Using Intraverbal Prompts to Establish Tacts for Children with Autism

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Some children with autism have difficulty acquiring tacts, despite their ability to mand, echo words, and imitate actions. The current study focused on 2 nonvocal children who had acquired a few mands using sign language, but had repeatedly failed to acquire signed tacts. Two procedures were compared to determine the most effective approach for training tacts to these participants. One procedure (the standard condition) used the general verbal prompt "What is that?" The other procedure (the intraverbal condition) used a specific intraverbal prompt "Sign [spoken word]." The results showed that both participants acquired nonimitative verbal responses during the intraverbal condition but not during the standard condition. One participant demonstrated complete transfer to pure tacts, and the other participant showed a partial transfer to pure tacts. These results have implications for the design of language intervention programs for children with autism who have difficulty acquiring tacts.

Children with autism frequently show substantial linguistic gains as a function of intensive behavioral intervention (e.g., Lovaas, 1987; Maurice, Green, & Luce, 1996; Smith, 1993; Sundberg & Partington, 1998). However, some children are more difficult to teach than others in that they present linguistic challenges not easily treated by typical behavioral interventions. With these more difficult and often nonvocal children, special procedures are required to move the children past certain linguistic barriers. The current study examined a language problem experienced by 2 nonvocal children with autism. Both children had failed to acquire functional speech and had only limited success with sign language. The children did acquire a few signs as mands (requests) for reinforc-

ers, but they repeatedly failed to acquire signs as tacts (labels).

This language problem may be related to Skinner's (1957) point that the mand benefits the speaker, whereas the tact (and the other types of verbal behavior) benefits the listener (p. 36). Within the mand, establishing operations (EOs) directly relevant to the speaker evoke verbal behavior that receives specific reinforcement. The tact, however, is controlled by nonverbal discriminative stimuli and receives only generalized conditioned reinforcement. Some types of mands (especially those involving food and drink) are often easier to teach than tacts, perhaps because of the potent evocative effects of the relevant EOs and the related repertoire-altering effects of specific reinforcement (Michael, 1993a).

Successful tacting requires attending to nonverbal stimuli that may be irrelevant to a child or that are blocked by a child's ongoing EOs (e.g., EOs related to self-stimulation). In addition, the consequences of the tact involve conditioned reinforcement, which may be ineffective for some children with autism (Bijou & Ghezzi, 1999). Thus, the controlling variables of the tact may

make teaching this verbal operant more task-like and of less interest or value to children with autism. Therefore, it is often the case that special procedures are necessary to establish tacts for children who repeatedly fail to acquire this important type of verbal behavior with the standard procedures.

When the participants in the current study were required to tact objects they would typically "guess" by emitting several signs in rapid succession. The participants emitted a correct sign only when given imitative prompts; thus, the response was not a tact. Attempts to eliminate the participants' dependence on imitative prompts by using delayed and partial prompting procedures repeatedly failed. This failure to acquire tacts has been observed in a number of children with autism. For example, Partington, Sundberg, Newhouse, and Spengler (1994) observed that the verbal stimulus "What is that?" had inappropriately acquired intraverbal control over a specific response (i.e., regardless of the object presented, the participant always signed "ball" when asked "What is that?"). Partington et al. suggested that the participant's "failure to acquire tacts may have been due to the presence of a verbal stimulus that blocked the establishment of stimulus control by a nonverbal stimulus" (p. 734). A procedure that consisted of eliminating the verbal stimulus and increasing the salience of the nonverbal stimulus by placing it in a box and using pointing prompts was effective in overcoming the participant's failure to acquire tacts.

The results from Partington et al. (1994) further support the findings of other researchers who have suggested that the blocking and overshadowing of stimuli can impede the transfer of stimulus control (e.g., Glat, Gould, Stoddard, & Sidman, 1994; Singh & Solman, 1990; Urcuioli, 1984). For example, Glat et al. found that in a delayed-cue matching procedure involving printed-word comparison stimuli (e.g., DOG) and dictated-name sample stimuli (e.g., "dog"), the "failure of

stimulus control transfer . . . may occur because the subject ignores the new stimulus and responds only to the delayed cue" (p. 703). These authors found that a procedure that involved having the participants repeat the sample, and a progressive increase in the delay between the sample and the comparison stimulus, resulted in the successful transfer of stimulus control.

Given the data that show that an existing verbal discriminative stimulus can block the establishment of nonverbal stimulus control, removing the existing verbal stimulus (e.g., "What is that?") can eliminate an inappropriate verbal response, but additional measures are necessary to establish a new form of nonverbal stimulus control. The procedure of placing individual objects in a box and opening the box while giving, then fading, pointing prompts was an effective method for establishing nonverbal control (Partington et al., 1994). However, the procedure had long intertrial intervals and required the use of auxiliary objects (i.e., a box). The current study sought to examine a faster way to eliminate dependence on imitative prompts and establish nonverbal stimulus control.

Skinner (1957) suggested that the use of multiple sources of control can help establish new forms of verbal behavior. Multiple control occurs when two separate sources of control combine to evoke a response. Skinner points out that "separate sources of strength are additive. . . . As a result, multiple causation produces many interesting verbal effects" (p. 228). The common use of echoic and imitative (motor) prompts along with a target stimulus is a well-established form of multiple control in language training. Less widely used, but sometimes more effective, is the use of establishing operations as additional sources of control (e.g., Carroll & Hesse, 1987; Drash, High, & Tutor, 1999; Sundberg & Partington, 1998). For example, it is often easier to teach a child to say "book" when he sees a book (nonverbal stimulus) and wants a book (estab-

lishing operation). The transfer to a pure tact may occur because the relevant nonverbal stimulus is present in the original training condition and may gain some degree of stimulus control over the target response.

Other types of verbal stimuli, such as textual (written stimuli) and intraverbal prompts, can also be used to teach new forms of verbal behavior. However, textual stimuli, like echoic and imitative stimuli (called *formal prompts* by Skinner, 1957), share the common drawback of revealing to the participant the desired response form. Intraverbal prompts, like establishing operations, do not reveal the response form but may still have the benefit of an added source of strength (these are called *thematic prompts* by Skinner, 1957). It is possible that thematic prompts can facilitate the transfer of stimulus control more effectively than formal prompts when a participant is dependent upon response-form prompts.

