

## **A Comparison of Textual and Echoic Prompts on the Acquisition of Intraverbal Behavior in a Six-Year-Old Boy with Autism**

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A comparison of textual and echoic prompts was conducted to determine which form of prompts was more effective for teaching intraverbal behavior to a 6-year-old boy with autism. A multiple baseline design across three sets of questions measured (a) the number of full-sentence target answers, (b) partial answers that made sense, and (c) partial answers that did not make sense, or no response, to direct questions asked. A fading procedure using either scripted textual or scripted echoic prompts was employed to evoke the child's correct answers. Although both forms of prompts were effective, results indicated that textual prompts were much more effective. These findings suggest that textual prompts may be effective in teaching complex skills to children with autism.

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One of the most prominent characteristics of children with autism is a profound delay or impairment in their expressive language (Secan, Egel, & Tilley, 1989). Given the recognized impact of severe language and communication delays on all facets of the child's life, a thorough understanding of all variables that contribute to successful treatment is needed (Shafer, 1993). These language problems are quite complex and usually require specialized intervention programs. Various effective strategies, including functional communication training, incidental teaching, pivotal response training, social inclusion, speech intelligibility training, and discrete-trial training, have been developed by researchers for teaching language skills to persons with autism and other severe handicaps (Koegel, Koegel, & Dunlap, 1996; Lo-

vaas, 1987). One feature of most instructional and social interchanges, regardless of specific content, involves mands and intraverbals (Secan et al., 1989). Intraverbal responding, such as question answering, plays an important role in the development of appropriate conversational skills (Skinner, 1957; Watkins, Pack-Teixeira, & Howard, 1989). Specific question-answering skills may also be necessary for safety reasons in today's society (e.g., giving name, phone number, and address when asked by police should one become lost).

Communication impairments may include a lack of functional receptive or expressive language; delayed or defective mand, tact, and intraverbal repertoires; speech that is repetitive or nonsensical; or well-developed speech that is not used socially (Maurice, Green, & Luce, 1996). Each child is a unique individual; thus, it is necessary to design a language intervention plan to meet the needs of the individual most effectively. Children with autism may require different or unique teaching approaches. It is critical that these children learn how to use language functionally. For example, answering questions appropriately will allow an increased degree of independence that people without disabilities take for

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granted. Also, learning to communicate effectively should reduce the stigma that can accompany autism.

A surprising number of children with autism can identify numbers and letters (Sundberg & Partington, 1998). These children often selectively or overselectively attend to letters and words. Hyperlexia refers to a group of children with cognitive deficits and behavioral abnormalities who manifest an unusual ability to read (Silberberg & Silberberg, 1967). Children with hyperlexia and autism share the unique attribute of advanced word-recognition skills in the presence of poor reading comprehension and deficits in linguistic or cognitive functioning (Tirosh & Canby, 1993). Hyperlexia is an important variable because its appearance in some children with autism may indicate an improved outcome (Burd, Kerbeshian, & Fisher, 1985). A recent study showed that a participant with autism acquired new mand, tact, and intraverbal responses quicker with written words than without the words (Judd, Endicott, & Sundberg, 1997). The use of written words as prompts, therefore, may assist in the improvement of language and speech (Sundberg & Partington, 1998). Of critical importance in using prompts is the successful fading of the prompts while control is transferred to the relevant original stimulus, so that the original stimulus becomes a functional discriminative stimulus without dependence on prompts.

The purpose of the present study was to compare and evaluate the effects of textual prompts and echoic prompts on the intraverbal skills of a 6-year-old boy with autism in a natural setting. The questions used were selected at random from questions deemed likely to be asked by peers and those required for personal safety (see Table 1). In comparing the effectiveness of textual and echoic prompts, we used a fading procedure to try to avoid dependence on either form of prompts (Krantz & McClannahan, 1998). To further evaluate the quality of the re-

Table 1

*Questions used to compare the effects of textual prompts and echoic prompts.*

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Set 1 questions

Questions with textual prompts

1. What's your name?  
TR = "My name is \_\_\_\_\_."  
(must include both first and last name)
2. How old are you?  
TR = "I'm six years old."

