Article

Hammill Institute on Disabilities

Focus on Autism and Other Developmental Disabilities
2014, Vol. 29(4) 206–215

DOI: 10.1177/1088357614522288
focus.sagepub.com
SAGE

The Combined Effects of Social Script Training and Peer Buddies on Generalized Peer Interaction of Children With ASD in Inclusive Classrooms

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Abstract

One of the challenges in supporting young children with Autism Spectrum Disorder (ASD) in inclusive classrooms is the generalization of improved social behaviors. Using a multiple-baseline design across participants, this study examined the generalized effects of social script training alone and combined with peer buddies on the interactive play of three children with ASD to play settings in inclusive classrooms where the training was not in effect. Social script training alone increased the interactive play of children with ASD when the intervention was in place, but did not generalize to another play setting when social script training was not being conducted. The addition of peer buddies combined with social script training produced a generalized increase in peer interaction to play settings in inclusive classrooms when theme-related play materials and adult assistance were unavailable. Implications of these results for inclusion of young children with ASD are discussed.

Keywords

social, skills, autism spectrum disorder, applied behavior analysis

Introduction

One area that frequents needs to be targeted for children with Autism Spectrum Disorder (ASD) is improvement in social functioning, including how to impart skills involved in interacting with peers (American Psychiatric Association, 2000). Compared with their typically developing peers, children with ASD show (a) lower occurrence of peer interaction in natural play settings even when there is an ample number of capable play partners present (Kamps et al., 1992; Koegel, Koegel, Frea, & Fredeen, 2001; Wainscot, Naylor, Sutcliffe, Tantan, & Williams, 2008); (b) more immature forms of play (Anderson, Moore, Godfrey, & Fletcher-Finn, 2004); (c) lack of pretend play (Charman, 1997); and (d) more interaction with adults who are present in the setting (Hundert, Mahoney, Mundy, & Vernon, 1998). Presumably because of these deficits, children with ASD are frequently viewed by their typically developing peers as non-preferred play partners (Ochs, Kremer-Sadlik, Soloman, & Sirota, 2001).

Addressing deficits in the peer interaction of children with ASD may be particularly challenging in inclusive school settings where achieving academic outcomes may be a more prominent focus for educators than improving the peer interaction of students (Odom et al., 2004). In addition, educators may have limited experience and/or time availability to implement systemic strategies that increase the peer interaction of children with ASD in the classroom or in the playground (Harper, Symon, & Frea, 2008).

A number of interventions have been used in school settings to increase the peer interaction of children with ASD with varying degrees of success. These interventions have included social stories (Chan & O'Reilly, 2008; Kuoch & Mirenda, 2003), pivotal response training (Koegel, Kuriakose, Singh, & Koegel, 2012), self-monitoring (Parker & Kamps, 2011), video modeling (Hine & Wolery, 2006; Palechka & MacDonald, 2010), correspondence training (R. S. Morrison, Sainato, BenChaaban, & Endo, 2002), training peers to initiate and maintain interactions (Kamps et al., 1997), and social script training (Goldstein & Cisar, 1992; Wichnick, Vener, Pyrtek, & Poulson, 2010). Because of the practicality of its implementation by school staff, social script training has particular promise as an intervention that can be used in an inclusive setting. Social script

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training consists of constructing a specific play sequence that (a) has theme-related play materials available, (b) involves reciprocal exchanges in play, (c) taps the interests and/or compulsions of the child with ASD, (d) is at the ability level for the child with ASD, and (e) is of interest to potential play mates (Hundert, 2009). For example, Goldstein and Cisar (1992) designed a carnival hoop toss game to be played in a preschool setting with three groups of three children. One child in a triad was diagnosed with ASD. The actions and associated dialogue of this script and two other scripts were modified to fit the ability level of each child with ASD. The results indicated that the child with ASD in a triad learned all three play scripts, increased his theme-related social behavior with peers, and generalized the use of each play script to a new group of children. There was no corresponding increase in the social behaviors of children with ASD that was not related to the particular script in place nor was there examination if the interactive play of children with ASD improved during play sessions when the theme-related play material was not available.

