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Effects of Reinforcement on Peer Imitation in a Small Group Play Context

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Abstract

Children with disabilities often have deficits in imitation skills, particularly in imitating peers. Imitation is considered a behavioral cusp—which, once learned, allows a child to access additional and previously unavailable learning opportunities. In the current study, researchers examined the efficacy of contingent reinforcement delivered within a small group play context on the unprompted peer imitation (UPI) behaviors of three children with disabilities. UPI behaviors increased when contingent reinforcement was provided, and maintained with a thinned schedule of reinforcement. However, pretend play and social interactions did not increase concurrently with peer imitation.

Keywords

imitation, play, children with disabilities

Introduction

Children with disabilities often have deficits in imitation skills, particularly in imitating peers (Cooke, Apolloni, & Cooke, 1977; Peck, Apolloni, Cooke, & Raver, 1978). Delays in imitation are especially common in children with intellectual disabilities (ID), developmental disabilities (DD), and autism spectrum disorder (ASD) (Dawson & Adams, 1984; Rogers, Hepburn, Stackhouse, & Wehner, 2003; Stone, Ousley, & Littleford, 1997). Imitation is considered a behavioral cusp—a skill that, once acquired, allows a child to access additional and previously unavailable learning opportunities across a range of skills (Hixson, 2004; Najdowski, Gould, Lanagan, & Bishop, 2014). It also is a prerequisite skill for observational learning, or learning from observing models (Bandura, 1977). Observational learning allows children to learn from peers' and adults' behavior in everyday situations, and might be particularly important to systematically facilitate when children with disabilities are in inclusive environments rich with peer models (Bricker, 1978; Strain, Schwartz, & Barton, 2011; Wolery, 1994). Although researchers have proposed that imitation serves two distinct functions—learning or social (Ingersoll, 2008)—both functions are socially mediated, suggesting distinctions between these two functions might be inconsequential. Moreover, for children with disabilities, imitation abilities are correlated with positive outcomes in other areas, such as language and play development (Ingersoll, 2010; Stone et al., 1997; Thurm, Lord, Lee, & Newschaffer, 2007).

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A variety of intervention strategies have been developed to improve the imitation skills of children with disabilities (Ingersoll, 2008; Ledford & Wolery, 2011). For example, highly structured, one-on-one learning contexts and discrete trial approaches to teaching imitation have been effective; however, maintenance and generalization of skills were limited (Ledford & Wolery, 2011). Conversely, Ingersoll and Schreibman (2006) used a naturalistic intervention approach—contingent imitation and other naturalistic social communication strategies—to increase object imitation skills in children with ASD. Children increased their object imitation, pretend play, and language skills, and generalized imitation skills to novel contexts. In a follow-up study, Ingersoll (2010) used a randomized controlled trial to examine a naturalistic intervention approach to increase imitation skills in children with ASD. They found that children receiving the intervention made more gains in imitation than children in a control group. Furthermore, children in the intervention group with higher play skills at the start of the intervention made greater gains in imitation overall. The ability to imitate is a crucial skill for maximizing learning across environments. However, each of the aforementioned studies examined object imitation skills performed by an adult who did not have a prior relationship with the target child, which limits external validity of the findings.

Peer imitation, on the contrary, might be a particularly critical skill for young children in typical early childhood classrooms. Furthermore, structuring small group activities such that observational learning can occur has been effective for teaching children to imitate their peers within typical small group activities and has led to generalized increases across contexts (Ledford, Gast, Luscre, & Ayres, 2008; Ledford & Wolery, 2013, 2015). For example, Venn and colleagues (1993) had classroom teachers use a progressive time delay (PTD) procedure to teach students with disabilities to imitate their peers during art activities. This resulted in children's increased use of imitation, which generalized to classroom activities. Researchers also have examined the use of peer models within a common preschool follow-the-leader small group activity to teach imitation skills. Carr and Darcy (1990) had target children interact with a peer who modeled motor actions during a follow-the-leader activity; they found clear increases in peer imitation within the activity and children *generalized their imitative skills to new settings, materials, and behaviors.* Garfinkle and Schwartz (2002) used a system of least prompts (SLP) procedure during a small group follow-the-leader activity, but had less robust findings and minimal changes in concomitant behaviors.

Despite research showing the efficacy of prompting procedures for teaching imitation as a new skill (Ledford & Wolery, 2011), some researchers have found that poor imitation performance can be a result of the absence of contingent reinforcement, rather than a true skill deficit (Steinman, 1970); researchers also have found increases in imitation with the use of social interactive strategies (e.g., contingent imitation) that do not use explicit prompting strategies (Hwang & Hughes, 2000; Ingersoll & Schreibman, 2006). Understanding the reinforcement contingencies that promote peer imitation might assist in identifying effective practices for thinning or replacing contrived reinforcement with typically occurring consequences, resulting in improved imitation in typical activities and settings. Small group play contexts might provide a practical and advantageous setting for teaching children to imitate their peers. Thus, teaching children to imitate their peers' play actions in small group settings might expand target children's current repertoire of social and play behaviors, and facilitate future observational learning. SLP has been successful for increasing levels of pretend play in children with disabilities (Barton & Wolery, 2008), and teachers can be successfully trained to implement SLP with fidelity in typical early childhood settings (Barton, Chen, Pribble, Pomes, & Kim, 2013). However, Garfinkle and Schwartz (2002) demonstrated minimal increases in unprompted peer imitation (UPI) when SLP was used with social praise as reinforcement for UPI in a small group context. Additional research is needed examining the use of SLP with contingent reinforcement using known reinforcers to increase UPI within play contexts. Furthermore, although the generalization of peer imitation to

Table 1. Target Participant Summary Data.

Participant	Diagnosis/eligibility	Age (months)	Mullen age equivalent (months)	Peer MIS score	Adult MIS score
Ava	Seizure disorder; developmental delay	53	30.5	25%	87.5%
Patrice	Developmental delay	57	40.5	4%	100%
Nora	Prader-Willi; developmental delay	57	42	8%	100%

Note. MIS = Motor Imitation Scale.

novel behaviors that were not targeted within instruction is a documented phenomenon (Carr & Darcy, 1990; Venn et al., 1993), additional research is needed to examine conditions under which peer imitation increases *and* generalizes.

The current study examined the efficacy of contingent reinforcement for UPI within a typical, small group play activity with multiple peer models. The research questions were as follows:

Research Question 1: When using a follow-the-leader small group activity and SLP, are differential levels of UPI observed when reinforcement is provided contingent on imitation versus not provided contingently?
Research Question 2: Do increases in UPI maintain over time following systematic thinning of reinforcement?
Research Question 3: Do children generalize imitation behaviors to a different small group activity?
Research Question 4: In conditions in which children have increased UPI behaviors, are there concomitant increases in play and social interactions?