Intraverbal prompts are common in our day-to-day verbal behavior. These prompts can occur in the form of hints, clues, reminders, notes, lists, word associations, and so on. They are verbal stimuli that evoke specific, nonechoic verbal responses. One of the benefits of using sign language as a response form is that it allows a type of intraverbal prompt that is not available with vocal or picture training. Specifically, there is an intraverbal relation between a signed word and a spoken word (as is the case for all translations between languages). For example, when a teacher signs "shoe" and a child emits the vocal response "shoe," this verbal relation is intraverbal because both are verbal stimuli and there is no point-to-point correspondence between the stimulus and the response (Skinner, 1957). This type of prompt is different from an imitative prompt because it does not model the response form. The child must emit the response form without a model. It is possible, then, that this type of prompting may result in a more successful transfer of stim-

ulus control to the target nonverbal stimulus.

The current study examined the use of specific intraverbal prompts as a method to establish tacts for children with long histories of unsuccessful tacting. Specifically, the verbal stimulus "What is that?" was dropped, and the name of the object (e.g., "sign shoe") was vocally presented while the nonverbal object was displayed (e.g., a shoe). This procedure was contrasted with the standard tact training procedure (i.e., "What is that?" with imitative prompts) suggested in many of the behavioral language programs (e.g., Guess, Sailor, & Baer, 1976; Kent, 1974; Lovaas, 1977; Sundberg & Partington, 1998).

METHOD

Participants and Setting

Participant 1 was a 5-year-old boy with a diagnosis of autism. His speech was very limited, but he could echo several complete words and would occasionally say random words that were understandable to the general community. Despite intensive efforts to teach speech as a response form, he failed to acquire any vocal mands, tacts, or intraverbals or any correct receptive discriminations. Because of his strong motor imitation skills, a sign language program was implemented, and he quickly acquired several signs as mands (e.g., candy, book, music, teether) but failed to acquire any receptive skills or tacts (labels), despite an intensive daily program over several months. Most presentations of objects to tact resulted in guessing by the participant (i.e., he would emit several incorrect signs in varying order).

Participant 2 was a 4-year-old boy with a diagnosis of autism. His vocal abilities were very limited in that he could only echo approximately 10 different sounds. Despite intensive efforts to teach speech as a response form, he failed to acquire any vocal mands, tacts, or intraverbals or any correct receptive discriminations. However, he

was able to imitate a wide variety of motor movements, so a sign language program was implemented. He quickly acquired several signs as mands (e.g., book, candy, cookie, music, puzzle), but failed to acquire any receptive discriminations or tacts. Like Participant 1, most presentations of objects to tact resulted in guessing.

The study was conducted at the participants' school, which was a private school that primarily served children with autism. Typically, one session for each participant was conducted each school morning at a table in a partitioned area (1.7 m by 2 m) in their regular classroom. The other children, the teachers, and the aides were present in the classroom during the study. Sessions lasted 10 to 20 min for both training procedures.

Dependent and Independent Variables

The dependent variables consisted of the percentage of correct tacts for the 10 training trials for each condition (five trials per session for each object). A correct tact was defined as emitting the right sign for the object within 5 s, without emitting any additional signs. Also, the cumulative number of correct tacts during a single pre- and postsession pure tact probe was recorded across sessions. During this probe the experimenter held up the target object and said nothing. A correct tact was defined as the participant emitting the right sign for the object within 5 s, without emitting any additional signs. The independent variable consisted of the manipulation of two types of verbal prompts.

Experimental Design

A within-subject design with a between-subjects replication was used to isolate the relevant independent variables. The within-subject comparisons were achieved by the use of a multielement design that included a reversal design (Ulman & Sulzer-Azaroff, 1975).

Table 1

Objects assigned to each condition. Note that the assignment of the same object (e.g., bed) to the same condition for each participant was random.

	Participant 1	Participant 2
Intraverbal	Scissors	Table
	Bed	Bed
Standard	Shoe	Shoe
	Car	Fish
Control	Dog	Dog
	Top	Sock

Procedure

Word selection and baseline. A pool of potential objects was selected based on their apparent lack of reinforcement value and general developmental appropriateness (e.g., shoe, hat, car, bed, top, cat, fish, dog, scissors, pen, paper, table, chair, cup, spoon). Each participant was assessed on (a) his ability to correctly imitate the sign for these objects, (b) his ability to correctly tact the objects when presented with the object and asked "What is that?" and (c) his ability to correctly provide the sign given only the English word (e.g., "sign shoe") with no object present. For an object to qualify as a target tact, the participant (a) must have been able to correctly imitate the sign for the object, but (b) must have failed to tact the object, and (c) must have failed to emit the sign given only the English word. Six objects were selected from each participant's pool and were randomly assigned to either the treatment conditions or a control (untreated) group, resulting in two objects in each condition (see Table 1). A baseline was then conducted on the six objects for each participant. The baseline consisted of presenting each of the six objects and the verbal discriminative stimulus (S^D) "What is that?" five times in varying order for three sessions. The control groups received an additional three baseline sessions prior to starting intervention on those objects.

Phase 1: Probes and intervention. Prior to the start of each daily training session, a presession single-trial pure tact probe was conducted. Each of the four targeted objects from the two training conditions was held up in the participant's line of vision while the experimenter said nothing (i.e., no verbal S^D was presented). The order of the objects presented was alternated between the two conditions for each session. A correct response or a successive approximation to a correct response was followed by social praise (e.g., "Good job!") and a mand trial in which the experimenter asked the participant "What do you want?" Typically, both participants asked for candy, but they also asked for other objects such as a book, music, cookie, or puzzle. Following the delivery of the requested item and either the consumption of the item or approximately 30 s of time with the manded item, the next object to be tacted was presented. An incorrect response or no response was ignored. Following the consequence for the fourth object, there was a brief pause (1 to 2 min) before starting the tact training conditions.