Although interventions to improve the interactive play of children with ASD have tended to increase interactive play when the particular intervention was being used, there has been less positive evidence that obtained improvements in the peer interaction of children with ASD will generalize to different settings when the intervention is not present (Bellini, Peters, Benner, & Hopf, 2007; Gresham, Sugai, & Horner, 2001; Hundert & Houghton, 1992; Hwang & Hughes, 2000). Generalized peer interaction for children with ASD may depend upon interventions that not only increase the amount of interactive play with other children but also arrange for children with ASD to initiate and respond to play exchanges with other children in the absence of adults. For example, Koegel et al. (2012) first taught three kindergarten students with ASD how to interact with peers on the playground during recess. There was little generalization of increased peer interaction to play times when the interventionist was absent until the children with ASD were subsequently directly taught how to initiate play exchanges with peers.

Another intervention to increase peer interaction that is practical to implement in inclusive educational settings is "peer buddies." Peer buddies have been used with students with ASD in elementary school (Jackson & Campbell, 2009) and secondary school (Hughes & Carter, 2008) to support their general inclusion. Peers also have been used strategically to increase the interactive play of children with ASD at recess (Harper et al., 2008; Laushey & Heflin, 2000).

In some applications, peers to be used in peer buddy programs have been selected from a broader student group (e.g., Hughes & Carter, 2008; Jackson & Campbell, 2009). In the Laushey and Heflin (2000) study, all students in two kindergarten classes, including one student with ASD in each class, were paired with a different peer each school day. Students were instructed to "stay with, play with, and talk to" their "buddy" during play times throughout the day. Names of student pairs who followed the rules were placed in a daily draw for a prize. This peer buddy program resulted in an increase in the appropriate interactive play of the student with ASD in each class. The results of this study suggest that peer buddies may be a promising and practical strategy to initiate play between children with ASD and their peers under natural conditions in an inclusive school setting.

The purpose of the present study is to examine if the introduction of social script training alone or social script training combined with peer buddies would result in the generalization of increased peer interaction of children with ASD in inclusive classrooms to a setting when a trained social script was not present. It was hypothesized that social script training alone would result in children with ASD acquiring a play sequence that they would use when theme-related materials were available, but not when those materials were absent. It was also hypothesized that the addition of peer buddies for entire classes of children would serve as a platform to start play exchanges and would result in generalization of children with ASD's increased peer interaction to settings when theme-related play materials were not present.

Method

Participants and Settings

Three children diagnosed with ASD by community pediatricians or psychologists participated in the study. Each child had been receiving one-on-one early intensive behavior intervention (EIBI) in their home for between 1.3 and 2.7 years. In addition, each participant was attending a general education preschool or kindergarten classroom on a part-time basis as they continued to receive home-based EIBI.

Noah was 4 years 8 months at the time this study began and attended a junior kindergarten class (for children who were 4 years old) at a private religious school for five mornings of the week. Noah had an *Adaptive Behavior Composite* score of 73 on the *Vineland Adaptive Behavior Scale II* (VABS-II; Sparrow, Cicchetti, & Balla, 2005) and a Full Scale score of 56 on the *Wechsler Preschool and Primary Scale of Intelligence III* (Wechsler, 2002). Experimental sessions for Noah were held during daily play periods conducted in the classroom along with his 15 typically developing classmates and the classroom teacher. Noah did not have the assistance of an aide in the classroom.

Katie was 5 years 10 months at the beginning of this study and attended a general education kindergarten

classroom at a public school for three mornings a week and a general education for preschool two mornings a week. She received an *Adaptive Behavior Composite* score of 61 on the VABS-II (Sparrow et al., 2005) and a standard score of 49 on the *Mullen Scales of Early Learning* (Mullen, 1995). Experimental sessions were held during regularly scheduled indoor play periods at the preschool, during which time, there were 12 typically developing children, the classroom teacher, and an aide assigned specifically to assist Katie. Katie continued to receive EIBI at home each afternoon, for 5 days a week.