Questions with echoic prompts

3. When's your birthday?  
TR = "My birthday is \_\_\_\_\_."
4. What do you like to eat?  
TR = "I like to eat muffins." (name of any food item)

Set 2 questions

Questions with textual prompts

1. Where do you live?  
TR = "I live in Spokane."
2. "What's your telephone number?"  
TR = My telephone number is \_\_\_\_\_.

Questions with echoic prompts

3. What's your address?  
TR = "My address is \_\_\_\_\_."
4. What's your favorite movie?  
TR = "My favorite movie is Thomas." (any movie name)

Set 3 questions

Questions with echoic prompts

1. What's your mother's name?  
TR = "My mother's name is \_\_\_\_\_." (must include both first and last name)
2. Where do you go to school?  
TR = "I go to school at \_\_\_\_\_ Elementary."

Questions with textual prompts

3. What's your favorite color?  
TR = "My favorite color is red." (name of any color)
  4. How are you?  
TR = "I'm okay." (any emotion)
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sponses to questions asked, three types of responses were measured: (a) full-sentence targeted responses, (b) partial responses that made sense, and (c) responses that did not make sense or no response.

## METHOD

### *Participant and Setting*

The participant was a 6-year-old boy who had been diagnosed with autism. At the time of this study he was performing academically at a kindergarten level, with slightly above average sight-reading skills for a child his age based on teacher observation and curriculum-based assessments. He correctly echoed six-word utterances and correctly sight read each of the words contained in the textual prompts selected for this study. However, his expressive language skills, including question answering, were far below what would be expected of a typical 6-year-old child. Although he attended a regular kindergarten classroom, he spent part of the school day in a resource room receiving direct one-on-one assistance in expressive language skills from a certified speech language pathologist. He was also receiving direct one-on-one help with language and academic skills approximately 30 hr per week in his home from undergraduate and graduate students trained in discrete-trial teaching methods (Maurice, 1993). The participant was selected for this study because he possessed few intraverbal skills and did not answer direct questions.

The setting was the child's home. A separate room with a work table and two chairs was designated for the purpose of this study. Only the child, the first author, and the observer were present during the daily sessions. Sessions were conducted 5 to 6 days per week in the evening.

### *Response Definitions and Observation Procedures*

The behaviors measured during this study were (a) the number of correct

full-sentence target answers to direct questions, (b) the number of correct partial answers that made sense to direct questions, and (c) the number of answers that did not make sense or no response to direct questions.

Examples of answers that did not make sense to direct questions included the response "telephone" to the question "What's your telephone number?" or the response "color" to the question "What's your favorite color?" Examples of partial answers that made sense included the response "red" to the question "What's your favorite color?" or the response "chips" to the question "What do you like to eat?"

Each of the three dependent variables was measured by tests administered prior to intervention, during the fading procedure, during the postfading procedure, and during follow-up (i.e., 7 and 14 days after the last question presented). The test consisted of 12 questions divided into three sets of four questions each. A coin toss was used to randomly divide the questions into two sets: Two questions from each set were taught using textual prompts, and two questions from each set were taught using echoic prompts. A target response (value of 1) was recorded when the participant used the targeted full-sentence correct answer to the question. A partial response (value of .5) was recorded when the participant used a partial answer that made sense. No response (value of 0) was recorded when the participant used either a response that did not make sense or, after 10 s, had made no response. All responses were recorded by the experimenter on a simple chart designed for that purpose. No prompting or contingent praise for accuracy was used during the measurement of target responses.

### *Experimental Design and Experimental Conditions*

*Experimental design.* A multiple baseline design across behaviors (Kazdin, 1982) was used to evaluate the ef-

