

## Teaching Intraverbal Behavior to Children with Autism: A Comparison of Textual and Echoic Prompts

Joseph Vedora and Laura Meunier, BEACON Services  
Harry Mackay, Northeastern University and Praxis Inc.

Although echoic prompts may be effective for teaching intraverbal behavior to children with autism, the performance of some children may become dependent on such prompts (i.e., the prompts cannot be eliminated). Recent research suggests that visual rather than echoic prompts may be used to teach children with autism a variety of skills and may facilitate independent performance. In the present study, an adapted alternating treatments design was used to compare the effects of using visual (textual) and echoic prompts on acquisition of intraverbal responses (answering questions) by 2 children with autism. The results indicated that the textual prompts were more effective than the echoic prompts. Implications for the use of visual prompts during instruction with children with autism are discussed.

*Key words:* echoic prompt, textual prompt, intraverbal, autism

Children with autism often rely on prompts provided by teachers to answer questions and may never come to answer the questions independently. Echoic (verbal) prompts are often used, for example, to teach children with autism to tact, mand, and ask questions (e.g., Williams, Carnerero, & Perez-Gonzalez, 2006; Williams, Donley, & Keller, 2000). The procedures typically involve presentation of a vocal-verbal model of the desired response, differential reinforcement, and fading of the model. However, echoic prompts may be difficult to eliminate by fading. Even a single brief sound used as a prompt in the final fading step may come to exert lasting control over responding (McClannahan & Krantz, 1997). Such failure to eliminate instructional prompts significantly limits a child's independent performance.

Visual prompts may provide an alternative to echoic prompts. For example, Quill (1997) noted that children with autism benefited from visually cued instruction and recommended a shift in emphasis from language-based instruction to the use of more visual supports. Other research has demonstrated the effective use of pictorial prompts for

teaching children with autism (e.g., McClannahan & Krantz, 1997; Pierce & Schreibman, 1994; Schmit, Alper, Raschke, & Ryndak, 2000). Their use in activity schedules (MacDuff, Krantz, & McClannahan, 1993), the picture exchange communication system (Bondy & Frost, 1994), and schedule boards (Savner & Myles, 2000) are a few examples. In addition, Goldsmith, LeBlanc, and Sautter (2007) used pictures as a form of tact prompt to teach intraverbals to 3 children with autism.

To date, only Finkel and Williams (2001) have compared the instructional effectiveness of textual and echoic prompts. They used these prompts to teach the intraverbal behavior of answering questions (with sentences) in an experiment with a multiple baseline design. The participant was a 6-year-old boy with autism who was described as a visual learner with slightly above average sight-reading skills. Finkel and Williams's results indicated that the participant answered no questions correctly during an initial baseline condition. Then, introduction and fading of the echoic prompts slightly increased partial-sentence answers that were maintained in follow-up tests. In contrast, the use of the textual prompt-fading procedure increased the number of questions answered correctly with target full-sentence answers. That performance was maintained at follow-up. In sum, these data suggested that textual prompts were more effective than echoic prompts in teaching intraverbals to a child with autism.

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This report is based on a thesis submitted by Laura Meunier to the Department of Counseling Psychology, Rehabilitation, and Special Education, Northeastern University, Boston.

Correspondence concerning this article should be addressed to Joe Vedora, BEACON Services, 321 Fortune Blvd, Milford, Massachusetts 01757. (e-mail: jvedora@beaconservices.org).