Molly, aged 5 years 11 months at the beginning of the study, attended a kindergarten class in a private school on a full-time basis. The classroom contained 14 typically developing children, a classroom teacher, and an aide who was assigned to assist Molly and other students in the class who had special needs. Molly received an *Adaptive Behavior Composite* score of 50 on the VABS-II and a *Test Composite* score of 72 on the *Stanford–Binet Intelligence Scales–Fifth Edition* (Roid, 2003). Experimental sessions for Molly were conducted during regularly scheduled play periods in the classroom.

Participants were selected because of their identified deficits in peer interaction. Typically, during free play times such as at recess for Noah and Molly, or indoor play periods for Katie, participants would display little or no occurrence of peer interaction. Instead, they tended to engage in stereotypic behaviors and isolate themselves from other children in the setting.

Measures

Three trained observers coded participant play behaviors on a 15-s momentary time sampling basis. Coders noted whether participants were engaged in interactive play or not. Using earphones, observers listened to an auditory cue recorded digitally on an mp3 player. The response definition of interactive play was based on Hundert and colleagues (1998) and was defined as,

> The child is engaged in a play activity (e.g., pushing a toy truck) within 2 m of at least one other child and is interacting either verbally (e.g., talking) or nonverbally (e.g., taking turns, looking at a child when that child is talking). (p. 56)

Observers were trained in the behavior codes and the observation method used in the study until each demonstrated at least 80% correct answers on a paper-and-pencil quiz, and achieved at least 90% agreement with the trainer when coding a videotape of the play behavior of a child who did not participate in the study.

Sessions

Two, 20-min play sessions were conducted daily for each participant and were randomly assigned to be a "training" or a "generalization" session. The two daily sessions were held at least 1-hr apart. During training sessions, theme-related play materials associated with a social script developed for that child were available on a table or on the floor in addition to the usual play material located in the setting. Social scripts were developed before the study began, but were not introduced until after a baseline phase and only during training sessions.

The other 20-min daily playtime was a "generalization" session and was identical to training sessions except that the play material associated with a social script was not available and no interventions were introduced to increase the interactive play of participants during generalization sessions at any time in the study. The purpose of "generalization" sessions was to measure transfer of effects of interventions to a situation where adults did not directly prompt or reinforce play and the specific play materials used in a social script were not available. Generalization sessions were conducted during a baseline phase to measure if having play materials in the room associated with later social scripts before social script training started would affect children's interactive play.

Design

A non-concurrent multiple-baseline design across participants was used to evaluate the effects of interventions on the peer interaction of participants during both training and generalization sessions. During training and generalization sessions, each class of children was free to play with available play material in the room as they typically did. In all other ways, the sessions were the same.

Following baseline conditions for all three participants, social script training was introduced to increase peer interaction, and the effects on participants' interactive play were measured. For Katie and Noah, the social script alone condition was followed by a phase when social script training was combined with peer buddies. For Molly, the peer buddies program alone was introduced first and then removed. Next, Molly received social script training alone and finally received the social script training combined with the peer buddies program. The order of introducing the experimental phases was different for Molly to control for potential order effects and to determine if the peer buddies program by itself would be sufficient to produce generalized changes in peer interaction.

Procedures

Baseline. Data were collected on the occurrence of participants' interactive play under typical condition in each of the three classrooms. Classroom teachers were asked to conduct each of the two play sessions daily as usual without any change to routine or the play materials that were available. The exception was that play materials associated with

the social script training that was to be introduced subsequently would be available during training sessions only.

Social script training alone. The purpose of social script training was to teach participating children with ASD and their typically developing peers a sequence of reciprocal play interactions that involved a play theme of strong interest to the child with ASD. Each play script was developed by the experimenters to be at a level commensurate to the communication and motor skills of the child with ASD. The play script was also designed to have a clear beginning, a clear end, and appeal to the rest of the class. Play scripts could typically last from 5 to 10 min and were only introduced for the participants because they were the only ones in their respective classes to have pronounced problems sustaining social exchanges with peers. In addition, because a social script could only be played with a child with ASD in the class, we wished to heighten the appeal to classmates of playing with the participants.

