Effects of a Peer-Mediated Intervention on Social Interactions of Students with Low-Functioning Autism and Perceptions of Typical Peers

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Abstract: Students with autism display challenges acquiring friendships and participating in relationships with typical peers. Social interaction is further impacted in students with low-functioning autism, necessitating consideration of their unique characteristics when designing and implementing interventions. This single-subject study examined the effects of a peer-mediated intervention on initiations and responses of four K-2 students with low-functioning autism and their second-grade peers. Students were taught a shared reading intervention using visual support, role-play, discussion, and peer reinforcement. Three participants with low-functioning autism increased mean responses to peer initiations from baseline to intervention stages. Further, second-grade students held positive perceptions of peers with autism and considered them as friends. The unexpected response pattern of one participant with low-functioning autism warrants further investigation into individual variation and peer group characteristics.

Autism is defined as a spectrum disorder characterized by deficits in social communication and social interaction (DSM-V, 2013). Consequently, students with autism often incur significant challenges with acquiring friendships and participating in ongoing relationships with typical peers (Owen-DeSchryver, Carr, Cale, & Blakeley-Smith, 2008). Even when physically included with general education peers, students with autism may be socially excluded because of limited social skills and peculiar mannerisms. Many of these students display very narrow interests, struggle with understanding the social nuances of peer interactions, misinterpret what is being said, and fail to engage in the give and take of conversation, all of which limit their acceptance by typical peers (DiSalvo & Oswald, 2002).

Inclusion

Including students with autism with typical students is important to supporting their overall social development. Research indicates that learners with autism in inclusive settings benefit from increased opportunities to engage with appropriate peer models and demonstrate improved adaptive behavior (Boyd, Conroy, Asmus, & McKenney, 2011; Lyons, Cappadocia, & Weiss, 2011). However, inclusion by itself may not necessarily lead to social competence. Conflicting research suggests the physical presence of typical peers is not enough to promote appropriate peer interactions for students with autism (Bass & Mulick, 2007; DiSalvo & Oswald, 2002). These learners may not attend to peers and engage appropriately without specific strategies in place. Students with autism in inclusive settings who participate in interventions incorporating modeling and reinforcement have shown more improvement in social skills than similar students with no specific intervention in place (Harper, Symon, & Frea, 2008; Kamps et al., 2002). Thus, providing students with autism with appropriate interventions is important to improving outcomes and reducing social isolation.
Social Profiles of Students with Low-Functioning Autism

To date there has been little research on the social profiles of students with low-functioning autism (LFA; IQ < 80), though social skills of these students are thought to be less well-developed than students with high-functioning autism (HFA; IQ ≥ 80) and indicative of more social deficits even after intensive intervention (Ben-Itzchak & Zachor, 2007; Walton & Ingersoll, 2013). Most students with autism are challenged by social interaction, however the social profiles of students with LFA can be quite different than those with HFA. Compared to students with HFA, students with LFA typically display more stereotypical and self-injurious behavior, are more resistant to change, show less emotional expression and generally show fewer improvements in social skills over time (Mayes & Calhoun, 2011; McGovern & Sigman, 2005). Additionally, social opportunities for students with LFA are often impeded by their limited communication skills even when verbal language is present. Students with LFA have been shown to engage in fewer communicative acts for interaction or joint attention and more for behavior regulation than students with HFA (Maljaars, Noens, Jansen, Scholte, & Van-Beckelaer-Onnes, 2011). Consequently, students with LFA may need social interventions that are less complex, target initiations and responses, and reinforce appropriate behaviors.

Peer-mediated Interventions

Peer-mediated interventions are promising interventions that teach typical peers how to interact with students with autism; the peers become the intervention agents, modeling and reinforcing appropriate social behavior for the students with autism (Odom & Strain, 1984). Peer-mediated interventions are grounded in the framework of Vygotsky's sociocultural theory (Vygotsky, 1978), where learning takes place through the social interactions of the student with autism and the more capable, typical peer who scaffolds and reinforces the development of appropriate social skills. Such interventions have been used successfully to increase social interactions between students with autism and typical peers across a variety of settings (Morrison, Kamps, Garcia, & Parker, 2001; Odom & Strain, 1986). Many peer-mediated interventions rely on specially chosen typical peers, however students with autism need opportunities to interact with a variety of individuals. Laushey and Heflin (2000) successfully used a class-wide approach and included all members of a class, but few other studies have included a wide range of peers.

