphasis may be placed on the social deficits of the student with ASD which might result in an increase in labeling and social exclusion. Second, there may be a risk that peers might neglect or miss educational opportunities due to their role in the implementation of interventions. Third, interventions might not be implemented with as high a level of fidelity by peers as that of professionals. Last, PMI may require changes in classroom routine; thus, ecological validity of the intervention should be considered attentively.

Despite concerns, the effectiveness of PMI in improving social skills in individuals with ASD has been demonstrated in the behavioral literature (e.g., Watkins et al., 2014). For example, Banda, Hart, and Liu-Gitz (2010) evaluated the effects of PMI with students with ASD and typically developing peers on social skills (i.e., initiations and responding) in general education classrooms. The investigators trained all participants to ask peer-directed questions and to respond to questions asked by their peers during academic-related center time activities. Following the implementation of direct instruction and peer training, instant and considerable increases in peer-to-peer initiations and responses were observed with both participants (Banda et al., 2010).

In another study, Harper, Symon and Frea (2008) investigated the effectiveness of peer-implemented naturalistic strategies (i.e., pivotal response training techniques) to improve social skills of children with ASD. The study included two students with ASD and six typically developing third grade peers who were trained to use pivotal response techniques (i.e., gaining attention, varying activities, narrating play, reinforcing attempts, and turn-taking) during recess time. Following the implementation of the naturalistic intervention by peers, both participants showed improvement in social skills (i.e., gaining attention, initiations and turn-taking) during recess time. Furthermore, the results also demonstrated that the observed improvements were maintained at elevated levels after the intervention was removed (Harper, et al., 2008).

Kris, Goldstein, Shafer and Kaczmarek (1997) examined the effects of pairing children with disabilities with typically developing peers. They conducted the study with 10 children with disability and 5 typically developing children with age ranging from 43

months to 60 months. They trained the typically developing children on sensitivity about target children's potential attention-getting or requesting behaviors and on "buddy" strategies which are stay with your friend, play with your friend and talk with your friend. Trained peers were informed about "buddy days" and were verbally praised contingent upon the use of stay-play-talk strategies and received stickers if they reach their goals. Trained peers were reminded about buddy steps with a 1-min review session on the morning of next buddy assignment. They also implemented a dyadic training procedure consisting two to four training session. Training of target children were slightly different than the peers, they were only trained in two buddy steps: stay and play. They found that social-communicative interactions were increased as a result of the implementation of buddy strategies. All participants increased their use of communicative acts (i.e., general behaviors, praise and prompts) compared to baseline. The results of the study showed that rotating peers as buddies did not have positive impact on relationship development. Kris et al. (2007) demonstrated that peer-mediated intervention was effective in increasing the rates of interactions among preschoolers with and without disabilities and use of dyadic training generated more responsive and reciprocal communication.

Social skill deficits of children with ASD can adversely impact the play behaviors of children with the diagnosis. Further, social interaction problems of children with ASD and other developmental disabilities become more obvious during unstructured or free-play times (Guralnick & Hammond, 1999). Compared to typically developing children, children with disabilities spend relatively short amounts of time in engagement in activities with other children (McWilliam & Bailey, 1995). Social participation was first

examined by Parten (1932) who investigate the social participation under the categories of unoccupied, solitary play, onlooker, parallel group activity, associative group play and cooperative group play. Parten asserted that engagement in group occurs when the target child has purposeful visual or verbal interactions with one or more peers in the setting. Parten described parallel play as occurring when the target child prefers to engage in imitating other children in close proximity without having any interaction with them. Parten described solitary play as occurring when the target child is engaging in neither group or parallel play. Parten also described two forms of task activity: occupied and unoccupied. Parten described occupied as the active engagement of a child in the environment (e.g., playing with objects, steady social interaction or participating in gross motor activities). Parten described unoccupied as other behaviors that differ from occupied behaviors (e.g., watching peers, wandering around, repetitive behaviors).

McWilliam and Bailey (1995) described engaged time as “the time children spend interacting with the environment in a developmentally and contextually appropriate manner” (p. 123). It has also been suggested that internal (e.g., motivation level) and external factors (e.g., presence of adults, physical setting) might have an impact on children’s engagement as well as the presence of disabilities and their impact on cognitive or/and physical impairment to children. Even though there are times when inactive engagement is considered appropriate for all children, the allotment of the majority of one’s time engaged in looking or watching is not considered developmentally appropriate (Kruif & McWilliam, 1999).