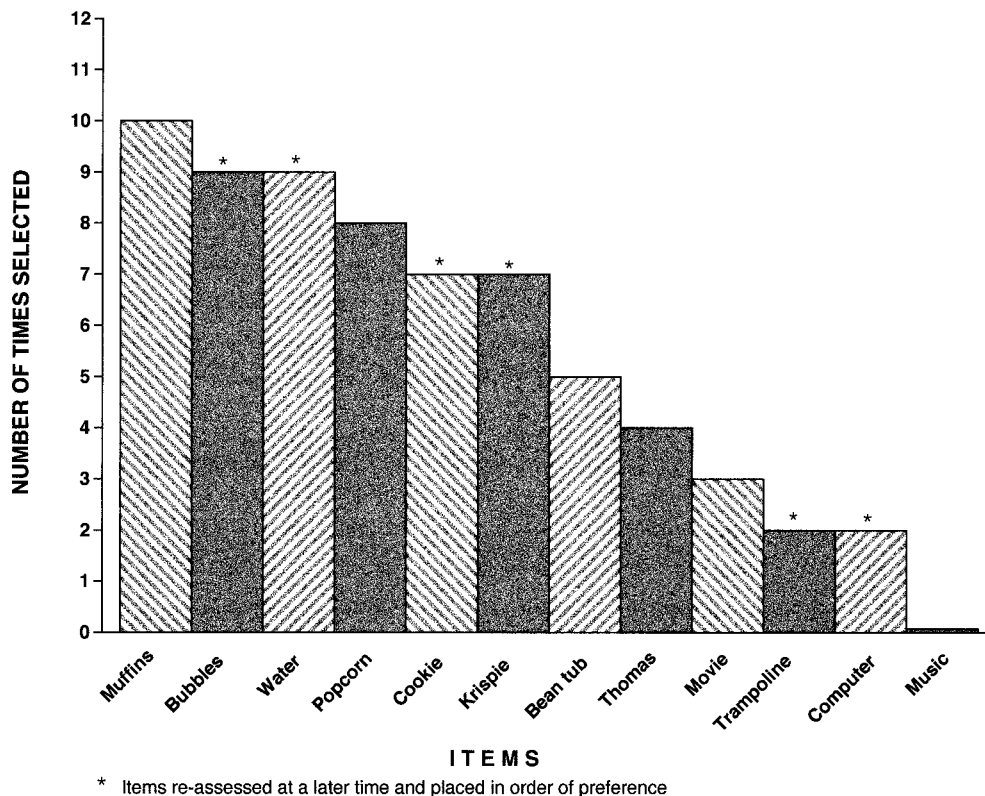


Fig. 1. Preference assessment to identify highly preferred items to serve as likely reinforcers. Data are presented as number of times each item was selected and are ranked in order of preference.

fectiveness of textual prompts and echoic prompts across the sets of questions.

*Baseline.* During baseline, the first author administered the test by asking 12 questions. Data were collected on each response. Praise for trying was delivered after every response to encourage participation, but praise was not contingent upon right or wrong responses. No instruction occurred during baseline or any other time of day. However, it is possible that some of the questions may have been asked by peers during the school day.

*Fading procedure.* The fading procedure was used to teach the child to answer the questions using either scripted textual prompts or scripted echoic prompts delivered by the first author. The 30-min sessions were highly structured and fast paced, corrections were delivered immediately, and

contingent praise occurred frequently. The correction procedure involved immediate delivery of an instructional "no" followed by a second presentation of either textual or echoic prompts. A brief preference assessment (Fisher et al., 1992) was conducted prior to the intervention to identify highly preferred items to serve as likely reinforcers. The results of the brief preference assessment are shown in Figure 1. Less preferred rewards (e.g., contingent praise, a few minutes of music, a few jumps on a trampoline) were given at the end of a session for the child's effort. Highly preferred rewards (e.g., a piece of a muffin, popping some bubbles, a splash from a water bowl, popcorn, etc.) were given only after correct partial or full target answers were emitted. The fading procedure for the six questions with word prompts entailed presenting written answers to the ques-

tion while orally prompting "Read this."

The written answers were presented directly in front of the child and were printed in large black letters on letter-sized white paper. Each written answer to a question was systematically faded one word or phrase at a time, beginning with the end of the sentence (as in backward chaining). The fading procedure for the six questions taught with echoic prompts entailed presenting the echoic prompt "say" before orally giving the answer directly to the child. Each oral answer to its respective question was systematically faded one word or phrase at a time, beginning with the end of the sentence. The participant correctly initiated a full textual or echoic prompt to each question before fading began.