Most peer-mediated interventions have been conducted during relatively unstructured activities such as lunch and recess with few studies examining interventions within academic activities in the classroom. Yet at least one study including an academic component resulted in greater social skill outcomes than free-play interventions (Kamps et al., 2002). The structure of the academic activity may have supported increased opportunities for social interaction between the individuals with autism and the typical peers. Further investigation into peer-mediated interventions incorporating an academic activity is warranted.

Shared Reading

Shared reading interventions have been used to support the development of reading and social skills in typical students by encouraging social interactions around a story. Research suggests that these activities provide typical students with an opportunity to improve reading skills, such as fluency, vocabulary, and comprehension while also supporting the development of social skills, such as turn-taking and interacting with peers (Brown, 2006; Flint, 2010; Lowery, Sabis-Burns, & Anderson-Brown, 2008). As students engage in the give and take of shared reading they exchange ideas and experiences related to the story. These shared reading activities support the development of reciprocal relationships between the buddies that extend beyond the classroom reading setting (Lowery et al., 2008). Expanding shared reading activities to include participants with autism can provide needed structure for social interactions and increased opportunities for friendship development.
Findings from several studies indicate that typical students enjoy activities with their peers with autism (Carter, Hughes, Copeland, & Breen, 2001; Jones, 2007). Typical students indicate they feel good about helping their peers and they develop an appreciation of diversity to which they previously had little exposure. However, few of these studies have examined the quality of the relationship between the typical peer and the student with autism, especially in interventions aimed at students with LFA (Owen-Deschryver et al., 2008; Rogers, 2000). Examining the peer relationship is important to understanding the success of the intervention overall and to understanding how peer-mediated interventions may improve long-term outcomes of students with autism.

The purpose of this study was to examine the effects of a class-wide peer-mediated shared reading intervention on the social interactions of K-2 students with LFA and their second-grade typical peers. The perspective of the typical peers and the quality of the relationship between the peers and the students with LFA were examined for social validity and evidence of emerging friendship. The study addressed the following research questions:

1. What is the effect of a class-wide peer-mediated social skills intervention on the social interactions, as measured by initiations and responses, of students with low-functioning autism and typically-developing peers?
2. What are the perceptions of typically-developing second-graders toward their peers with low-functioning autism, and the quality of the relationship?

Method

Participants and Setting

The study took place at a mid-size public elementary school in a suburban area of Northern California. The school serves over 600 students from preschool to fifth grade, including students with LFA and students with moderate to severe disabilities in several self-contained special education classes.

The participants included a class of 24 second-graders and a special education class of eight K-2 students with LFA. The students with LFA ranged in age from five to eight years old, qualified for special education services for autism per the California education code definition, and were identified as a student with LFA (IQ < 80) using the Childhood Autism Rating Scale, second edition (Schopler, Van Bourgondien, Wellman, & Love, 2010), and a measure of intellectual functioning administered by a licensed school psychologist. (See Table 1 for further descriptions of participants with LFA).

The second-grade students ranged in age from seven to eight-years old, and included 14 boys and 10 girls comprised of White (71%), Asian (25%), and Hispanic (4%) ethnicities. One second-grade student was a student with a learning disability, and one second-grade student was an English language learner.

All students in both classes participated in the study. Students were randomly placed in eight shared reading groups and stayed with this group for the duration of the study. Each group had one student with LFA and three second-grade typical peers. Four of the shared reading groups were selected for data collection purposes based on parental consent.

Materials

An abundance of books were available in the special education classroom for use during the shared reading intervention. The books were common to early literacy classroom libraries and included popular titles such as Brown Bear, Brown Bear (Martin, 1967), and The Very Hungry Caterpillar (Carle, 1994), as well as alphabet books, counting books, and farm theme books. Books were placed in plastic boxes and arranged on the tables to allow easy access for the students. Teachers made sure there were books available for a variety of student interest and reading levels.

Independent Variable

The independent variable was a peer-mediated shared reading intervention designed to enhance social interactions among the students with LFA and their typical peers. The Reading Buddies intervention had a peer-reading component and a peer-reinforcement component. Centering the intervention on shared reading was important because it in-
corporated an activity that all of the students with LFA enjoyed, encouraged social interaction related to the story, and was an academic activity in which most children would regularly participate. Additionally, incorporating the semi-structured activity of shared reading allowed the typical second-graders to scaffold initiations and responses of their peers with LFA, in a way that would likely not be present in an unstructured free play activity.