The effects of social engagement states have also been evaluated within the literature. For example, Spinrad et al. (2004) examined the link between children's nonsocial behaviors and their emotionality, regulation, and social adjustment. They suggested that children with high internalizing emotions, such as high level of anxiety, are likely to be interested in solitary play and nonsocial behaviors such as onlooker or unoccupied behaviors. Long-term exposure to solitary play might prevent the children, who are unregulated and demonstrate high level of anxiety, from learning social and play skills that promotes peer acceptance. These children might experience peer exclusion during play times. Spinrad et al. (2004) found that solitary play co-occurred with high levels of nonsocial behaviors and peer rejection along with anxiety and regulation problems in the future.

Coplan and Armer (2007) suggested that there might be various reasons contributing a child's preference for alone play and emphasized that social fear, anxiety, social disinterest, and social avoidance might all negatively affect the social interactions of children with ASD and other developmental disabilities with typically developing peers. These forms of social avoidance might also lead to future depression and social adjustment problems (Coplan & Armer, 2007).

Several studies have also focused on patterns of transitions between social engagement states. Parten (1932) suggested that chronological age was the only logical way to explain shifts between states. Specifically, younger children generally engaged in parallel play, possibly because of level of maturity. However, engagement in task activity might not represent the level of child's social maturity (Smith, 1978).

Guralnick and Hammond (1999) investigated the transitions between the play states and found that the transition between states was dynamic and sequential. Children with and without disabilities showed similar transition patterns during free play. They found that parallel play was a sign for a transition to either solitary or group play similar to Bakeman and Brownlee (1980). Guralnick and Hammond (1999) pointed out that deliberate use of parallel play suggested that the availability of materials during unstructured play times might foster joining a peer group and retaining play with peers.

Peer interaction is a crucial component of social engagement. McWilliam and Bailey (1995) conducted a study to evaluate the effects of adult involvement, developmental age, disability status, and age grouping in the engagement of children with disabilities. They included forty-eight children; sixteen children were with moderate disability. The results of the study showed that children showed greater attention to adult and spent less time in interacting with peers regardless of disability and therefore, there is a correlation between lack of adult involvement and high level of peer engagement. In addition, children's attentional engagement in mixed-age grouping was slightly higher than same-age grouping. Children spent less time in watching and listening to peers in mixed-age groups. Moreover, McWilliam and Bailey (1995) reported that chronological age impacts the child's engagement and interactions with peers, and that the negative influence caused by disability on engagement is alleviated by developmental gain.

Similarly, Coolahan, Fantuzzo, Mendez and McDermott (2000) also examined the effects of age and gender in play behaviors. They found that high levels of peer interaction were observed during play among older children whereas the level of peer

interaction was lower and high level of disconnected play behaviors and peer withdrawal was observed among younger children. Boys exhibited more frequent disruptive and disconnected play behaviors compared to girls (Coolahan et al., 2000).

Coolahan and her colleagues (2000) also investigated the relationship between peer-interactions and learning behaviors and problem behaviors in classroom. The conducted a research with 556 preschool children who enrolled in Head Start program. They found that children who interacted with peers during play were highly motivated to learn and actively participated learning activities whereas children who did not frequently interact with peers showed low level of motivation, attention and participation. In addition, children with disconnected play behaviors such as hovering around demonstrated high rates of classroom conduct problems and hyperactivity, and educators reported these children as inattentive and passive (Coolahan et al., 2000).

Various strategies have been used to address the lack of social engagement of students with disabilities. McClannahan and Risley (1975) emphasize the importance of manipulation of environment in increasing participation in recreation activities. They found that the procedure of providing materials and offering activities effective was improved the participation of adults in recreational activities. They also suggested interventions address recreational participation should include initial prompting as a crucial component.

Kruif and McWilliam (1999) evaluated the effects of teacher's interaction styles on children's engagement with sixty-two children, 13 of whom were with special needs, age ranged from zero to five. They found that the way how teacher interact with students

may promote higher level engagement behaviors (i.e., goal directed problem solving attempt, acting out a scenario, or substituting objects).

