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AN EVALUATION OF INTRAVERBAL TRAINING TO GENERATE SOCIALLY APPROPRIATE RESPONSES TO NOVEL QUESTIONS

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Four preschool children (with and without disabilities), who often responded inappropriately to questions, participated in the current study. Pretest results were used to create sets of questions that the children either did or did not answer correctly (i.e., known and unknown questions). We then sequentially taught two different responses to a subset of unknown questions: (a) "I don't know" (IDK), and (b) "I don't know, please tell me" (IDKPTM). Results showed that following acquisition with the target set, both responses generalized across questions and teachers for all participants. Following IDK training, some undesirable generalization of IDK to known questions occurred for 3 participants. Training of IDKPTM with the addition of a restricted reinforcement contingency was sufficient to establish correct answers to a portion of previously unknown questions. The importance of teaching generalized responses that enable the acquisition of novel intraverbals is discussed.

DESCRIPTORS: behavioral cusp, generalization, intraverbal behavior, intraverbal training, preschool children, verbal behavior

The importance of teaching skills that facilitate entry into natural communities of reinforcement has been discussed in the behavior-analytic literature (e.g., Baer & Wolf, 1970). Among the skill deficits that may limit children's access to naturally occurring reinforcers is the inability to answer developmentally appropriate questions. Children who frequently fail to answer questions accurately (or provide inappropriate answers) may experience lower quality and amount of adult interactions and may be less likely to be accepted by their peers.

Question answering may be conceptualized as intraverbal responding according to Skinner's (1957) analysis of verbal behavior. In this conceptualization, the intraverbal response (i.e., the answer) is under the discriminative control of a preceding verbal stimulus (i.e., the question), but a formal point-to-point correspondence is absent. The intraverbal concept is thought to account for much of everyday verbal behavior, including conversations and question answering, but has received relatively little attention from behavior-analytic researchers (Dymond, O'Hora, Whelan, & O'Donovan, 2006; Sautter & LeBlanc, 2006).

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There are at least three potential (and possibly interrelated) reasons why children may respond inappropriately or fail to answer questions. First, children may not learn a sufficient number of answers through everyday interactions. This is evident for many children with developmental delays who may require direct training to acquire answers to commonly asked questions, and for children for whom English is a second language who have had little exposure to English-speaking verbal communities. Second, questions may exert loose, incomplete, or faulty stimulus control. For instance, the child who answers ''red'' when asked, ''How old are you?'' may be labeling the color of his or her shirt. In this example, the child may have emitted a tact (a response under the control of a nonverbal discriminative stimulus, the shirt) when control by the preceding verbal stimulus (i.e., an intraverbal) would have been more appropriate. Third, children may repeat the question, thereby engaging in an echoic verbal operant. The echoic concept describes verbal behavior that, unlike intraverbal behavior, has a point-to-point formal correspondence with an antecedent verbal stimulus (Skinner, 1957). Echoic behavior emitted under socially inappropriate conditions is often referred to as echolalia. Immediate echolalia involves repeating a verbal stimulus (e.g., a question) immediately following its presentation, whereas in delayed echolalia, the repetition may occur days, weeks, or even months later (Fay & Schuler, 1980; Ricks & Wing, 1975; Siegel, 1996; Wootton, 1999). It may be useful to consider both immediate and delayed echolalia as instances of vocal stereotypy (Ahearn, Clark, MacDonald, & Chung, 2007). Functional analyses have frequently shown stereotypy to persist in the absence of social consequences (Hanley, Iwata, & McCord, 2003), although some instances of escape-maintained stereotypy have been reported (e.g., Mace & Belfiore, 1990). It is possible that echoic and unrelated answers to questions may sometimes be instances of vocal stereotypy that are reinforced by the sensory consequences that they produce.

Children for whom these behavioral deficits or excesses occur are likely to benefit from direct intraverbal training. Such training involves prompting the appropriate intraverbal response following the question (e.g., by presenting pictures, text, or other stimuli that occasion the target response), and then fading the prompt such that stimulus control is transferred to the appropriate verbal antecedent. For example, Braam and Poling (1983) and Luciano (1986) successfully established thematic intraverbal behavior in children with autism and other developmental disabilities using transfer-of-control procedures in which visual prompts were gradually faded to establish control of responding by category labels. Examples of correct thematic responses included answering with one or more item labels (i.e., ''apple,'' ''banana'') when presented with a category label (i.e., ''What are some fruits?''). Thematic intraverbal responding has also been targeted with typically developing preschool children. Partington and Bailey (1993) found that neither tact training (teaching children to tact items belonging to categories) nor multiple-tact training (teaching children to tact both the items and the category) were sufficient to establish thematic intraverbal behavior. Similarly, Miguel, Petursdottir, and Carr (2005) found that neither multiple-tact training nor receptive-discrimination training (i.e., training listener behavior with respect to items and categories) resulted in substantial increases in thematic intraverbal behavior. In both of these studies, prompting and fading were successful in training intraverbal behavior by transferring control from tact prompts (picture cards) and echoic prompts (vocal models) to category labels.

Although direct training can establish intraverbal repertoires with both typically and atypically developing children, questions remain regarding the appropriate answer (intraverbal response) to teach. Educators and treatment

providers have at least three choices: (a) Teach correct answers to each question, (b) teach generalized responses that are appropriate for a wide range of questions, or (c) teach children to recruit answers to questions they are unable to answer. The first approach involves teaching correct answers to individual questions (e.g., teaching the answers to ''How old are you?'' and ''What is your name?'' as in Finkel & Williams, 2001). Although such programs are clearly appropriate, the effects of this approach are likely to be limited to the questions directly taught. For instance, McMorrow and Foxx (1986) taught an individual with autism to respond with specific correct answers to a set of questions; however, these authors did not observe generalization to responses for unknown questions. In other words, the participant correctly answered known questions but incorrectly answered unknown questions. Because specific answers to questions are targeted, the large number of intraverbal responses that must be taught requires long-term training, making this strategy challenging.

The second alternative is to teach a single intraverbal response that may be an appropriate answer to a number of questions. For instance, in treating the immediate echolalia of 2 children diagnosed with autism, Schreibman and Carr (1978) taught the response ''I don't know'' to a subset of questions and observed generalization of this response to novel questions (see also Huntley & Hayes, 1994; Tucker, O'Dell, & Suib, 1978). These results demonstrated that training the intraverbal response ''I don't know'' was effective in replacing incorrect answers to unknown questions. Although generalization is often a desirable intervention outcome (Baer, Wolf, & Risley, 1968; Stokes & Baer, 1977), there are conditions under which generalization is undesirable. For instance, it would be detrimental for children to answer, ''I don't know'' to known questions after learning to say, ''I don't know'' to unknown questions. Schreibman and Carr addressed this concern by implementing a correction procedure if the child answered, ''I don't know'' to known questions. That is, the therapist withheld the delivery of reinforcement and immediately prompted a correct answer. Although desirable from an educational perspective, this correction procedure limited the extent to which undesirable generalization of ''I don't know'' was evaluated. More specifically, it is possible that this response might have replaced some previously correct answer had the correction procedure not been implemented. Therefore, one of the goals of the current study was to evaluate desirable and undesirable generalization of ''I don't know'' to unknown and known questions, respectively. An additional purpose of the current study was to replicate the intraverbal training procedure used by Schreibman and Carr with children who incorrectly answered questions with either delayed echolalia or unrelated answers, or simply did not respond to questions.