Table 1  
*Questions and Answers for Each Participant*

Child	Textual	Echoic
Sam	Set 1 Q: "What do you do with a stove?" A: "cook"	Q: "What do you do with a cup?" A: "drink"
	Set 2 Q: "What do you do with a book?" A: "read"	Q: "What do you do with a fork?" A: "eat"
	Set 3 Q: "What do you do with a phone?" A: "talk"	Q: "What do you do with a pencil?" A: "write"
Kevin	Set 1 Q: "What do you do with a vacuum?" A: "clean"	Q: "What do you do with a crayon?" A: "color"
	Set 2 Q: "What do you do with a bike?" A: "ride"	Q: "What do you do with a toy?" A: "play"
	Set 3 Q: "What do you do with a chair?" A: "sit"	Q: "What do you do with scissors?" A: "cut"

The present study sought to extend the research of Finkel and Williams (2001). Specifically, we aimed to assess the effects of echoic and textual prompts on acquisition and generalization of intraverbals (answering questions with single words) by 2 young children with autism.

METHOD

*Participants*

Two 7-year-old boys with autism participated. Both spoke in three- to four-word sentences, could follow a few simple one- or two-step instructions, and had learned a vocabulary of sight words (Sam, about 50 words, Kevin, about 100). Kevin also was able to answer a few social questions (e.g., "What's your sister's name?"; "Where do you live?"). Both attended school and received one-on-one instruction based on the principles of applied behavior analysis.

*Setting and Materials*

For Sam, each session was conducted in a small classroom where he sat with the experimenter at a table facing a wall to minimize distractions. Sessions lasting 10 min occurred once or twice a day during school hours. Sessions with Kevin also lasted about 10 min. They occurred three to five times per week and were conducted at his desk in his bedroom.

Table 1 shows the three sets of questions and the corresponding target single-word answers that were used in each condition for each participant. The questions and responses were considered to be functional, referring to common objects and activities that the participants might encounter, and the responses were presumed equally difficult to learn based on an analysis of the answer words (i.e., number of syllables) and baseline performance. Each set consisted of two questions; the answer to one was prompted by a textual prompt and the answer to the other by an echoic prompt. Each textual prompt was the word to be spoken by the participant in answer to a particular question. The words were printed on individual laminated pieces of paper (5 cm by 5 cm). Echoic prompts were the same single words spoken by the experimenter.

*Dependent Variables and Measurement*

The dependent variable was the accuracy of a participant's one-word responses (listed in Table 1) to questions. Partial responses, responses that contained multiple words, and prompted responses were scored as incorrect (e.g., answering "cl" when asked, "What do you do with a vacuum?"), as were responses that contained part of the questions (e.g., answering "bike ride" when asked, "What do you do with a bike?") and answers that did not make sense (e.g., answering "fork" when asked, "What do you do with a fork?").

In every session, 10 questions were presented. The mastery criterion, at least nine correct answers to the 10 questions asked in each of two consecutive sessions, was the same for both participants in both prompt conditions. After both questions in a set were mastered, baseline and training began for the following set.

### *Experimental Design*

An adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985) was used to compare the effects of textual and echoic prompts on the acquisition and generalization of the intraverbal responses. The order in which the different prompts were used in training was varied unsystematically. This design permitted assessment of the effects of the training conditions within and across participants. When criterion was not met after four sessions of training with one prompt type, it was replaced by the other type of prompt in a final best treatment phase.

### *Interobserver Agreement*

Interobserver agreement data were collected in 33% of the sessions by having an independent observer score the answer given to each question. Agreement was defined as both observers scoring a response correct, or both observers scoring a response incorrect. Interobserver agreement was determined by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Agreement was 100% for each participant.

### *Procedure*

*Preliminary teaching.* This training was given to ensure correct oral naming of the words to be used in the textual prompt condition before experimental training began. Sam learned to name these printed words in a total of three sessions. Kevin named the necessary words prior to the study. The responses to be used in the echoic condition were also evaluated. On these trials, the experimenter asked the students to, "Say —." Both students did so on all trials.

*Baseline.* Each question in a set was presented 10 times (20 trials total). No prompts were delivered, and no programmed consequences followed correct or incorrect responses.