Kim et al. (2003) reviewed the 13 studies evaluating the impacts of toys and group composition in social behaviors of 3- to 5-year-old children. They found that social toys such as blocks or balls enhanced social behaviors of children more than isolate toys such as books or puzzles and also found that inclusion of children without disabilities in a playgroup led to improvement of social behaviors for children with disabilities. Kim et al. (2003) suggested that availability of social toys, playing opportunities with typically developing children with lower ratio might be beneficial to augment social behaviors of children with disabilities. However, they also pointed out to the need for other social interventions since environmental manipulations alone might be insufficient to improve social behaviors of children with disabilities.

Koegel and her colleagues (2012) emphasized that lack of social behaviors might be caused by performance deficits rather than skill deficits. Therefore, they focused on environmental manipulations instead of teaching social skill interventions. They examined how creating activities (i.e., social clubs) based on the preferences of children with autism effect social engagement of children with autism. They conducted a study with three three-year-old kids diagnosed with ASD. They created social clubs based on the preference assessment results. The results of study showed instant improvement in spontaneous verbal initiations and social engagement of the children with ASD without training focal children in use of social skills.

While there are strong evidences of positive effects of environmental manipulations on social engagement of children with disabilities, environmental manipulations alone might be insufficient to improve social behaviors of children with disabilities (Kim et al., 2003). Therefore, we hypothesize that training peers to apply social skill strategies might be sufficient to increase social engagement of children with autism. The purpose of our study is to extend Kris et al. (1997) by creating a peer-buddy group for each target student instead of one-on-one buddy system. By doing so, we expected to provide more interaction opportunities to the target students, to take the advantage of available peers when other peers are absent, and to help generalization of treatment outcomes. An additional purpose of creating peer-buddy groups was to provide available play partners to trained peers when target students were not responding. In one-on-one peer buddy system, trained peer only has one playing partner. If a target child does not respond to the peer or insists on solitary play, there is a little possibility that the trained peer will have a good time during planned play or recess. The peer might even not want to be a buddy with the target child or might develop challenging behaviors or negative feelings toward the target child. We wanted to peers to enjoy their playtime while they provide more opportunities to the target child to socially engage.

Chapter 2: Methods

Participants and Setting

This study included eight participants (two target participants and six peers) ranging in age from 4-to-6. They were all enrolled in a private pre-school in Central Texas. Target participants, Andrew and Bradley, were referred for the study by their teachers due to high levels of solitary play during planned play and recess on the playground.

Andrew was a 6-year-old boy who had been diagnosed with autism. He was diagnosed at the age of four and had been enrolled in the preschool for two years and has been receiving 1-on-1 speech therapy. He is required a shadow person to function in preschool. He was able to verbally express his wants but his verbal repertoire was limited to requests.

Bradley was a 6-year-old boy diagnosed with high-functioning autism. He operated independently throughout the school day and performed academically above his chronological age. He was referred to the study because of limited engagement and refusing to respond to peers during play. He attended social skills groups outside of the school on weekends.

Six peers, three boys and three girls, were all typically developing children ranging in age from 4-to-5 years old. They were included in the study as implementer agents and were selected because of their highly developed play and social skills

repertoires; frequent attempts to initiate play with the target peers; and their ability comprehend the contingency of researcher as reported by their teacher.

All planned play sessions were conducted in a 16 x 41 classroom at the preschool they attended. During planned play, 2-to-4 teachers and total of 20 children, only three of them were diagnosed with disabilities including two target kids, were present in the classroom. The students were divided in to three play centers and centers were assigned to specific portion of the room. Students were rotated in 5-to-7-min intervals. They were provided with at least 20 different toys that can generally be found such as wooden blocks, legos, imaginext, dolls, toy animals, cars, and characters. However, they were only allowed to play with the toys available for a specific center.

All generalization sessions were conducted at Pre-K's playground in which participants and other students in the school had access to lots of activities such as climbing and sliding, running, and playing on the sand box.

Response Definitions

The percentage of engagement with peers and non-engagement with peers for target children were recorded. Percentage of initiation was recorded for all participants. Engagement with peers for both participants were defined as remaining in proximity (i.e., 5 feet) with peers and engaging in one of the following social activities with at least one peer: talking, playing a game, creating something together, discussing the activity, or listening to a peer while making sustained eye contact.