A third alternative is to teach a generalized response that will occasion a teacher or caregiver to provide the correct answer. Schreibman and Carr (1978) suggested that the response ''I don't know'' set the occasion for others to teach correct answers. However, it may be preferable to instead teach a mand for the correct answer. For example, Taylor and Harris (1995) taught children with autism to ask ''What's that?'' when presented with novel stimuli during an instructional task. The children acquired new speaker and listener behavior (i.e., tacting, pointing) with respect to novel objects after learning to ask the question (see also Esbenshade & Rosales-Ruiz, 2001; Hung, 1977; Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998; Twardosz & Baer, 1973; Williams, Donley, & Keller, 2000; and Williams, Perez-Gonzales, & Vogt, 2003, for similar procedures). Although acquisition of tacts has been shown to result from teaching children to ask questions, it appears that no study has evaluated the potential acquisition of novel intraverbals as

a result of teaching children to mand the correct answer.

In the current study, we examined the effects of sequentially teaching two responses to unknown questions: (a) "I don't know," and (b) "I don't know, please tell me." We also evaluated whether generalization of the mand to known and to unknown questions occurred following training of each response and whether acquisition of correct answers to unknown questions emerged.

METHOD

Participants

The 4 participants were enrolled in a university-affiliated full-day inclusive preschool program serving children between 2.5 and 5.5 years of age. These boys were selected for participation because they were reported to answer fewer developmentally appropriate questions than their peers and sometimes provided inappropriate answers to such questions, according to their classroom teachers and parents. The participants' parents or legal guardians provided informed consent allowing for their participation, and assent was also obtained from the participants prior to each session.

Jason was 5 years old and was receiving special education services due to a language delay. When asked questions, he sometimes did not reply or made comments regarding objects in the immediate environment (e.g., toys). Jason was able to communicate using simple phrases (up to five to seven words), but verbal imitation and pronunciation skills were delayed relative to most same-age peers.

Bruce was 5 years old. He was typically developing, and English was his second language. When asked questions, his answers were often unrelated to the question or were unintelligible. In addition, his father reported that Bruce's answers were frequently unintelligible when conversing in his native language. Bruce's pronunciation was relatively poor, but he was able to communicate wants and needs using simple phrases (up to five to seven words).

Kevin was 4 years old. He had been diagnosed with attention deficit hyperactivity disorder and was receiving special education services. According to Kevin's teachers, his social and academic skills were delayed in comparison to most of his same-aged peers, but he was able to communicate using simple phrases (up to five to seven words). When asked questions, his answers were frequently unrelated to the question or were profane. Some of his answers were repetitious phrases (especially profanity) that may have been instances of vocal stereotypy (possibly delayed echolalia). Anecdotal evidence suggests that this behavior may have been maintained by automatic reinforcement or by social positive reinforcement (i.e., attention).

Travis was 5 years old. He had been diagnosed with mild mental retardation and was receiving special education services. He was able to communicate using simple phrases (approximately three to five words), but his verbal development was delayed compared to same-age peers. His mother and teachers reported that he often answered questions inappropriately. In particular, he often provided labels for nearby items that were irrelevant to the question asked. For example, he might answer "red" while looking down at his red shirt when asked, "What did you have for breakfast?" At other times, Travis would reply with unrelated phrases from his favorite movies or cartoons (e.g., "I'm Spiderman!"). This suggests that some of his inappropriate phrases may have been instances of delayed echolalia.

Setting

All sessions were conducted in rooms (2.8 m by 3.2 m) that were located close to the preschool classroom. The rooms contained a child-sized table and chairs. During Jason's, Bruce's, and Kevin's evaluations, the participant and teacher sat side by side or opposite each

other at the table. Both Travis and the teacher sat on the floor during his evaluation.

Measurement

Observers recorded data using data sheets that were specifically prepared for each session. For each trial, the data sheet included the question, the correct answer, and precoded letters corresponding to the following potential child responses: (a) the correct answer, (b) the incorrect answer, (c) "I don't know" (IDK), and (d) "I don't know, please tell me" (IDKPTM). Observers scored responses for each trial by circling the appropriate letter. They also recorded whether responses were preceded by a teacher model (i.e., a prompted response) or not (i.e., an independent response). Independent responses were scored only if they were initiated within 5 s of the teacher's question, and prompted responses were scored only if they were initiated within 5 s of the teacher's prompt. Performance was evaluated in terms of the percentage of independent (i.e., unprompted) answers; thus, only independent answers are depicted in the figures.

Interobserver Agreement

A second observer simultaneously but independently collected data during 38%, 49%, 67%, and 43% of sessions for Jason, Bruce, Kevin, and Travis, respectively. Agreement was determined by comparing observers' records on a trial-by-trial basis. Each trial was scored as an agreement if both observers circled the same behavioral code or as a disagreement if any scoring for a given trial differed. For each session, the number of trials scored as an agreement was divided by the total number of trials and multiplied by 100%. Agreement averaged 99% (range, 86% to 100%) for Jason, 99.6% (range, 86% to 100%) for Bruce, 98% (range, 87% to 100%) for Kevin, and 94% (range 65% to 100%) for Travis.

Procedure

Overview. Pretests were conducted to identify known and unknown questions. Two teachers then conducted separate baseline sessions in which they presented sets of known and unknown questions. One teacher taught each child to say IDK in response to one set of unknown questions, allowing the assessment of generalization of IDK both within and across teachers. The same teacher then taught the participant to reply with the IDKPTM response to the same set of unknown questions. Again, we assessed generalization across questions and teachers, as well as acquisition of correct answers.

General procedure. During all sessions, the participants were provided access to age-appropriate toys that they selected from the preschool's material rooms immediately before each session. All the participants had attended the center for at least 6 months (Jason and Travis had attended the center since they were toddlers) and were familiar with the toys that were available in the material rooms. Sessions were conducted in the context of toy play for two reasons: (a) to simulate conditions in the regular classroom environment, in which toys were typically available, and (b) to introduce preferred items into the session environment to increase the likelihood that the sessions would be reinforcing and enjoyable for the children.

