The Analysis of Verbal Behavior 1991, 9, 19-28

The Effects of Specific Versus Nonspecific Reinforcement on Verbal Behavior

Steven J. Braam
New Medico Rehabilitation Center of Wisconsin

AND

Mark L. Sundberg
Sundberg and Associates, Concord, CA

The current study is a systematic replication and extension of previous research on the differences between specific (mand) and nonspecific (tact) reinforcement. The focus was on the role that these different consequences played in the acquisition of verbal behavior. Using both a within-subject and a between-subjects design, the current researchers trained eight essentially nonverbal individuals to tact a variety of foods under two different reinforcement conditions. The results showed no significant differences between the four matched-pairs in rates of acquisition, or in the resistance to extinction. However, subjects in the specific reinforcement condition emitted more untrained mand-compliance responses, while subjects in the nonspecific group demonstrated increased generalization to multiply controlled mand conditions. The results supported previous findings which indicated that the two types of consequences were equally effective in the acquisition of tacting, but each had unique features and implications for language training with nonverbal populations.

Skinner (1957) proposed that a distinction be made between the mand and the tact because these two operants involve different types of controlling variables. The mand is evoked by establishing operations (EOs) and followed by specific consequences, while the tact is evoked by nonverbal discriminative stimuli (S^Ds) and followed by nonspecific, or generalized reinforcement. The conceptual distinctions Skinner made between these verbal operants seem clear. However, there is very little experimental work that identifies the differences in the evocative or repertoire-altering effects of these separate independent variables (Michael, 1982, 1983, 1988). The distinction between establishing operations and discriminative stimuli, the antecedent side of these two verbal operants, has received the most amount of attention. Several empirical studies have now demonstrated differences in the evocative effects of the EO versus the S^D (e.g., Carroll & Hesse, 1987; Lamarre & Holland, 1985; Hall & Sundberg, 1987; Sigafoos, Reichle, Doss, Hall, & Pettitt, 1990; Sundberg, San Juan, Dawdy, & Argüelles, 1990). This research has also resulted in several practical applications.

However, the consequences of the mand and the tact have received less conceptual and experimental attention, hence, less is known about their differential strengthening effects. The first known attempt to directly examine the effects of specific versus nonspecific reinforcement was conducted by Saunders and Sailor (1982). These researchers, while studying receptive language (mand compliance), pre-

This research was part of a study conducted by the first author in partial fulfillment of the requirements for a Ph.D. degree at Western Michigan University. Portions of this paper were also presented at the 1990 meeting of the Association of Behavior Analysis: International, Nashville, TN. The authors thank Cassandra Braam, R. Wayne Fuqua, Jack Michael, Paul Mountjoy, and Thelma Urbick for their comments on an earlier version of the manuscript. Address correspondence and reprint requests to Steven J. Braam, New Medico Rehabilitation Center of Wisconsin, 1701 Sharp Road, Waterford, Wisconsin 53185.

sented developmentally disabled (DD) children with toys that appeared to function as reinforcers. Two toys (training stimuli) were presented and the subjects were asked to point to each one when named by the experimenter. In the specific reinforcement condition the subjects' correct response was followed by an opportunity to play with the toys to which they had pointed. In the nonspecific reinforcement condition, subjects' correct responses were followed by an opportunity to play with toys that were not training stimuli. There was also a variable reinforcement condition where, following a correct response, subjects were given either specific or nonspecific reinforcement. The results showed that the percentage of correct responses were greater in the specific reinforcement condition than in either the nonspecific or the variable reinforcement condition.