*Postfading.* During postfading, all textual and echoic prompts were completely absent. All responses were made without prompts of any type. Less preferred rewards (e.g., contingent praise, music, and trampoline) were given at the end of each daily session for the child's participation, and highly preferred rewards (e.g., muffins and bubbles) continued to be given only for correct partial answers or full-sentence target answers.

*Follow-up.* Two follow-up tests were given after the postfading condition (i.e., 1 and 2 weeks later) as maintenance checks to determine the degree to which behavior was maintained. These follow-up tests used the same procedures as tests administered during the postfading condition.

### *Reliability*

Interobserver reliability of measurement was carried out systematically for each of the 26 tests. Each observer made a mark on a data sheet symbolizing a target full-sentence answer (TR), partial answer that made sense (PR), or no response or responses that did not make sense (NR) after each question. The experimenter sat across the table directly in front of the child,

and the observer sat on the opposite side of the table directly behind the child. This seating arrangement made it unlikely that the experimenter or observer would see each other's recordings. An agreement was marked when the experimenter and the observer recorded the same symbol. A disagreement was counted when the symbols were different. Interobserver reliability was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Interobserver reliability throughout all phases of the study for textual prompts and echoic prompts was 100%.

## RESULTS

The numbers of questions answered correctly by the participant across conditions for questions taught using echoic prompts are shown in Figure 2. During all baseline phases, no questions were answered correctly using target full-sentence answers across all three sets of questions. For Set 1 questions, the mean number correct was 0.1 out of 2 possible (1 of the 10 questions was answered with a correct partial response). For Set 2 questions, the mean number correct was 0.09 out of 2 possible (2 of the 22 questions were answered with correct partial responses). For Set 3 questions, the mean number correct was 0.12 out of 2 possible (4 of the 34 questions were answered with correct partial responses).

With the implementation of the echoic prompt fading procedure, improvements in partial responses occurred. For Set 1 questions, correct partial answers increased from a mean of 0.1 to a mean of 0.5 out of 2 possible (5 of the 5 questions were answered with correct partial responses). This improvement was maintained and slightly increased during postfading and follow-up, when one question was followed by a target full-sentence answer (Session 19). For Set 2 questions, correct partial answers increased from a mean of 0.09 to a mean of 0.8 out of

