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COMPARING THE EFFECTS OF ECHOIC PROMPTS AND ECHOIC PROMPTS PLUS MODELED PROMPTS ON INTRAVERBAL BEHAVIOR

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We compared strategies to teach vocal intraverbal responses to an adolescent diagnosed with autism and Down syndrome. One strategy involved echoic prompts only. The second strategy involved an echoic prompt paired with a modeled prompt in the form of sign language. Presenting the modeled prompt with the echoic prompt resulted in faster acquisition of correct responding. Results are discussed in terms of using functional stimulus classes to facilitate vocal intraverbal acquisition with learners who have a history of sign language training.

Key words: intraverbal, echoic, modeled prompts, functional stimulus class

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Intraverbal behavior is controlled by a verbal stimulus, lacks point-to-point correspondence with the verbal stimulus, and is maintained by generalized conditioned reinforcement (Skinner, 1957). An example of an intraverbal behavior is saying "fine" in response to the verbal stimulus "How are you?" Identification of effective prompt strategies for teaching vocal intraverbal behavior to children with disabilities may be difficult (Schreibman, 1975). Results of previous studies suggested that prompting that involved transfer-of-stimulus-control procedures may be an effective strategy for teaching intraverbal behavior (Finkel & Williams, 2001; Goldsmith, LeBlanc, & Sautter, 2007; Vedora & Meunier, 2009). In these studies, the nonverbal stimuli (printed words, picture, or object) or the vocal stimulus (echoic) reliably evoked vocal behavior, resulting in successful transfer of stimulus control to a verbal stimulus. For some learners, however, these procedures may be ineffective, and it may be necessary to examine further the learner's history of responding to determine a more appropriate prompting strategy. For learners with a history of communicating with sign language, modeled prompts may facilitate acquisition of vocal intraverbal behavior when other prompts fail. Sign language, although topographically dissimilar to spoken language, may facilitate vocal language because both response forms may be members of the same functional stimulus class. The purpose of the current study was to compare the effectiveness of echoic prompts alone with echoic prompts plus a modeled prompt to teach vocal intraverbal responses to an adolescent girl with autism and Down syndrome who had a history of sign language training.

METHOD

Participant, Setting, and Materials

Penny was a 13-year 9-month-old girl who had been diagnosed with autism and Down syndrome. She attended an intensive behavioral intervention clinic-based program. At admission, Penny echoed two sounds, imitated two movements, and engaged in minimal listener behavior. She did not emit tacts or intraverbals, and mands were limited to gestures. She previously had been taught to use sign language as a response for

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various verbal operants. After 7 months of intervention and prior to the start of the study, she no longer was taught sign language and instead was taught vocal responses.

Penny was chosen for this study because she seemed to acquire vocal intraverbal responses more slowly than other verbal behavior. Intraverbal behavior was targeted because Penny's echoic repertoire appeared to be extensive. Prior to the study, she had been taught intraverbal behavior exclusively with echoic prompts (although she had been taught other verbal operants with modeled prompts). She was also chosen for this study because she had been observed to emit motor movements independently during vocal responding, although she was not required to do so. These movements consisted of three to five of the same gross motor movements (e.g., moving one hand back and forth horizontally in the air). Specific motor movements did not appear to correspond with specific vocal responses. For example, although at times she clapped her hands when emitting the vocal response "go," this was not always the case; and, at times, she clapped her hands when emitting other vocal responses. These motor movements also did not resemble any form of stereotypy. All sessions were conducted in a classroom with other children and instructors. Penny's area contained a table, chairs, and other classroom materials.