For Noah, the play script was called "The Pirate Treasure Game" and consisted of a board game created specially for him because of his strong interest in flags and their association with countries. Four pairs of pictures of flags placed on 2 × 2 inch cards were placed face down in a random pattern between Noah and his playmate. One child turned more than two cards to see if they matched. If so, the child moved his or her marker to the country corresponding to the matched flag that was depicted on a simple 20 × 20 inch drawing of a world map, took a pretend gold piece located on the country, and placed it in a small pretend treasure chest. If the two cards did not match, the other child took a turn.

Katie's play script consisted of one child pretending to teach calendar and weather to a second child much like what was conducted each day by the preschool teacher of Katie's class. One child played the role of a teacher, and the other played the part of a student. Play props consisted of a large calendar, cards with names of the days of the week, and cards depicting different weather conditions.

Molly's play script consisted of pretending to go grocery shopping and paying for items at a pretend check-out. Props to play the game included a toy cash register, play money, and plastic imitation food packages. One participant pretended to be a shopper and the second participant pretended to be a cashier.

When each play script was first introduced, all children in the class were brought together in a "circle" held just before the first training session. Children were informed that there was to be a new play activity introduced that would involve the child with ASD playing with other children in the class. A brief (2–4 min) videotape was shown to the class depicting two socially competent children playing the developed script. Immediately following the video, volunteers were then solicited from the rest of the class to play the game with the child with ASD. The video was only shown once when the play script was first introduced, but for each session, a partner for the child with ASD was selected by the teacher to play the social script.

The theme-related play materials were placed in a 10 × 10 foot area of the room in which play sessions were conducted. An undergraduate university student served as the play leader and delivered physical, gestural, and verbal prompts as well as praise to the child with ASD and his or her play partner to follow the general sequence of the script. Over time, prompts were faded by systematically reducing the amount of prompt delivered, delaying the timing of the delivery of the prompt, and increasing the physical distance between the leader and the children as long as the child with ASD continued to demonstrate at least 70% correct implementation of the play script.

Each play script consisted of a sequence of eight steps with each step involving a play exchange (e.g., one child directing play behavior toward the other child who, in turn, directed play behavior back). A correct response from the play partner and the child with ASD was defined for each of the eight steps.

Both children received a token for each step of the social script that was implemented correctly. Tokens consisted of 0.75 × 0.75 inch laminated pictures associated with the play script. Once the number of accumulated tokens reached 15, the tokens were exchanged for a back-up reward (e.g., play a game, watch a brief video, break 2 min earlier for lunch) that was given to the entire class. A class contingency was selected to encourage interest in all of the children in the play behavior of the child with ASD.

Peer buddies. A peer buddies program was introduced during training sessions only specifically to increase the frequency of play initiations among all children in the class including the child with ASD. Peer buddies were introduced for all children in a class because of the ease of doing so and to minimize possible stigma to the participants. The procedures for the peer buddies were based on Laushey and Heflin (2000) and consisted of a 20-min initial verbal presentation to the entire class by the teacher and play leader modeling: (a) how to initiate play (go over, look at the person, and ask); (b) how to accept a play invitation ("stop what you are doing," "look at the person," "say whether or not you want to play"); and (c) how to maintain play behavior. The teacher explained to the class the three rules of the peer buddies program: "stay with," "play with," and "talk to your buddy." This explanation only occurred once.

A schedule similar to that described by Laushey and Heflin (2000) along with a printed list of the three rules of peer buddies was posted in the classroom at the beginning of each training session and indicated the pairings of peer buddies for that session. Prior to the beginning of each

training session, the teacher brought the class' attention to the schedule and rules.

During the training sessions, the teacher and the play leader praised those pairs of children who were observed to be following the three rules of peer buddies. Furthermore, each child in the pair received a colorful sticker from the teacher during a brief discussion period at the end of the session. Children who did not receive a sticker during the session were asked what they needed to do to earn a sticker the next time.