Method

Participants

The authors recruited three children with disabilities after obtaining human subjects approval from the Institutional Review Board. Inclusion criteria for imitation were a minimum score of 75% on the Motor Imitation Scale (MIS) (Stone et al., 1997) for imitating adults, and a maximum score of 25% on the MIS for imitating peers. This ensured that children were imitative of adult motor actions, but not imitative of peer motor actions. The Mullen Scales of Early Learning (MSEL) (Mullen, 1995) was administered to determine children's mental ages. Eligible children had a mental age of at least 18 months, as this is the age at which typical children begin to engage in pretend play (Belsky & Most, 1981). Additional inclusion criteria were (a) age between 24 and 72 months, (b) eligibility for special education services, and (c) greater than 80% attendance for the previous month (based on teacher report). Table 1 provides child demographic information.

Ava was a 53-month-old White, non-Hispanic female who was diagnosed with a seizure disorder. She was eligible for special education services under the category of developmental delay, and she received speech therapy (ST), physical therapy (PT), and occupational therapy (OT) during the study. Ava communicated verbally with limited intelligibility and occasional echolalia. She often repeated lyrics of songs during conversations. Ava's teacher reported that she primarily played by holding two small people or animal figures and having them hug or kiss in a perseverative manner (i.e., she repeated the same action multiple times with minimal differentiation except when prompted). The teacher also reported infrequent imitation of peers, noting that Ava occasionally followed certain peers but did not imitate their actions. Patrice was a 57-month-old Black female who was eligible for special education services under the category of

developmental delay and received ST during the study. Patrice communicated verbally with adults and peers. Patrice's teacher reported that she had a behavior plan in place within the classroom to address attention maintained challenging behaviors (i.e., verbal and physical aggression, property destruction, noncompliance). Patrice's teacher reported that she engaged in some basic pretend play, such as pretending that she was a monster, and that she would imitate gross motor actions, but did not generally attend to peers' play. Nora was a 57-month-old White, non-Hispanic female with a diagnosis of Prader-Willi syndrome who received ST and OT during the study. Nora communicated verbally with age-appropriate speech and some idiosyncratic, perseverative speech patterns. She occasionally initiated to peers, but more often sought adult attention. Nora's teacher reported that she engaged in pretend play by herself, but not with peers. The teacher also reported that Nora rarely imitated her peers.

In addition to the target children with disabilities, seven classroom peers were consented to participate. Peer children's age, gender, ethnicity, and diagnoses were recorded, along with anecdotal information about their play skills. The only eligibility requirements for peer children were the ability to participate in small group play activities with two peers and an adult for 5 min, as reported by teachers. All consented peers were between the ages of 49 and 58 months at the start of the study, and none had an identified disability. Four girls and three boys served as peers, and they were White (4), Asian (2), and Black (1). All peers were in Ava and Nora's classroom and were familiar with Patrice, because they participated together in alternate activities during nap time. The implementer was a White, female special education graduate student who held a special education teacher license and was working toward behavior analysis certification; she also was the primary data coder. The secondary data coder was a White, female special education graduate student who was working toward teacher licensure and behavior analysis certification. Both students were trained in direct observation and single-case research design.

Settings and Materials

All sessions were conducted in an inclusive, university-affiliated preschool in the southeastern United States. Sessions for Ava and Nora occurred in their classroom. Their classroom had a lead teacher, a co-teacher, and a teaching fellow during most sessions; other adults such as therapists and practicum students were sporadically present. Twelve total children were enrolled in the classroom including four with identified disabilities (and Individual Educational Programs). As all sessions occurred during free play or an alternative unstructured time, normal classroom activities were simultaneously occurring. Other adults (e.g., teachers, therapists) were always present in the room, and nonparticipating children played throughout the room. Because Patrice did not nap at school, her sessions were conducted during the scheduled nap time in a separate classroom across the hallway from her classroom. During nap sessions, two to three other children and two to three other adults were present and engaging in nonstudy play activities. Across all sessions, the materials and activities were similar to the typical activities and materials in the context, which aligns with current Division for Early Childhood (DEC) recommended practices (DEC, 2014).

Instructional materials included three different but functionally equivalent toy sets: a housework/tools set, an animals/ocean set, and a baby/doctor set. All sets also included junk toys with ambiguous functions (e.g., blocks, cloth, straws). Three copies of each toy (i.e., one for each peer) were provided in each set. Sessions were recorded with a video camera, and recordings were downloaded onto a secure laptop following each session; recordings were analyzed using the ProCoderDV software (Tapp, 2003).

Response Definitions, Measurement, and Reliability

Frequency of UPI per 5 min was the primary dependent variable used to make experimental decisions. UPIs were recorded within or outside of trials during each session. Pretend play and social

Table 2. Response Definitions.

Response	Definition	Example
UPI	An action that is carried out by the target child independently (i.e., without physical assistance or verbal instructions from an adult) that is a repetition of the motor action of a peer and begins within 5 s of that action's cessation. Imitation must have approximate motor correspondence to the original action and have the same outcome.	Covering a baby with a washcloth 3 s after a peer covers his or her baby with a washcloth; stacking two blocks immediately after a peer stacks two blocks.
Unprompted Pretend Play	Any action carried out independently (i.e., without any physical assistance or verbal instructions from an adult) by the child, with or without objects, that is FPP, OS, IAO, and AAA.	Putting a toy bottle to a baby doll's lips; putting blocks in a toy pot; saying, "I'm a superhero!"
Social Initiation	A verbal or nonverbal behavior directed toward a peer in an apparent attempt to gain a social response. Includes gestures, vocalizations, or words, but excludes aggression (e.g., hitting, kicking, or grabbing a toy from a peer's hands).	Holding out a toy to a peer; vocalizing in a peer's direction while making eye contact with them; reaching hand toward peer while gazing at a toy held by a peer.
Social Response	A verbal or nonverbal behavior that occurs in response to a peer's social initiation and begins within 5 s of the initiation. Includes gestures, vocalizations, or words, but excludes aggression (e.g., hitting, kicking, and grabbing a toy from a peer's hands).	Handing a bottle to peer after a peer points to it; shaking one's head "no" in response to a peer's request for a block; vocalizing after a peer's initiation while gazing at them.