During training two types of tact procedures were compared. One procedure (the standard condition) used the verbal prompt "What is that?" along with the presentation of the object. A correct response or a successive approximation was followed by social praise (e.g., "Good job!") and a mand trial as described above. An incorrect response or no response was followed by a correction procedure that consisted of presenting an imitative and intraverbal prompt (e.g., the experimenter would sign and say "bed") along with the "What is that?" prompt with the presentation of the object. A correct response (which always occurred under these conditions) was followed by praise and the re-presentation of the original verbal prompt "What is that?" A correct response under these conditions was followed with praise only, and a new trial on the other object in the set began. An incorrect response

was followed by the imitative and intraverbal prompt procedure (but no return to the original verbal prompt this time), and a correct response was followed by praise and a new trial on the other object.

The second procedure (the intraverbal condition) used a specific intraverbal vocal prompt (e.g., "sign bed") along with the presentation of the object (without the verbal prompt "What is that?"). Correct responses and successive approximations were followed by praise and a mand trial. An incorrect response or no response was followed by a correction procedure similar to the one described above, except the return to the original prompt was a return to the specific intraverbal prompt rather than the "What is it?" prompt.

The order of training was alternated between the two conditions each session. Within a condition, training was given on both of the objects from one condition, alternating between the two objects each trial. There were five training trials and correction procedures, if necessary, for each object.

Following training on the two objects from a condition, there was a brief pause (1 to 2 min) and a postsession single-trial pure tact probe on each object. This probe was conducted in exactly the same manner as the presession probe, except that the probe was conducted on the two objects immediately after each condition rather than on all four objects successively, as was the case in the presession probe.

Phase 2: Reversal. The verbal prompts were reversed for each set of objects during this condition. Thus, the two objects that were initially presented with the standard format (i.e., "What is that?") were now presented with the intraverbal format (i.e., "Sign [object]"), and the two objects that were initially presented with the intraverbal format were now presented with the standard format.

Phase 3 (only for Participant 1). All four objects were placed in the intraverbal condition.

Phase 4. The four control objects (two for each participant) were placed in the intraverbal condition.

Phase 5: Reversal (only for Participant 1). The verbal prompt was changed to "What is that?" during this condition.

Response Definition and Reliability

The experimenter recorded the occurrences of the signed responses and scored them as correct, an approximation, or incorrect. A correct response was scored if the participant emitted the complete sign (e.g., for the sign "shoe" the closed fists coming together at the thumbs in front of the body). An approximation was scored if the participant emitted part of the sign (e.g., for the sign "shoe" the closed fists without bringing the hands together). Approximations were given half the point score of a fully correct response. An incorrect response was scored if the subject emitted a sign that did not correspond with the object, emitted more than one sign, or failed to respond within 5 s.

A second observer independently recorded the participants' responses during 12.4% of the sessions (there were 85 sessions for Participant 1 and 68 sessions for Participant 2). Reliability data were taken for the baselines, pre- and postsession probes, and the training sessions. A point-by-point reliability method of dividing the total number of agreements by the number of agreements plus disagreements and multiplying by 100% was used. The mean percentage agreement score for the baselines was 100%, the mean percentage agreement score for the pre- and postsession probes was 98.6% (range, 87.5% to 100%), and the mean percentage agreement score for the training sessions was 93.6% (range, 85% to 100%).

RESULTS

Figure 1 shows the results of the experiment. During the standard condition, Participant 1 failed to acquire either tact ($M = 27.6\%$). Often he would emit the same sign for both objects, thus scoring 50% correct. During the intraverbal condition the participant met the criterion of three consecutive sessions of 80% or better after 11 sessions. Following these sessions, his performance stabilized at or above 80% correct for the remainder of the condition ($M = 77.2\%$ for the whole condition). Training was continued after the 11th session in an effort to see if acquisition would eventually occur in the standard condition, and if a pure tact would occur in either condition. It is interesting to note that after a 13-day vacation (Session 26), performance in the standard condition dropped to 0% but was maintained at or above 80% in the intraverbal condition.

During the reversal phase, Participant 1's performance immediately deteriorated when the objects from the intraverbal condition were presented in the format of the standard condition ($M = 10\%$). The verbal stimulus "What is that?" consistently evoked a number of different signs in rapid succession, despite a history of success on these objects when they were in the intraverbal condition. On the other hand, when the objects from the standard condition were presented in the format of the intraverbal condition there was an immediate increase in correct responding ($M = 70\%$). When all four objects were placed in the intraverbal condition, performance stabilized at 80% or better ($M = 86.1\%$).