As previously indicated, the peer buddies program was introduced alone for Molly and in combination with social script training for Katie and Noah. For training sessions during which the peer buddies program was paired with social script training, the social script procedures were implemented as described above with the exception that peer partners for the social script training were determined through the peer buddy program.

Inter-Observer Agreement

Inter-observer agreement checks were conducted on an average of 32.3% of training and generalization sessions across all three participants. A second trained observer simultaneously, but independently, recorded the peer interaction of the same participant. The two observers listened to the same 15-s auditory cue signal through earphones attached to a mp3 player using a Y-adaptor. Inter-observer reliability was calculated by counting the total number of agreements, divided by the total number of agreements plus disagreements, and multiplied by 100. The mean inter-observer agreement for interactive play was 93.1% (range = 80%–100%) for Katie, 95.8% (range = 90%–100%) for Molly, and 91.2% (range = 83%–100%) for Noah.

Procedural Fidelity

Procedural fidelity was calculated for 21.7% of baseline sessions during both training and generalization sessions. During baseline procedural fidelity checks, observers determined if (a) there were no interventions present and (b) no prompts were provided to participants. Procedural fidelity was met for 100% of baseline sessions. Procedural fidelity was measured for 21.4% of training sessions for social script training alone, 20.0% for peer buddies alone, and 21.0% for the combination of social script training and peer buddies. To determine intervention procedural fidelity, observers rated whether each of eight criteria of correct implementation of each intervention was followed.

Prior to the beginning of the study, observers practiced completing procedural fidelity checks on 10-min videos of each of the interventions being implemented with other children. Training continued until each observer achieved at least 90% agreement with the experimenter. Procedural fidelity was met for 100% of the sessions in which the peer buddies program alone was implemented, 98.4% of sessions with social script training alone, and 94.2% of sessions when social skills were combined with peer buddies.

Results

Changes in the occurrence of the children's interactive play with the introduction of experimental phases are shown in Figure 1.

As can be seen, baseline levels of interactive play for Katie were low for both training and generalization sessions with her mean occurrence of interactive play being about 0% for both types of sessions. Although somewhat more variable, baseline levels of interactive play were also low for both Noah and Molly. The mean occurrence of interactive play for Noah was 5.4% (range = 0%–10.3%) during training sessions and 8.0% (range = 0%–28.4%) during generalization sessions. For Molly, the mean occurrence of interactive play during training sessions was 11.9% (range = 1.1%–27.8%) and during generalization sessions, 6.9% (range = 0%–25.6%).

Following baseline, the staggered introduction of social script training was associated with an immediate and marked increase in the level of interactive play during training sessions with a mean of 64.1% (range = 53.7%–74.3%) for Katie and a mean of 64.5% (range = 59.7%–76.2%) for Noah.

There was little or no change in the occurrence of interactive play for Katie and Noah during generalization sessions from baseline levels when social script training was introduced in their training sessions (M = 0% for Katie; M = 3.4% for Noah). The percentage of non-overlapping data points (Scruggs & Mastropieri, 1998) of interactive play during training sessions from baseline to social script training was 100% for both Katie and Noah.

There was no increase in the level of interactive play during generalization sessions for Katie or Noah after social script training alone was introduced. They did not interact with peers more often during generalization sessions until social script training was combined with the peer buddies program for each of these children. During the social skills training combined with peer buddies phase, the occurrence of interactive play in training sessions remained at about the same elevated level as during the social script training only phase (M = 71.6% for Katie; M = 65.5% for Noah). Also, the occurrence of interactive play during generalization sessions increased from baseline, but not to the same levels as found during training sessions (M = 25.9% for Katie; M = 35.1% for Noah).