For the peer-reading component, two teachers (one general education and one special education) and the researcher instructed students to follow three rules during the intervention phase of the study: Stay with your buddy, Read with your buddy, and Talk with your buddy. The teachers and the researcher modeled the steps of the intervention, engaged students in discussion (e.g. “What does it mean to stay with your buddy?” and “How might we talk with our buddy about the book?”), and called upon students to role-play the steps of the intervention (e.g. “Who can show me what it looks like to read with their buddy?”) A chart displayed the steps of the intervention to increase comprehension for all students (see Figure 1). Teachers instructed students to take turns reading their

### TABLE 1

**Descriptions of Participants with LFA**

<table>
<thead>
<tr>
<th>Student</th>
<th>Language Skills</th>
<th>Reading Skills</th>
<th>Interaction Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caleb</td>
<td>1-3 word phrases</td>
<td>Reads 10 sight words</td>
<td>Did not initiate with peers</td>
</tr>
<tr>
<td>Male</td>
<td>Did not initiate social conversations</td>
<td>Named pictures</td>
<td>Rarely acknowledged peers</td>
</tr>
<tr>
<td>Cauc 2nd Gr</td>
<td></td>
<td>Enjoyed books</td>
<td>Avoided peers on playground</td>
</tr>
<tr>
<td>Jack</td>
<td>1-3 word phrases</td>
<td>Reads 20 sight words</td>
<td>Did not initiate with peers</td>
</tr>
<tr>
<td>Male</td>
<td>iPad for backup communication</td>
<td>Named pictures</td>
<td>Did not acknowledge peers</td>
</tr>
<tr>
<td>Cauc 2nd Gr</td>
<td></td>
<td>Enjoyed books</td>
<td>Often walked over peers</td>
</tr>
<tr>
<td>Mary</td>
<td>iPad for communication</td>
<td>Reads 20 sight words</td>
<td>Occasionally grabbed peers on playground</td>
</tr>
<tr>
<td>Female</td>
<td>Did not initiate social conversations</td>
<td>Named pictures</td>
<td>Did not initiate with peers</td>
</tr>
<tr>
<td>Cauc 2nd Gr</td>
<td></td>
<td>Enjoyed books</td>
<td>Did not acknowledge peers</td>
</tr>
<tr>
<td>Thomas</td>
<td>1-3 word phrases</td>
<td>Reads alphabet</td>
<td>Avoided peers on playground</td>
</tr>
<tr>
<td>Male</td>
<td>Did not initiate social conversations</td>
<td>Named pictures</td>
<td>Frequently agitated in peer activities</td>
</tr>
<tr>
<td>Asian 2nd Gr</td>
<td></td>
<td>Enjoyed books</td>
<td>Did not initiate with peers</td>
</tr>
<tr>
<td>K</td>
<td>Did not initiate social conversation</td>
<td></td>
<td>Did not acknowledge peers</td>
</tr>
</tbody>
</table>

For the peer-reading component, two teachers (one general education and one special education) and the researcher instructed students to follow three rules during the intervention phase of the study: Stay with your buddy, Read with your buddy, and Talk with your buddy. The teachers and the researcher modeled the steps of the intervention, engaged students in discussion (e.g. “What does it mean to stay with your buddy?” and “How might we talk with our buddy about the book?”), and called upon students to role-play the steps of the intervention (e.g. “Who can show me what it looks like to read with their buddy?”) A chart displayed the steps of the intervention to increase comprehension for all students (see Figure 1). Teachers instructed students to take turns reading their
books but it was left up to each group to determine who would go first, second, etc. When teachers concluded their discussion, all students chose a book from any of the available books and sat together with their groups. The peer reading lasted 15 minutes with students taking turns reading their books every few minutes. Most books were completed in about 5 minutes.

For the peer-reinforcement component, the students rewarded each other for appropriate behavior. As part of their classroom program the students with LFA used an individualized token economy in which they earned “happy faces” throughout the day for appropriate behavior, and then exchanged the happy faces for rewards (e.g. small edible, hug, high five). During the Reading Buddies intervention, the second-grade students reinforced the students with LFA using these same happy face cards. The teachers and researcher instructed the second-grade students in how to use the cards and elicited several examples from the students of what a good buddy might do to earn a “happy face.” Students were not told specifically when to give the happy faces, but rather they decided on their own when their peer was being a “good buddy”. Most groups settled into a routine of giving the happy face at the end of each book (i.e. every three to five minutes), which seemed to be a naturally occurring break for the participants.