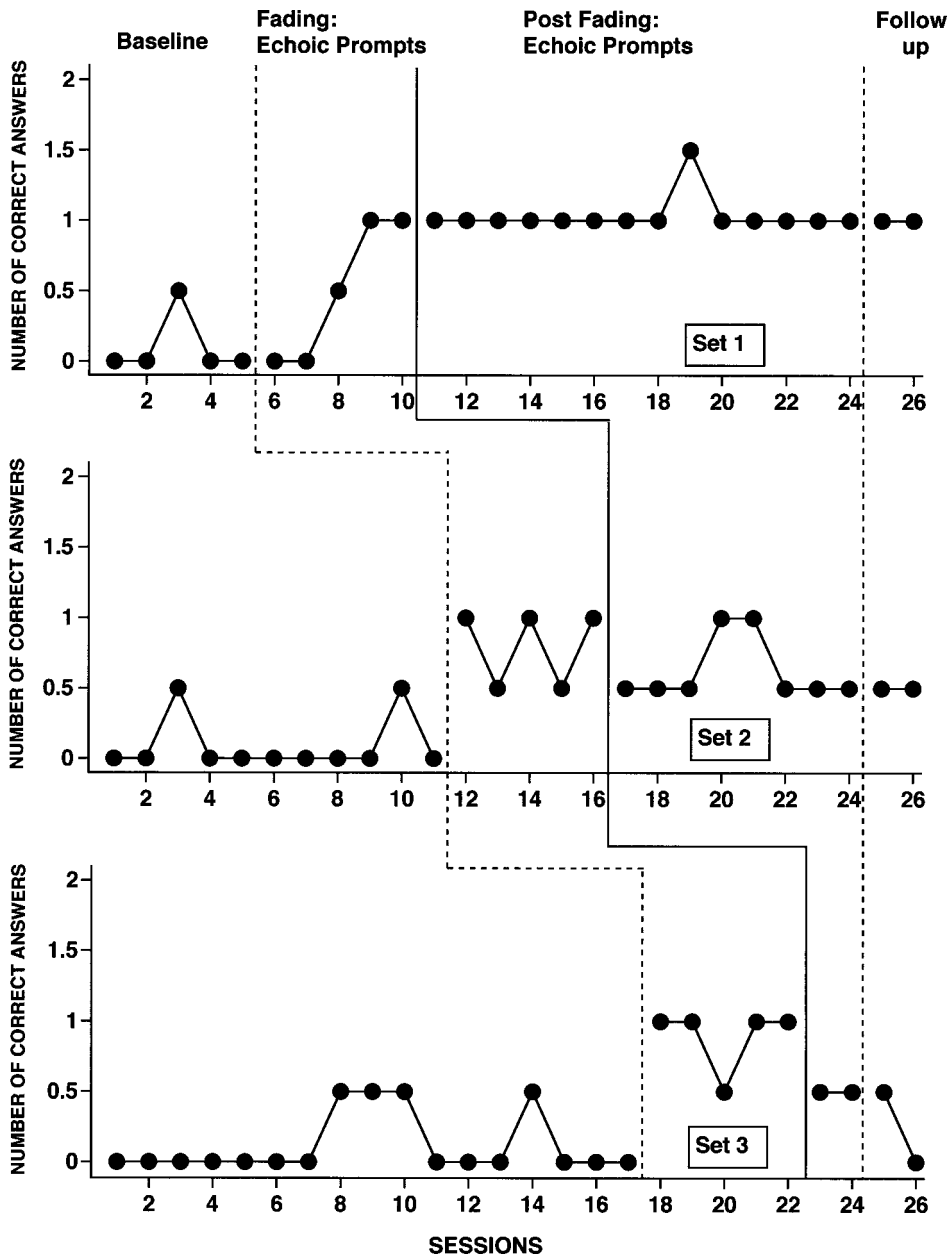


Fig. 2. The number of questions answered correctly across conditions for questions taught using echoic prompts. Data are presented for Set 1 questions (top panel), Set 2 questions (middle panel), and Set 3 questions (bottom panel).

2 possible (8 of the 10 questions were answered with correct partial responses). During postfading and follow-up, the mean decreased from 0.8 to 0.6 out of 2 possible. For Set 3 questions, correct partial answers increased from a mean of 0.12 to a mean of 0.9 out of

2 possible (9 of the 10 questions were answered with correct partial responses). During postfading and follow-up, the mean decreased from 0.9 to 0.36 out of 2 possible.