The sequence of introducing experimental phases was altered for Molly to control for possible order effects. Baseline levels of interactive play for Molly were low for both training sessions (M = 11.9%) and generalization

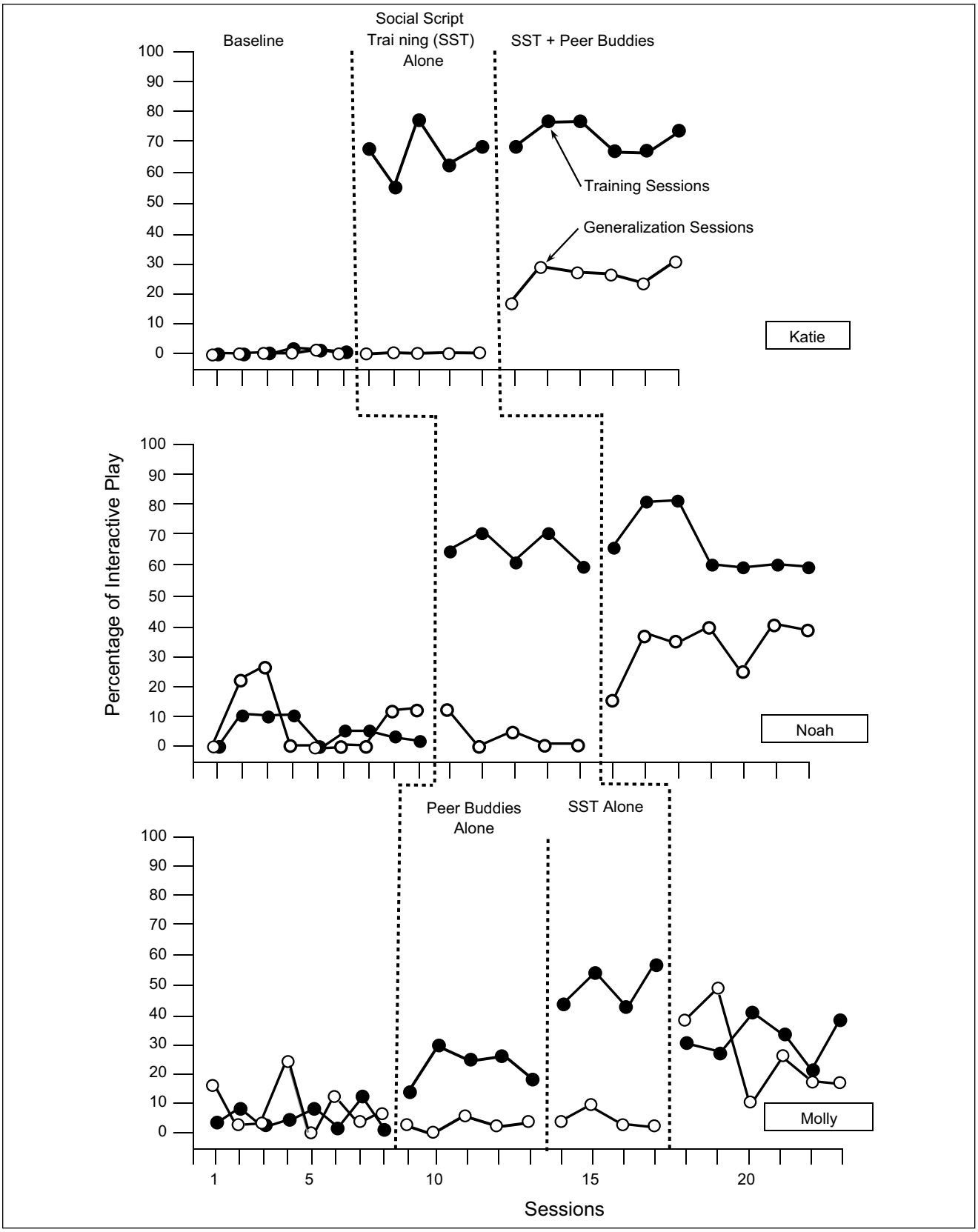

Figure 1. The percentage of interactive play by Katie, Noah, and Molly under different experimental phases during training and generalization sessions.

sessions (M = 6.9%). Following baseline, the peer buddies program was introduced alone for Molly to determine if that condition by itself, without being combined with social script training was sufficient to produce generalized increases in her interactive play. Molly's level of interactive play increased when the peer buddies program alone was introduced but only during training sessions and only to a moderate level (M = 20.4%). Molly's interactive play during generalization sessions remained near zero (M = 3.5%).