Note. UPI = unprompted peer imitation; FPP = functional play with pretense; OS = object substitution; IAO = imagining absent objects; AAA = assignment absent attributes.

interactions were measured as secondary dependent variables (see Table 2 for definitions and examples). Pretend play types were measured using the pretend play taxonomy described in Barton (2010, 2015). Timed event recording was used to code all variables. Interobserver agreement (IOA) data were collected for at least 30% of sessions across all children, dependent variables, and conditions. Sessions coded for IOA were designated via a random number generator. A secondary data collector was trained to code videos by reviewing response definitions and examples, watching the primary data collector code a sample video, practicing, and discussing discrepancies until 90% agreement was achieved for practice videos. IOA was calculated using the point-by-point method, with the number of agreements divided by the number of agreements and disagreements and multiplied by 100 (Ayres & Ledford, 2014). IOAs for each participant and condition are found in Table 3. The average level of IOA across all conditions was 95% for Ava and Nora, and 93% for Patrice.

Experimental Design and Visual Analysis

The researcher used a multitreatment design (A-B-C-B-C-Ć; Wolery, Gast, & Ledford, 2014) replicated across three children, with B referring to the SLP component and C referring to contingent reinforcement. This design allowed for (a) the parametric analysis of the intervention package (i.e., the use of SLP with or without contingent reinforcement) and (b) three intra- and inter-subject replications. The criterion for moving to the next condition was stable responding for three consecutive sessions. Specifically, the researcher visually analyzed the UPI data for

Table 3. IOA and Procedural Fidelity Results.

Condition	Ava	Nora	Patrice
IOA			
Baseline (A)	100 (100)	100 (100)	100 (100)
SLP alone (B)	95.5 (87.8-100)	97.6 (92.8-100)	100 (100)
SLP + CR (C)	91 (86-100)	90.9 (86.7-93.7)	91.9 (84.7-99)
Thinning (Ć)	88 (88)	98.3 (98.3)	100 (100)
Generalization	98.9 (97.8-100)	93.8 (87.7-100)	84.2 (81.7-86.7)
Procedural fidelity			
Baseline (A)	98.9 (97.8-100)	100 (100)	96.7 (96.7)
SLP alone (B)	98.3 (96.7-100)	100 (100)	98.3 (96.7-100)
SLP + CR (C)	100 (100)	96.7 (96.7)	94.3 (90-96.7)
Thinning (Ć)	96.7 (96.7)	100 (100)	96.7 (96.7)
Generalization	90 (80-100)	90 (80-100)	98.3 (96.7-100)

Note. Average across sessions, with range across sessions in parentheses. IOA = interobserver agreement; SLP = system of least prompts; CR = reinforcement contingent on imitation.

immediacy of change, overlap between adjacent conditions, variability within and between adjacent conditions, consistency of behavior changes following condition changes, and increasing or decreasing trends within and across adjacent conditions (Gast & Spriggs, 2014). The design met What Works Clearinghouse single-case design standards with reservations, given there were three data points rather than five across conditions (Kratochwill et al., 2013).

Screening and Assessments

Prior to baseline conditions, imitation performance, preferences, and reinforcers were assessed for all target children. Two versions of the MIS were administered: one with an adult model and one with a peer model. Multiple stimuli without replacement (MSWO) or paired stimulus (PS) preference assessments (PAs) were conducted by the implementer to determine the children's most- and least-preferred items (see Figure 1). PAs varied based on dietary restrictions and teacher report. Ava's PA was conducted with edibles, Patrice's was conducted with different topographies of attention, and Nora participated in tangible and social PAs. Due to teacher report of Patrice's and Nora's high preference for adult attention, the implementer conducted PS social PA to determine whether a particular form of attention was more highly preferred than others.

For each child, a reinforcer assessment (RA) was conducted following each PA in the context of an A-B-A-B withdrawal design. RAs included pre-exposure to the active contingency (e.g. "Clap your hands and you get [X]") before each session. Target behaviors were chosen that were within the child's repertoire (based on teacher report) but were infrequently observed during the screenings (e.g., clapping). The implementer alternated provision of no contingent consequences (A) with contingent delivery of a potential reinforcer (B) for completion of the action. For each participant, items and interactions identified as highly preferred during MSWO or PS PAs served as reinforcers for an arbitrary response. This suggested that these items and interactions might also serve as reinforcers for peer imitation responses.

Although Ava displayed a strong side bias (i.e., tending to pick the right-most item despite rearrangement), she also demonstrated a slight preference for small chocolate candies (see Figure 1). During the RA for small chocolate candies, Ava showed differentially higher rates of responding when an arbitrary response, bringing a block to the implementer, was followed by candy delivery than when it was not followed by any contingent response. Patrice's highest