The numbers of questions answered correctly by the participant across con-

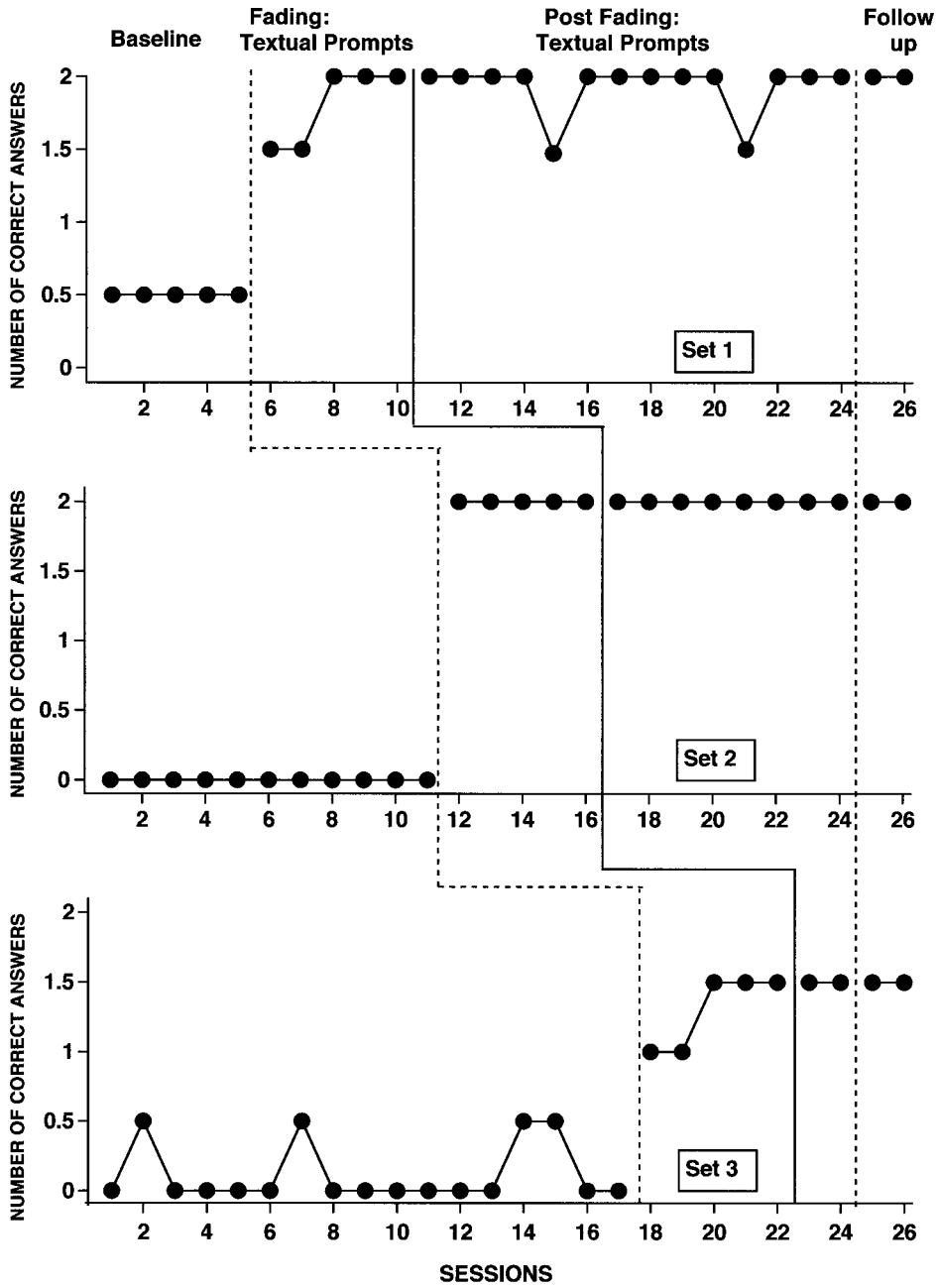


Fig. 3. The number of questions answered correctly by the participant across conditions for questions taught using textual prompts. Data are presented for Set 1 questions (top panel), Set 2 questions (middle panel), and Set 3 questions (bottom panel).

ditions for questions taught using textual prompts are shown in Figure 3. During all baseline phases, no questions were answered correctly using target full-sentence answers across all

three sets of questions. For Set 1 questions, the mean number correct was 0.5 out of 2 possible (5 of the 10 questions were answered with correct partial responses). For Set 2 questions, the mean

number of correct responses was zero. For Set 3 questions, the mean number correct was 0.12 out of 2 possible (4 of the 34 questions were answered with correct partial responses).

With the implementation of the textual prompt fading procedure, there was an immediate increase in the number of questions answered correctly using target full-sentence answers and partial answers across all three sets of questions. For Set 1 questions, correct target full-sentence answers increased from a mean of 0.5 to a mean of 1.8 out of 2 possible (8 of the 10 questions were answered with target full-sentence responses). This increase was maintained during postfading and follow-up. For Set 2 questions, the mean number of correct target full-sentence answers increased from 0 to 2 out of 2 possible. This increase was maintained during postfading and follow-up, with 100% of all questions answered with target full-sentence responses. For Set 3 questions, target full-sentence answers increased from a mean of 0.12 to 1.3 (3 of the 10 questions were answered with target full-sentence responses). Correct answers to Set 3 questions not only were maintained but increased to 1.5 during postfading and follow-up.