Although Saunders and Sailor (1982) studied the use of these types of reinforcement with mand-compliance behavior, the application of the techniques to verbal behavior training has also been conducted. In reviewing the literature regarding tact training with DD individuals, it appeared that there were two general teaching procedures differentiated by the relationship between discriminative and reinforcing stimuli. One procedure is typified by using reinforcers bearing no specificity to the discriminative stimuli evoking the responses. For example, when shown a cup or a picture of one and a learner said "cup," a teacher delivered a small and quickly consumable edible reinforcer, such as M&M candies (e.g., Faw, Reid, Schepis, Fitzgerald, & Felty, 1981). In a second approach to tact training, reinforcers specific to the discriminative stimulus were given contingent on correct responses. In this approach, when shown a ball and a learner responded correctly (said "ball") s/he received the object to play with, or in the case of edibles, the food to eat (Carr, Binkoff, Kologinsky, & Eddy, 1978). In another variation of this procedure a learner was shown a picture of an object or event as the stimulus, and following a correct response, the actual object or event depicted by the picture was delivered to the learner (Carr et al., 1978). All of these procedures resulted in increased tacting, however they have not been compared with each other.

In an attempt to further examine these two types of consequences, Stafford, Sundberg, and Braam (1988) replicated the basic procedure used by Saunders and Sailor (1982), but focused on mands and tacts rather than mand-compliance responses. A within-subject multielement design was used to study the acquisition of two separate complex signed mand/tact responses with a developmentally disabled youth. In both conditions stimuli which also functioned as reinforcers were shown to the subject and placed in the condition-respective container (a cup in one condition and a bowl in the other). At the same time the experimenter asked the youth, "What do you want?" Following a correct response (e.g., *food-blue-cup-on-table*) in the specific reinforcement condition, the experimenter gave the youth the reinforcer in the cup. In the nonspecific reinforcement condition, following a correct response (e.g., *soda-green-bowl-under-chair*) the experimenter delivered a reinforcer different from that in the bowl.

Stafford et al. (1988) found no difference in the percentage of correct responding across the increasing levels of difficulty between the two conditions. However, they found a shorter response latency in the specific reinforcement condition. Furthermore, the subject chose the specific reinforcement condition more frequently when allowed to choose between training conditions. Although the data demonstrated that responses trained with specific reinforcement were not acquired more rapidly than responses trained with nonspecific reinforcement, the differences in latency and condition preference indicated that such training may affect verbal repertoires in unique ways.

The current study was designed to further investigate these two types of reinforcement procedures. Since the Stafford et al. (1988) study was conducted with a single subject it seemed important

to replicate the procedure using several subjects. In addition, a different research methodology, along with three new dependent variables, was used. Using both a within-subject and a between-subjects design, eight essentially nonverbal individuals were trained to tact a variety of foods under the two different reinforcement conditions. Of particular interest were the measures of maintenance of previously reinforced responding during extinction, the generalization of trained responses to different antecedent conditions, and the emergence of untrained mand-compliance relations.

METHOD

Subjects

Eight young adults, ages 18 to 24 years (mean=22), served as subjects. Standardized testing conducted with the Stanford-Binet (Terman & Merrill, 1973) and the Vineland Social Maturity Scale (Doll, 1965) indicated their IQs were below 25. They were all diagnosed Severely Mentally Impaired. The subjects were all ambulatory, toilet-trained, and self-feeding. They resided in the community, either with their families or in group foster care, and attended daytime special education programming.

These individuals were chosen to participate because of their extremely limited repertoires. Isolated examples of mands, tacts, and mand compliances (pointing to named objects) were observed. However, these behaviors were under poor stimulus control, and occurred at a very low frequency rendering the subjects essentially nonverbal. Subject characteristics are presented in Table 1. Prior to the start of this study the subjects received no systematic language training either vocal or signed.

Setting and Apparatus

The study was conducted at a large special education center. All sessions were conducted in a 4′ X 6′ partitioned area of the subjects' classroom. The experimenter (first author) worked daily with each of the eight subjects on an individual basis. To the experimenter's left was a table on which training stimuli were displayed or manipulated. Also, to the experimenter's left was a small bookshelf used to store subsequent training stimuli out of sight during training or testing with another stimulus.

Table 1

Subject characteristics.