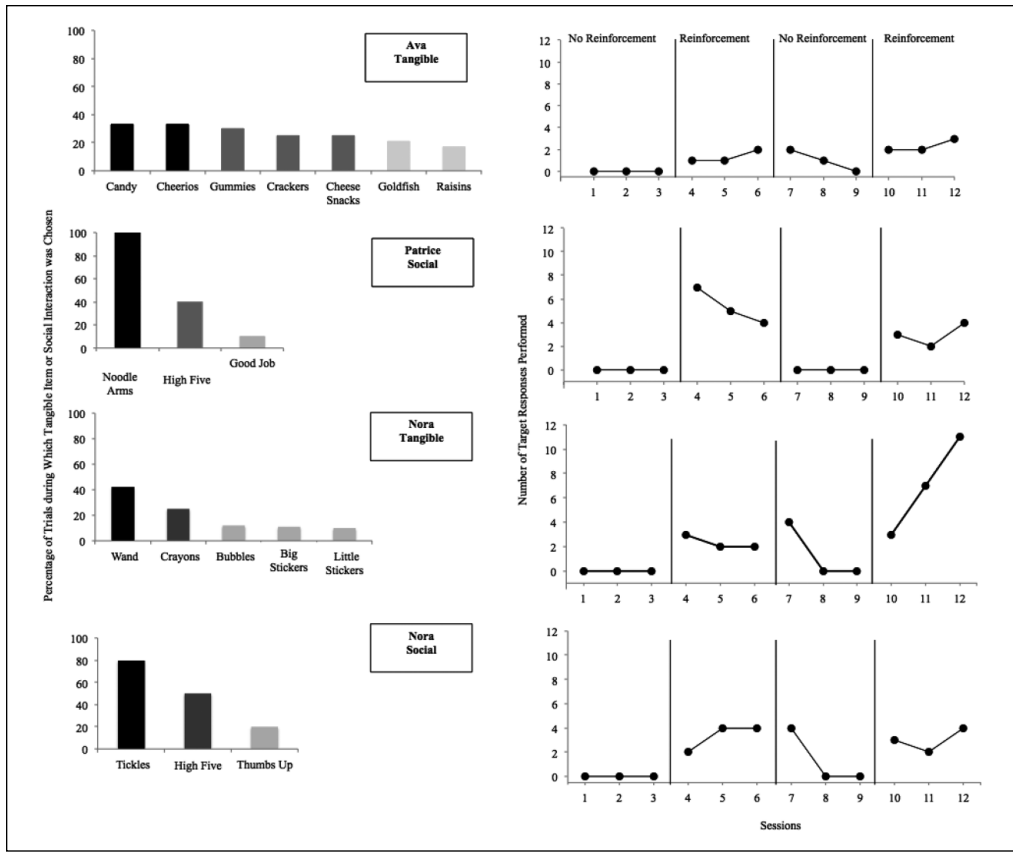

Figure 1. Preference (left panel) and reinforcer (right panel) assessments for Ava, Nora, and Patrice.
Note. For the PA graphs (left panel), the dark columns represent the most highly preferred items, the medium shaded columns represent the moderately preferred items, and the lightly shaded columns represent the least-preferred items. PA = preference assessments.

preferred form of attention, based on the PA, was noodle arms (i.e., the implementer held her hands and wiggled her arms up and down while making a silly noise; see Figure 1). The RA for noodle arms indicated that they did function as a reinforcer. Patrice did not clap her hands when clapping was not followed by a contingent response, and clapped at a differentially higher rate when clapping was followed by noodle arms. Nora's highest preferred item during the tangible MSWO was a light up wand (see Figure 1). The RA for the light up wand indicated that it was reinforcing for the target behavior (e.g., clapping). The results of this PA indicated that Nora's highest preferred form of social attention was tickles. Also, the RA indicated tickles were reinforcing for the target behavior.

Experimental conditions. Five-minute sessions were conducted daily across conditions. All sessions included the implementer, the target participant, and two peers (selected based on availability). The same seven peers were used across all three target participants. The implementer arranged the children in a circle and sat beside the target participant. In all sessions, the implementer began by passing around three identical bags of toys from the target toy set. The toy sets were rotated daily to prevent satiation, with the order of introduction assigned by a random number generator prior to the first session.

Baseline. During baseline sessions, the implementer distributed the toys and explained the rules of follow-the-leader (e.g., "I will choose a leader and you can copy what they are doing") before randomly choosing the leader. The implementer observed, responded to social initiations, and announced a new leader approximately every 50 s—such that each child was the leader twice—but did not deliver prompts or praise other than for staying in the area. This type of small group activity was ecologically congruent to other activities occurring during this time in the classroom. Challenging behaviors were addressed by redirecting the child to continue playing with the toys. At the end of the 5-min session, the implementer praised the children for staying and playing. This condition examined UPI under typical conditions.

Prompting. Sessions during the prompting without contingent reinforcement (B) condition were identical to baseline sessions, but with the addition of an SLP procedure to each leader trial. The implementer began the first trial by selecting a peer who was appropriately engaged with the toys as the leader. The task direction, "[Child] is the leader! You can copy what [child] is doing" was delivered. The implementer waited 3 s for the target participant to perform a UPI. If the target participant performed a UPI of either peer, the trial ended. If the target participant did not respond, the implementer delivered a prompt by nudging the target participant and pointing at the leader's action. The implementer then waited another 3 s for the target child to imitate either peer. A UPI by the target participant ended the trial, and lack of response resulted in the delivery of the controlling prompt—full physical prompting—to imitate the leader. If at any point during the trial the target participant started to commit an error, the implementer immediately used the controlling prompt as error correction. A new leader was chosen approximately every 50 s so that the children had time to engage in new actions during the intertrial interval; target children were included in the leader rotation. Throughout the 5-min session, noncontingent social and edible/tangible reinforcement was delivered approximately once every 30 s for staying in the play area, which allowed for consistent and systematic interactions between the implementer and the children. This increased the ecological congruence of the activity, allowed the implementer to interact with the children outside of the prompting hierarchy, and controlled for the quantity and quality of implementer interactions with the children. The implementer ensured that at no point did reinforcement delivery occur within 5 s of a prompted imitation or UPI. To signal the unavailability of attention aside from those occurring at planned intervals, the implementer turned away from the target child and pretended to be distracted by a clipboard. A contingency review was provided to the target child prior to each session (e.g., "You'll get stickers for playing however you want"). The peers received identical reinforcement at the same time as the target participant. At the end of the 5-min session, the implementer provided stickers for playing and praise to all of the children for staying in the area.

Prompting and contingent reinforcement. Prompting and contingent reinforcement sessions (C) included small group sessions similar to those during the B condition, with contingent provision of reinforcement for UPI. Trial structure, intertrial intervals, and praise at the end of the session remained the same. Small groups during C were nearly identical to those during B, with the only difference being the contingent reinforcement and the availability of adult social reinforcement. Rather than turning away, the implementer oriented toward the target participant. However, no adult attention was provided in the absence of imitation. During the summary of the follow-the-leader rules, the implementer provided a contingency review for the target child (e.g., "You'll get a sticker every time you copy a friend"). Following every instance of prompted imitation or UPI, the implementer immediately provided verbal praise ("Wow! Great job copying your friend!") and the edible/tangible reinforcer. As in the B condition, peers received identical reinforcement at the same time as the target participant.

Thinning. During thinning (Ć), edible/tangible reinforcement was systematically thinned and the SLP procedure was eliminated. Delivery of edible/tangible reinforcers was reduced to a fixed ratio (FR)-2 schedule and then an FR-3 schedule once performance stabilized or improved. Social praise was always delivered on an FR-1 schedule.

Generalization. Generalization of peer imitation was assessed across contexts in separate small groups. Small group generalization sessions used procedures identical to small group baseline sessions, but the children were provided with a variety of musical instruments instead of toys. There were three of each musical instrument such that each child had access to one of each. These sessions occurred at least once during every condition except thinning (Ć).

Individual Procedural Adaptations

Several procedural adaptations were made for Nora and Patrice; none were made for Ava.

Nora. Although the wand was found to be Nora's most preferred tangible item, small stickers—placed on her shirt by the implementer—were also delivered as reinforcement because the provision of stickers was less disruptive to ongoing play. In addition, to motivate Nora to come to the playgroup, the implementer utilized a first-then statement (e.g., "First playgroup, then big sticker." Or, "First play, then dress up shoes."). Nora was given a choice of which teacher-nominated preferred item to earn prior to each session and the consequences were delivered immediately following the session, regardless of her UPI. During the thinning condition (Ć), tangible reinforcement was eliminated completely and social praise was thinned to an FR-2 schedule then an FR-3 schedule to explore the strength of praise as a reinforcer for imitation, given that social praise was reinforcing during her social reinforcement assessment.