The bottom panel of Figure 1 shows the results for Participant 2. His performance was very similar to that of Participant 1, except that there was more variability in his scores. During the standard condition, Participant 2 failed to acquire either tact ($M = 22\%$). However, during the intraverbal condition he met the criterion of three consecutive sessions of 80% or better after eight sessions ($M = 72.3\%$ for the whole condition). Sessions were also continued with this participant to see if acquisition would eventually occur in
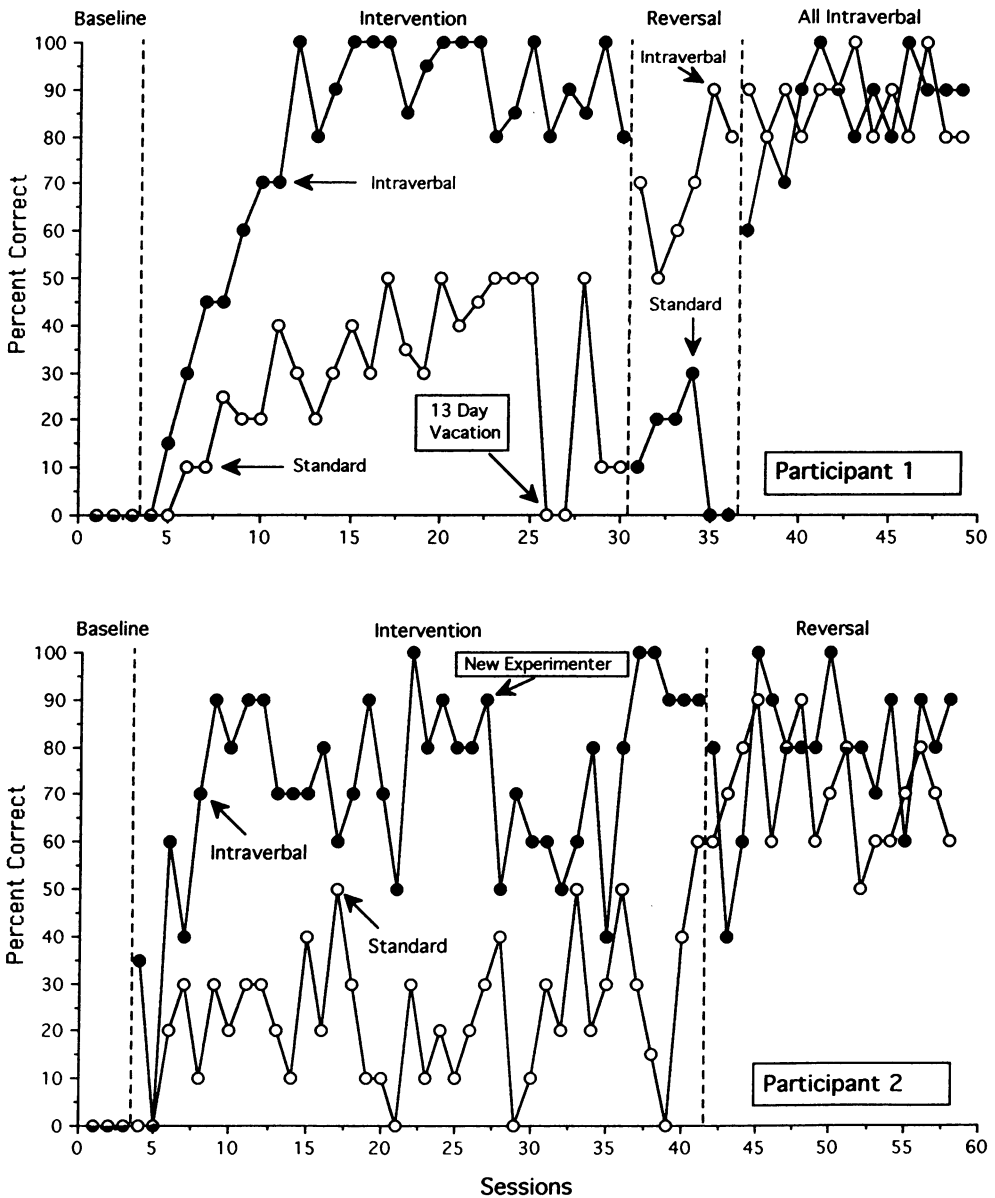
Sign Language Acquisition

Fig. 1. Percentage of correct tacts for Participants 1 and 2 in the intraverbal and standard condition. The open circles represent the objects "shoe" and "car" for Participant 1, and "shoe" and "fish" for Participant 2. The closed circles represent "scissors" and "bed" for Participant 1, and "table" and "bed" for Participant 2.

the standard condition, or if a pure tact would occur.

It is interesting to note how a change in the experimenter affected this participant's performance. During the first session with the new experimenter

(who had previously worked with this participant on other skills), there was no substantial change in his performance, but by the next session his performance deteriorated. Observations of his behavior during these sessions

showed an increase in his task-avoidance behaviors (e.g., falling on the floor, climbing on the table), suggesting the instructional stimulus control established by the first experimenter did not generalize to the second experimenter. However, the split in performance between the two conditions was maintained, and his performance gradually returned to the previous level, and then improved further.

During the reversal phase, Participant 2's performance deteriorated somewhat when the objects from the intraverbal condition were presented in the format of the standard condition, but his performance recovered after three sessions (M = 79.4% for the whole condition). However, his performance never returned to the level achieved in the final five sessions of the previous condition. When the objects that had previously been in the standard condition were presented in the intraverbal format, performance improved (M = 70%), but not to the level that had been achieved with the other objects during the intraverbal condition in the previous phase. However, it was observed that during the standard condition the verbal stimulus "What is that?" began to function appropriately as an S^D for the participant to look at the object, rather than as a verbal stimulus that immediately evoked a verbal response without regard to the presence of a nonverbal stimulus. In addition, this participant correctly tacted the objects in the pre- and postsession probes; thus, these objects were not returned to the intraverbal condition.

Figures 2 and 3 show performances on the pre- and postsession pure tact probes. There was a single tact trial for each object during these probes. The cumulative number of correct pure tacts across sessions are presented. Figure 2 shows that Participant 1 did not completely acquire pure tacts in either probe; however, he did demonstrate a better overall performance on both probes during intraverbal conditions.
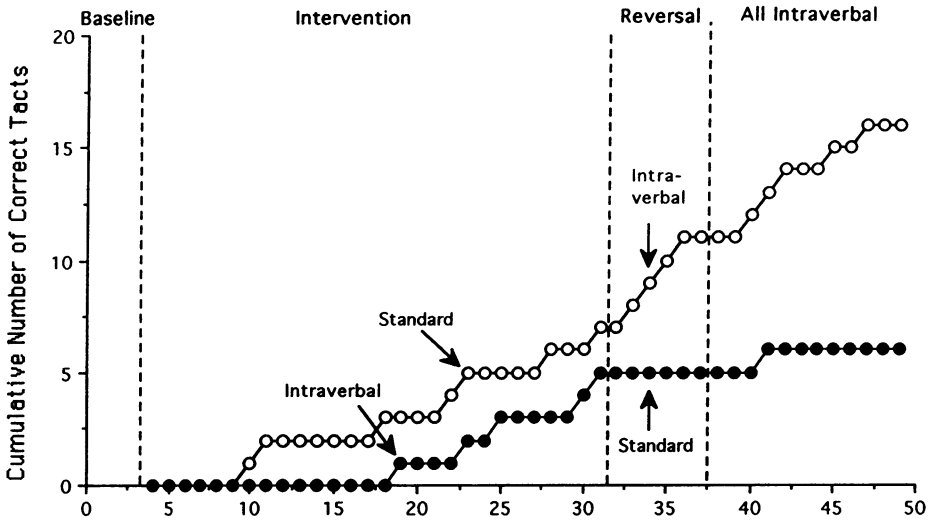
During the presession probe (Figure 2, top panel), Participant 1 performed slightly better with the standard procedure. On this probe he correctly tacted an object from the standard condition seven times in 56 trials (12.5%), whereas in the intraverbal condition he correctly tacted an object five times in 56 trials (8.9%). During the reversal phase, however, his performance was substantially better in the intraverbal condition. He correctly tacted an object in the intraverbal condition four times in 12 trials (33%), whereas in the standard condition he never successfully tacted an object in 12 trials (0%). When the conditions were the same, he showed better performance in one intraverbal condition, with five correct tacts out of 24 trials (20.8%), than he did in the other, with one correct tact out of 24 trials (4.2%).