*Textual prompt.* The textual prompts listed in Table 1 were used to teach three intraverbal responses to Sam and Kevin. The training used a progressive prompt-delay procedure (Touchette, 1971). Initially, prompts immediately (0-s delay) followed question presentations. Then the delay between the question presentation and the prompt was increased gradually to allow the participant time to respond independently before the prompt was presented. Correct responses canceled the scheduled presentation of the prompt, and after two consecutive correct trials the delay was increased by 1 s up to a maximum of 5 s. If the participant did not respond or made an error, the prompt was given, the trial was scored as incorrect, and the delay was reduced by 1 s on the following trial. Tokens and praise were delivered contingent on correct responses and prompted responses during the 0-s delay condition.

*Echoic prompt.* The echoic prompts listed in Table 1 were used. The training used the same progressive prompt-delay procedure used in the textual prompt condition.

*Generalization tests.* After the trained performances were mastered, two additional teachers (Sam) and two family members (Kevin) implemented trials with the trained stimuli to examine generalization across people. Sam's tests were conducted during his school day in the separate room where training occurred or in his regular classroom. Kevin's tests occurred after school at his home. Ten trials were implemented for each question.

## RESULTS

Figure 1 displays Sam's unprompted answers to questions during baseline, training with both textual and echoic prompts, and generalization tests. During the baseline conditions with all three stimulus sets, he answered no questions correctly. Sam then learned to answer all six questions, but the effectiveness of the prompting conditions differed. He learned the answer presented by textual prompt in Set 1 (top) in five sessions.