Subject	Sex	Age	Mand	Tact	Mand Compliance	Matched Pair/Condition
BL	M	25	None	None	None	1/Specific
JN	M	21	None	None	None	1/Nonspecific
JD	M	19	None	None	None	2/Specific
FD	M	18	Weak	Weak	Weak	2/Nonspecific
ML	M	19	Weak	Weak	Weak	3/Specific
ME	M	25	Weak	Weak	Weak	3/Nonspecific
KH	M	24	Weak	Weak	Weak	4/Specific
MN	F	25	Weak	Weak	Weak	4/Nonspecific

Procedures

A matched-pair design was used. Between-groups and between-subjects statistical analyses of the number of tact training trials to criterion were made using *A*-tests. In addition, within-subject and between-groups visual analyses were made across behaviors (mand, tact, and mand compliance) in post-training probes.

Assignment to treatment groups. Subjects were matched according to their ages and functioning levels. This procedure yielded four matched-pairs of subjects. Using a random numbers table, one subject of each pair was assigned to an experimental condition. That subject's corresponding pair was then automatically assigned to the opposite condition. For example, if the first subject of a pair was assigned to the specific reinforcement condition, his/her pair was automatically assigned to the nonspecific reinforcement condition.

The next subject to be assigned was chosen at random, but the condition was predetermined by the previous pair's assignments. That is, if the first subject chosen at random went to specific and his pair went to nonspecific, then the next subject chosen at random automatically went to the nonspecific condition and his pair automatically would go to the specific condition. This procedure ensured the equal assignments of subjects to conditions.

Reinforcer sampling. Foods used for training stimuli were demonstrated functional reinforcers for the subjects in classroom activities. To assess relative levels of deprivation and satiation and also to provide a basis for selecting training stimuli 10 two-phase reinforcer sampling sessions were conducted with each subject prior to the start of training. For each subject, five of the reinforcer sampling sessions were conducted during the mornings and five were conducted during the afternoons of 10 consecutive school days. At the start of a reinforcer sampling session, each of the 10 food items were individually presented in a random order. During this first phase of sampling the experimenter placed a piece of food on a 13 cm paper plate directly in front of the subject. If hesitant, the subject was encouraged to pick up the food from the plate and eat it. Afterwards, the next item was presented in exactly the same way. This procedure continued for all of the 10 items.

Immediately following the above procedure, the second phase of reinforcer sampling began. Ten items identical to those previously presented and eaten were simultaneously placed in front of the subject. Each item was on an identical paper plate and arranged in an arc so that each was relatively equidistant from the subject's dominant hand. Since some of the subjects had gross and fine motor movement limitations, this arrangement was an attempt to ensure that an equivalent response effort would be required to choose each item.

The experimenter then directed (by pointing) the subject to look at each item and touch the corresponding plate (observing response). Any attempts to pick up the food were discouraged. After an observing response was made to all 10 stimuli, the experimenter allowed the subject to choose and eat any one item s/he wished. Once the chosen item was eaten, the procedure began again and continued until all the food was eaten. The numerical order of the selections was recorded, yielding a hierarchy for that session. This information was used to choose training stimuli, as explained in the subsequent section.

Selection of training stimuli. Following the 10 reinforcer sampling sessions, the numbers corresponding to each subject's selection order for each reinforcer were summed across the 10 test sessions (e.g., peach = 1+3+2+1+6+2+4+3+2+1=25). These summed scores were averaged and rank-ordered, yielding each subject's satiation/deprivation level for each reinforcer. The ranks of all subjects' reinforcers were summed according to reinforcers and averaged across subjects, yielding a rank-order measure of satiation/deprivation levels of reinforcers for all subjects.

The experimenter selected training stimuli and reinforcers (these were identical for specific reinforcement subjects) in a balanced fashion from the rank-order list.

Initially, one-half of the nonspecific reinforcement subjects were trained with cookie (ranked first) reinforced by popcorn (ranked ninth) and peach (ranked seventh) reinforced by pudding (ranked third). The other two subjects were trained with cereal (ranked tenth) reinforced by banana (ranked second) and pop (ranked fourth) reinforced by bean (ranked eighth). When criteria were met, paired training stimuli and reinforcers were switched between the nonspecific reinforcement subjects. One-half of the specific reinforcement subjects were trained with identical stimuli and reinforcers ranked first (cookie) and seventh (peach) and one-half with those ranked fourth (pop) and tenth (cereal). When criteria were met, the training stimuli were switched.