Each group was given a marker to make the happy faces and the student with LFA carried his/her own “happy face” card. Once the card was full (i.e. three happy faces) the student with LFA exchanged it for his/her reinforcement, which usually occurred at the end of the session. In return, the students with LFA reinforced their reading buddies by giving them praise, hugs, high-fives, or a sticker at the end of the session (with verbal prompting if needed).

**Dependent Variable**

The dependent variable in the study was the students’ with LFA and the typical peers’ initiations and responses towards each other. Initiations and responses were chosen as a means to examine social interaction between participants and is widely supported in the literature (Owen-DeSchyrver et al., 2008). **Initiations** were defined as any appropriate motor or vocal behavior demonstrated by the students to gain attention or a response from another student, including verbalizing to another student, looking at another student’s face, touching the other student (e.g., tapping shoulder, touching hand), presenting the book to another student, and pointing to a picture in the book while looking at the student. **Responses** were defined as any appropriate motor or vocal behavior demonstrated by the students that was preceded by an initiation and occurred within 10 seconds of the initiation including looking at the other student’s face, verbalizing to the other student, smiling at the other student, touching the other student, and giving a motor response such as nodding head or touching a picture in the book.

**Data Collection**

During the 15-minute shared reading intervention, initiations and responses were measured simultaneously on all target groups every session, using trained data collectors. Observation and recording took place for two minutes, followed by a 30-second break in which no recording took place, and repeated until 10 minutes of data had been recorded for each group. At the end of the 10 minutes of observation, the number of initiations and responses were totaled for each participant.

**Design**

A reversal design (ABAB; Horner et al., 2005) was used to assess the effect of the Reading Buddies intervention on the initiations and responses of the participants with LFA and their typical peers. The ABAB or reversal design requires the active manipulation of the independent variable by the researcher who introduces the intervention after a period of stable baseline data. The researcher then reverses and goes back to the baseline phase and finally re-introduces the intervention phase. A functional relationship is demonstrated in the reversal design when the dependent variable co-varies (e.g. changes level or trend) in relation to the independent variable. For example, behavior decreases when a behavior-reduction intervention is introduced and
increases when the intervention is withdrawn. Researchers use visual analysis of the data graph to examine levels of the dependent variable across phases and/or to examine trends in the dependent variable across phases (e.g., is data trending down with a behavior reduction intervention and trending up during baseline phases).

The reversal design was chosen for this study because it was suitable for the classwide implementation of the intervention while also assessing individual participants. There were a total of 20 sessions across 10 weeks (average two sessions per week), alternating two weeks of baseline, three weeks of intervention, two weeks of baseline, and three weeks of intervention. Constraints of the public school schedule and the need to minimize disruption resulted in less than five data points in some phases.

**Intervention Procedures**

**Pre-intervention procedures.** Prior to the intervention, the researcher, who is a certified special education teacher, conducted a 20-minute overview about students with autism to the second-grade class. The purpose was to provide general information about students with autism and give the students an opportunity to ask questions since their prior indirect exposure to students with autism was limited to the playground, the outside lunch area, and school assemblies. She conducted a read aloud of *Since We’re Friends: An Autism Picture Book* (Shally & Harrington, 2007), and facilitated a discussion about how students could have a friend with autism and how friends can be alike and different.

**Baseline one procedures.** (Four sessions). To introduce the two classes to each other at the first baseline session, the teachers and researcher again facilitated a short discussion about how everyone was both alike and different. Then the students were told who was in their reading buddy group, and instructed to find their buddies, choose a book and go to their assigned place (e.g., small table, floor, desk area) to read. Students were not given any directions about how to interact with each other. Classroom teachers and staff intervened only if students needed to be redirected for inappropriate behavior. Groups read with each other for 15 minutes.

**Baseline two and intervention two procedures.** For baseline phase two, the procedures during baseline phase one were replicated. The visual support was removed and there was no use of modeling, discussion, or role-play at the start of the session. Likewise the reinforcement system was withdrawn. The happy face cards were not used with participants with LFA and stickers were not provided for second-grade students. When students entered the classroom, they were simply instructed to find their buddy and read.

Moreover, the procedures during intervention phase two were replicated exactly as during intervention phase one. The visual support was present again and the teachers and researcher used modeling, discussion, and role-play to engage students at the beginning of each session. Reinforcement was also reinstated with second-grade students reinforcing students with LFA using the happy face cards, and the students with LFA reinforcing the second-grade students with stickers.