On the postsession probe (Figure 2, bottom panel) Participant 1 correctly tacted an object from the intraverbal condition 17.5 times in 54 trials (32.4%), whereas in the standard condition he correctly tacted an object 12.5 times in 54 trials (23.1%). He was successful in tacting all four objects at least three times (but never all four in the same session). The separation between the two conditions appears to widen in the later sessions of this phase. During the reversal phase he correctly tacted an object in the intraverbal condition six times in 12 trials (50%), whereas in the standard condition he correctly tacted an object four times in 12 trials (33.3%). When the conditions were the same (all intraverbal), the slight separation between the two sets of objects was lost. The total number of correct tacts in this condition was 16 of the 52 trials (30.7%).

It is interesting to note the lasting effects of the reversal to the standard condition for Participant 1. When the objects that had been in the intraverbal condition were presented with the "What is that?" S^D, not only did his performance decrease (see the top panel of Figure 2, reversal phase, standard condition), but he never recovered

Pre-Session Pure Tact Probe

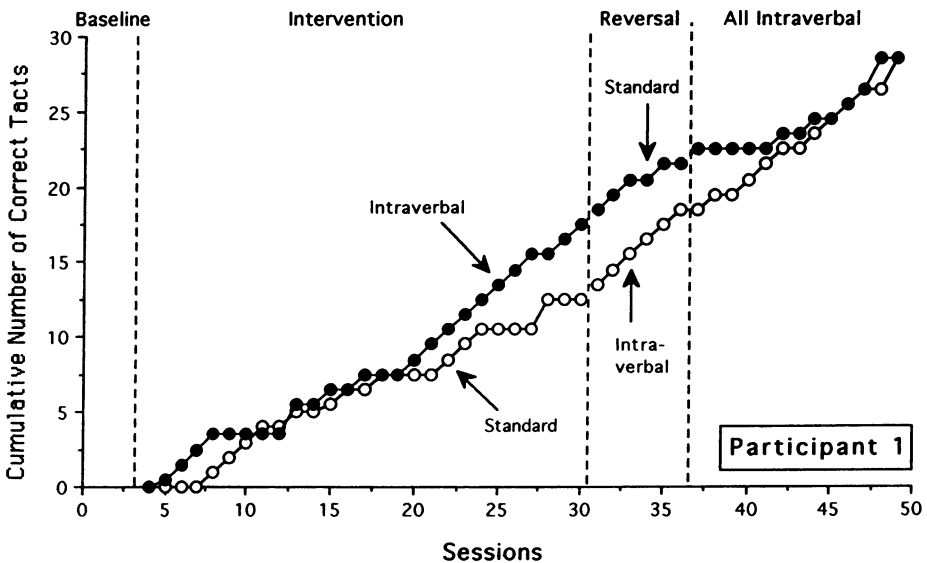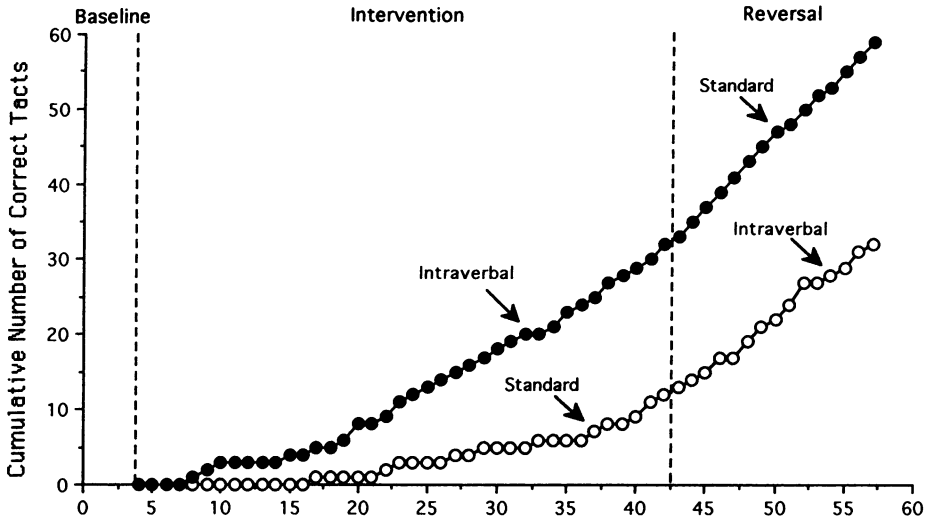## Post-Session Pure Tact Probe

Sessions

Fig. 2. Cumulative number of correct tacts for Participant 1 during the pre- and postsession probes. The open circles represent the objects "shoe" and "car," and the closed circles represent "scissors" and "bed."

from this condition, even when the conditions were reversed back to intraverbal. A similar effect can be observed in the postsession probes, but to a lesser degree. This effect was not observed in the within-session data (Fig-

ure 1, top panel), thus demonstrating an additional value of the probes as a separate measure of performance.