Response Measurement and Interobserver Agreement

Correct independent intraverbal responses served as the primary dependent variable. Correct independent intraverbal responses were defined as vocal responses that occurred within 3 s of the presentation of the verbal stimulus, occurred in the absence of prompts (i.e., modeled or echoic prompts), and matched the target trained response. Approximations that consisted of minor articulation errors were accepted and defined prior to the start of the study. Interobserver agreement was calculated on a trial-by-trial basis by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. An agreement occurred if the primary and reliability collector recorded a correct response. A disagreement occurred if one collector recorded a correct response and the other collector recorded an incorrect or no response. Mean interobserver agreement was 96% (range, 75% to 100%) and was collected during 78% of sessions.

Design

A modified alternating treatments design with a repeated A–B design across sets of stimuli was used. Six intraverbal stimuli in the form of questions were chosen. Each of the three stimuli in the two sets was assigned to a different teaching method.

Baseline. During baseline, the three verbal stimuli for the set being evaluated were presented in a block of five trials (i.e., five times in a row). The order in which these five trial blocks were presented was determined quasirandomly. Sessions continued until each verbal stimulus was presented 15 times (i.e., three blocks of five trials for each verbal stimulus). Correct responses resulted in praise and access to an edible item that had been identified as preferred in a single-stimulus preference assessment (Pace, Ivancic, Edwards, Iwata, & Page, 1985). Incorrect responses were followed by the next trial. No prompts were delivered.

Treatment sessions. Six intraverbal stimuli were assigned to two sets and three treatment conditions, as shown in Table 1. The three stimuli assigned to Set 1 were always presented together in the same sessions, and those assigned to Set 2 were presented together in the remaining part of the treatment sessions. Thus, the two stimuli associated with each treatment condition were exposed to the same intervention, but in different treatment sessions.

Each treatment session consisted of 35 trials that involved either the three intraverbal discriminative stimuli (S^D) in Set 1 ("What

Table 1
The Two Sets and Three Treatment Conditions for the Six Intraverbals

	S^D verbal only	S^D + echoic	S^D + echoic + model
Set 1	What do you throw?	What do you swim in?	What can you drive?
Set 2	What goes with socks?	What goes with a spoon?	What goes with brush?

do you throw?," "What do you swim in?," "What can you drive?") or the three intraverbal stimuli in Set 2 (What goes with socks?," "What goes with spoon?," "What goes with brush?"). For 15 of these trials, each of the three intraverbal stimuli in a given set was presented alone without any additional prompts (e.g., "What do you swim in?"). These independent probe trials (verbal S^D only [control] condition) were identical to baseline trials except for their presentation order. In baseline, the intraverbal stimuli were presented individually in blocks of five trials each, but during treatment (a) each session began with three of these independent probe trials (one for each intraverbal stimulus in a given set) and (b) the remaining 12 independent probe trials were interspersed in a quasirandom fashion with the other 20 trials (described below). Because they were identical to baseline, these independent probe trials were used as the dependent variable to measure changes from baseline to treatment and across treatment conditions.

For five of the trials in each treatment session, the stimulus assigned to the S^D with echoic prompt condition (e.g., for Set 1, "What can you drive?") was presented immediately followed by the relevant echoic prompt (e.g., "car"). For another five trials in each treatment session, the intraverbal stimulus assigned to the S^D with echoic and modeled prompt condition (e.g., for Set 1, "What do you swim in?") was presented immediately followed by the relevant echoic prompt (e.g., "pool") concurrent with the relevant modeled prompt (e.g., the therapist moved two hands in a swimming motion based on the American Sign Language sign for swimming).

The remaining 10 trials in each treatment session were identical to the 10 described immediately above, with the following exceptions. If Penny responded correctly following either the echoic prompt or the combined echoic plus modeled prompt (e.g., said "car" after the therapist provided the echoic prompt "car"), the therapist provided brief praise and then repeated the intraverbal stimulus without any additional prompts (e.g., "What can you drive?"). If Penny responded correctly after this repetition of the intraverbal stimulus, the therapist provided praise and a preferred item. After Penny responded correctly to this repetition of the intraverbal stimulus during 80% or more of such trials for four consecutive sessions, distracter questions that consisted of previously mastered tasks (e.g., "clap hands") were inserted between the prompt and the repetition of the intraverbal stimulus (e.g., "What can you drive?" → "car" → correct prompted response → "clap hands" → correct response to distracter task → "What can you drive?"). These additional procedures were intended to decrease prompt dependence and promote independent responding, but were not measured as part of the primary dependent variable (and thus are not shown in Figure 1).