Patrice. Starting with Session 11 (see dashed line on middle panel of Figures 2-4), edible reinforcement was delivered along with the highest preferred form of attention, due to escalating levels of challenging behavior, which might have been due to the limited attention provided by the implementer during these sessions. The implementer also provided general attention at least once per minute, and responded to all of Patrice's appropriate initiations.

Procedural Fidelity

Procedural fidelity data were collected for at least 30% of randomly selected sessions across conditions and children. Implementer behaviors included provision of materials, session duration, provision of rules, selection of leaders, noncontingent (B) or contingent (C) reinforcement, and the provision of prompts (B and C conditions). Fidelity was calculated by dividing the number of correct behaviors by the sum of correct and incorrect behaviors. Average fidelity across all conditions was 97% for Ava and Nora, and 96% for Patrice (see Table 3).

Social Validity

Normative data were collected on a typical peer's rates of imitation during sessions for Nora and Ava as an objective measure of social validity. A 49-month-old female classmate with no identified disability and average levels of pretend play was identified based on teacher report; she also was a participating peer. Her imitation frequency for at least one small group session per condition was coded and graphed alongside primary data. The normative peer displayed a stable level of imitation across conditions during Ava's and Nora's sessions (see Figure 2). Both target children matched or exceeded the normative peer's level of UPI during intervention sessions.

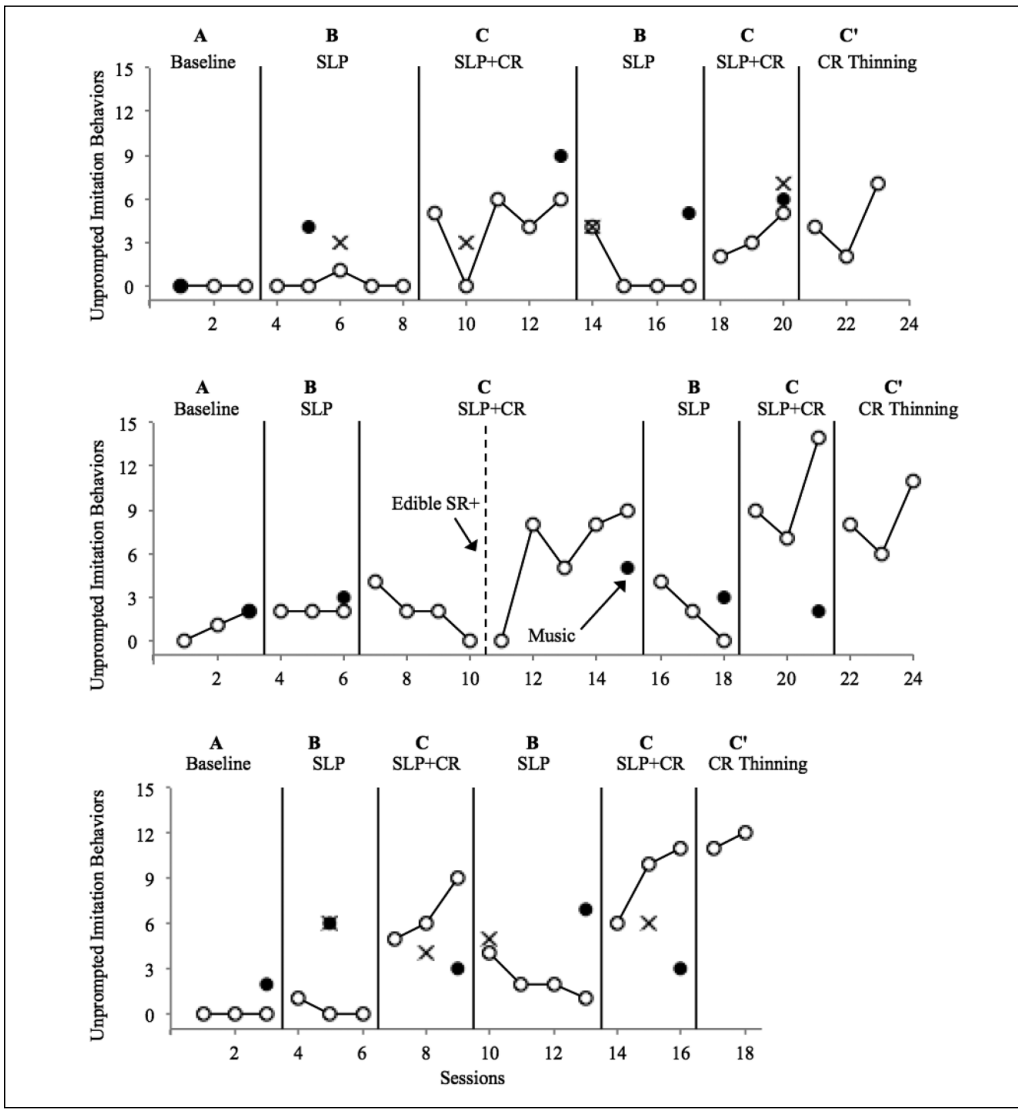

Figure 2. Ava's (top panel), Patrice's (middle panel), and Nora's (bottom panel) UPI.
Note. Open circles represent frequency of UPI in standard sessions. Closed circles represent frequency of UPI during music generalization sessions. For Patrice, edible reinforcement was provided in addition to social reinforcement in both B and C conditions starting with Session 11. The data points marked with an X are normative peer UPI data; these were collected for Ava and Nora. UPI = unprompted peer imitation; SLP = system of least prompts; CR = reinforcement contingent on imitation; SR+ = positive reinforcement.

