THE ACQUISITION OF MAND AND
TACT RESPONSES

A Thesis
Presented to
The School of Graduate Studies
Drake University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
Mary Grace Percival
September, 1982
THE ACQUISITION OF MAND AND TACT RESPONSES

by

Mary Grace Percival

Approved by Committee:

W Scott Wood
Dr. W. Scott Wood, Chair

Larry Alferink
Dr. Larry Alferink

S Pike Hall
Dr. S. Pike Hall

Dr. Earl L. Canfield
Dean of the School of Graduate Studies
THE ACQUISITION OF MAND AND TACT RESPONSES

An Abstract of a Thesis by
Mary Grace Percival
September, 1982
Drake University
Advisor: W. Scott Wood

The present study was designed to assess the acquisition of mand and tact responses as a result of mand or tact training. Three subjects were taught vocal responses corresponding to objects as requests (mands) or as labels (tacts). Responses in the untrained repertoire were also assessed. The results indicated that acquisition of a vocal mand repertoire facilitated acquisition of a vocal tact repertoire and vice versa. Implications concerning the separation of mand and tact repertoires are discussed. A technology for investigation of elementary verbal operants is presented.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Methods</td>
<td>17</td>
</tr>
<tr>
<td>Results</td>
<td>27</td>
</tr>
<tr>
<td>Discussion</td>
<td>35</td>
</tr>
<tr>
<td>Reference Notes</td>
<td>40</td>
</tr>
<tr>
<td>References</td>
<td>41</td>
</tr>
</tbody>
</table>
LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Schematic presentation of procedural manipulations for each subject.</td>
<td>15</td>
</tr>
</tbody>
</table>

LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Schematic illustration of the apparatus.</td>
<td>18</td>
</tr>
<tr>
<td>2. Mand and tact acquisition for Subject 1.</td>
<td>28</td>
</tr>
<tr>
<td>3. Mand and tact acquisition for Subject 2.</td>
<td>30</td>
</tr>
<tr>
<td>4. Mand and tact acquisition for Subject 3.</td>
<td>31</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Definition of Verbal Behavior

Ordinarily we think of verbal behavior as speaking, but vocal behavior is only one of the forms that verbal behavior may take. An individual is behaving verbally when engaged in any performance whose major effect on the environment is to provide a stimulus which controls the behavior of a second person whether observer, listener, or reader (Skinner, 1957). The significance of this type of stimulus lies in the mediacy of a second person who is behaving under the control of the verbal stimulus rather than in the direct effects of the stimulus on the environment (Ferster, 1968). For example, one can close a door by the appropriate hand and arm movements which achieves the desired effect directly (the door is closed); or one can say "Close the door!" and in the presence of an appropriate listener achieve the same effect indirectly. It is this indirect reinforcement that characterizes verbal behavior.

Stimuli control operant performances in verbal communication. The behavior of the listener is influenced by verbal stimuli produced by the speaker. The verbal stimulus differs from other kinds of stimuli in complexity of dimension such as the order of words or the pitch changes in intonation (Ferster, 1968, p. 493). This complexity does not preclude a functional analysis of verbal behavior. The
control of verbal behavior by all the elements of a stimulus is analyzed in terms of the same basic processes by which any operant comes under the control of a stimulus.

Topography v. Function

As in other kinds of operant behavior, the topography of the response is not so important as the change it effects in the environment. When we talk about the meaning of a word to a speaker, we generally refer to the variables which generated it and are currently maintaining it. Behaviors which appear identical may be functionally very different depending on the conditions which generated them. The word "toast", for example, emitted by a speaker has different functional significance depending upon whether it occurs as a result of a prior textual stimulus (the written word "toast"), an auditory vocal stimulus (say "toast"), a high level of deprivation (going without breakfast), or a non-verbal stimulus in the environment (a picture of toast). In many cases we can tell little about a verbal performance by its form if we lack knowledge of the kind of reinforcement and/or level of deprivation which generated it (Ferster, 1968, p. 493).

Many attempts to analyze verbal behavior emphasize topography of response as opposed to the functional analysis proposed by Skinner (1957). As a result of this emphasis on topography, a child who has "learned a word" is expected to emit that word in situations other than that in which it
was learned. If the child does not, a host of internal explanations are given for the lack of generalization. From a functional point of view, however, the child's failure to emit the appropriate response may be due to the fact that different stimuli control different responses even though the topography of the response may be similar. For example, a child may say "milk" because he/she wants milk (a mand) or because he/she is in the presence of a glass of milk (a tact). The topography of the response is the same; the controlling relations differ. Skinner identifies several elementary verbal operants in terms of controlling stimuli. The mand and the tact are two of the verbal operants described by Skinner.