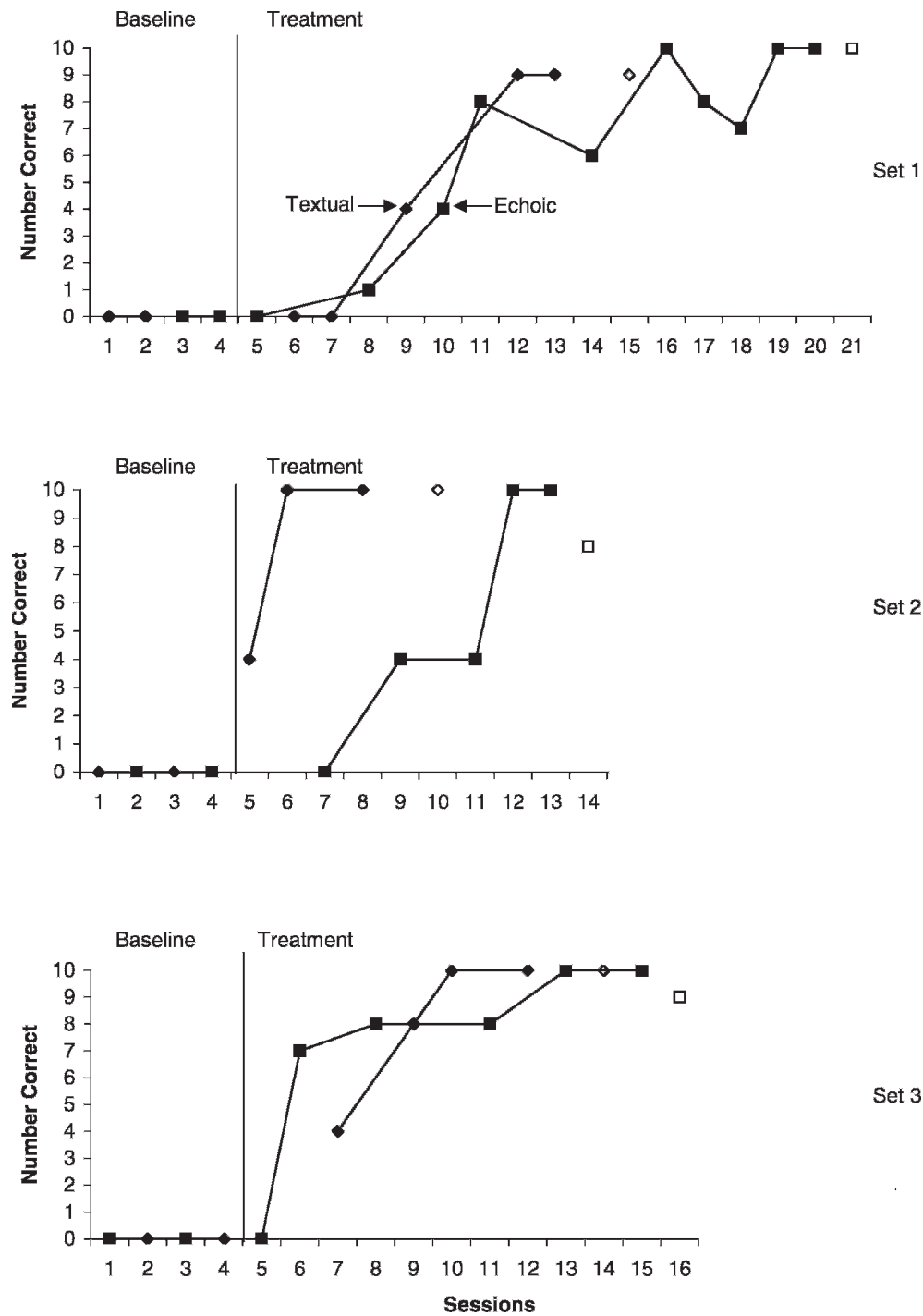


Figure 1. Number of independent correct responses per session for Sam. The upper, middle, and bottom panels show data for Sets 1, 2, and 3, respectively. The open data points represent generalization tests.

On all the trials on which answers were not given independently (e.g., all textually prompted trials in Session 5), delivery of the prompt produced the correct answer. In contrast, training with the echoic prompt took 10 sessions, and errors (e.g., partial answers) as well as prompted correct answers occurred. On generalization tests, Sam independently answered almost all questions. The same advantages for textual prompts occurred for Sets 2 (middle) and 3 (bottom). These performances generalized across persons regardless of training method.

Figure 2 displays the results for Kevin. During baseline, no questions were answered correctly for any stimulus set. In the first session with Set 1 (top), he responded correctly in four textually prompted trials. Criterion then was met in Sessions 2 and 3. In the echoic prompt condition, he failed to reach criterion for the response to the question, "What do you do with a crayon?" In the first four sessions, he responded incorrectly by either repeating the last word of the question or giving an approximation of the word. The textual prompts were then applied, and criterion was met after three sessions. On generalization tests, he independently answered all questions. His results for Set 2 (middle) and Set 3 (bottom) show faster acquisition in the textual prompt condition. Performance on generalization tests was highly accurate.

Table 2 displays the number of trials to criterion for each participant. Both required fewer trials to reach criterion for each stimulus set that was taught using the textual prompt.

## DISCUSSION

The present results extend the findings of Finkel and Williams (2001) with 2 participants with autism and different tasks and training procedures. The data suggest that the use of textual prompts and a progressive prompt-delay procedure established intraverbal skills, like those studied by Finkel and Williams, more rapidly than echoic prompts with the same delay procedure. At the start of the experiment, both participants failed to answer the questions. Both then quickly reached criterion performance in the textual prompt conditions. They responded correctly

on all trials in the textual prompt conditions, thus demonstrating errorless learning of the answers to the questions presented during these conditions. In contrast, although both children demonstrated generalized echoic repertoires prior to this study, they made errors during training with echoic prompts and thus required more instructional trials to reach criterion. During his first exposure to the echoic prompt condition, Kevin did not respond independently on any trial in four sessions. However, after the echoic prompts were replaced by textual prompts, he learned to answer the same question appropriately in three sessions. These results suggest that the participants' possession of generalized echoic repertoires did not suffice to enable effective use of echoic prompts as critical training cues.