Pretesting. After reinforcer sampling and assignment to groups, pretesting was conducted to control for untrained acquisition of the target responses prior to training. A three-trial pretest occurred prior to the start of the first training session for each stimulus. A pretest trial was identical to a training trial, as described in the following section, but was not systematically reinforced. Responses were recorded as correct or incorrect during the pretest.

Training sessions. The experimenter placed a piece of food on a paper plate on a colored mat. He then prompted the subject to look at the food by pointing at it. After waiting for the subject to look at the food, he said/signed, "What is this?" Thus, the training stimulus had four components: (1) a nonverbal stimulus (food), (2) an observing prompt, (3) a verbal stimulus ("What is this?"), and (4) the colored mat. A correct response was a signed tact corresponding to the nonverbal training stimulus and occurring within five seconds of the experimenter saying/signing, "What is this?". The experimenter reinforced (praised and gave the subjects food) following correct unprompted signed responses (tacts). After three consecutive tacts, training ended for that stimulus in that session.

A graduated prompt procedure was instituted for incorrect or no responding. Modeling the correct response was the first level of prompting. First, following an incorrect response or no response within five seconds, the experimenter re-presented the training stimulus and modeled the correct signed response. He reinforced correct responses. At the second level of prompting following an incorrect or no response, the experimenter re-presented the four-component training stimulus and immediately took the subject's hands and helped him/her form the correct signed tact. As before, the experimenter reinforced correct responses.

Two tacts were consecutively trained daily with each subject. After the daily criterion was met for the first training stimulus, training with the second stimulus was conducted in exactly the same manner. Daily training continued until the subject gave three consecutive tacts or 10 training trials occurred (the end-of-session criterion). The end-of-training criterion for each target response was three consecutive sessions at or above 90% unprompted correct accuracy. For practical purposes, if the training criterion was met for one response prior to the other, training continued for both until the criterion was met for both responses, or the end-of-training limit (25 sessions) occurred. This procedure allowed a trained response to be minimally maintained while training of the second response continued.

Reinforcement procedures differed between conditions. In the specific reinforcement condition following a correct tact (prompted or unprompted) the experimenter gave the subject food identical (specific) to the nonverbal training stimulus. For example, the experimenter gave subjects pieces of peaches when real pieces of peaches were used as training stimuli. In the nonspecific reinforcement condition, the experimenter gave subjects food that was different (nonspecific) from the nonverbal training stimulus. For example, if subjects correctly tacted peaches, the experimenter gave them pudding. Nonverbal stimuli used during the nonspecific reinforcement condition remained consistently paired throughout training. For example, the

correct response "pop" always resulted in delivery of a bean. Additionally, a different colored paper mat was placed underneath each nonverbal training stimulus to clearly distinguish between training stimuli changes.

Post-training probe sessions. Probe sessions were used to measure the resistance to extinction of the previously reinforced responses. In addition, probes were used to assess generalized responding in a multiply controlled mand condition [a combination of EOs (mand), nonverbal stimuli (tact), and verbal stimuli (intraverbal)]. Finally, a probe was conducted to measure mand compliance. Sessions were conducted every five to seven days after the criterion for a particular stimulus was met. The experimenter said/signed one of the following: (a) "What is that?" (tact stimulus); (b) "What do you want?" (multiply contolled mand); and (c) "Show me the _____," (mand-compliance stimulus). The experimenter simultaneously presented the training stimuli (pieces of food) with each of the verbal probes. Additionally, as before, the experimenter placed the training stimuli on different colored paper mats to distinguish clearly between probe stimulus changes. Probe trials were not reinforced and were presented in a random order.

Data collection and interobserver agreement. The experimenter collected data on correct signed tacts corresponding to the nonverbal training stimulus and occurring within five seconds of the verbal stimulus, "What is that?" For example, a correct tact for the training and probe stimuli of corn was the sign "corn." The experimenter also collected data on correct mands and mand compliances during probe sessions. A correct mand following the experimenter's presentation of corn and saying/signing, "What do you want?" was the subject signing "corn." A correct mand compliance for the experimenter's presentation of corn and saying/signing, "Show me the corn," was the subject touching or pointing at the corn.