Non-engagement for target children was defined as playing apart from at a distance of at least 3 feet or with one's back to other children, wandering aimlessly (e.g.,

walking on rocks without a purpose) or staring off into space, watching other children but does not play with and talk to them, playing with similar materials but does not play with them (parallel play).

Initiation for target children was defined as verbally initiating a conversation to a peer from trained peer group. Initiation for peer group was defined as verbally initiating a conversation to the target child. Peer groups initiations were recorded as a one entity (e.g., one of the peers verbally initiated a conversation by calling the target child's name or asking question).

All planned play sessions were video recorded by using a Kindle®. Data were collected from video recordings of these sessions by using 10 s partial interval recording system; and data were converted to percentage by dividing the intervals with engagement by total intervals, and then multiplied by 100. The target children were observed during generalization sessions. All generalization data were collected by trained observers by using 10 s partial interval recording sheets.

Interobserver Agreement

Three trained observers, who were teachers at the school and one of them was a Board Certified Behavior Analyst (BCBA), scored at least 20% of all sessions for both target children. Agreement data for engagement with peers were calculated by dividing the number of intervals with agreement (i.e., two observers recording the occurrence of a response in a given 10-s interval) by the number of agreements plus disagreements, multiplied by 100. Agreement data for initiation were calculated by dividing the number of intervals with agreement (i.e., two observers recording the occurrence of a response in

a given 10-s interval) by the number of agreements plus disagreements, multiplied by 100. The inter-observer agreement scores for engagement with peers were as follows: for Andrew the mean was 91.33% (range, 86.66% to 100%); for Bradley the mean was 90.66 (range, 80% to 100%). The inter-observer agreement scores for initiation were as follows: for Andrew's peer-group the mean was 98% (range, 93.33% to 100%); for Bradley's peer-group the mean was 95.33 (range, 90% to 100%).

Experimental Design

A non-concurrent multiple baseline design across participants was used to evaluate the effectiveness of peer implemented intervention on the engagement of students with autism during planned play and recess.

Procedures

Prior to the baseline sessions, participants are assigned into two peer-buddy groups; one group for Andrew and one group for Bradley. Peers were selected based on teacher's recommendation and each group included a target student and three typically developing peers. The students were not informed about the peer-buddy groups prior to the intervention sessions.

Baseline

During the baseline, the classroom teacher divided all students in the class into groups and assigned them to play in a specific center during planned play. Target students were intentionally placed into a group with selected peers. After all students were assigned to a play center, a timer was set for five minutes. The students switched their centers after 5 min. During baseline, participants did not receive any training and no

prompting procedures were implemented. The students were able to move freely in the classroom but they were only allowed to play with the toys in the assigned center.

Peer Training

Following baseline, peers in the buddy-group were provided with training sessions that lasted approximately 30 min. Total of two training sessions, one training session for Andrew's group and one training session for Bradley's group, were conducted by researcher and the classroom teacher in a secluded room in the preschool. Peers were trained by using direct instruction, modeling, and role-play techniques. Peers were trained in the three buddy strategies, which were similar to "STAY-PLAY-TALK strategies described by Kris et al. (1997). Peers were taught to stay together with their buddy, who was Andrew for Andrew's group; and who was Bradley for Bradley's group. They were taught acceptable physical proximity when playing with their buddy and why they should maintain physical proximity to their buddy. They were also taught to play together with their buddy by either showing interest in a toy with which their buddy was playing, or getting his attention by showing the toys they are playing with. Last, peers were taught to talk while they play with their peers. They were provided with hypothetical scenarios in which they called their buddy's name, asked for help, offered help, suggested playing together, or narrated what they were doing with the toys. Each peer was asked comprehension questions about the three buddy strategies and prompted when needed. Training sessions ended when peers were able to answer the comprehension questions independently and explain all three buddy strategies independently in two consecutive sessions.

Buddy-Group Time

Following the completion of peer training, peer-implemented intervention sessions (5 min in length) were conducted. The teacher said, “it is buddy time, now” just before initiating planned play, asked all three buddy strategies and reminded them if needed. Buddy-groups (i.e., one target student and three trained peer) were assigned to one of the play center in the class. They were allowed to move freely in the classroom but they were asked to only play with toys in the assigned center. If students left their assigned center, they were verbally or physically prompted to go back to their assigned center. Peers were verbally praised for using buddy strategies, and were verbally prompted for following condition: no interaction with the target student more than a minute and failure to re-gain physical proximity when the target students left the play center.