Figure 3 shows that Participant 2 acquired pure tacts in both conditions, but did substantially better in the in-

Pre-Session Pure Tact Probe
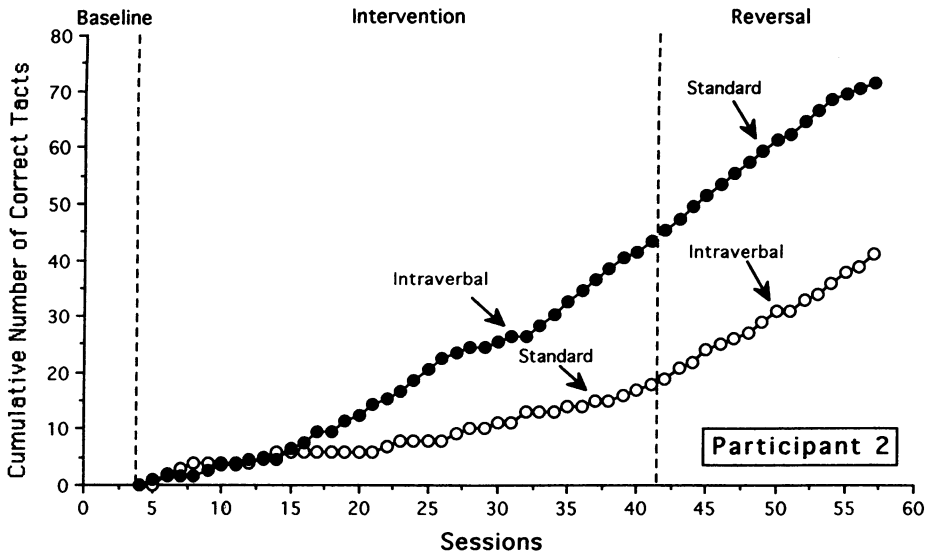

Post-Session Pure Tact Probe

Fig. 3. Cumulative number of correct tacts for Participant 2 during the pre- and postsession probes. The open circles represent the objects "shoe" and "fish," and the closed circles represent "scissors" and "bed."

traverbal condition. During the pre-session tact probe (Figure 3, top panel) he correctly tacted an object from the intraverbal condition 32 times in 78 trials (40.1%), whereas in the standard condition he correctly tacted an object 11 times in 76 trials (14%). During the reversal phase, however, his performance was better in the standard condition. He correctly tacted an object in the standard condition 26 times in 30 trials (86.7%), whereas in the intra-

verbal condition he correctly tacted an object 19 in 30 trials (63.3%).

During the postsession probe (Figure 3, bottom panel) Participant 2 correctly tacted an object from the intraverbal condition 43.5 times in 76 trials (57.2%), whereas in the standard condition he correctly tacted an object 18 times in 76 trials (23.7%). During the reversal phase he correctly tacted an object in the standard condition 28 times in 32 trials (87.5%), and in the intraverbal condition he correctly tacted an object 23 times in 32 trials (71.8%). The failure to show a reversal in pre- and postsession probes was probably due to the fact that this participant (unlike Participant 1) had nearly acquired both pure tacts in the intraverbal condition prior to reversal. At this point the verbal S^D "What is that?" seemed to help the discrimination (see Figure 3, top panel, reversal condition) by functioning as an S^D to attend to the nonverbal stimulus. It should be pointed out that the improvement in tacting during the probes by both participants may have been partially due to the use of reinforced probes. However, this contingency was in effect for both conditions, and there still was a split in performance.

Figure 4 shows the participants' performance on the control objects. During the initial baseline conditions and the baseline conducted during intervention on the other objects, neither participant correctly tacted any of the objects. The participants were given training with just the intraverbal procedure. The top panel shows that Participant 1 met the criterion of three consecutive sessions of 80% or better after 18 sessions ($M = 63.3\%$). Training on this condition was initially started in Session 43, but it took too long to conduct the training sessions with six target objects, so training was discontinued until the end of the all-intraverbal condition. Training on this condition was extended past the criterion level to see if pure tacts would emerge. The conditions were reversed to the standard format following Ses-

sion 66. There was a slight decrease in performance, but not to the degree that had occurred during the reversal with the first objects (see Figure 1, top panel), and the participant quickly recovered and correctly tacted with the S^D "What is that?" The bottom panel of Figure 4 shows that Participant 2 acquired the signs for the two control objects very quickly. He met the criterion of 80% or better in four sessions. This rate of acquisition is substantially faster than this participant demonstrated with the first set of objects (see Figure 1, bottom panel).

Figure 5 shows that both participants were successful under pure tact conditions. During the presession tact probe, Participant 1 correctly tacted an object 14 times in 48 trials (29.1%), and during the postsession tact probe, he correctly tacted an object 23 times in 48 trials (47.9%). This percentage of correct pure tacting is a substantial improvement over his performance with the first set of objects (see Figure 2), despite the slower acquisition demonstrated with these objects. Participant 2 also showed a transfer to pure tacts. During the presession tact probe, Participant 2 correctly tacted an object three times in eight trials (37.5%), and during the postsession tact probe he correctly tacted an object six times in eight trials (75%).