A second observer independently recorded the subjects' responses during 33% of pretest, training, and probe sessions. Interobserver agreement was calculated according to the formula: [Number of Agreements/(Number of Agreements + Disagreements)] X 100. Agreement was 100% for pretest sessions, 96% for training sessions, and 100% for probe sessions.

RESULTS

Number of Learned Verbal Responses

Figure 1 shows that specific reinforcement subjects learned 13 out of 16 (81%) tacts to criterion. The nonspecific subjects learned 12 out of 16 (75%) tacts to criterion. No significant difference in the data between groups was found using an *A*-test. Figure 1 also shows that the pairs were closely matched with Pair 1 performing the lowest and Pair 4 the highest.

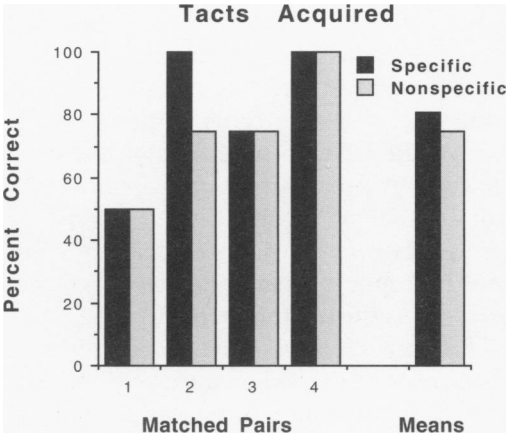

Fig. 1. The percent of the tacts acquired to criterion for the matched pairs. The group means are also presented.

Trials to Criterion

Figure 2 shows that there was very little difference in the trials to criterion between the two conditions. An *A*-test supported this observation showing no statistically significant differences in three out of four pairs. An *A*-test also showed that there was no significant differences between the trials to criterion for acquisition for any of the four training stimuli. These data again show that the pairs were well-matched with Pairs 1 and 2 generally requiring more training than Pairs 3 and 4.

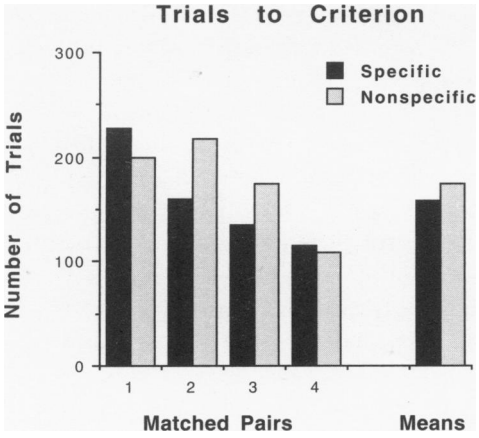

Fig. 2. The trials to criterion for the matched pairs. The group means are also presented.

Tact Probes (Resistance to Extinction)

All subjects demonstrated resistance to extinction for some, but not all of the trained responses. Figure 3 shows that specific reinforcement subjects, as a group, averaged similar amounts of correct tacts (52%) compared to nonspecific reinforcement subjects (50%). Subjects 3 and 4 maintained responding closest to the trained criteria. These data further demonstrated the close matching of pairs, as well as the differences in performance between pairs.

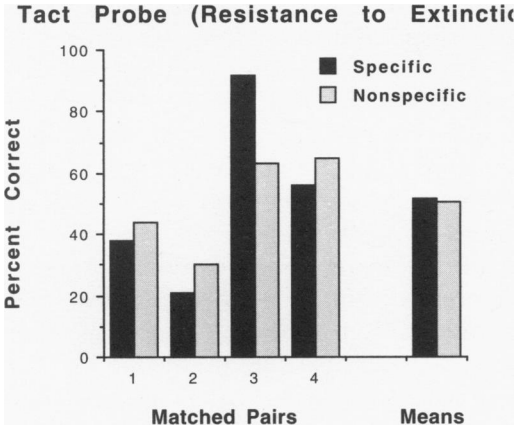

Fig. 3. The percent correct during resistance to extinction conditions for the matched pairs. The group means are also presented.