Throughout the experiment, two teachers conducted sessions alternately with each child. Each teacher targeted specific sets of questions that did not overlap between teachers (with the exception of known questions for Travis, see below). The order of question presentation was randomized from session to session. In every session, teachers asked a question every 30 s. A total of 21 (20 for Travis) questions were asked in each session, resulting in approximately 10- to 11-min sessions. Before asking each question, the teacher stated the child's name and waited for him to orient his head with eyes open towards the teacher. If the orienting response did not occur, the teacher repeated the child's name. If the orienting response still did not occur, the teacher removed the toys and

continued prompting until the orienting response occurred. Anecdotally, the participants rarely failed to orient following the first or second prompt. Three of the participants (all except Travis) had previously received classwide social skills training in which they were taught to orient towards a person and say ''yes'' upon hearing his or her name (Hanley, Heal, Tiger, & Ingvarsson, 2007). This response occurred often and was periodically praised. Jason, Bruce, and Travis were always compliant in sessions; Kevin displayed noncompliance in some sessions, requiring some procedural modifications toward the end of the experiment (see below).

Pretest and question selection. Pretests included questions that were procured from a teaching curriculum for children with autism (Taylor & McDonough, 1996) as well as unpublished curricula developed at the participants' preschool program. The questions targeted personal information (e.g., ''Where do you live?''), general knowledge (e.g., ''Where do you buy groceries?''), and preacademic skills (e.g., ''How much is a dime?''). Each question was asked once per session, and three pretest sessions were conducted with each child. Thus, each question was asked three times with each child. Questions always answered incorrectly were classified as *unknown*. Questions answered correctly all three times were classified as *known*. Questions that were sometimes answered correctly and sometimes incorrectly were excluded from subsequent analyses. Pretests continued until a sufficient number of questions had been identified to create two sets of known questions (one set for each teacher) and four sets of unknown questions (two sets for each teacher). The exact number of questions in each set differed across participants, due to the variability in the number of known questions that could be identified for each participant. The one set of known and two sets of unknown questions were then assigned to each of the two teachers who were designated to conduct sessions for each child. An exception was made for Travis, for whom only one set of known questions could be established. Table 1 contains a list of the specific questions used by each teacher. Throughout the experiment, the teachers (first, second, and fourth authors), who also supervised the participants' general classroom curricula, ensured that the selected questions were targeted only in the experimental sessions and were not included in educational activities during other parts of the school day.

Baseline. In baseline, questions were presented and correct answers, IDK, and IDKPTM were followed by teacher praise. Incorrect and inappropriate responses to questions were ignored.

IDK training. In this phase, questions were presented, and correct answers, IDK, and IDKPTM were followed by teacher praise. In addition, Teacher 1 taught the participants the IDK response to the target question set (Unknown Set 1) using progressive prompt delay (Touchette, 1971). Initially, the teacher prompted the IDK response by immediately stating, ''Say, 'I don't know,''' after asking a question from Unknown Set 1. A 1-s delay was then inserted between the question and the IDK prompt. The delay was increased by 1 s following each session in which the IDK response was emitted prior to or following at least 85% of the prompts. There were no criteria for decreasing the delay had acquisition not occurred.

IDKPTM training. In this phase, questions were presented and correct answers, IDK, and IDKPTM were praised. In addition, Teacher 1 taught the participant to engage in the IDKPTM response to Unknown Set 1 questions using the same procedures as in the IDK training phase (i.e., the teacher proactively prompted the IDKPTM response after asking the questions from Unknown Set 1). For example, the teacher might ask, ''How much is a dime? Say 'I don't know, please tell me.''' Following the child's imitation of the model

(i.e., ''I don't know, please tell me'') the teacher provided praise and then the correct answer (i.e., ''a dime is 10 cents''). If the child did not repeat the correct answer (''10 cents''), the teacher repeated the phrase and prompted imitation (i.e., ''a dime is 10 cents; you say it''). The participant always repeated both the IDKPTM response and the correct answer during this teaching sequence. As in the previous phase, a progressive prompt delay was used to fade the prompts. When the IDKPTM response occurred unprompted, only the second part of the teaching sequence was implemented (i.e., the child was provided with the correct answer and prompted to repeat it if necessary). If the IDK response occurred in response to Unknown Set 1 questions, it was ignored, and training on the IDKPTM response was initiated. Note that the IDK response was still praised if it occurred following questions from sets other than Unknown Set 1.

Jason initially did not successfully imitate the teacher's model of ''I don't know, please tell me.'' This presented a difficulty for training because the procedures relied on participants having this skill in their repertoire. Therefore, Teacher 1 (first author) implemented additional training sessions (five 10-min sessions conducted over a span of 2 days) following Session 31 (not shown on graph). Modeling, backward chaining, and contingent access to preferred toys were used to teach Jason to imitate the IDKPTM response. First, imitation of the words ''me'' and ''tell'' was targeted separately. Subsequently, he was able to imitate the phrase ''tell me.'' The phrase was then gradually expanded word for word (i.e., ''please tell me,'' ''know, please tell me'') until he could imitate the whole phrase. Correct responses in each step of the chain were reinforced with 10-s access to preferred toys, and three consecutive correct responses resulted in presentation of the next step (i.e., expanded phrase). Incorrect responses resulted in the presentation of the next trial and a return to the previous step following three consecutive incorrect responses. The experimental sessions resumed when Jason was able to imitate the teacher's model of the full IDKPTM response for six consecutive trials.

Direct teaching of correct answers (Jason only). Although Jason frequently engaged in the IDKPTM response following training, he did not acquire any correct answers to questions. Therefore, additional training was implemented with his Unknown Set 1 questions. First, these questions were asked consecutively at the beginning of each session (as opposed to randomly interspersed within other sets). Second, he was prompted to engage in the correct answer following each question from Unknown Set 1 (as opposed to only after engaging in the IDKPTM response). The prompt was then gradually faded using progressive delay. The IDKPTM response was then no longer prompted for Unknown Set 1 questions. For all other questions the procedures were identical to baseline. That is, correct answers, IDK, and IDKPTM were followed by teacher praise, and incorrect and inappropriate responses to questions were ignored.

Restricted contingency (Jason, Bruce, and Kevin). In this phase, access to toys was restricted prior to each question (this contingency was applied for all question sets). For Jason and Kevin, toy access was reinstated following the correct answer only, but for Bruce toy access was provided following both IDKPTM and the correct answer (this was due to the fact that the IDKPTM response had not occurred reliably towards the end of the previous phase). A 10-s time-out from toy access and teacher attention was implemented if these responses did not occur to the training set questions. Following the time-out, toy access was restored.

Due to a high level of inappropriate behavior displayed by Kevin (yelling, swearing) and his periodic refusal to attend sessions, additional changes were made to his training to minimize potentially aversive aspects of the training setting.