Generalization Sessions

In order to monitor the generalization effects of treatment outcomes across settings, target students were observed during recess and sessions were five minutes long. Trained peers neither were prompted to use peer buddy strategies nor praised for interacting with target students. All students were allowed to move freely on the playground and had access to variety of ground level activities such as sliding and playing on the sand box.

Chapter 3: Results

Figure 1 shows the results for engagement with peers for both participants.

Initiations

Baseline data of Andrew's verbal initiations (top panel of Figure 1) towards assigned peers recorded over three planned-play sessions remained mostly at zero levels. The mean percentage of verbal initiations for Andrew was 1.11% with a range of 0% to 3.33%. Baseline data recorded over three sessions during recess showed that Andrew's percentage of verbal initiations towards assigned peers was stable and remained at 0% during recess. Following the implementation of the intervention, Andrew's percentage of verbal initiations changed slightly. The mean verbal initiations was 0.51 % (range 0-3.33%) for planned play sessions, and 0% for recess sessions.

Baseline data of Andrew's peer-buddy group's verbal initiations towards Andrew recorded over three sessions during planned play were very low. The mean percentage of verbal initiations for Andrew's buddy group was 3.33 % with a range of 0% to 10%. Following the implementation of the intervention, Andrew's buddy-group's percentage of verbal initiations increased. The mean percentage of verbal initiations was 28.46% with a range of 0% to 66.67% for planned play sessions.

Baseline data of Bradley's verbal initiations towards assigned peers recorded over ten planned-play sessions remained at zero level (M=0%). Baseline data recorded over three sessions during recess showed that Bradley's percentage of verbal initiations towards assigned peers was stable and remained at 0% during recess. Following the implementation of the intervention, Bradley's percentage of verbal initiations positively

changed and slightly increased. The mean verbal initiations were 4.07% (range 0-16.67%) for planned play sessions, and yet still remained at 0% for recess sessions.

Baseline data of Bradley's peer-buddy group's verbal initiations towards Bradley recorded over ten sessions during planned play remained at zero (M= 0%). Following the implementation of the intervention, Bradley's buddy-group's percentage of verbal initiations increased. The mean percentage of verbal initiations was 29.63% with a range of 6.67% to 43.33% for planned play sessions.

Engagement with Peers

Baseline data of Andrew's engagement with assigned peers recorded over three sessions during planned play indicated low level of engagement. The mean percentage of engagement with assigned peers for Andrew was 2.22% with a range of 0% to 6.67%.

Baseline data recorded over three sessions during recess showed that Andrew's percentage of engagement with assigned peers was not consistent. The mean percentage of engagement with assigned peers for Andrew was 5.55% with a range of 0% to 16.67%. Following the implementation of the intervention, the mean percentage of Andrew's engagement increased. The mean engagement with peers was 24.1% with a range of 0% to 96.67% for planned play sessions. The mean engagement with peers remained at zero level (M=0%) for playground sessions.

Baseline data of Bradley's engagement with assigned peers was recorded over ten sessions during planned play. The mean percentage of engagement with assigned peers for Bradley was 14.81% with a range of 0% to 60%. Baseline data recorded over three sessions during recess showed that the mean percentage of Bradley's engagement

with assigned peers was 30% with a range of 6.67% to 66.67%. Following the implementation of the intervention, Bradley's percentage of engagement with peers increased. The mean engagement with peers was 66% with a range of 36.67% to 93.33% for planned play sessions. Bradley's percentage of engagement with assigned peers was not consistent compared to the planned-play sessions on the baseline. The mean engagement with peers was 3.33 % with a range of 0% to 6.67% for playground sessions.

Chapter 4: Discussion

This study evaluated the effectiveness of peer-implemented treatment on the social engagement of children with autism with their peers. Present study differed from the previous studies by training multiple peers as main implementer of buddy strategies and grouping them with a target child with social skill deficits. By doing so, we expected to provide more opportunities for interactions with different people and we also expected the increase probability of generalization of treatment effects across people and across settings. The baseline results supported the idea that grouping the children with autism with their typically developing peers was not adequate to improve the social interactions of children with autism (Knapczyk, 1989). Even though the results of the study for both participants were not positive in the generalization setting, the results still add to previous findings showing that peer-implemented interventions can promote social interaction between children with ASD and their typically developing peers (e.g., Harper, et al., 2008; Chung et al., 2007).