Multiply Controlled Mand Generalization Probes

Limited generalized responding was demonstrated by all subjects during the multiply controlled mand probes as shown in Figure 4. However, nonspecific reinforcement subjects averaged a greater percentage of correct responses (38%) during these probe sessions than did specific reinforcement subjects (28%). In addition, Pairs 1 and 2, who consistently performed lower than Pairs 3 and 4 in the acquisition and maintenance of the tacts, performed better under these probe conditions.

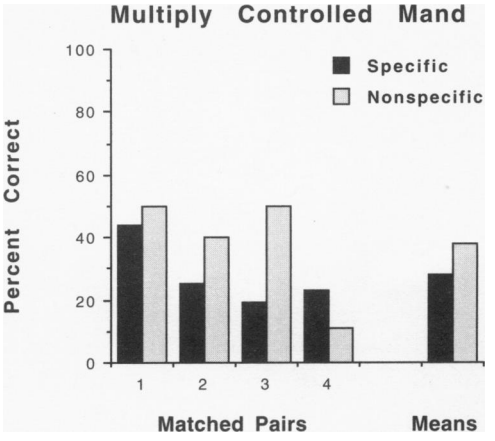

Fig. 4. The percent of correct responses during the multiply controlled mand condition for the matched pairs. The group means are also presented.

Mand Compliance Probes

Figure 5 shows the emergence of untrained mand-compliance responses for all subjects. As a group, specific reinforcement subjects averaged a greater percentage of correct mand compliances during

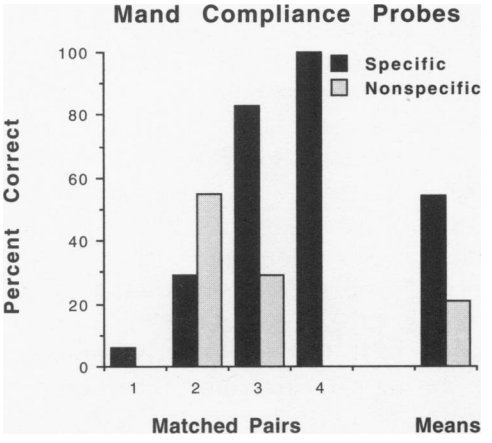

Fig. 5. The percent of correct responses during the mand compliance condition for the matched pairs. The group means are also presented.

probes (55%) than did nonspecific reinforcement subjects (21%). Subjects in Pairs 3 and 4 who acquired and maintained the tact responses better than Subjects in Pairs 1 and 2, also acquired more mand-compliance relations. In addition, Pair 1 averaged only 3% on this probe, yet performed the best of all groups on the multiply controlled mand probe.

DISCUSSION

The current study found no significant differences between the four matched-pairs in rates of acquisition, or in the resistance to extinction, for tacts learned under specific reinforcement conditions versus tacts learned under nonspecific reinforcement conditions. However, there was a mixed, but orderly difference in generalization and in the emergence of untrained mand-compliance relations. These results support those of Stafford et al. (1988) who also found no difference in tact acquisition, but did find a difference in measures of latency and choice. These results, taken together, seem to indicate that the two types of consequences were equally effective in the acquisition of tacting. Yet specific reinforcement resulted in quicker responding, seemed preferred by the subjects, and resulted in the emergence of untrained mand compliances. Nonspecific reinforcement, while less preferred, seemed to facilitate more generalization of verbal responses to multiply controlled stimuli.

This study extended the methodological procedures used by Stafford et al. (1988) by measuring the resistance to extinction of reinforced responses, the generalization of trained responses to different antecedent controlling stimuli (multiply controlled mand) and testing for mand compliance. Generalized responding during probes, although unexpected, was demonstrated by both groups. Previous work in language training with DD individuals suggested that during early training little transfer of learning occurs between different verbal and nonverbal repertoires. Yet, as the learner's verbal repertoire expanded and a more extensive history of reinforcement for responding under different stimulus conditions was established, transfer between repertoires occurred. The current subjects clearly did not have functional verbal repertoires at the outset of this study, yet they demonstrated generalized responding. These data also support the position that severely developmentally disabled individuals are capable of acquiring an increasingly complex sign language repertoire, provided the appropriate training is given.