Table 1
Questions for Each Participant

Child	Teacher 1		
	Known 1	Unknown 1	Unknown 2
Jason	What is your name?	What do you smell with?	What color is the sun?
	What is your daddy's name?	What state do you live in?	How does ice feel?
	What does a cow say?	Where do you go to school?	When do the stars come out?
	What does a pig say?	How much is a penny?	How much is a nickel?
	What does a dog say?	How does sugar taste?	What shines in the sky at night?
		How many days are in a week?	What do you walk with?
		What do you do with a key?	What do you do with a spoon?
		What animal says meow?	What does a firefighter do?
Bruce	What is your name?	How much is a penny?	What room do you sleep in?
	What color is the sun?	How does sugar taste?	What do you see with?
	What animal says woof?	What city do you live in?	How much is a nickel?
	How does lemon taste?	What room do you take a shower in?	Where do you put your socks?
	What does a cow say?	What does a pilot do?	What do you do with a camera?
	What animal says oink?	How many months are in a year?	What day comes after Sunday?
	What does a sheep say?	How much is a quarter?	What does an illustrator do?
Kevin	What does a pig say?	What do you do with money?	What room do you sleep in?
	Where do you buy groceries?	What do chickens lay?	Where do you put your socks?
	What is your name?	How much is a nickel?	How does sugar taste?
	What color is your hair?	What day comes after Sunday?	What do you smell with?
	How does ice feel?	What year is it now?	What does a pilot do?
	What do you do with a book?	What season is hot?	What does an illustrator do?
	What animal says moo?	What does a mail carrier do?	How much is a quarter?
Travis	What does a cow say?	How do birds fly?	Where do you live?
	What does a dog say?	What do you blink with?	What is your phone number?
	What does a cat say?	What do you sneeze with?	What does a donkey say?
	What do you do if you're thirsty?	When's your birthday?	What room do you cook in?
		What do you do if it's raining?	Where do you buy groceries?
		What do you do if you're tired?	What do you taste with?
		When does the sun come up?	What do you see with?
		Where do you play on the slide and swings?	When do you eat breakfast?

Child	Teacher 2		
	Known 2	Unknown 3	Unknown 4
Jason	What is your mother's name?	What color is Clifford?	What do you hear with?
	What color is the grass?	What street do you live on?	What does a bird say?
	What does a sheep say?	Where do you buy groceries?	When is your birthday?
	What does a horse say?	How much is a dime?	What season is hot?
	What do you do with a toothbrush?	How does lemon taste?	What do you see with?
		What animal says oink?	What do you do with a camera?
		What season does it snow in?	What do you talk with?
		What do chickens lay?	What does a mail carrier do?
Bruce	What animal says meow?	When do you go to sleep?	Where do you buy groceries?
	How old are you?	What does a teacher do?	What do you smell with?
	What does a pig say?	What season is hot?	How many days are in a week?
	What do you do with a spoon?	What room do you cook in?	What do you hear with?
	What does a cat say?	When is your birthday?	What street do you live on?
	How does ice feel?	Where do you go to school?	How much is a dime?
	What does a dog say?	What do chickens lay?	What state do you live in?
Kevin	How does an oven feel?	What is a dishwasher for?	What does an author do?
	What does a cow say?	How does a lemon taste?	How much is a dime?
	What city do you live in?	What do you do with a key?	How many days are in a week?
	What does a dog say?	What do you hear with?	What do you taste with?
	What do you do with a spoon?	What do you do with a camera?	What color is the sun?
	What color is Clifford?	What animal says meow?	How many months are in a year?
	What does a bird say?	How much is a penny?	What street do you live on?

Table 1
(Continued)

Child	Teacher 2		
	Known 2	Unknown 3	Unknown 4
Travis	What does a cow say?	What do you kiss with?	What do you walk with?
	What does a dog say?	When do you go to school?	When does it get dark?
	What does a cat say?	When do you wake up?	What is your address?
	What do you do if you're thirsty?	What does a pig say?	What do you do if something is funny?
		How old are you?	Where do you go to school?
		What do you do if you're hungry?	What do you fly in?
		What do you do with your nose?	What do you smell with?
		What do you hear with?	What do you do with your ears?

Starting with Session 63, session duration was shortened to 5 min and the frequency of question asking was reduced to once per minute (as opposed to once every 30 s) such that only five or six questions were asked per session. With this procedure, each teacher targeted all three sets of questions in four short sessions (5 to 6 min in duration) instead of one 10- to 11-min session that contained 21 questions. Data from each of these sets of four shorter sessions were combined, and the results are displayed as one session data point to allow a comparison of these data with those from previous phases.

Experimental Design

The direct and indirect effects of training were assessed in a multiple baseline design across responses. This design permitted an analysis of the effects of training across the IDK and IDKPTM responses as well as detection of potential desirable generalization to other unknown questions and undesirable generalization to known questions. Because two teachers conducted sessions and only one of four sets of unknown questions was targeted for training (Unknown Set 1 by Teacher 1), desirable and undesirable generalization could be evaluated both within and across teachers.

RESULTS

Jason

Two sets of five known questions and four sets of eight unknown questions were identified for Jason (see Table 1). Figure 1 depicts results for Jason's intraverbal training assessment. (In all figures, only independent answers, i.e., those not preceded by a teacher model, are presented.) In baseline, correct answers to known questions occurred 100% of the time, but there were only two instances of correct answers to unknown questions. He did not engage in the IDK and IDKPTM responses in baseline. When IDK training was implemented with Unknown Set 1, IDK occurred at high levels for all sets of unknown questions. In addition, correct answers to known questions decreased, and IDK occurred at moderate levels for both sets of known questions.

During IDKPTM training, immediate acquisition of the IDKPTM response did not occur. Because anecdotal observation indicated that Jason did not successfully imitate the teacher's vocal model of the IDKPTM response, additional training was conducted after Session 31. Subsequently, the IDKPTM response occurred at high levels across unknown question sets and replaced the IDK response. However, baseline levels of correct responding to known questions did not recover, and IDKPTM started to occur as an answer to some of the known questions.