**Measures**

**Observational recording.** The initiations and responses of the participants with LFA and their typical peers were recorded on an observational data form. The form was a basic grid
with participant names across the top of the grid and underneath each name were two boxes, one for initiations and the other for responses. The left side column was labeled with the instruction to record data for two minutes. A gray horizontal bar ran underneath this entire set and was labeled with the words “30 second break.” This sequence was repeated four more times such that there were five sections altogether on the page, representing a total of 10 minutes of data collection and a total of two minutes of no recording. A total of 12 minutes were used to record the data. Data recorders allowed time for students to choose a book and settle into their area, approximately one to two minutes, before beginning data collection.

The observers used a tally mark placed in the appropriate box to indicate that an initiation or response had occurred and by whom. The data recorder totaled the initiations and responses separately for each participant at the bottom of the data sheet.

A total of six data collectors were trained and used in the study. Each of the four buddy groups had one assigned data collector and 10 minutes of data were collected on all four groups every session. Two additional data recorders rotated across the groups to observe and record data simultaneously with the assigned recorder, such that each group had 25% of sessions double-scored for reliability. The 30-second break after each two-minute session of data collection was put in place to provide data collectors with a brief respite from intense observation and recording of data.

Interobserver agreement and treatment integrity. All six data collectors were trained prior to beginning the study; one assigned to each group and two rotating for reliability data. Data collectors included the researcher (reliability) and five paraprofessionals (four assigned to groups and one rotating for reliability) employed with the district as behavioral support staff that regularly collected observational data as part of their job duties. Training was conducted with the data sheet using role-play among the adults and in-vivo practice with students with LFA in similar activities until 90% agreement was reached on all data collectors.

Interobserver reliability was achieved using two observers to record the initiations and responses of each buddy group. Interobserver agreement (IOA) was conducted on 25% of each group’s sessions. The percentage of interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and then multiplying by 100. IOA for participants were Caleb 90%, Jack 80%, Mary 81%, and Thomas 91%.

Treatment integrity was assessed by using a simple checklist to make sure materials were in place (visual chart, books, markers, reinforcement cards) and that the steps of the intervention (stay with your buddy, read with your buddy, talk with your buddy) were reviewed and discussed each session of intervention. There were ten items on the checklist and treatment integrity was calculated each session as a percentage of items completed. As each item on the checklist was essential to the intervention, overall treatment integrity for the study was 100%.

Social validity measures. Social validity was assessed using open-ended interviews with eight randomly selected typical second-grade students with parental consent. The interview was comprised of questions related to the intervention and the relationship with the students with LFA. Examples of questions included:

(a) Do you think your buddy likes having you read to him/her in Reading Buddies? How can you tell?

(b) Do you and your buddy ever help each other out? (c) Do you think you and your buddy are friends? How do you know?

Data Analysis

Single-subject data analysis was used to compare the students’ initiations and responses across baseline and intervention phases, including visual inspection of the data for non-overlapping data points and a comparison of means across conditions (Horner et al., 2005). Interview data were analyzed using thematic analysis across questions. Interviews were coded as themes emerged by grouping similar comments together then further reviewed for categories within themes.

Results

Figures 2 through 5 show initiations and responses of all participants with LFA and typical peer groups throughout the study. Mean initiations and responses of all participants with LFA and typical peer groups are presented in Table 2.
Initiations

Participants with LFA. A visual analysis of the data focusing on the initiations of the participants with LFA reveals variability within and across conditions for all participants. Data did not represent a consistent change in level from baseline to intervention phases. As a result, these data do not support a functional
relationship between the introduction of the intervention and increased initiations for participants with LFA.

Typical peers. Visual analysis of the initiations of the typical peers revealed that the participants did follow the expected pattern for baseline and intervention phases with improved initiations in both intervention phases. Comparison of the means support the visual analysis and indicate improved initiations by

Figure 3. Typical Peer Buddy Group Initiations.
all typical peer groups in intervention phases. Caleb’s peers increased mean initiations from baseline one \( (M = 16.75) \) to intervention one \( (M = 32.00) \), and from baseline two \( (M = 16.50) \) to intervention two \( (M = 35.67) \). Jack’s peers increased mean initiations from baseline one \( (M = 19.25) \) to intervention one \( (M = 39.40) \), and from baseline two \( (M = 18.33) \) to intervention two \( (M = 64.50) \). Mary’s peers increased mean initiations from baseline one \( (M = 15.25) \) to intervention one \( (M = 36.60) \), and from baseline two \( (M = 17.83) \) to intervention two \( (M = 64.50) \).
27.25) to intervention two ($M = 41.17$). Thomas’ peers increased mean initiations from baseline one ($M = 44.33$) to intervention one ($M = 68.00$), and from baseline two ($M = 35.50$) to intervention two ($M = 42.80$).