The Mand Relationship

A mand is defined as "a verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation" (Skinner, 1957, pp. 35-36). The reinforcement for the mand is the event which is manded and it is this history which accounts for the tendency to mand in the future. However, a mand (which "specifies" its reinforcer) is mostly controlled by levels of deprivation or aversive stimulation that make that reinforcer effective (Michael, Note 1). For example, the statement "Pass the butter!" produces a characteristic reinforcer, i.e., receipt of the butter. The response would not
have been omitted, however, unless the speaker was deprived in such a way as to make butter an effective reinforcer. Furthermore, because the speaker receives butter upon the emission of the response "Pass the butter!" the probability that this response will occur in the future is increased. The presence of some other person who may provide the reinforcement also exerts discriminative control. Such a person sets the occasion for the mand's being reinforced.

The Tact Relationship

Verbal responses for which an object, event or some characteristic of an object or event are discriminative are called tacts. In order for a response to be controlled by the prior presentation of a stimulus, the response is reinforced in the presence of one stimulus with many different reinforcers or a generalized reinforcer. "The object together with the presence of the listener as an audience, and possibly an appropriate mand for verbal action emitted by the listener (for example, What color is that?) is the occasion upon which the response 'red' on the part of the speaker receives the reinforcement 'Right!'" (Skinner, 1957, p. 84).

The statements "it's raining", "car", and "pretty flower" are usually tacts. Although it is common to talk of the tact as if it "names" or "refers to" something, this is not what distinguishes it from other types of discriminated verbal operants. Tacts are usually reinforced by the listener who presents the speaker with some generalized
reinforcer. A specific tact is not characteristically followed by a particular reinforcer. Tacts are mostly controlled by the object or event that is discriminative for them.

The distinctions between mands and tacts may be summarized in the following fashion. A mand benefits the speaker, is controlled by immediate levels of deprivation and/or aversive stimulation, and is consequated by receipt of the object or event manded. Mands also inform the listener of the relevant conditions of deprivation or aversive stimulation. A tact benefits the listener, is controlled by the presence of appropriate discriminative stimuli, and is consequated by a generalized reinforcer. Tacts also inform the listener about the environment.

**Tact Acquisition**

Several studies have investigated the operant control of a verbal response through the application of generalized reinforcement, e.g., training of a conversational speech form (Garcia, 1974) and teaching speech and reading in nonverbal retardates (MacAulay, 1968). The results of these studies demonstrated the effectiveness of generalized reinforcement in increasing tact response rates.

Cohen (1981) demonstrated the effectiveness of modelling and generalized reinforcement in training the verbal labelling behavior and rudimentary telegraphic speech of an autistic child. The child received reinforcement (food and vocal praise) for successively finer approximations to the
therapist's model. When the subject imitated the vocal and signed responses with 90% accuracy for two consecutive sessions, the use of the model was gradually eliminated and the question "What is this?" was introduced. Incorrect responses and lack of response were conseqeuated with a brief period of social isolation. The results demonstrated an increase in simultaneous vocal and signed labelling by the child indicating the effectiveness of generalized reinforcement in label training. A similar effect was observed for all three groups of words that were trained.

Mand Acquisition

Several studies have investigated the operant control of a verbal response through the manipulation of deprivation levels and application of a characteristic reinforcer. The results of these studies indicated an increase in mand responses emitted by the subjects.