Despite the fact that Jason frequently engaged in IDKPTM during Sessions 31 to 53 (and was prompted to say the correct answers every time he did so), he rarely engaged in correct answers independently. Therefore,

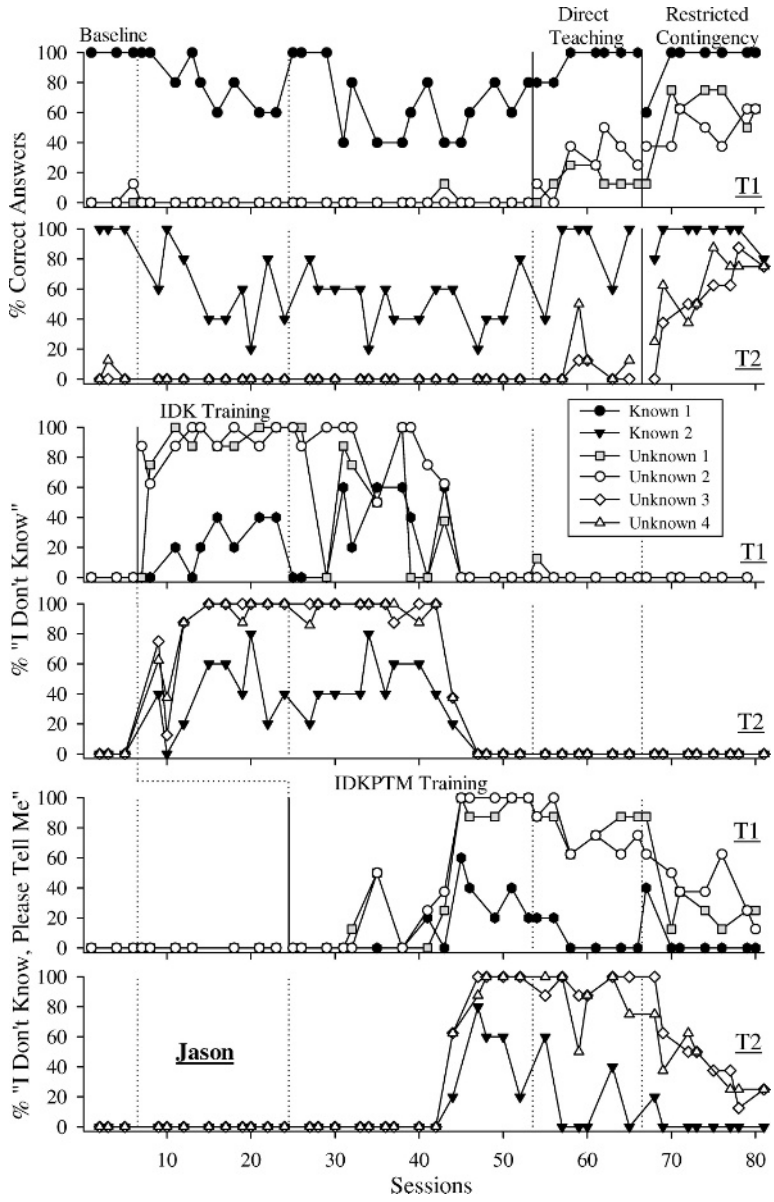

Figure 1. Results for Jason. Percentages of correct answers, IDK, and IDKPTM are depicted in the top two, middle two, and bottom two panels, respectively. Panels marked T1 and T2 show data from Teacher 1's and Teacher 2's sessions. Known questions are represented with filled symbols, the target set (Unknown Set 1) symbols are gray, and the untargeted sets (Unknown Sets 2, 3, and 4) are depicted with open symbols.

direct training of correct answers to Unknown Set 1 questions was conducted. This intervention resulted in a slight increase in the number of correct responses for that set and limited generalization across questions and teachers. Interestingly, correct answers to known questions recovered to almost 100% during this phase. Because the effects of directly training correct answers to Unknown Set 1 questions were limited and the percentage of correct

Table 2
Percentage Correct During Final Two Sessions of Baseline and Treatment

		Participants							
		Jason		Bruce		Kevin		Travis	
Teacher	Questions	Baseline	Treatment	Baseline	Treatment	Baseline	Treatment	Baseline	Treatment
1	Known Set 1	100	100	100	100	28.6	85.7	50	50
1	Unknown Set 1 (training set)	0	50	0	28.6	0	28.6	0	12.5
1	Unknown Set 2	0	62.5	0	42.9	0	42.9	0	12.5
2	Known Set 2	100	75	100	100	85.7	85.7	50	50
2	Unknown Set 3	0	75	0	42.9	0	57.1	0	12.5
2	Unknown Set 4	0	62.5	0	42.9	0	28.6	0	12.5

Note. Data are presented for the last two sessions before the IDK training phase was implemented (baseline) and for the last two sessions of the experiment (treatment). The latter involved contingency restriction for Jason, Bruce, and Kevin and IDKPTM training for Travis. Although both teachers used the same set of known questions with Travis, separate percentages are presented in the table for simplicity.

answers was on a stable or downward trend following several sessions, this phase was discontinued and was not conducted with the other participants.

During the restricted contingency phase, an increase in the percentage of correct responses to all unknown questions and a decrease in the occurrence of the IDKPTM response were observed. Known questions were answered correctly almost 100% of the time in this phase. Toward the end of this phase, Jason answered most unknown questions correctly, but he still engaged in the IDKPTM response to some questions. His analysis ended when he graduated from the center (his last sessions were conducted on his final day in the preschool).

To further gauge the extent to which correct answers were acquired, we calculated the percentage of questions that were answered correctly in each set during the last two sessions conducted by each teacher as well as the last two sessions of baseline. To be scored as correct by this criterion, a question had to be answered correctly two of two times during these sessions. The results of this analysis are shown in Table 2. These data indicate that Jason consistently answered more than half of the unknown questions correctly toward the end of the experiment.

Bruce

Two sets of seven known questions and four sets of seven unknown questions were identified for Bruce (see Table 1). Figure 2 depicts the results of Bruce's intraverbal training assessment. In baseline, Bruce answered known questions correctly almost 100% of the time and rarely answered the unknown questions correctly. The IDK and IDKPTM responses did not occur in baseline. During IDK training, the IDK response increased to high levels and generalized across question sets and teachers. Similar to Jason's results, undesirable generalization of the IDK response occurred for known questions, and correct responses to known questions decreased.

During IDKPTM training, the IDKPTM response initially increased and occurred across questions and teachers, and the IDK response decreased. However, toward the end of the phase, the IDKPTM response decreased, and the IDK response subsequently recovered. Because of the limited occurrence of IDKPTM towards the end of the training phase, Bruce's restricted contingency phase was designed such that toy access was provided for both IDKPTM and correct answers (as opposed to correct answers only for Jason and Kevin). In the restricted contingency phase, the IDK response decreased to zero, and the IDKPTM response