When the peer buddies program ended and social script training alone was introduced for Molly, there was an increase in Molly's interactive play during training sessions (M = 49.7%), but not during generalization sessions (M = 4.7%). These results are similar to those found with Katie and Noah. The re-introduction of the peer buddy program combined with social skills training was associated with an increase in the level of Molly's interactive play during generalization sessions (M = 23.9%). Molly's occurrence of interactive play during training sessions continued to be higher than her baseline levels (M = 32.6%), but less than the levels of interactive play found during the social script training only phase.

Discussion

This study found an increase in the occurrence of peer interaction for each of the three participants with ASD when social script training alone was introduced during play sessions held with classmates in inclusive school settings. Each social script was designed to fit the interests and abilities with a particular child with ASD. Although there was an increase in the interactive play of children with ASD when social script training alone was implemented during training sessions, there was no increase in interactive play during generalization sessions when the theme-related play materials were unavailable and children did not receive adult assistance to play.

Limitations

There are several limitations to this study that may restrict the generalizability of the results. First, although the participants were from different inclusive educational classrooms in different schools with different staff, they numbered only three. The results found in this study may not affect children with ASD who are older, demonstrate more severe symptoms, and so on.

A second limitation was that the social script used for each participant was developed only for the child with ASD and not other children in the classroom. The rationale for this was previously explained. In inclusive classrooms, it may be important not to introduce interventions that treat the child with ASD differently than the rest of the class as was done with the peer buddies program. There may have been advantages of having social scripts developed for a number of children in the class not only to minimize any stigma to the children with ASD but also to expose them to a variety of theme-rated play scripts.

A third limitation of the study was that the social scripts were developed by the experimenters who also assisted the classroom staff with the initial introduction of social scripts in the classroom. It is unclear if classroom staff would be able to develop and introduce social scripts without this assistance.

A meta-analysis suggested that school-based social skills interventions for students with ASD have a moderate effect on producing lasting improvement in students' social behaviors and a low effect on producing effects that generalize across settings (Bellini et al., 2007). Greater treatment effectiveness on average was found for studies in which the intervention was implemented in the child's typical classroom, as in the present study. The use of typically developing children as play partners and having interventions implemented in typical classroom settings may have contributed positively to the results of this study.

A number of studies have found that an intervention to increase peer interaction will result in maintenance of effects in the same environment when the intervention is withdrawn (e.g., Chan & O'Reilly, 2008; Leaf et al., 2009; McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992; Parker & Kamps, 2011). There are fewer studies which have found generalized changes in the interactive play of children with ASD to other settings/or sustain play with peers. Delano and Snell (2006) found that after three children with ASD were read social stories on how to play with peers and practiced with one play partner in a resource room, their social engagement with other children in their classrooms increased. Children were specifically taught how to get a peer's attention and to initiate a conversation. Similarly, Pierce and Schreibman (1997) used pivotal response training for each children with ASD to initiate conversation and play with peers and found generalization of peer interaction with new play partners in the classroom.

In this study, generalized increase in children's interactive play did not occur with social script training until it was combined with the peer buddies program. During this combined condition, levels of children's interactive play for Katie and Noah increased for generalization sessions. For Molly, there was a slight decline in the levels of interactive play with the combined condition during training sessions but an increase in interactive play during generalization sessions. The decline in Molly's interactive play from social script training alone to social script combined with peer buddies may have occurred because the peer buddies program alone in Molly's class was previously introduced and then removed. The prior exposure to peer buddies without a social script for her partners to follow may have resulted in a looseness in which Molly and her partner subsequently

followed social script training when it was paired with peer buddies.

The ability of children with ASD to sustain interactive play without adult assistance may require that children with ASD be proficient in several play-related behaviors. One play-related behavior that may be necessary for children with ASD is to attend to the actions of a peer and respond in a complimentary way, consistent with the evolving theme of the play exchange. To some extent, social script training provides children with ASD and a play partner with a learned sequence of interactions to follow. The results of this study indicated that with the introduction of social script training alone, children with ASD increased their interactive play with peers by following the provided play script, but only when the associated play materials were available and adults assisted the children to follow the script. Social script training alone may have failed to increase children's interactive play in a second setting because it did not provide a way for children with ASD and their play partners to start play exchanges in the absence of an adult. The peer buddies program may have helped to produce generalized interactive play by initiating the partnering for play and encouraging play partners to stay together when adults were not assisting.