Premack (1971) trained verbal behavior in a chimpanzee using colored plastic symbols. During the first step of training a piece of fruit was placed on a table in front of the chimpanzee. The chimpanzee was allowed to eat the fruit. Next, a plastic symbol was placed on the table within the chimpanzee's reach along with the fruit which was out of reach. The chimpanzee was taught to place the symbol on a slate board. This constituted a mand for the fruit. The chimpanzee received the fruit manded when she placed the appropriate symbol on the board.
In three case studies, Hansell (1975) utilized Premack's training procedure to teach mands to retarded adults. During baseline none of the subjects demonstrated any verbal behavior defined as "any pointing gesture, attempt at speech, or sign language, within ten seconds after the discriminative stimulus, 'What do you want?'" (Hansell, 1975, p. 19). In this study, mand training consisted of two procedures. First, the experimenter presented an object saying, "What do you want?". The experimenter then presented a discriminative stimulus for imitation, i.e., "Do this", and modelled the correct response (pointing to the object). The subject was reinforced for appropriate responses by receipt of the object manded. During the next procedure the experimenter presented the object and placed a symbol in front of the object. The experimenter asked, "What do you want?" followed by a discriminative stimulus for imitation. The experimenter demonstrated the correct response (pointing to the symbol) and the subject was reinforced by receipt of the object manded. The discriminative stimulus for imitation and the modelled response were gradually eliminated. Then the object was moved away from the symbol until the symbol was the only stimulus presented prior to the experimenter asking, "What do you want?". The results indicated that these procedures increased the mand responses emitted by all three subjects.

Schedule Control

The effects of different schedules of generalized
reinforcement in picture-name training with severely retarded children were investigated by Olenick and Pear (1980). During Phase 1 correct responses on either prompt or probe trials were followed by reinforcement according to a fixed ratio schedule. During Phase 2 correct responses on prompt and probe trials were sequenced according to separate fixed ratio schedules [DIFF (FR, FR)]. During Phase 3 correct responses on prompt trials were reinforced on a fixed ratio schedule while correct responses to probes were reinforced on a continuous reinforcement schedule. Phase 4 was identical to Phase 3 except that schedules of reinforcement were reversed. Phase 5 was a replication of Phase 3. The results indicated no change in frequency of correct responses to probes from Phase 1 to Phase 2 (non-differential to differential fixed ratio schedules). During Phase 3, however, when responses to probes were reinforced on a continuous schedule, correct responding to probes increased. The continuous schedule of reinforcement for correct responses to probes also generated the highest accuracy on probe trials and the highest rate of learning to name pictures. During Phase 4, correct responses to probes dropped to levels observed during Phases 1 and 2. When the DIFF (FR, CRF) schedule was reinstated during Phase 5, rates at which the picture-naming criterion was reached increased to levels observed in Phase 3. The results indicated that if the density of reinforcement is higher on probe trials, picture
names were acquired at a higher rate than if the densities of reinforcement on prompt and probe trials were equivalent.

**Separation of Mand and Tact Repertoires**

Skinner (1957) hypothesizes that if a response is acquired as a mand this does not imply that an individual then "spontaneously possesses a corresponding tact of similar form" (p. 187). Two studies examined the effects of reinforcement characteristic of the mand and reinforcement characteristic of the tact when the establishing operation and the response requirements were equated.

Saunders, Sailor, and Taylor (Note 2), as reported by Stafford, Sunberg, and Braam (Note 3) used toys which appeared to function as reinforcers as consequent objects and arranged three experimental conditions to investigate acquisition of correct receptive discriminations (pointing responses). Nonsense syllables were used to avoid known topographies of object lables. In the "specific" reinforcement (mand) condition correct pointing responses were followed by an opportunity to play with the toy to which the subject pointed. Under the "nonspecific" reinforcement (tact) condition correct pointing responses were followed by the opportunity to play with a toy offered by the experimenter, but which was not part of the training pair. In the "variable" reinforcement condition correct pointing responses were consequated by receipt of the toy pointed to or one which was not of the
pair being trained in random order. The results indicated that the level of correct responding was higher under the "specific" reinforcement condition than under either of the other two conditions.

Stafford et al. (Note 2) also examined the effects of reinforcement characteristic of the mand and generalized reinforcement when the establishing operation and response requirements were equated. Several procedural differences should be noted: 1) In Stafford et al., manual signing was used as the response topography rather than pointing; 2) Complex responses (multi-component) were required rather than a single pointing response; 3) Stimulus conditions associated with "specific" and "nonspecific" reinforcement differed greatly; 4) A concurrent heterogeneous chain with choice links was used rather than a reversal design; and, 5) Choice, response topography, and latency were used as dependent variables rather than choice and response topography alone. In Phase 1, "Two different sets of contingencies were used to shape two different five-component responses e.g., ball-in-bowl-under-chair " (p. 7). In the mand condition, a correct response resulted in obtaining the reinforcement item contained in the cup. In the tact condition a correct response resulted in obtaining any one of four different forms of reinforcement none of which were in the bowl. Phase 2 consisted of choice trials where the experimenter gave the stimulus to the subject and instructed the subject to "Throw
it in the box". The boxes were in the same position as in Phase 1 for five trials, were reversed for five trials, were in different positions in a larger room for five trials, were in various positions for five trials, and were in various positions with the cup and bowl in opposite boxes for five trials. A correct five-component response for the box chosen by the subject resulted in reinforcement as in Phase 1. Phase 3 consisted of ten interspersed forced trials with "specific" and "nonspecific" consequences followed by five choice trials as in Phase 2.