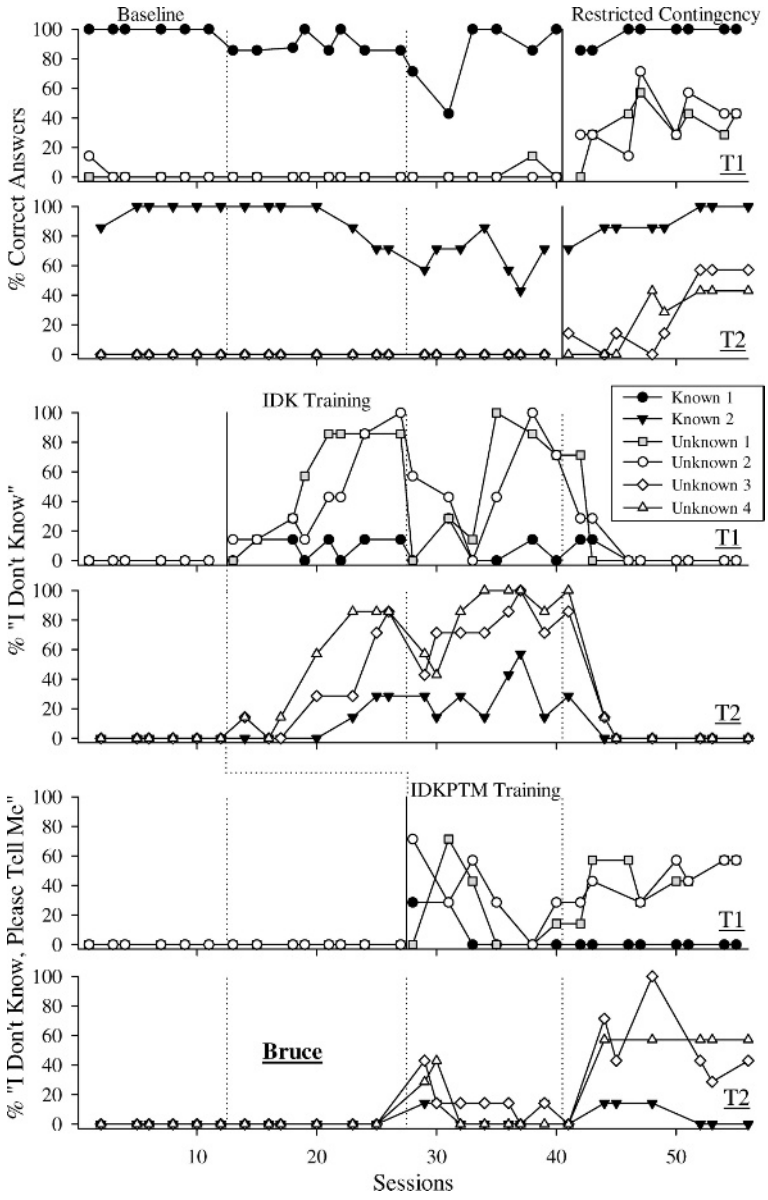

Figure 2. Results for Bruce. Percentages of correct answers, IDK, and IDKPTM are depicted in the top two, middle two, and bottom two panels, respectively. Panels marked T1 and T2 show data from Teacher 1's and Teacher 2's sessions. Known questions are represented with filled symbols, the target set (Unknown Set 1) symbols are gray, and the untargeted sets (Unknown Sets 2, 3, and 4) are depicted with open symbols.

increased to moderate levels for all Unknown Sets (overall, there was little generalization of the IDKPTM response to known questions). Bruce's participation ended when all measures were stable for three sessions. The data depicted in Table 2 suggest that toward the end of the experiment, Bruce answered slightly less than half of the unknown questions correctly.

Kevin

Two sets of seven known questions and four sets of seven unknown questions were identified

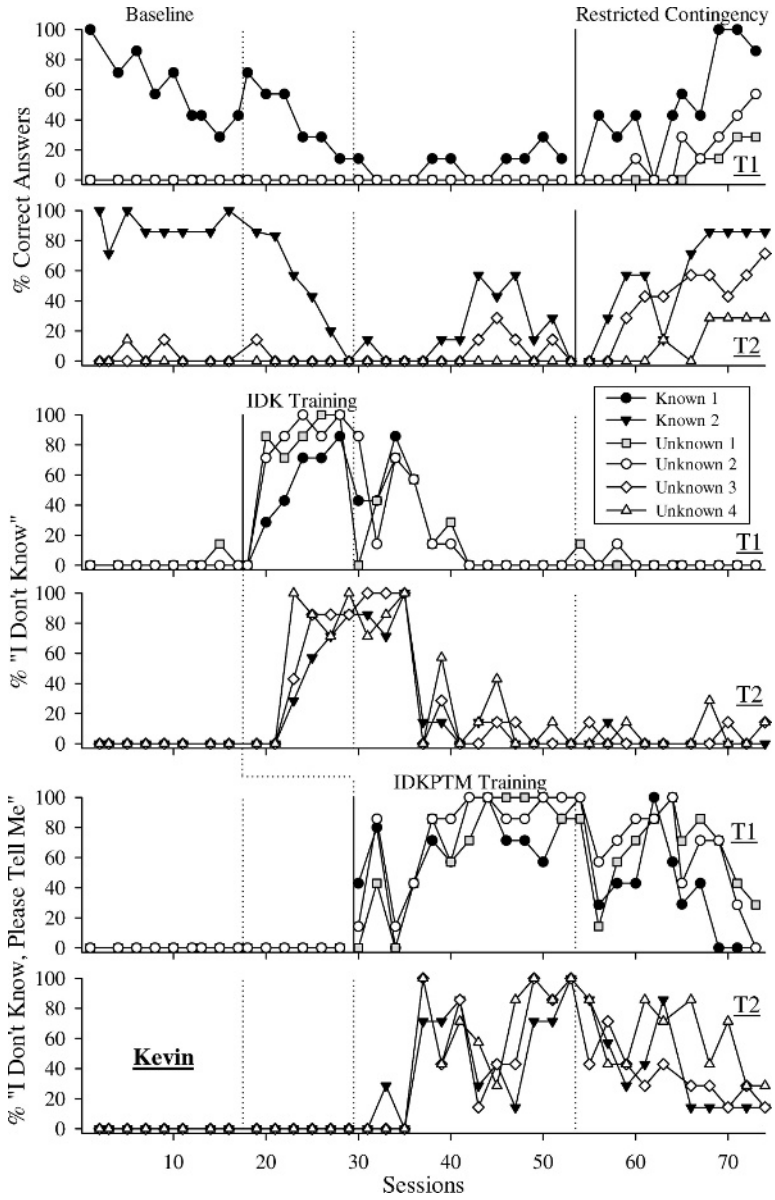

Figure 3. Results for Kevin. Percentages of correct answers, IDK, and IDKPTM are depicted in the top two, middle two, and bottom two panels, respectively. Panels marked T1 and T2 show data from Teacher 1's and Teacher 2's sessions. Known questions are represented with filled symbols, the target set (Unknown Set 1) symbols are gray, and the untargeted sets (Unknown Sets 2, 3, and 4) are depicted with open symbols.

for Kevin (see Table 1). Figure 3 depicts the results of his intraverbal training assessment. During baseline, correct answers to known questions presented by Teacher 1 initially increased, but then decreased, remaining low and stable toward the end of the phase. Correct answers to known questions presented by Teacher 2 occurred at high and stable levels. The IDK response rarely occurred, and the IDKPTM response never occurred. During IDK training, quick acquisition and generalization of the IDK response across questions and

teachers were observed. Undesirable generalization of the IDK response to known questions also occurred to a greater extent than with the other participants, such that correct answers to known questions decreased to near zero.