The results of the study showed that Andrew exhibited little to no level of engagement with peers during the baseline. His engagement with peers was increased following the implementation of the treatment. Compared to Andrew, Bradley exhibited a little higher level of engagement with peers during baseline. This might be attributed to his expanded verbal repertoire and broad range of interest in play materials. Bradley, also, showed an improvement in his engagement with peers after implementation of treatment. However, the results also indicated that generalization of treatment outcomes across settings did not occur for either participants. Even though we did not record any

data about trained peers' social behaviors during recess, we observed that they also did not generalize the buddy training strategies across settings. This might be attributed to availability of more interested and attentive playmates during recess, since target students did not reinforce trained peers' attempts at a satisfactory level.

We found that inclusion of multiple peers in trained group was advantageous. It provided the basis for lots of attention and interaction attempts from different sources for target children. Moreover, trained peers also benefited from the structure of buddy group. In the cases when the target child was not attentive or disinterested in the activity that peers were engaged, the structure of the buddy-group ensured that there were still available partners for the peers to interact with. Therefore, this feature still promotes social and communication development of peers, and may minimize detrimental effects of treatment for long-term period. In addition, buddy-groups may reflect the nature of play times better than one-on-one match and allows more opportunities to build rapport among students; therefore, it may prevent the occurrences of negative labeling or stigmatizing in inclusive settings. Even though we did not see generalization of treatment outcomes across settings, we believe that switching target children into different buddy groups might stimulate the generalization of treatment outcomes across people.

There are several limitations within this study. First, it was sometimes impossible to hear the peer's initiations during the sessions due to the high-level of noise in the classroom and incapability of the recording device to record from a distance when peers were speaking at a low pitch. Therefore, data coded from video recording might, at times, not represent actual initiations of trained peers. Second, a prompting strategy was used

after the first three treatment sessions with Andrew because of the low level of treatment fidelity. Although trained peers had mastered all buddy strategies, they failed to implement these strategies during planned play sessions. This may be due to either the structure of training session or lack of reinforcement from target students. Intense training sessions with the use of different training exemplars might increase verbal initiations of peers as suggested by Jahr et al. (2000). This might eliminate the need for prompting procedure.

Moreover, there was no control of the play centers and materials during planned play sessions. Centers and materials are randomly assigned. We did not conduct a preference assessment prior to the study; however, students, still, may have special interest to specific toys; therefore, this might have contributed to higher level of solitary play or engagement with peers. In addition, the natural structure of play materials may require cooperative play skills and promote engagement with peers. For example, we observed high level of non-engagement with peers for Andrew while he was playing with dinosaurs, which was reported his favorite toys by his teachers. We also observed high level of engagement with peers for Andrew while was completing the alphabet puzzle with his friends on the floor. Everybody in his group was taking part at completion of the alphabet and he was actively seeking for the next letter, and waiting his turn. Future research should conduct a preference assessment and investigate the effects of play materials on engagement of children with autism with peers.