Anecdotal Follow-Up

Approximately 1 year after the start of the study, both participants had acquired over 50 tacts and receptive discriminations. They both were able to successfully respond to the verbal S^D "What is that?" and no longer needed the intraverbal prompt procedure. In addition, manding increased substantially, and both participants demonstrated improved echoic skills including vocal mands and tacts. They also both began to acquire some simple intraverbal behavior. These advancements were considered substantial for these 2 participants because they had
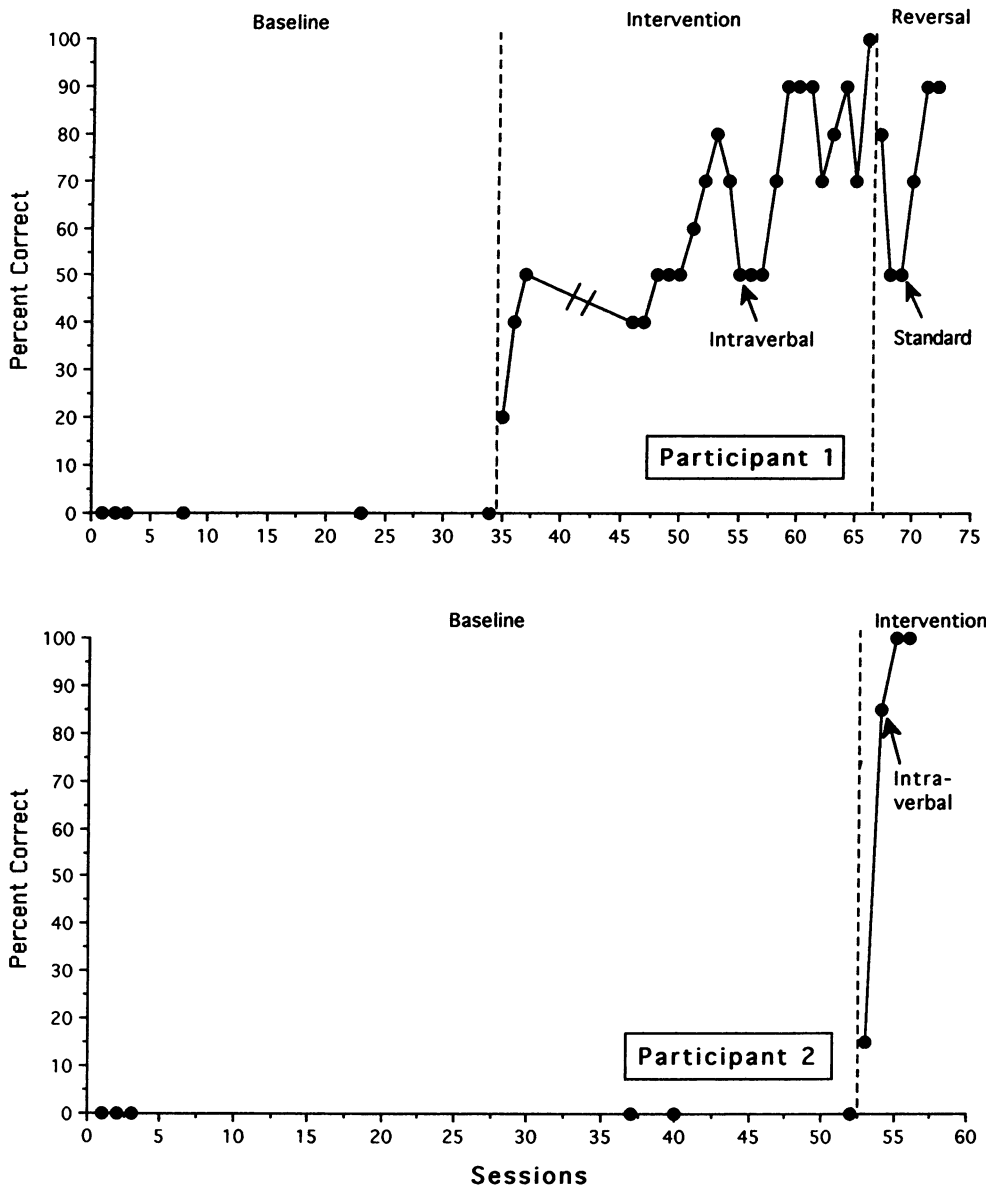
Sign Language Acquisition for the Control Groups

Fig. 4.   Percentage of correct tacts for the control objects for Participants 1 and 2. The closed circles represent the objects "dog" and "top" for Participant 1, and "dog" and "sock" for Participant 2.

long histories of failing to acquire any verbal behavior.

DISCUSSION

The current study demonstrated that the intraverbal prompt procedure can be an effective technique for freeing sign language responses from imitative prompts. In addition, despite long histories of failure with the "What is that?" procedure, the participants not only acquired pure tacts, but both of them were ultimately able to emit correct tacts with the "What is that?" ver-

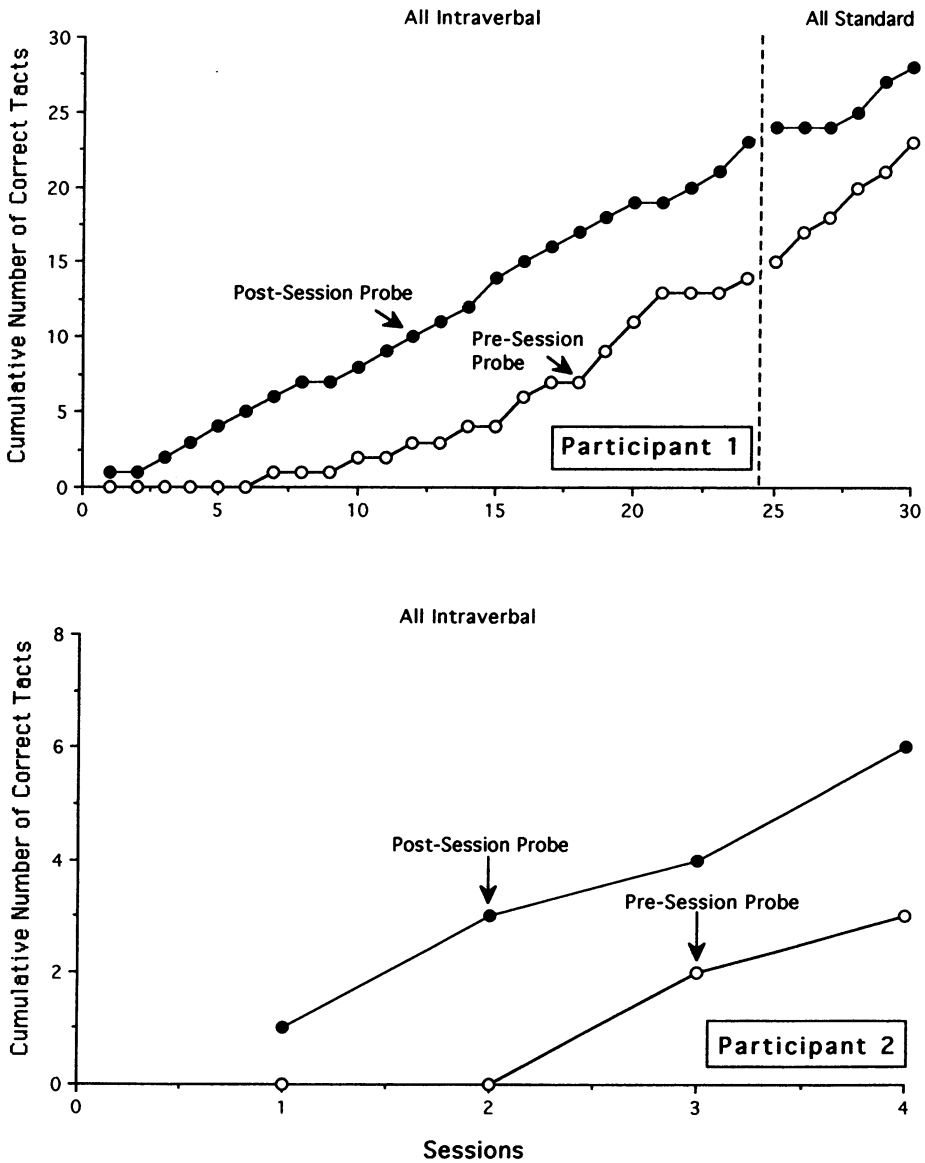## Pre- and Post-Session Tact Probes for Control Objects