IDKPTM training resulted in quick acquisition and generalization of the IDKPTM response, accompanied by a reduction in the IDK response for all sets. In addition, correct answers to known questions remained at low levels, and the IDKPTM response generalized to known questions. Although some correct answers to unknown questions in Set 3 were observed (Sessions 38 to 54), this effect was small and unreliable. During the restricted contingency phase, an increase in the percentage of correct answers to all questions was observed, but to a greater extent for known questions. Towards the end of Kevin's participation, data paths representing correct answers were mostly on an ascending trend, and his IDKPTM data paths were on a descending trend. Instead of further evaluating the trends in his data, we determined that other educational and treatment needs were more important at that time (e.g., issues relating to problem behavior). Table 2 indicates that toward the end of the experiment, Kevin could answer slightly less than half of the unknown questions correctly.

Travis

For Travis, pretest results were used to establish one set of four known questions (targeted by both teachers) and four sets of eight unknown questions (see Table 1). Despite extended pretest sessions, we were unable to identify a sufficient number of known questions to establish separate sets for each teacher. Figure 4 shows results for his intraverbal training assessment. In baseline, correct answers occurred to most known questions but rarely to unknown questions. The IDK and IDKPTM responses never occurred. The IDK training resulted in acquisition of the IDK response and generalization across teachers and questions. Although generalization of the IDK response to known questions was observed, levels of correct answers to known questions were not affected. Anecdotally, Travis consistently gave a wrong answer to one "known" question in baseline (even though he had answered that question correctly in pretests). During IDK training, the IDK response replaced the incorrect answer to that question but not the correct answers to the other known questions.

During IDKPTM training, minimal increases in the IDKPTM response occurred for both the target set (Unknown Set 1) and the other unknown sets, indicating limited generalization across teachers and questions. Although the IDKPTM response was used following known questions, undesirable generalization of this response was limited. During his last five sessions, a small increase was seen in the number of correct answers to the unknown sets. Further evaluation of the acquisition of correct answers was not possible because Travis left the preschool. Table 2 shows that that towards the end of the experiment, Travis had acquired only one answer (i.e., 12.5%) from each set of unknown questions.

DISCUSSION

The present study evaluated the direct and indirect effects of two intraverbal training approaches to establish appropriate, and ultimately correct, answers to questions. The first procedure involved teaching an IDK response to a set of unknown questions and led to acquisition of IDK with the targeted unknown questions. This response also generalized across unknown questions that were not in the original training set and two additional sets of unknown questions that were delivered by a second teacher with no training history. However, with 3 of the 4 children, IDK also generalized to questions previously answered correctly. The second approach, which involved teaching IDKPTM (i.e., teaching the children to mand for the correct answer) also resulted in acquisition with the targeted unknown questions.

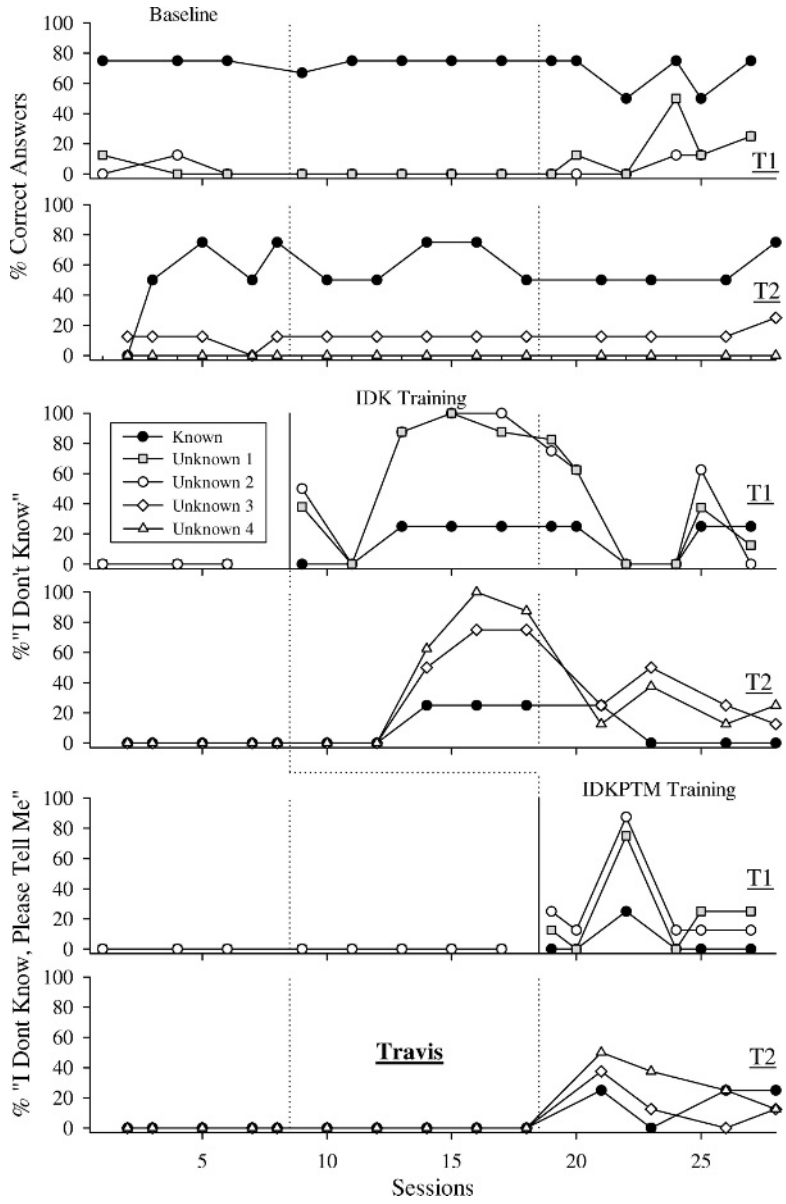

Figure 4. Results for Travis. Percentages of correct answers, IDK, and IDKPTM are depicted in the top two, middle two, and bottom two panels, respectively. Panels marked T1 and T2 show data from Teacher 1's and Teacher 2's sessions. Known questions are represented with filled symbols (because both teachers targeted the same set of known questions, these data paths are identical), the target set (Unknown Set 1) symbols are gray, and the untargeted sets (Unknown Sets 2, 3, and 4) are depicted with open symbols.

This response also generalized to untrained questions asked by teachers with and without training histories. Following acquisition and generalization of IDKPTM, notable increases in the number of correct answers were observed for only 1 child. However, correct answers occurred at the highest levels when access to preferred toys was restricted. This suggests that low levels of correct answers prior to contingency restriction may have been primarily due to

motivational deficits. In other words, it is likely that the IDKPTM training phase provided sufficient opportunities for acquisition of answers to take place, but additional reinforcement contingencies were necessary for the procedure to have its desired effects.