Responses

Participants with LFA. Visual analysis of the responses of the students with LFA indicated that the participants’ responses to peers in-
TABLE 2
Summary of Means

<table>
<thead>
<tr>
<th></th>
<th>Baseline 1</th>
<th>Intervention 1</th>
<th>Baseline 2</th>
<th>Intervention 2</th>
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<tbody>
<tr>
<td></td>
<td>Initiation</td>
<td>Response</td>
<td>Initiation</td>
<td>Response</td>
</tr>
<tr>
<td>Caleb</td>
<td>M=7.25</td>
<td>M=4.50</td>
<td>M=5.00</td>
<td>M=17.67</td>
</tr>
<tr>
<td></td>
<td>SD=6.24</td>
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<tr>
<td>Peers</td>
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</tr>
<tr>
<td></td>
<td>SD=10.21</td>
<td>SD=3.70</td>
<td>SD=6.84</td>
<td>SD=3.99</td>
</tr>
<tr>
<td>Jack</td>
<td>M=11.75</td>
<td>M=1.50</td>
<td>M=10.60</td>
<td>M=15.60</td>
</tr>
<tr>
<td></td>
<td>SD=4.03</td>
<td>SD=2.38</td>
<td>SD=9.69</td>
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<tr>
<td>Peers</td>
<td>M=19.25</td>
<td>M=14.50</td>
<td>M=39.40</td>
<td>M=10.60</td>
</tr>
<tr>
<td></td>
<td>SD=11.95</td>
<td>SD=9.85</td>
<td>SD=17.60</td>
<td>SD=6.47</td>
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<tr>
<td>Mary</td>
<td>M=1.25</td>
<td>M=6.50</td>
<td>M=5.00</td>
<td>M=31.20</td>
</tr>
<tr>
<td></td>
<td>SD=1.26</td>
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<td>Peers</td>
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</tr>
<tr>
<td></td>
<td>SD=12.01</td>
<td>SD=0.96</td>
<td>SD=10.38</td>
<td>SD=7.40</td>
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<tr>
<td>Thomas</td>
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<td>M=14.00</td>
<td>M=4.83</td>
<td>M=12.50</td>
</tr>
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<td>Peers</td>
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<td>M=68.00</td>
<td>M=5.50</td>
</tr>
<tr>
<td></td>
<td>SD=4.16</td>
<td>SD=10.60</td>
<td>SD=17.29</td>
<td>SD=3.99</td>
</tr>
</tbody>
</table>

Increased for Caleb, Jack, and Mary during intervention phases. Caleb increased mean responses to peer initiations from baseline one (M = 4.50) to intervention one (M = 17.67) and again from baseline two (M = 5.25) to intervention two (M = 15.67). Jack increased mean responses to peer initiations from baseline one (M = 1.50) to intervention one (M = 15.60) and again from baseline two (M = 8.00) to intervention two (M = 24.00). Mary increased mean responses to peer initiations from baseline one (M = 6.50) to intervention one (M = 31.20) and again from baseline two (M = 23.75) to intervention two (M = 37.00). These data support the establishment of a functional relationship between introduction of the intervention and responses of these three students. However the functional relationship is not as strong as preferred because baseline two levels did not return to baseline one levels. Higher baseline two levels may indicate that the intervention was difficult to completely reverse once introduced. The visual analysis of data for the fourth participant with LFA, Thomas, revealed variability across conditions and did not indicate a functional relationship between the introduction of the intervention and Thomas’ response to peers.

**Typical peers.** Visual analysis of data graphs for typical peer responses to initiations made by participants with LFA indicates typical peers were only somewhat effective at responding to participants with LFA. Mary’s peers indicated improved responses to her initiations during the first intervention phase, but baseline two resulted in variability of responses before a general accelerating trend in the second intervention phase. Examining the means to support visual analysis indicates that Mary’s peers increased mean responses from baseline one (M = 0.75) to intervention one (M = 10.20) and from baseline two (M = 9.00) to intervention two (M = 17.33). However, a functional relationship is difficult to establish because baseline two data presented with variability that overlapped both intervention one and intervention two phases. Visual analysis of the remaining three peer groups indicates variability within and across conditions without demonstration of a functional relationship.