Results

Peer Imitation

Ava. During baseline sessions, Ava did not independently imitate her peers (see Figure 2). Throughout the first prompting and noncontingent reinforcement condition (B), Ava demonstrated low and stable levels of UPI. She engaged in one UPI in the third session, and her performance immediately decreased to zero for the subsequent two sessions. Ava exhibited an immediate increase in level of UPI with the introduction of reinforcement contingent on

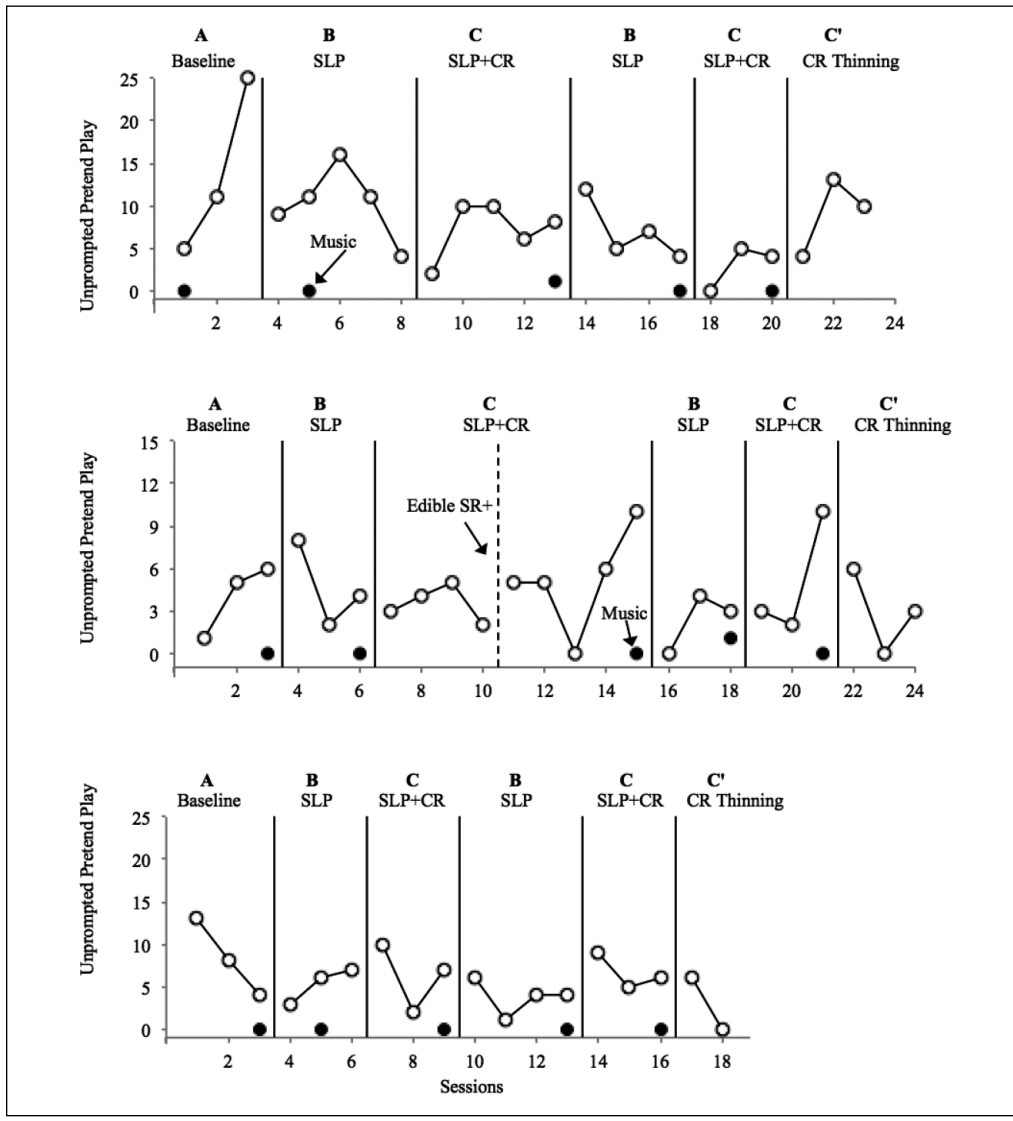

Figure 3. Ava's (top panel), Patrice's (middle panel), and Nora's (bottom panel) unprompted pretend play actions.

Note. Open circles represent the frequency of unprompted pretend play during standard sessions and closed circles represent the frequency during music generalization sessions. For Patrice, edible reinforcement was provided in addition to social reinforcement in both B and C conditions starting with Session 11. SLP = system of least prompts; CR = reinforcement contingent on imitation; SR+ = positive reinforcement.

UPI (C). She engaged in no UPI during the second session, but returned to a high and stable level for the subsequent three sessions. Ava displayed a similar level of imitation during the first session during the return to prompting and noncontingent reinforcement (B), but decreased to zero imitations for the final three sessions. During the final contingent reinforcement condition (C), Ava evidenced an immediate increasing trend for three consecutive sessions with minimal overlap with preceding A and B conditions. Ava's level of imitation remained at comparably high levels when edible reinforcement was thinned to an FR-2 schedule, and increased to the highest observed level when reinforcement was thinned to an FR-3