The results were consistent with Saunders et al. Responses were stronger under the "specific" reinforcement (mand) condition where the mean latency of response during five-component training was 3.4 seconds. Mean latency of response under "nonspecific" reinforcement (tact) was 4.6 seconds. Choice data also demonstrated the control exerted by reinforcement characteristic of the mand. The mand box was chosen 100% of the first four blocks of trials and the five-component response was always correct. During the fifth block of trials (cup and bowl reversed) the mand box was chosen 80% of the time and correct responses dropped to 50%. Following forced trials, mand choices dropped to 0% during the first block of trials. However, the subject responded 100% correctly for the chosen tact condition. Over the succeeding blocks of choice trials mand choice increased to 60% with 100% correct responding. The subject responded correctly
on 90% of the tact choice trials. The results of the studies described above support the notion proposed by Skinner of the separation between mand and tact repertoires.

**Generalization Between Mands and Tacts**

Research in applied settings (Lovaas, Berberich, Perloff, & Schaeffer, 1966; Risley & Wolf, 1968) has focused on the development of procedures for the establishment of functional speech in echolalic, psychotic, and generally speech-deficient individuals. First, a tact repertoire is established. Then the subject is exposed to a mand contingency, i.e., a change in stimulus control is attempted. For example, once a subject could reliably label "milk", he/she would receive milk only after emitting the response "milk". In these studies it is assumed that acquisition of a tact repertoire facilitates acquisition of a mand repertoire. Though generalization did not occur spontaneously, mand responses were acquired more quickly following the establishment of a tact repertoire.

Conversely, Skinner (1957) states that the object a speaker obtains with a mand often resembles the object which controls the tact in response to the question, "What is this?" (p. 189). Hansell (1975), following Skinner, hypothesized that this resemblance might facilitate the acquisition of the tact following mand training. For one subject Hansell trained the response of pointing to a symbol as a tact subsequent to mand training. For each trial the experimenter
held up one item represented by a corresponding symbol on the table. Correct pointing responses were conseuated by receipt of ice cream, applesauce, or praise. Hansell states that "the ease with which the subject acquired tacts should be an indication that the corresponding mands were already part of the subject's verbal repertoire. For all sessions of tact training the percent of correct responses ranged from 85% to 100% with a mean over sessions of 96%" (Hansell, 1975, p. 54).

The results of the Hansell study seem to support the notion that if an individual acquires a particular response through mand training, then that response will also be emitted as a tact when the individual is asked "What is this?." However, as recognized by Hansell, there was no comparison made between the acquisition of tacts previously trained as mands and the acquisition of tacts for which there was no prior mand training. It is possible that 1) reinforcing mands or tacts could affect both classes similarly, 2) reinforcing either class could affect only responses of that class, 3) reinforcing mands could affect mands and tacts but reinforcing tacts, only tact responses, or 4) reinforcing tacts could affect mands and tacts but reinforcing mands, only mand responses.

The present study was designed to investigate further the relationship between mands and tacts. Specifically, it addressed the question of whether or not acquisition of a vocal mand repertoire would produce an
increment in vocal tact responding and vice versa. Colloquially, if a child learns an object label as a request, will the child emit the response when asked, "What is this?" in the presence of the object? And, conversely, will the child emit the response as a request when the object label is acquired under tact conditions?

In Phase 1, three subjects were taught to say words corresponding to different objects during mand training or tact training. Correct responses to objects in the training mode were modelled and reinforced. Correct responses in the other repertoire were reinforced only. This established a "known" repertoire of mand and tact responding (see Table 1). In Phase 2, three novel stimuli were added to three stimuli from Phase 1. Stimuli from Phase 1 were chosen because the subject emitted the appropriate response to them in both mand and tact situations. This gave a stable baseline of mand and tact responding against which to compare, for example, correct mand responses and correct tact responses during mand training. It also allowed for reinforcement of some correct responses not in the repertoire being trained, thereby avoiding extinction of those responses. Correct responses to novel stimuli were trained during either mand or tact trials. Correct responses to novel stimuli were reinforced only on trials of the repertoire being trained. Correct responses to stimuli carried over from Phase 1 were reinforced according to the specific trial (i.e., receipt
Table 1. Schematic presentation of procedural manipulations for each subject.