Koegel et al. (2012) obtained results similar to those found in this study. They taught three kindergarten children with ASD who were attending general education classrooms to play with peers on the school playground during recess. Initially, children were taught to interact with peers when an interventionist started the play activity. The three children with ASD increased their play engagement with peers but only at times when the interventionist was present. There was no increase in the social engagement of children with ASD when the interventionist was not present until the children were taught how to initiate play.

It is possible that the participants in the present study may also have generalized the effects of social script training if they were taught how to initiate play with peers or experience some other intervention than peer buddies that would have resulted in a way that play would be able to start with other children in the absence of adult assistance. Pivotal response training (Koegel et al., 2012) and correspondence training (R. S. Morrison et al., 2002) are examples of other interventions that may have shown an increase to play initiation of children with ASD. Unfortunately, we did not directly measure children's initiation of play to determine if this behavior was increased with the introduction of peer buddies. Another limitation of this study was that the children with ASD used as participants were relatively homogeneous in age and functional skills. The applicability of these results to children with different degrees of symptom severity of ASD or of different ages is unclear. Moreover, generalization of play was measured to the same physical setting as the training setting, but with theme-based play material associated with script unavailable. We did not determine whether generalization would occur to another location in the school such as a playground or to different children than those who participated in the classroom intervention.

Other play-related behaviors in addition to play initiation and sustained reciprocal interaction may also be important for generalized peer interaction such as how to comment on play (Goldstein, Kaczmarek, Pennington, & Shafer, 1992; L. Morrison, Kamps, Garcia, & Parker, 2001), how to respond to peer interactions (Wichnick et al., 2010), or how to end play appropriately (Stahmer & Schreibman,1992).

Both this study and Koegel et al. (2012) showed that generalized interactional play of children with ASD did not occur until a specific intervention was added, which targeted the initiation of play interactions. It is unclear if targeting play initiations alone without additional intervention to sustain interaction would produce increased play exchanges to generalize to new settings and play partners. In the current study, the interactive play of Molly during peer buddies alone did not increase during generalization session. Future research should examine in greater detail which specific play behaviors of children with ASD are necessary for generalized peer interaction across settings.

Implications

There are also implications for practice. The results of this study suggest that a combination of interventions may be necessary to produce generalized peer interaction (Harper et al., 2008). As suggested by the results of the present study, an intervention may only affect some of the skills that compose peer interaction. A comprehensive approach to improving the social behavior of children with ASD in schools may require an initial assessment of a child's proficiency in skills components resumed to be necessary for peer interaction (e.g., play initiation, response to play invitation, repeated reciprocal social exchanges). The results of the assessment would suggest what skills associated with peer interaction would need to be targeted for a child. It is possible that a different combination of peer interaction interventions may be needed for different children with ASD.

Another implication may be the need to plan sufficient training opportunities during the school day. In the current study, the interventions to improve the peer interaction of the three children with ASD were implemented during free play times held in the classroom with all classmates present. It is unclear if effects found here could be produced by conducting the interventions in a less consistent setting such as in the playground during recess. It is likely that it would be important to consider where and when sufficient number and type of play opportunities can be arranged to implement interventions to improve the peer interaction of children with ASD.

A third implication is that the specific interventions used in the present research (social script training, peer buddies) would most likely need to be modified to be applicable to older children with ASD and their peers or to be used in other inclusive settings other than school (e.g., clubs, summer camps). This study also suggests that the effects of social script training introduced in inclusive classrooms for children with ASD may be enhanced by combining it with a class wide strategy to start peer interaction. It is likely that larger repertoires of social skills are needed by children with ASD to result in generalized reciprocal interaction with other children and perhaps peer acceptance.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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