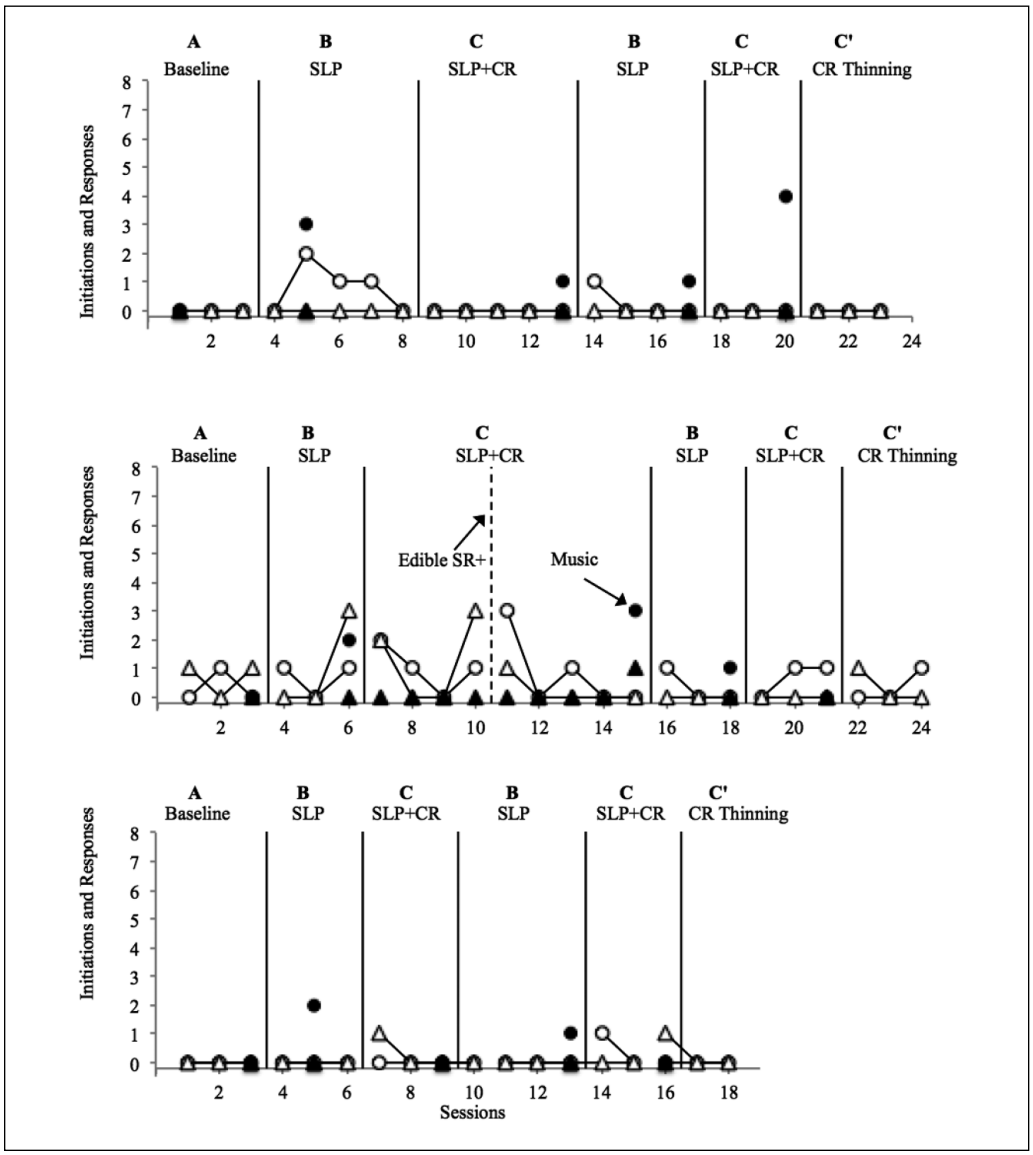

Figure 4. Ava's (top panel), Patrice's (middle panel), and Nora's (bottom panel) unprompted social initiations and responses to peers.

Note. Triangles represent social responses and circles represent social initiations. Closed shapes represent music generalization sessions. For Patrice, edible reinforcement was provided in addition to social reinforcement in both B and C conditions starting with Session 11. SLP = system of least prompts; CR = reinforcement contingent on imitation; SR+ = positive reinforcement.

schedule. These results indicated the presence of a functional relation between contingent reinforcement for peer imitation and Ava's UPI performance. During the first generalization session, Ava did not engage with the music toys. During all subsequent sessions, she engaged with the toys, resulting in comparatively high levels of imitation across subsequent conditions and slightly higher levels of imitation in generalization sessions during contingent reinforcement conditions.

Patrice. During baseline sessions, an increasing trend in the level of Patrice's UPIs was observed (Figure 2). During the prompting and noncontingent reinforcement condition (B), Patrice's level of UPI was low and stable. A slight increase in frequency of peer imitation occurred in the first session with contingent reinforcement (C), but Patrice's performance evidenced a decreasing trend over the next three sessions. Edible reinforcers were added to the fourth session to address increasing levels of challenging behavior, and a clear increased level of UPIs followed this adaptation. When the condition changed and noncontingent edible reinforcement was provided, an immediate decrease in level was noted with a decreasing trend. A differential increase in level was observed immediately after returning to contingent edible reinforcement (C), and imitation remained at this level throughout the thinning condition (Ć). These results indicated the presence of a functional relation between contingent reinforcement for peer imitation and Patrice's UPI performance. Patrice displayed similar levels of UPIs during all generalization sessions across conditions.

Nora. During baseline sessions, Nora engaged in no UPI (see Figure 2). She independently imitated one time during the first session with prompting and noncontingent reinforcement (B), but did not have any UPI during the subsequent two sessions. An immediate and substantial increase in level was noted when the contingent reinforcement condition commenced (C), with an increasing trend. An immediate decrease in level of UPI frequency occurred following the return to prompting and noncontingent reinforcement, with a decreasing trend. During the second contingent reinforcement condition, Nora had an immediate increase in level of UPI and an increasing trend, which continued with the start of the thinning condition (Ć), with her highest level of imitation occurring when the FR-3 schedule was used. The minimal overlap and differentially higher levels of UPI when contingent rather than noncontingent reinforcement was used indicated the presence of a functional relation between the intervention package and Nora's UPI behaviors. Nora evidenced an opposite pattern to Ava's during generalization sessions. Her UPIs were low in the baseline generalization session, with higher levels of UPI during the noncontingent reinforcement conditions.

Pretend Play and Social Interactions

No systematic differences were observed in the level of pretend play between baseline and intervention conditions (see Figure 3). The frequency of pretend play actions remained stable for all participants across conditions and toy sets. These results indicated that prompting and contingent or noncontingent reinforcement for peer imitation was not functionally related to increased levels of pretend play. Ava, Patrice, and Nora had low levels of social interactions during all conditions (see Figure 4). Ava evidenced few initiations and responses across conditions. Most of her interactions occurred during the initial condition without contingent reinforcement. Patrice's levels of social initiations and responses were variable and low across conditions. Despite frequently initiating to the implementer, Nora did not engage in any peer social initiations and responses for most sessions. Thus, the intervention package was not functionally related to increased levels of play or social interactions.

Discussion

In this study, we sought to determine whether providing contingent reinforcement for imitation increased the rate of imitation for three young children with disabilities. The results of the study indicated that the use of SLP with contingent reinforcement, implemented during a typical play-based activity, facilitated peer imitation to a greater extent than the use of SLP without contingent reinforcement. The results also indicated that peer imitation was reversible; that is,

low imitation performance of some children with disabilities might be due to insufficient reinforcement. Moreover, the maintenance of peer imitation following systematic thinning of reinforcement suggested that, once contingencies for imitation were established, they could be thinned to levels that might be feasible for indigenous implementers to use in a classroom. DEC recommends that interventions for children with disabilities occur within typical activities, materials, settings, and people of the child's context (DEC, 2014), which was the case in the current study.

Compared with a normative peer, Ava's and Nora's imitative performance reached and in some cases superseded the peer's frequency of UPIs. As no reinforcement contingencies specifically targeted the peer's imitation, the peer's responding was indicative of a general level of imitation by a typically developing child in the same context. This suggested that the achieved results corresponded with a meaningful difference in peer imitation. These findings support previous research suggesting *reinforcement* might be the active ingredient even in studies with an intervention using systematic prompting (Carr & Darcy, 1990; Ingersoll & Schreibman, 2006). Additional research should examine the assertion that low rates of imitation might be due to performance rather than (or in addition to) skill deficits. Although the generalization data were insufficient for evaluating causation, the lack of generalization across contexts (and toys) suggested discriminative stimuli might be critical for governing children's imitative behavior. That is, the primary instructional context might have served as a discriminative stimulus for the availability of reinforcement contingent on peer imitation, whereas the same was not true for the generalization context (i.e., musical toys). Additional research is warranted examining contexts under which generalized peer imitation occurs.

