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Although visually cued imitation training may increase peer imitation, the preexisting skills necessary for success should be identified¹

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1. Would an imitation training package that included a visual cue and multiple levels of prompts result in increased peer imitation and decreased reliance on adult prompts?
2. Would the amount of imitation displayed be different depending on the types of activity?

Design

The study used a multiple-baseline-across-participants design.

Allocation

The participants were assigned to the tiers in the multiple-baseline design based on the order in which their baseline performance became stable.

Blinding

Unblinded; the first author and research assistants collected data. The first author was not blind to the purpose of the study. It is unclear whether or not the research assistants were blind to it.

Study Duration

A total of from 29–57 sessions were conducted with approximately 6 sessions per week.

Setting

This study was conducted in a private school for children with autism spectrum disorders and cognitive impairment.

Participants

Four boys (ages 8 through 13) who met the DSM-IV-TR diagnostic criterion for Autistic Disorder or Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS)

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participated in this study. They were chosen because they failed to imitate peers during classroom activities.

Intervention

The intervention involved presenting a visual cue to imitate and providing multiple levels of prompts. The children engaged in one of the three activities (playing with modeling dough, drawing on a magnetic drawing board, and crafting with paper and other craft supplies) that rotated across sessions. A child was assigned to be a leader (model) and a necklace stating, "Do the same as the leader," was put around the child's neck. The trainer presented the materials for the activity chosen and demonstrated two ways in which the materials could be used. If necessary, a trainer verbally and physically prompted the leader to engage in the activity. If a target child (imitator) did not imitate within 5 s after the leader began an action, the trainer prompted the target child to imitate the leader following this sequence. First, the trainer told the child, "Look at what the leader is doing," and physically guided the child's hand to point to the necklace stating, "Do the same as the leader." Second, the trainer briefly described what the leader was doing and told the target child to do the same. Third, the trainer physically guided the target child's hands on the materials with which the leader was working. Finally, the trainer physically guided the target child to do the same. The trainer stopped the prompting sequence if the target child began engaging in the same activity as the leader. Participants took turns being the leader. A session lasted for 4 min, with data collected on each of 2 target children for half of the session. Following the session, the trainer delivered verbal praise to the target child for imitating the leader, regardless of the level of prompt required.

Interobserver agreement (IOA) was assessed for an average of 60.8% ($SD = 28.9$) and 43.3% ($SD = 20.1$) of sessions across participants during baseline and intervention phases, respectively. Mean IOA during baseline and intervention phases was 93.0% ($SD = 4.1$) and 89.5% ($SD = 3.2$), respectively.

Treatment integrity was assessed for an average of 29.3% of sessions across participants ($SD = 4.5$). The observer scored whether or not each step of the procedure was implemented correctly. The mean treatment integrity across participants was 98.5% ($SD = 1.1$). IOA was not reported for treatment integrity.

Outcomes

The number of 15-s intervals during which at least one imitation occurred served as the primary dependent measure. An instance of imitation was scored "if the participant clearly did the same activity as a peer" (p. 58). The number of intervals, out of 8 possible, during which at least one imitation occurred was compared between baseline and intervention phases as well as across the types of activity. The highest level of prompt delivered during a session was also measured.

Attrition

One of the four originally enrolled participants was dropped from the study due to the lack of significant progress and difficulties with compliance.

Main Results

The implementation of the training package increased imitation and decreased reliance on adult prompts. In three out of the four participants, the number of intervals during which prompted and unprompted imitation occurred increased. Reliance on prompts, as measured by the highest levels of prompt used during each session, decreased as intervention progressed. There was a negative correlation between these two measures: the higher the

number of intervals during which imitation occurred, the lower the level of prompt. Finally, there was no systematic difference in the number of intervals with imitation among the three activities across the participants who completed the study.

Authors' Conclusion

The study demonstrated that the package including the visual cue and multiple levels of prompts is effective in increasing peer imitation in children with autism spectrum disorders (ASD) and developmental delays. Teachers can easily implement this procedure in a classroom setting without great expense in resources.

Commentary

There is no doubt that imitation skills are fundamental to the success of children with ASD. The present study nicely extends previous studies (e.g., Garfinkle & Schwartz, 2002). For example, the addition of the visual cue can be of great value in teaching children with ASD (e.g., Quill, 1997). The procedures used in the target article are of potential value in increasing peer imitation. The authors point out two limitations. First, the study was limited to one setting, and to a restricted set of materials. Second, participants did not demonstrate imitation without the verbal prompt to "look at what the leader is doing." This outcome was at odds with the study's goal of dropping out the prompts. It should be noted, however, that the prompt level that remained was nonspecific in that it did not describe the behavior to be emitted. Control by a nonspecific prompt does not seem to compromise a demonstration of imitation.