The present study involved several methodological and procedural differences from Finkel and Williams (2001), including a different experimental design, teaching single word rather than short sentence answers to questions, and the use of prompt delay instead of fading. Of particular interest is the use of the prompt delay to transfer control from the prompt to the relevant antecedent verbal stimulus. Despite this procedural difference, the textual prompts were more effective, suggesting that the type of prompt rather than the transfer-of-control procedure was responsible for the differences in responding.

Accounting for the greater effectiveness of the textual prompts may involve both subject and procedural variables. First, some researchers suggest that children with autism are visual learners (e.g., Quill, 1997; Tissot & Evans, 2003). Previous research has demonstrated that visual prompts can be used effectively with children with autism to establish a variety of skills, including communication, self-help, and leisure skills (Bondy & Frost, 1994; McClannahan & Krantz, 1997; Pierce & Schreibman, 1994; Quill; Schmit et al., 2000). The present research extends these findings and, together with that of Finkel and Williams (2001), suggests that visual (here textual) prompts also are effective for teaching intraverbal behavior. It is not clear, however, to what extent such results may reflect a greater sensitivity of individuals with autism to

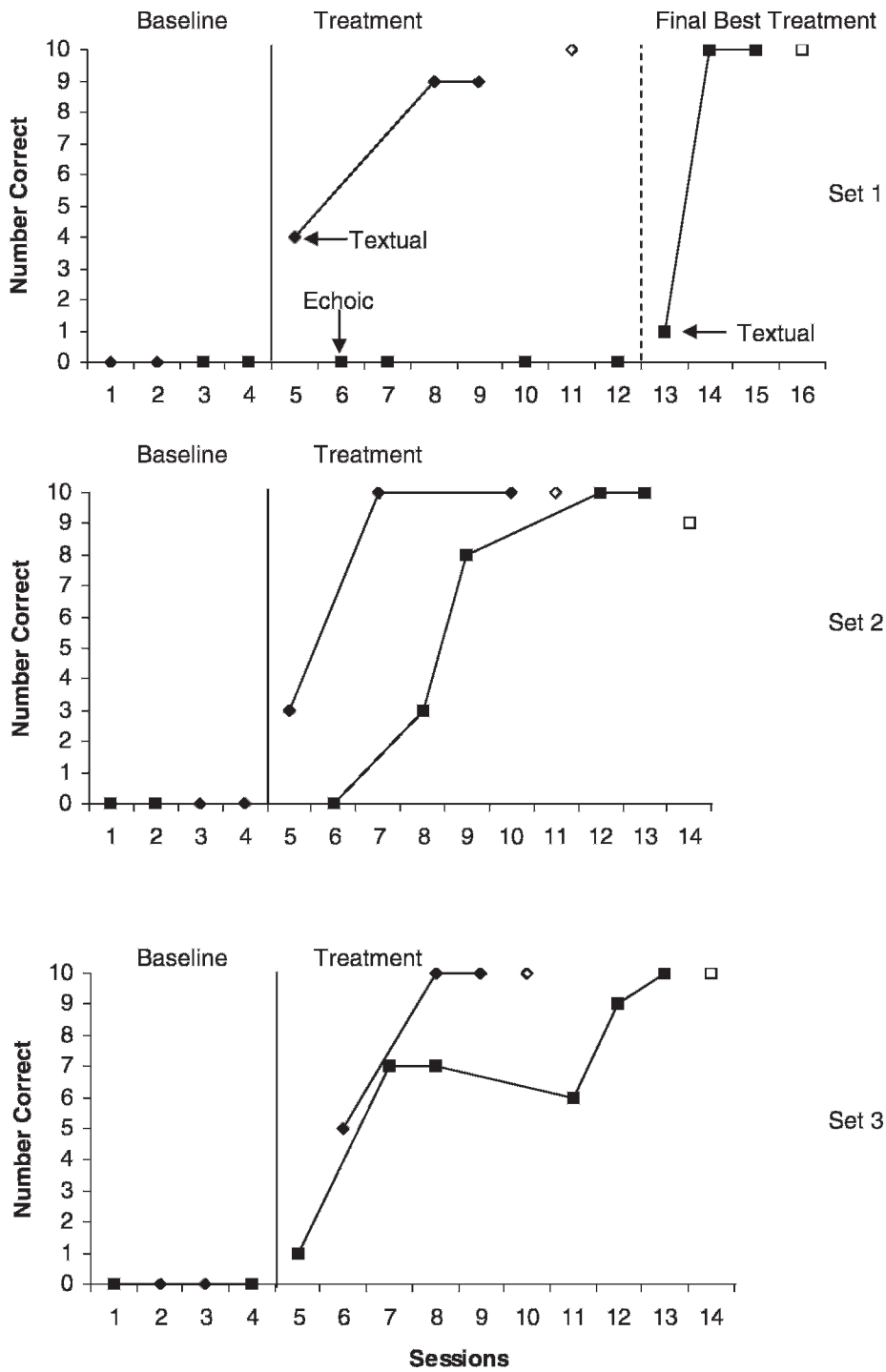


Figure 2. Number of independent correct responses per session for Kevin. The upper, middle, and bottom panels show data for Sets 1, 2, and 3, respectively. The open data points represent generalization tests.



Table 2  
*Total Number of Trials to Criterion for  
 Each Condition*

Child		Textual	Echoic
Sam	Set 1	50	100
	Set 2	30	50
	Set 3	40	60
Kevin	Set 1	30	— <sup>a</sup>
	Set 2	30	50
	Set 3	30	60

<sup>a</sup> Did not meet criterion.

visual cues or, as Finkel and Williams described, a prior history that did not establish or maintain attending to echoic prompts. Such a history would render the echoic prompts used in this study less effective at evoking the responses to be trained and, more generally, would help to account for the behavior that underlies the notion that children with autism may attend better to objects than to people (Charlop-Christy, Le, & Freeman, 2000). In addition, aspects of the prompt procedures used in this study may contribute to the difference in effectiveness of the textual and echoic prompts. The textual prompts remained available until the child answered the question. In contrast, the spoken echoic prompts were transitory. They were presented only once and were not repeated, thus yielding a delayed prompting condition that may have failed to support the desired behavior of answering the question by imitating the prompts. Further research is needed to clarify these possibilities.