One of the most interesting findings of the current study was the increased occurrence of mand compliances following specific reinforcement tact training. Subjects trained with specific reinforcement performed significantly better than subjects trained with nonspecific reinforcement during the mand-compliance probes (55% vs. 21%, respectively). These results indicate that tact training with specific reinforcement may encourage the emergence of untrained mand compliances. Although not directly trained, components of this new behavior were taught and practiced throughout the study. The relation between the nonverbal stimulus (e.g., peach), and the verbal (signed) response was strengthened during specific reinforcement training trials, as was the touching response when the subject reached for, touched, and received the object in this condition (e.g., peach). In addition, the relation between reaching for and touching the nonverbal stimulus was strengthened during *Reinforcer sampling trials.* During the mand-compliance probes, the verbal stimulus (now emitted by the experimenter) combined with the new verbal stimulus ("Touch the . . . ."), and the novel array of nonverbal stimuli (the food items) to evoke the correct mand-compliance response.

The only facilitative effect observed with the nonspecific subjects was that they demonstrated slightly better generalized responding to the multiply controlled mand stimuli. In these probes subjects trained with nonspecific reinforcement averaged 38% correct, while subjects trained with specific reinforcement aver-

aged 28% correct. However, this pattern of increased correct responding in the nonspecific condition may have been due to the fact that the nonspecific reinforcement subjects never received the probe stimuli as consequences in training (although they had been exposed to them in reinforcer sampling). This contrived state of deprivation and being asked, "What do you want?" in the presence of the now available food—a novelty effect—might have been responsible for some of the increased responding.

Another type of generalized responding also occurred for subjects in both conditions. As correct tacts were emitted and reinforced more frequently in a training session, the same response was sometimes emitted (although incorrectly) to other training stimuli. For example, one subject who correctly tacted a peach and was reinforced, later signed "peach" in response to cookie. Similar patterns of responding (for different stimuli and responses) were demonstrated by each subject. Although considered incorrect tacts, this type of responding suggested reinforcement carryover effects and verbal stimulus control of a thematic nature. It was possible for the subjects to emit different tacts such as "dog" or "cup" or no response at all. However, a verbal response from the same thematic category (both peaches and cookies are food) was given instead. This pattern is similar to that reported by Braam and Poling (1983), who found that as training progressed and correct intraverbals increased, more incorrect (thematically unrelated) intraverbals were given in response to untrained verbal stimuli during intraverbal generalization probes. The results of Braam and Poling (1983) and the results of the current study suggest that learning might be facilitated by concurrently training groups of thematically related responses in context and across different stimulus conditions (e.g., train "toys" as mands, tacts, and intraverbals). This is a language training strategy that merits further investigation.

It still is unclear as to why specific reinforcement did not differentially affect the rate of acquisition or resistance to extinction, but did affect latency, preference, and the emergence of untrained relations. Especially given that specific reinforcement seems intuitively more effective as indicated by Carr et al.'s, (1978) recommended use in addition to the countless number of parents, grandparents, teachers, etc. who use this technique. It may be that the more rapid responding, preference for specific reinforcement, and the transfer to untrained conditions are enough to make it more desirable.

A possible explanation for the finding that there was no difference in the tact acquisition between the two different conditions may have been because the establishing operations (the relative deprivation/satiation levels for the foods) were balanced for both conditions (see *Selection of training stimuli*). That is, both specific and nonspecific subjects received more and less preferred foods as reinforcers. This balancing of stimuli, intended to control for confounding effects, may have negated the effects of the establishing operations in the specific reinforcement condition. Skinner (1957) noted that the consequences that control the mand are directly related to the conditions of deprivation or aversive stimulation, and that in the mand "the response...comes to 'specify' its characteristic consequence" (p. 83). With these conditions being balanced in the current experiment all forms of consequences were relatively equally effective in strengthening tacts.