## DISCUSSION

The data show that textual prompts can be more effective than echoic prompts for the establishment of intraverbal behavior for a child with autism. After the implementation of the textual prompt fading procedure, the number of questions answered using target full-sentence responses increased dramatically. The range of improvement was 360% correct to a maximum of 1,083% correct. A child who could not answer any of the 12 questions prior to this study acquired an important functional verbal repertoire. After the implementation of the echoic prompt fading procedure, the number of questions answered with correct partial responses also increased. The range

of improvement for all sets of questions was a minimum of 500% correct to a maximum of 889% correct. However, answers using target full-sentence responses occurred only once. The echoic prompt procedure did not result in improvements in target full-sentence responses as was associated with the textual prompt procedure. However, initial acquisition of partial answers to questions asked during echoic prompts was achieved and maintained during postfading and follow-up, although not at the same high levels seen with textual prompts.

One implication of this study is that textual prompts, rather than echoic prompts, may be more effective in teaching intraverbal skills for some children with autism. Even though the participant had been diagnosed with autism and had almost no intraverbal skills prior to this study, he acquired a basic foundation of communication skills that should enable him to learn to answer a wider variety of questions in the future.

This study was practical in that the necessary materials were available in the participant's home, each session lasted only about 30 min per day, and the scripted materials would make it easy to implement without great effort across multiple settings, such as by teachers or aides in the classroom. Contingent praise and the use of low-cost rewards, besides being effective, were also practical. The initial effort for the experimenter involved producing and making copies of the scripted textual and echoic prompts. These sheets were produced using a personal home computer with minimal financial costs. The textual prompt fading procedure was shown to be efficient in terms of time, effort, and money.

The results of this study were socially significant. The child acquired critical expressive language skills and, from his facial expressions and gestures of affection, it was clear that he was proud of his answering questions expressively. In addition, textual prompts may have further enhanced

the participant's advanced sight-reading skills while simultaneously supporting intraverbal behavior. We believe that the target behaviors were behaviorally trapped; that is, the new behaviors brought added reinforcement in other settings that were not explicitly planned (Baer & Wolf, 1970). The more information the participant supplied in his responses to questions directed toward him, the more contingent attention he received in other natural settings.

There are several possible reasons why the visual stimuli were more effective than the auditory stimuli presented in this study. First, some professionals believe autistic children have above-average visual acuity coupled with deficits in auditory understanding (Freeman & Dake, 1996). Second, children with autism typically have more difficulties with the social interactions that are involved with echoic prompts (Autism Society of America, 1999). Textual prompts did not require nearly as much direct social interaction. The social interaction with echoic prompts may be a distracter or slight punisher for some children with autism. Also, it is likely that this child had a long history of failure with echoic prompts, and a lack of such history with textual stimuli may have resulted in better attending to the textual prompt.

For some children with autism, the functional skill of answering questions can lead to the acquisition of new information (Taylor & Harris, 1995). We believe that the use of textual prompts should be extended to teaching more complex skills to children with autism. Due to the effectiveness of textual prompts in this study, the utility of textual prompts was probed with the participant to teach other previously difficult and unsuccessfully taught concepts such as pronouns and prepositions. Preliminary results indicate that textual prompts may greatly reduce the instructional time needed to acquire a wide variety of new and complex ver-

bal skills for some children with autism.

One limitation of this study is that in comparing the effectiveness of textual and echoic prompts, variables other than the type of prompts may have varied. For example, with echoic prompts, the spoken prompt typically occurs very briefly, then disappears. With textual prompts, the written prompt remains present while the participant reads it. Longer exposure to textual prompts and not having to respond in the absence of the stimulus might conceivably affect learning when these prompts are used. However, the participant did not become dependent on textual prompts, as evidenced by the large increases in unprompted full-sentence answers.

A final point is that in teaching language skills to children with developmental disabilities, professionals often use the skills of typically developing children as a model (Partington & Bailey, 1993). The failure to acquire intraverbal skills by language-delayed children often requires educators to dissect the learning process to ensure the acquisition of the skills. Thus, through the analysis of specific prompts, research with language-delayed children may ultimately lead to improvements in our skills to educate the typical child.

Systematic replications are needed with other participants of different ages with autism and other disabilities or delays to determine the degree of generality of the efficacy of textual prompts in oral language acquisition. These replications should include evaluations on the effects of these procedures on pronoun and preposition acquisition and acquisition of other appropriate autoclitic responses. Other extensions could include the efficacy of textual prompts on mastering other skills such as math or independent living skills.

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