The results of this study are socially significant. Both participants demonstrated rapid acquisition of responses that also occurred in novel situations in which people who were not involved in the training asked the questions. Several empirically supported curricula for children with autism recommend that similar intraverbal performances be included as objectives in instructional programs (Leaf & McEachin, 1999; Partington & Sundberg, 1998). Such development of an intraverbal repertoire may enhance a child's conversational skills and enable him or her to respond more effectively and appropriately to other people. In addition, a student's ability to respond to statements and answer questions

may improve performance on tests designed to measure academic performance (Goldsmith et al., 2007). Thus, Sam's and Kevin's teachers could continue to use textual prompts to expand the intraverbal repertoires already established and improve conversational skills and performance on academic assessments. Lastly, the implications of the present study are practical because textual prompts can be applied in a variety of programs. Although the materials used were printed and laminated, they may be made more accessible and even less expensive by writing the cues on a piece of paper.

The present findings are limited by the failure to demonstrate formally the equivalence of the instructional sets (Sindelar et al., 1985). Thus, it is possible that the results reflect differences in the difficulty of questions and responses rather than effectiveness of instructional procedures. However, this concern is lessened by the successful replications with each participant. Another potential limitation in the use of textual prompts to teach intraverbal skills is the need to teach the reading responses that ensure the effectiveness of the printed prompts. This was not an issue in Kevin's case because he was able to read the textual prompts prior to beginning the study. However, Sam required training to do so, although that was not time consuming. Also, although generalization tests were conducted following training, generalization was not formally assessed, and further research is needed to clarify whether different instructional prompts affect generalized responding. Finally, the present study included only 2 children with autism. Future research should examine generality by including more participants of different ages and disabilities.

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