Perhaps by using the most preferred foods in the specific reinforcement condition a different rate of acquisition may have been seen since the establishing operation for these foods was strongest. Yet, it should be noted that Stafford et al. (1988) did not use all consumables, but did use the subject's strongest forms of reinforcement (e.g., ball, tickle, food), and it was found that these reinforcers were also equally effective in strengthening tacts. However, in both studies it was not possible to control for the subject's access to reinforcers outside of the school setting, so it was possible that their satiation/depri-

vation levels varied over time. These variables need to be examined in future research where different stimuli (not only food), and the momentary value of the establishing operation can be contrived. For example, conducting tact training for the response "pop" with specific reinforcement following the eating of a salty pretzel may increase the momentary value of pop as a reinforcer and may speed up training. Similar results might also be expected when training "umbrella" as a tact while getting wet standing in the rain or in a shower.

In conclusion, the results support Skinner's (1957) distinction between the mand and the tact by demonstrating that different repertoire-altering effects are produced by the independent variables that define those two verbal operants. The results also suggest that both nonspecific and specific reinforcement should be arranged whenever possible to facilitate generalized responding and the transfer of learning to mand compliances, respectively. In addition, isolated tact training may have limited effectiveness in the establishment of verbal and nonverbal repertoires. The concurrent training of the same sign or word under conditions with different controlling variables may have a more dramatic impact on the establishment of verbal behavior.

REFERENCES

Braam, S. J., & Poling, A. (1983). Development of intraverbal behavior in mentally retarded individuals through transfer of stimulus control procedures: Classification of verbal responses. *Applied Research in Mental Retardation, 4,* 279-302.

Carr, E. G., Binkoff, J. A., Kologinsky, E., & Eddy, M. (1978). Acquisition of sign language by autistic children. *Journal of Applied Behavior Analysis, 11,* 489-502.

Carroll, R. J., & Hesse, B. E. (1987). The effects of alternating mand and tact training on the acquisition of tacts. *The Analysis of Verbal Behavior, 5,* 55-65.

Doll, E. (1965). *Vineland Social Maturity Scale.* Circle Pines, MN: American Guidance Service.

Faw, G., Reid, D., Schepis, M., Fitzgerald, J., & Welty, P. (1981). Involving institutional staff in the development and maintenance of sign language skills with profoundly retarded persons. *Journal of Applied Behavior Analysis, 14,* 411-424.

Hall, G., & Sundberg, M. L. (1987). Teaching mands by manipulating conditioned establishing operations. *The Analysis of Verbal Behavior, 5,* 41-53.

Lamarre, J., & Holland, J. G. (1985). The functional independence of mands and tacts. *Journal of the Experimental Analysis of Behavior, 43,* 5-19.

Michael, J.L. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior, 37,* 149-155.

Michael, J.L. (1983). Evocative and repertoire-altering effects of an environmental event. *The Analysis of Verbal Behavior, 2,* 21-23.

Michael, J.L. (1988). Establishing operations and the mand. *The Analysis of Verbal Behavior, 6,* 3-9.

Saunders, R. R., & Sailor, W. (1979). A comparison of three strategies of reinforcement on two-choice learning problems with severely retarded children. *AAESPH Review, 4,* 323-333.

Sigafoos, J., Reichle, J., Doss, S., Hall, K., & Pettitt, L. (1990). "Spontaneous" transfer of stimulus control from tact to mand contingencies. *Research in Developmental Disabilities, 11,* 165-176.

Skinner, B. F. (1957). *Verbal behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Stafford, M. W., Sundberg, M. L., & Braam, S. J. (1988). A preliminary investigation of the consequences that define the mand and the tact. *The Analysis of Verbal Behavior, 6,* 61-71.

Sundberg, M. L., San Juan, B., Dawdy, M., & Argüelles, M. (1990). The acquisition of tacts, mands, and intraverbals by individuals with traumatic brain injury. *The Analysis of Verbal Behavior, 8,* 83-99.

Terman, L., & Merrill, M. (1973). Stanford-Binet Intelligence Scale. Boston: Houghton-Mifflin.