**Social Validity**

This study also examined the quality of the relationship between the students with LFA.
and the typical second-grade peers through open-ended interviews with eight of the second-grade students. Interview transcriptions were examined for common elements across participants, which were further grouped together by themes. Three main themes emerged: mutual enjoyment, helping behaviors, and developing friendships.

**Mutual enjoyment.** Typical peers expressed that the group enjoyed reading together and exchanging positive reinforcement. One student expressed, “He always hugs me on the arm and we always give him high fives. We are happy to interact with him.” Other participants stated, “We have lots of fun together,” plus “I like reading to him so he can be happy and he likes being with me,” and “It’s just been fun and I’d like to do it (again) next week.”

**Helping behaviors.** Typical peers described how they helped the student with LFA read and understand the book, and also how sometimes the student with LFA helped the typical students with reading. For example, the students stated, “We don’t hog the book to ourselves. We show them that they need to do what they are supposed to do,” and “He (student with LFA) listens to what I say when I point to something (in the book) or when I ask him a question or I ask him to do something with the book that involves the book.” They also expressed, “(Student with LFA) is actually a pretty good reader because he read the first word to me,” and “When I kind of get stuck on a word he (student with LFA) kind of says the beginning of the word.” In addition, participants indicated they helped each other withcompanionship saying, “We help each other if somebody feels bad, if he (student with LFA) feels bad or if I feel bad,” and “We don’t make him feel lonely.”

**Developing friendships.** Participants described being happy with their buddy and gave examples of how they knew they were friends. One student expressed, “I see him (student with LFA) sometimes at school and I can talk to him and I just like doing that because it just makes me happy.” Another participant indicated, “We are friends because whenever I hold his hand he holds it tighter,” and still another said, “Whenever someone else is reading to him, he (student with LFA) holds my hand, so I think we are good friends.” Another student said, “He’s my friend so if he was playing alone I would say don’t be lonely... do what you like doing with me.” When asked if he and his buddy with LFA were friends, a final student revealed, “Oh yeah definitely - Because we can do what we are best at doing together.”

**Discussion**

This study examined the effects of a classwide peer-mediated shared reading intervention, *Reading Buddies*, on the initiations and responses of students with LFA and their typical peers. The intervention proved more effective at increasing the initiations of the typical students than the initiations of the students with LFA. This is not entirely unexpected in light of the significant deficits in social communication skills displayed by the participants with LFA (Maljaars et al., 2011), and 10 weeks of intervention may not have been enough time to increase initiations toward peers.

A notable finding in the study was that increased initiations by the typical students lead to increased responses from three of the four participants with LFA. With the significant social deficits of the participants with LFA – all four showed little to no acknowledgement of peers prior to beginning the study – improving responses to peers’ initiations is extremely important. Responses require a level of attention to the typical peer when the initiation is made and for students characterized as having seemingly little awareness of the presence of others, increased responses to peer initiations is pivotal. Although the participants with LFA did not increase initiations, three of the four did increase responses to peer initiations, a critical component of reciprocal social interaction.

Improved responses to peer initiations is significant given that the participants with LFA were all served in a separate special education classroom with only limited opportunities for inclusion (e.g., lunch, recess, assemblies). None of the participants with LFA had previously been included with typical peers for academic activities. The *Reading Buddies* intervention provided an opportunity to participate in a shared reading activity and hear stories read by peers – an activity most typically-
developing students engage in on a regular basis in their classrooms.

The academic structure of the intervention may have contributed to the mean increases in initiations and responses between the students with LFA and their typical peers. The intervention did not specifically outline what types of initiations and responses to make, but rather the intervention encouraged participants to talk about the book. Results of the study indicate that the students were interacting during the shared reading activity and were not just initiating for highly preferred items as might occur in free-play settings. Results of the present study are supported by the literature from Kamps et al. (2002), which indicate that interactions may be higher in structured academic settings than non-academic settings, and by the work of Jackson and Campbell (2009) who found that typical peers displayed greater comfort in interacting with peers with autism in academic activities over recreational activities.