Fig. 5. Cumulative number of correct tacts for Participants 1 and 2 during the pre- and postsession probes of the control objects. The objects "dog" and "top" were used for Participant 1, and "dog" and "sock" for Participant 2.

bal S^D. These results replicate and extend the findings by Partington et al. (1994), and support their analysis of the potential blocking effect of the verbal stimulus "What is that?" in early tact training. The current data also support Skinner's (1957) proposal that cer-

tain types of multiple control can be effective for establishing new types of verbal behavior.

It is interesting to note the negative effects of the standard "What is that?" tact training procedure on the 2 participants in this study. It appears that for

some children with severe language delays, this verbal stimulus may acquire intraverbal control over a specific sign or word, as observed by Partington et al. (1994). In addition, this verbal stimulus may acquire control over a class of signs (or words) as demonstrated by the guessing type of errors observed in the current study. With both types of errors, the participants tended to respond quickly to the verbal S^D without even looking at the object; an effect similar to that observed by Glat et al. (1994). At one point Participant 1 was presented with each of five of his reinforcers (which he could easily mand for with signs) and was asked "What is that?" He signed "bed" for all five objects. The intraverbal procedure eliminated these errors, and thus overcame this linguistic barrier, making the further development of the tact repertoire possible, as demonstrated by current data and the anecdotal follow-up data.

The differences between the performances of the 2 participants was also of interest. Although both participants began at essentially the same verbal level, their day-to-day performance and acquisition varied considerably. Participant 1's performance was slow but increased steadily, whereas Participant 2 demonstrated much more variability. Participant 2 engaged in a substantial amount of avoidance and escape behavior during sessions and was more difficult to work with, but ultimately he demonstrated the best transfer to pure tacts. Participant 2 did not need the all-intraverbal condition, because after a brief decrease in the reversal condition his performance under the standard condition steadily improved (although it was quite variable) to a level higher than in the intraverbal condition. This may be due to his successful history with these objects, or to the possibility that the verbal stimulus "What is that?" appropriately functioned as an S^D to attend to the object. These possibilities are in need of further research, especially because Participant 1 also demonstrated successful

performance with the "What is that?" condition in the final phase of the control objects.

These findings have several interesting implications and other possibilities for further research. Perhaps most important is that the common practice of using the "What is that?" procedure may cause more harm than good for some children. However, many children can easily acquire tacts with the "What is that?" procedure, so it is important to develop an assessment tool that would allow the early identification of children who do not acquire tacts with the standard procedure and who would benefit from the intraverbal procedure. This type of early identification may help to avoid the establishment of error responses. In addition, procedures to fade the intraverbal prompt should be explored further. Following the current study, a delay procedure and a partial prompt procedure were shown to be effective for fading the intraverbal prompt; however, further research is necessary to examine these procedures empirically.

An important element of the current research was that the intraverbal prompt was actually used in both conditions. However, in the intraverbal condition it was used as an antecedent stimulus presented prior to the target response, whereas in the standard condition it was used in the correction procedure following an incorrect response. Thus, the results of the current study support the view that a focus on using prompts to prevent errors may be more beneficial than the use of prompts to correct errors (Terrace, 1963; Touchette, 1971). Further research on the location of prompts in the procedures used to teach verbal behavior to children with language delays would certainly be interesting.

There are several aspects of the classification of verbal behavior used in the current study that need to be further explained. First, the initial effect observed in the study was the elimination of imitative prompts. This step was significant for these participants be-

cause of their history of dependence on imitative prompts, but the responses at this point can only be classified as multiply controlled responses because it was unclear whether they were controlled by the English word (intraverbal) or the object (tact). It was clear that neither stimulus alone evoked the response initially, but when presented together they did control a correct response. Eventually the object alone evoked a tact, but no data were taken on the intraverbal prompt alone during training to determine at what point this stimulus could correctly evoke the target response. These data would be of interest in future research on this procedure.

Second, both procedures involved a type of multiple control in that they both used a verbal and nonverbal stimulus. However, the "What is that?" stimulus, although clearly a verbal stimulus, typically cannot control a specific verbal response form without the accompaniment of a nonverbal stimulus. That is, in the absence of any object to attend to (e.g., if someone is blindfolded) one cannot successfully answer the question "What is this?" Thus this type of prompt is perhaps more correctly identified as simply a verbal prompt. On the other hand, the verbal prompt "sign shoe" can successfully evoke a specific intraverbal response in the absence of the nonverbal stimulus. Thus, this type of prompt is classified as an intraverbal prompt in the current study.

Finally, the classification of the pre- and postsession tact probes as pure tacts suggests that there were no other sources of control for the response other than the relevant nonverbal stimulus. Although there were no verbal stimuli such as "What is that?" or "sign dog," there were possibly other variables, such as the presentation of the object in front of the participant (an S^D to respond), the presence of an audience with a history of reinforcing verbal responses, and the possibility of a reflexive conditioned EO (Michael, 1993b) that would involve the presence of an

aversive stimulus (the experimenter and an object presented in front of the participant) that is terminated upon a response. Although no measures were taken on any of these variables, it is probably the case that one or all of them played a role in evoking the response during the probe conditions. However, although they are not totally pure tacts, for purposes of the current study they were a significant approximation to pure tacts for these participants.

In conclusion, the data show that participants who had long histories of failing to acquire tacts could be successful with a modification of the teaching procedure. The analysis presented in this study and the intervention procedure that proved to be successful were directly derived from *Verbal Behavior* (Skinner, 1957). The results of this study lend further support to Skinner's point that his analysis of verbal behavior "is inherently practical and suggests immediate technological applications at almost every step" (p. 12).

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