<table>
<thead>
<tr>
<th>SUBJECTS</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject 2</td>
<td>Correct mand responses trained and reinforced. Correct tact responses reinforced.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
of a generalized reinforcer or receipt of the object manded). Trials were randomly ordered (see Table 1). Phase 3 was the same as Phase 2 except that training and reinforcement occurred in the repertoire not trained and reinforced in Phase 2. Three novel stimuli were added and the three stimuli added in Phase 2 were carried over. An apparatus was used to facilitate the distinction between conditions, to count responses, and to provide a means for consistent reinforcer delivery.

The distinction between mand and tact conditions may be summarized as follows: 1) Different vocal mands from the experimenter for subject verbal behavior ("What do you want?" versus "What is this?"); 2) Different discriminative stimuli on the apparatus (red light versus green light); 3) Two stimuli presented (mand) versus one stimulus (tact); and, 4) Different reinforcers (receipt of the object manded versus receipt of one of several nondescript toys).
CHAPTER II

METHOD

Subjects

Three children attending La Petite Preschool Academy participated in the study. When the experiment began Anna (subject 1) was 36 months old, Aaron (subject 2) was 24 months old, and Keren (subject 3) was 26 months old.

Setting

Sessions took place in a well-lighted, 4' x 4' area of the preschool. The subject was seated at a large desk upon which rested the apparatus (see Figure 1). The experimenter sat to the side of the desk and facing the subject. Training stimuli were placed on the desk behind the apparatus. Reinforcers for tact responses were placed in a box behind the desk. Daily sessions, 30 to 40 minutes in length, were held with each subject.

Apparatus

The apparatus consisted of a plywood board upon which two response buttons (doorbell buttons) were mounted (see Figure 1). The response buttons were connected to a counter. Above the buttons was a plexiglass window through which the subject viewed the stimulus objects. Behind this window was a shelf upon which stimulus objects were placed. Above the window was an aperture, one inch in diameter. Behind the aperture a projector was mounted which displayed a
Figure 1. A schematic illustration of the apparatus used in training.
red or green light depending on the training session (tact or mand). The projector was connected to an alternating stepper which was manually controlled by the experimenter.

**Stimuli**

During Phase 1, the following ten objects were used: toy car, milk, ball, raisin, toy dog, juice, whistle, cracker, toy boat, popcorn. During Phase 2, three stimuli from Phase 1 were used in addition to three of the following novel stimuli: apple, toy lion, toy giraffe, toy camel, cheese, toy zebra, pen. In phase 3, all of the stimuli just listed were used. The phrases "What do you want?" and "What is this?" were used as vocal discriminative stimuli for mands and tacts respectively. Each phrase corresponded with a particular light color.

**Responses and Consequation**

Two classes of responses were measured, mands and tacts. A correct mand was defined as an appropriate vocal response to the stimulus "What do you want?" when the object to be manded was one of a pair presented and the corresponding light stimulus was on. The subject was also required to push the response button corresponding to the light color. Correct mand responses were reinforced by giving the subject the object manded. A correct tact was defined as an appropriate vocal response to the stimulus "What is this?" when the object to be tacted was presented alone and the corresponding light stimulus was on. The subject was also required
to push the response button corresponding to the light color. Correct tact responses were reinforced by allowing the subject to choose from one of several toys to play with for 30 seconds. The toys were placed in a small box behind the desk and apparatus.