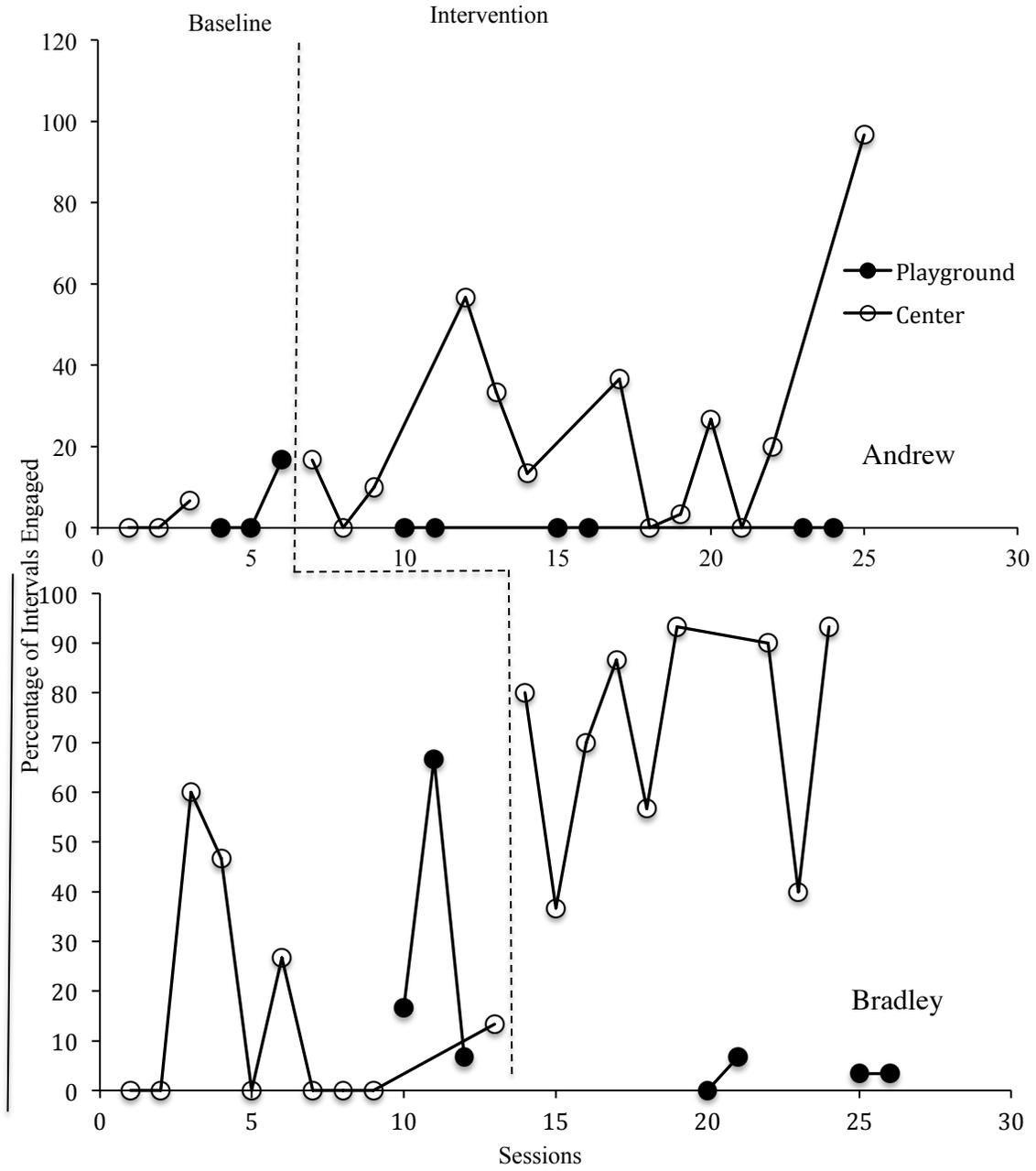
Another limitation of the study was the fact that this study focused the percentage of engagement of children with autism with peers and therefore used a partial time

interval recording system. Measuring the duration of engagement of children with autism with peers might lead to more concrete results. Additionally, there is a possibility that trained peers might generalize training strategies across people. Nonetheless, we did not group trained peers with another potential target student. It may become appealing to practitioners in inclusion settings if trained peers can implement the same strategies without requiring further training. Future researchers should investigate the generalization of buddy strategies across people to evaluate utility and feasibility of the peer-implemented interventions.

Future research should also examine the probable factors that prevent both target children and trained peers to transfer play and communication skills that were taught during the study across settings and they should also search for strategies to promote and establish generalization of treatment outcomes. In our study, all trained peers were selected among typically developing children. It should be further investigated that whether children with disabilities can also act as implementers of the buddy strategies. Our observations during the study raised another question that may extend the literature and require further investigation. We observed that peers were sometimes not highly motivated to use buddy strategies since target children were less likely to respond their initiation attempts and to show interest in the activities that peers were engaged. It might be interesting to assess social validity of this treatment for future studies. Another potential future research idea is combining self-management system or token economy with peer-implemented strategies in order to assess the effects of this combined treatment strategy on trained peers social, communication and play behaviors.

In summary, providing more opportunities for children with autism to interact with their peers is crucial to improve their social skills. The results of the present study demonstrated that improvements in engagement with peers were possible for children with autism through peer-implemented play strategies.

Figure 1: Peer-Implemented Intervention Results Across Participants



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