The conclusion that peer imitation performance was dependent on reinforcement contingencies has broad implications. Steinman (1970) suggested that the presence of generalized imitation in young children might be largely a result of social setting events related to reinforcement contingencies. The results of the current study indicated that children who are imitative of adults but not typically of other children might need to be provided with contingent reinforcement. Environments where children fail to imitate peers might be those in which infrequent reinforcement of imitation occurs. Carr and Darcy (1990) noted the importance of using multiple exemplars and responses while facilitating imitation in young children; the follow-the-leader procedure they used provided both multiple exemplars and responses with minimal implementer effort. Moreover, Ava, Patrice, and Nora's success during the thinning condition suggested that the tangible reinforcement contingencies might be thinned and supplanted by typically occurring consequences such as social praise.

Secondary research questions were related to whether increased peer imitation was correlated with increased levels of pretend play or social interactions; neither pretend play nor social interactions were related to peer imitation. Ava, Patrice, and Nora's pretend play levels remained stable despite improvements in peer imitation. A key consideration is that for more frequent imitation to result in more frequent pretend play, the imitated peers must be engaging in pretend play that can be imitated (Garfinkle & Schwartz, 2002; Werts, Caldwell, & Wolery, 1996). Throughout the course of this study, however, peers were not consistently engaging in high levels of pretend play; thus, many of the actions imitated by the target participants were functional or relational play rather than pretend (play category data are available from the first author via email). Similarly, there were little to no differences across children in levels of social interactions between conditions. This might have been due to the strict coding definitions used and to the structure and adult attention present during the sessions. Previous studies found similar results—social interactions only increased when they were specifically reinforced (Peck et al., 1978). Furthermore, the use of triplicate toys precluded the need for children to share materials, thus eliminating a common source of interaction. Fading the adult and using toy sets with fewer copies might have yielded different results. An important implication of this finding, irrespective of

ecological validity, is that teaching children to imitate their peers might not lead to immediate improvements in other behaviors.

Limitations

A primary limitation of this study was in regard to discriminative stimuli and motivating operations. The implementer conducted RAs for each participant at the beginning of the study to identify reinforcing stimuli. Those stimuli (i.e., tangibles/edibles and social praise) were then used throughout the study without reevaluation of reinforcing value. Thus, the researchers did not account for potential motivating operations that might impact variations in reinforcer value (e.g., hunger or lack of adult attention prior to the session). Furthermore, three different toy sets were used across conditions; however, we did not assess preferences for these toys, which might have influenced the participants' UPI and pretend play behaviors. Regarding discriminative stimuli, the immediacy of change in behaviors following a change in condition was at least partially dependent on the participant discriminating the changed reinforcement contingency. This discrimination might not be an easy task for some children, particularly those with disabilities, and failure to discriminate immediately might have accounted for Ava's slight delay in behavior change in the return to the baseline condition. Similarly, Nora might have been better able to discriminate between generalization sessions and standard play sessions and recognize the distinct contingencies therein, resulting in failure to generalize imitation behaviors.

Another limitation was the applicability of the small group follow-the-leader paradigm, which might not mirror typically occurring events in early childhood settings. Thus, performance in baseline and intervention sessions cannot be assumed to be fully reflective of typical behavior. The follow-the-leader and SLP procedures were implemented to ensure the target child emitted a target response (prompted or UPI) that could be differentially reinforced, which is the mechanism by which stimuli acquire control of responding. Furthermore, the structure of this activity might have influenced the lack of changes regarding play or social behaviors. Relatedly, although tangible and edible reinforcement was thinned during maintenance, social praise was still provided for each occurrence of UPI. The results of the current study indicated contingent reinforcement was a critical component; thus, the social and ecological validity of the reinforcement procedures should be assessed in future research.

Future Directions for Practice and Research

The current findings indicated that early childhood teachers should identify opportunities for peer imitation and provide contingent reinforcement for this behavior. Early childhood teachers also might intentionally plan and implement follow-the-leader type games to create regular opportunities for peer imitation. Follow-the-leader games might be embedded into typical activities such as circle time, small groups, or outdoor playground time. Likewise, peers can be taught to engage in contingent imitation. However, teachers also should promote generalized peer imitation by facilitating and reinforcing peer imitation across settings and activities, particularly for children who are not currently imitating their peers. This includes systematically thinning reinforcement to what is typically occurring.

Additional research is needed to refine and broaden knowledge regarding the use of SLP and contingent reinforcement for improving imitation. First, researchers might seek to determine whether instructing peers to engage in more pretend play results in increased levels of pretend play for the target participant, as improvements in play did not occur in this study. For example, teaching peers to contingently imitate target children during play contexts might serve to increase generalized imitation as well as impact social and play behaviors. Contingent imitation is a component of effective interventions for teaching play (Barton, 2015; Frey & Kaiser, 2011). Similarly,

peers might be trained to facilitate more social interactions throughout sessions. Programming for generalization to another context or set of materials is another potential direction, which might be accomplished through manipulation of the discriminative stimuli that signal the availability of reinforcement for peer imitation.

Third, continued investigation into how best to thin contrived reinforcement contingencies and put children in contact with commonly occurring contingencies could prove helpful in achieving long-term results (Leaf et al., 2012; Singer-Dudek & Oblak, 2013). Such research might contribute to generating a highly feasible strategy for increasing peer imitation across activities and contexts. For example, peer imitation is a social behavior that for typical children might be automatically reinforced or reinforced with peer attention. Methods for teaching generalized peer imitation that maintains in the absence of tangible reinforcement should be explored. Fourth, the limited number of generalization sessions per condition restricts interpretations of generalization results, which should be examined in future research. Children might identify reinforcement contingencies in commonly used interventions that rely at least partially on adult modeling but that fail to generalize to contexts with peers. Finally, additional research is needed to determine the processes by which peer imitation is associated with other outcomes (Stone et al., 1997; Thurm et al., 2007).

Conclusion

In this study, we examined the differential impact of reinforcement contingencies on peer imitation when the SLP was used in a play context. All three participants had increased peer imitation during play when contingent reinforcement was provided. The results indicated that the provision of a reinforcer contingent on imitation of peer play actions was critical for increasing imitation, above and beyond the use of a systematic prompting procedure. These findings are crucial as peer imitation might serve as a behavioral cusp for young children with disabilities, facilitating increased learning opportunities across settings.

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