Both the peer-reading and peer-reinforcement components contributed to the students’ use of the Reading Buddies intervention. Students were able to refer to the visual chart that outlined the three steps of the reading component, and reinforce each other’s appropriate behaviors with the happy face cards and stickers. As interactions increased during intervention phases, the interactions themselves may have become more reinforcing for both groups of students, thus promoting reciprocity. This design is supported by several studies suggesting that effective peer-mediated interventions incorporate the use of visual cues and evidence-based instructional strategies, such as modeling and reinforcement to enhance student acquisition of skills (McConnell, 2002; Reichow & Volkmar, 2010; Zhang & Wheeler, 2011).

Further, the interview results indicate that typical second-grade students found the experience of being a peer buddy to be enjoyable and wanted their buddy to be happy. The second-grade participants’ discussion of physical affection, i.e. hugs, high fives, holding hands, was somewhat unexpected as students with autism are often characterized as not enjoying physical affection. The strength of the buddy relationship may have supported the display of affectionate interactions not otherwise exhibited by students with LFA.

Another area of interest is found in the second interview theme. While the second graders understood that they helped their buddies with autism through the reading and social interaction, the second-graders also expressed several ways in which the students with LFA helped them. The second-graders clearly indicated that their buddies with LFA were able to help with the reading at times, and were also able to help with a reciprocal emotional response. The second-graders appeared to value the input of their peers with LFA and felt they contributed to the relationship. Finally, every interview participant identified their buddy with LFA as a friend and provided examples of how they knew they were friends, lending support to the use of peer-mediated interventions as an important means of friendship development for students with LFA.

Limitations

Results of this study provide important information on the use of peer-mediated interventions to improve social interactions of students with LFA, though the study does have some limitations. This study is limited by small sample size and by variability in data across conditions. Students with LFA are known to display a range of characteristics and often struggle with consistency even after intensive intervention (Ben-Itzchak & Zachor, 2007). Also, baseline two levels rarely achieved baseline one levels, indicating it may have been difficult for students to “reverse” or “unlearn” the intervention once it was introduced. Finally, several participants had missing data due to illness and generalization probes were not conducted. Though typical students revealed in the interviews that they did interact with their peers with LFA in other areas of the school, constraints of the school schedule did not allow for the collection of generalization probes.

Implications for Future Research

Results of the present study indicate that the classwide peer-mediated shared reading intervention, Reading Buddies, was effective at increasing the social responses of three of the
four students with LFA. Further research is needed to determine to what degree individual characteristics (e.g., age, exposure to peers) influence the participants’ response to peer-mediated interventions. Thomas was the youngest participant and had less cumulative exposure to typical peers than the other participants with LFA. To what degree these characteristics influenced his response to the intervention is unknown. Schreibman and colleagues (e.g., Ingersoll, Schreibman, & Stahmer, 2001; Schreibman, Stahmer, Barlett, & Dufek, 2009) have begun to investigate responder and non-responder profiles and suggest that children with autism who display high peer avoidance might need additional support in inclusive settings.

The Reading Buddies intervention was composed of a peer-reading component and a peer-reinforcement component. Using the reversal design the peer-reinforcement component was withdrawn along with the intervention. Further research should include a component analysis of the intervention examining the shared reading activity with and without the use of reinforcers. Such an analysis may help determine whether the use of reinforcement is a critical component of the intervention.

Implications for Practice

The Reading Buddies intervention presented an effective classwide peer-mediated shared reading intervention to increase social interactions between typical second-grade peers and students with LFA. Multiple peers were trained in a short period of time and all members of the class were mediators of the intervention. Using multiple peers lessens the burden on any one participant to engage the student with LFA and allows for natural variation in social responsiveness from day to day (Harper et al., 2008; Laushey & Heflin, 2000). Training all members of a class also gives more students the opportunity to develop relationships with students with LFA, contributing to improved long-term outcomes for these students. Peer-mediated interventions that integrate visual cues, reinforcement for all participants, and specific structured strategies to promote interactions should be an integral component of classwide intervention programs (McConnell, 2002; Reichow & Volkmar, 2010; Stichter et al., 2007).

Conclusion

The success of the Reading Buddies intervention suggests that peer-mediated shared reading interventions can be used to increase the social interactions of students with LFA and typical peers. Further, interview findings indicate that typical students participating in peer-mediated interventions hold positive perceptions of peers with LFA and consider students with LFA to be friends. Given the significant social deficits of students with LFA and the lack of social skill interventions for this population, the importance of addressing positive friendships for students with LFA cannot be overstated.

References


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