Every attempt was made to choose modeled prompts that were the American Sign Language version of the word. However, if the actual sign for the word involved fine motor movements, the sign was modified. The modeled prompt for "ball" consisted of four fingers and the thumb of both hands placed together in a circular shape, the prompt for "pool" consisted of two hands together in front of the face and moved apart as in a swimming motion, and the modeled prompt for "shoes" consisted of two fists placed together with the thumb of each hand touching one another.

Best alone. During the best alone phase for Set 1, the intervention shown as most effective

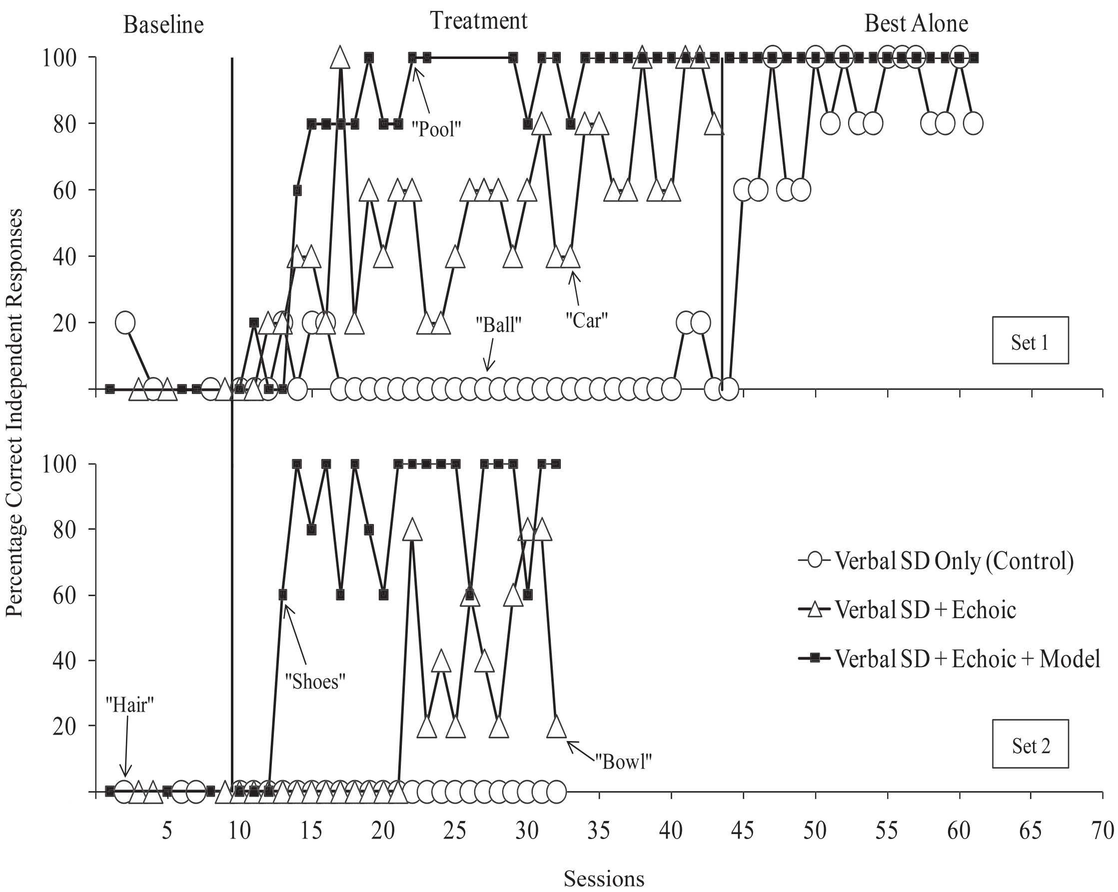

Figure 1. Percentage of correct independent responses associated with each teaching method for Set 1 and Set 2 across baseline and treatment during the verbal SD only trials.