We will comment on four general issues that are important in interpreting the results. These include issues of (a) participant generality, (b) the rationale for using visual prompts for verbally skilled participants, (c) defining and measuring imitation, and (d) whether the study demonstrated the *acquisition* of imitation.

The success of any teaching procedure depends on the skills that are already in the learner's repertoire. Thus, making decisions as to whether the evidence supports the use of a procedure involves, in part, the identification of relevant, preexisting skills. Several preexisting skills could have been critical to the rapid development of peer imitation. Broadly speaking, these include language skills and existing imitation skills. Future studies on this topic would benefit from more formal and current information on participants' existing language and imitation skills for purposes of predicting generality, and so that practitioners seeking to implement evidence-based practice may determine the similarity of the research participants to their learners. Measures that are easy to replicate across settings would be especially helpful.

Vocabulary level, as well as the comprehension of multi-word utterances (i.e., sentences), likely were of critical importance to the acquisition of peer imitation with the current procedures. The "flip side" of this is that it is currently unknown whether the procedures would be effective for learners with more limited language skills. Although the paper provides only narrative descriptions of current language skills (except for Nico), current standardized measures of single-word vocabulary (e.g., the Peabody Picture Vocabulary Test) and measures of sentence comprehension (e.g., the Test for the Auditory Comprehension of Language) would be useful in characterizing participant skills because they involve a specific set of stimulus materials that can be presented with fidelity across settings.

It seems likely that the participants had preexisting imitation skills (see below for further discussion). That is, given the model of a novel behavior and a request such as "do this," participants would imitate the model. The rapid development of peer imitation could have

depended on existing imitation skills, and the absence of such skills would likely predict much less success with these procedures. Measures of preexisting imitation skills would be very helpful in determining participant generality.

A central theme of the introduction is that visual cues are recommended for children with ASD due to difficulties “attending to and understanding auditory information” (p. 57). Based on the information presented in the participant section, it is not clear that the participants had general deficits in understanding auditory information. With regard to the specific skills targeted in the study, the effectiveness of the prompts showed that a brief verbal description (level 3 prompt), sometimes with the addition of a prompt that involved moving the participant’s hands to the materials (level 4 prompt), always produced the target behavior for Henry and Aidan, and sometimes did so for Santo (see Figure 2). Thus the reason for the use of the visual cue with these participants is unclear. This is also related to the issue of participant generality.

In imitation, the topography of the imitator’s behavior is functionally controlled by the model’s behavior (Baer, Peterson, & Sherman, 1964). Measuring imitation in a naturalistic context is clearly a challenge, and the paper takes a nice step towards meeting that challenge. Two features of the methods, however, leave open the possibility that the target child’s behavior was not controlled by the model. First, the definition of imitation (the target child emits the same behavior as the leader at least once during a 15-s interval) leaves open the possibility that the target child engaged in multiple actions, one of which happened to correspond to the leader’s action. Although the materials provided had multiple potential uses, which could have decreased the possibility of accidental correspondence, the trainer demonstrated two ways of using the materials. The demonstrations may have decreased variation in the activities that both the leader and the target child engaged in (potentially increasing accidental correspondence). It would be interesting to measure other behaviors involving the materials, to determine how precisely the model controlled the imitative response. Related to this, it appears that, by the end of training, the target child had experienced all of the modeled behaviors several times. It would be interesting to know whether the participants would imitate novel activities, an important test for generalized imitation.

Did participants learn to imitate peers within this study? The study is somewhat inconclusive in that, even if the behaviors observed in the target children did involve imitative control, it remains unclear whether the imitation was established during the study. It appears that imitative behavior was acquired without delivering reinforcers contingent on each occurrence of behavior. Although verbal praise was provided *following* a 4-min session, such delayed consequences would likely not result in the *acquisition* of imitative behavior. Taken together with the fact that some level of unprompted imitation was shown in baseline, peer-imitation skills may already have been in the participants’ repertoires, but the frequency was low for motivational reasons. This point again relates to assessing the generality of the findings—the procedure might be effective for increasing peer imitation, but it is yet to be seen whether it also is effective for establishing an initial repertoire of peer imitation.

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