For 3 of the 4 children, the IDK response generalized to questions that they had answered correctly in baseline and pretests. This suggests that IDK may replace correct answers to questions given identical consequences for both. The results of the current study extend previous research outcomes in Tucker et al. (1978) and Schreibman and Carr (1978), which suggested that acquisition of IDK did not adversely affect answers to previously known questions; in contrast, the current results demonstrate that IDK was likely to replace answers to both unknown and known questions. When using this approach, educators should ensure that reinforcement contingencies do not favor IDK if the correct answers are in the students' repertoires.

When two behaviors that differ in response effort result in the same or similar consequence (i.e., are functionally equivalent), response allocation tends to shift towards the less effortful alternative (Horner & Day, 1991; Irvin, Thompson, Turner, & Williams, 1998; Zhou, Goff, & Iwata, 2000). For known questions, this may in part explain the shift in response allocation from correct answers to IDK after the latter response was acquired. However, this shift did not occur uniformly for all known questions, nor did the shift occur with all participants. Alternatively, undesirable generalization of IDK may have occurred because reinforcement for that response was more probable than for any of the correct answers (i.e., in the IDK and IDKPTM training phases, there were multiple questions following which IDK might be reinforced, whereas individual correct answers were reinforced only if they followed particular questions). Nevertheless, future research should evaluate how response effort may affect engagement in appropriate answers. For example, some participants may choose to engage in IDK rather than IDKPTM because the former response is less effortful (this apparently occurred with Bruce in the current study). It might therefore be valuable to identify functionally equivalent responses that are less effortful.

During training of IDKPTM, a proportional increase in correct answers might be expected because the participants were provided with models and were prompted to repeat the correct answers. However, correct answers did not increase until the programmed contingencies strongly favored correct answers (i.e., during contingency restriction). Therefore, the current results suggest that although the acquisition of IDKPTM may contribute to the acquisition of correct answers, reinforcement contingencies that favor correct answers are necessary. Due to the undesirable generalization produced by IDK training and the desirable generalization that occurred after training IDKPTM, teaching the latter response as a generalized answer to unknown questions is recommended. However, the current data demonstrate that this intervention should be combined with differential reinforcement for correct answers. Further, it may be possible to develop a teaching program in which the schedule density, magnitude, or value (e.g., preference rank) of reinforcement is programmed such that correct answers receive the highest level of reinforcement, responses that include a mand for correct answers the second highest, and IDK the third highest, while inappropriate answers are placed on extinction. The purpose of such a program would be to support the most appropriate response that is available while avoiding extinction of other valuable responses. Future research should evaluate the efficiency and feasibility of such a program.

Educators should also note that prerequisite skills might need to be taught before this intervention can be successfully implemented.

These include verbal imitation (as shown by Jason's results) and listener skills (e.g., responding to one's name, orienting towards the speaker). For example, Foxx, Faw, McMorrow, Kyle, and Bittle (1988), Foxx, McMorrow, Davis, and Bittle (1988), and McMorrow, Foxx, Faw, and Bittle (1987) systematically taught their participants to pause, attend, and respond to prompts following questions. Such interventions should be employed as necessary.

Several potential limitations of the current study warrant discussion. First, access to toys may have partially maintained correct responses for Jason, Bruce, and Kevin in the restricted contingency phase. Therefore responding may have (at least in part) constituted mands for toys. It is also possible that responding may have functioned as mands for attention, and it may also be the case that responding was maintained by escape from aspects of the training context (e.g., prompting). Nevertheless, the observed stimulus control by specific questions over correct answers is consistent with the intraverbal concept. Future research should examine if intraverbals acquired under these conditions transfer to situations in which other types of consequences prevail exclusively (e.g., social approval, continued conversation). However, it is possible that impure training conditions of the sort described in the current paper are necessary to create the proper motivating conditions for children who do not acquire verbal operants naturally. To enable successful transfer of question answering to the natural environment, it may be necessary to thin the schedule according to which the artificial reinforcer (i.e., toy access) is delivered or to establish a reinforcer that is more likely to maintain the behavior in the everyday environment.

The current study is also limited in that acquisition of all targeted answers (i.e., percentage of correct answers approximating 100%) was not achieved. Future research should further evaluate the extent to which these procedures may lead to mastery of a wide range of questions. In addition, because the current intervention relied on the vocal and verbal abilities of the students, future research should examine alternative responses that could be useful for students who use different modes of communication (sign language, pictures). Another potential limitation of the current study is that continuous access to toys was provided during training, and toy engagement may have competed with the acquisition and generalization of the target responses. However, our training procedures required that participants pause and orient towards the teacher when questions were asked. Although participants in the current study successfully engaged in attending behavior during training, this approach may not be successful with students who do not have attending skills in their repertoires.

Two further possible limitations concern the unequal number of items in the training sets and the length of training phases. First, research has shown that training multiple exemplars may facilitate generalization (e.g., Baer, Peterson, & Sherman, 1967). Therefore the different number of questions in the training set may have affected outcomes differently across participants. However, greater generalization did not occur for Jason and Travis, whose training sets included eight questions, compared to Bruce and Kevin, whose training sets included seven questions. Therefore, the unequal number of training items was not likely to confound the results of the present study. Nevertheless, this issue should be considered in future research. Second, it is possible that further exposure to IDKPTM training would have resulted in greater acquisition and generalization of both IDKPTM and the correct answer. The current data do not support this notion, because increasing trends were not observed towards the end of the IDKPTM phase (with the exception of Travis, whose participation ended prematurely). Nevertheless, further research is necessary to evaluate this possibility.

Generalized answers (e.g., IDKPTM) can be beneficial in at least two ways: (a) They may

replace undesirable responses to questions, which in turn may enable the person to contact more social reinforcement from peers and teachers, and (b) such responses may enable acquisition of novel answers, which in turn may be beneficial to developmental and educational progress. To the extent that these consequences follow the acquisition of generalized answers, these responses may be considered behavioral cusps. Rosales-Ruiz and Baer (1997) defined cusps as behavior changes that have important consequences for the organism that go beyond the original change in behavior. Esbenshade and Rosales-Ruiz (2001) suggested that question asking in general is likely a behavioral cusp. In the current study, children learned novel answers that were never directly targeted for training (i.e., acquired answers from Unknown Sets 2, 3, and 4) as a result of learning to say, ''I don't know, please tell me.'' This outcome is consistent with the notion of question asking as a behavioral cusp. Future research should further explore this notion by examining the extent to which generalized answers lead to greater inclusion in desirable social interactions and knowledge acquisition that is important for the individual. For example, researchers could evaluate important behavior changes in different environments (e.g., classrooms) and how adults who are naive regarding the purpose of the intervention react to the children's behavior. A particularly important research topic may be the extent to which naive adults answer children's inquiries during everyday interactions, and whether those interactions yield additional social or academic benefits for the children.

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