in the previous phase was implemented with the control target. Therefore, the verbal stimulus originally assigned to verbal S^D only (control) trials during the treatment phase ("What do you throw?") was reassigned to the verbal S^D with echoic and modeled prompt trials. In addition, the verbal stimulus that was assigned previously to the verbal S^D with echoic and modeled prompt trials during the treatment phase ("What do you swim in?") continued to be presented as verbal S^D only trials. That is, no echoic or modeled prompt trials were interspersed with the verbal stimulus "What do you swim in?" during this phase because the response had been mastered. This phase was not conducted with Set 2 because Penny was discharged from the behavioral program.

RESULTS AND DISCUSSION

Figure 1 depicts the results for Set 1 (top) and Set 2 (bottom). Only independent responses are shown; trials with prompting and transfer trials are not included. During baseline for Set 1, Penny did not emit correct responses, except once for the verbal stimulus "What do you throw?" (M = 2.2%). During treatment, Penny occasionally continued to emit the response assigned to the verbal S^D only trials (i.e., "What do you throw?"); however, she typically responded incorrectly (M = 2.9%). When the verbal S^D with echoic trials was implemented, Penny's responding to the verbal stimulus "What can you drive?" increased; however, responding was variable and increased slowly (M = 52.3%). Responding to the verbal stimulus "What do you swim in?," which was assigned to the verbal S^D with echoic and modeled prompts trials, showed an immediate increase and remained stable and high through the treatment evaluation (M = 80%), suggesting that the addition of the modeled prompt aided in acquisition of the targeted response. In the final best alone phase, the response assigned to the verbal S^D only trials was reassigned to the verbal S^D with echoic and modeled prompt trials, and Penny's responding increased quickly and remained stable (M = 78.9%).

During baseline for Set 2, Penny did not emit correct responses (M = 0%). During treatment she never responded correctly to the verbal stimulus in the verbal S^D only trials, "What goes with brush?" In the verbal S^D with echoic trials ("What goes with spoon?"), responding increased; however, responding was variable and increased slowly (the first 13 treatment sessions consisted of 0% correct responding; M = 22.6%). Responding to the verbal stimulus "What goes with socks?" in the verbal S^D with echoic and modeled prompt trials showed an immediate increase and remained stable and high throughout the treatment evaluation (M = 76.5%), suggesting again that the addition of the modeled prompt facilitated acquisition of the targeted response.

These results had particular clinical significance for Penny. Teachers were instructed to use modeled prompts to augment echoic prompts when teaching intraverbals. The addition of a modeled prompt allowed Penny to acquire skills at a higher rate, resulting in more skill acquisition in less time.

Penny's prior sign language training may provide an explanation for the results obtained. It is possible that the modeled prompt and the targeted vocal intraverbal response were members of a functionally equivalent stimulus class due to Penny's prior sign language training. Thus, the modeled prompt may have facilitated acquisition of correct intraverbal responding because transferring stimulus control from a preexisting equivalent stimulus class member was easier than was the case for the echoic prompt, which may not have shared the same stimulus function.

The study is limited because it included one participant with a unique learning history. Future research should examine the effects of modeled prompts for learners with different histories. Data were not collected on whether Penny emitted the modeled prompt during vocal responding. Anecdotally, she occasionally emitted the modeled prompt. It would be interesting to determine whether she consistently emitted the modeled prompt or whether the modeled prompt within sessions simply helped later discrimination. Finally, future research should examine whether adding modeled prompts when teaching other verbal behavior may result in faster acquisition of vocalizations in the same way that modeled prompts effected vocal intraverbal language for Penny.

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