**Procedures**

**Baseline 1.** The experiment began with a baseline phase to assess the subject's 1) attending behavior, 2) imitation of vocal responses, and 3) mand and tact responses. Attending behavior was assessed by the experimenter saying, "(Name), look at me." Correct responses consisted of the subject looking at the experimenter within two seconds of the command. Imitation of vocal responses was assessed by the experimenter saying, "(Name), look at me. Say (name of an animal)." Correct responses consisted of the subject imitating the response modelled by the experimenter. Mand vocal responses were assessed by asking the subject, "What do you want?". Two objects were placed on the table. Correct vocal mand responses were defined as any vocal response corresponding to one of the objects present. Vocal tact responses were assessed by asking the subject, "What is this?". Two objects were placed on the table and the experimenter put a finger on one when presenting the discriminative stimulus for a tact response. Correct vocal tact responses were defined as any vocal response corresponding to the designated object. Correct responses for attending and imitation responses were consequtated with social praise. Correct mand
responses were consequated by receipt of the object manded. Correct tact responses were consequated by allowing the subject to play with a toy for 30 seconds. If the mean percent of correct attending responses was 90% or more, mand and tact training began. Otherwise, eye contact was to be trained.

**Preference Ordering.** As in Premack (1971) and Hansell (1975), independent preference ordering of food and toys was obtained in a free operant condition. Two objects were placed on the table within reach of the subject. The experimenter asked, "What do you want?" and allowed the subject to choose an item. Objects were presented in a random order of all possible pairwise combinations of the ten objects.

**Apparatus Adaptation.** This phase was included to familiarize the subject with the apparatus and to insure that errors during training were not due to lack of discrimination between the red and green stimulus lights and their corresponding response buttons. The apparatus was secured on the desk in a position as described previously.

The experimenter turned the red light on when the subject looked toward the aperture. If the subject did not respond within five seconds the experimenter said, "Push the button." If the subject responded correctly, i.e., pushed the appropriate button, the experimenter turned off the light while providing vocal praise and an edible. If
the subject failed to respond or responded incorrectly, the experimenter said, "Do this", and modelled the appropriate response. Correct responses were consequated as before. This procedure was continued until the subject looked at the aperture and pushed the appropriate button after the light came on for five consecutive trials. The same procedure was followed with the green button. Discrimination was then tested. Light color was randomized. Correct responses were reinforced with vocal praise. Incorrect responses were not reinforced and the light remained on until the subject pushed the appropriate button. The criterion for completion of this phase was correct responding on ten consecutive trials. Until the criterion was met, the experimenter began each session with red light training.

**Phase 1.** Preference ordering determined which objects were to be trained as mands and which were to be trained as tacts, i.e., items 1, 3, 5, 7, and 9 were to be trained as mands; items 2, 4, 6, 8, and 10 were to be trained as tacts.

During mand training the experimenter placed two objects in the window and turned the light on when the subject looked at the aperture. The light was red for Subject 1 and Subject 3 on mand trials. It was green for Subject 2. The experimenter said, "What do you want?". A correct response was defined as pushing the
appropriate button and emitting a vocal response corresponding to the object manded. If the subject did not respond or responded incorrectly, the experimenter said, "(Name), look at me. Say (object label)." Correct responses and correct imitative responses were consequtated by receipt of the object manded.

In tact training the objects presented were preferred items 2, 4, 6, 8, and 10. The light was green for Subject 1 and Subject 3 on tact trials. It was red for Subject 2. The experimenter placed one object in the window and turned on the appropriate light when the subject looked at the aperture. The experimenter asked, "What is this?" A correct response was defined as pushing the appropriate button and emitting a vocal response corresponding to the object. If the subject did not respond or responded incorrectly, the experimenter said, "(Name), look at me. Say (object label)." Correct responses and correct imitative responses were consequtated by receipt of one of ten toys which the subject was allowed to play with for approximately 30 seconds. The reinforcer toy was never the same as the tact stimulus object.

If the subject pushed the inappropriate button, no consequtation occurred until the appropriate button was pushed, i.e., the light did not go off and the subject did not receive a reinforcer. The number of
responses on the counter allowed the experimenter to determine to some extent whether or not the subject was discriminating between the two conditions, i.e., mand versus tact trial. For example, if twelve mand trials were run, then, if the subject discriminated between the mand and tact trials, twelve mand responses would have been recorded on the counter and no tact responses would have been recorded.

In this phase correct mands or tacts were modelled by the experimenter. However, all correct responses were reinforced. For example, correct mands were modelled and correct imitative responses were reinforced. Correct tacts of the same stimuli were never modelled but were consequated as described above to assess correct tact responding. Training for each mand or tact continued until the subject responded correctly to the stimulus objects on five consecutive training trials. Stimulus presentations were determined by the preference ordering. That is, the stimulus which was most preferred was trained first, the stimulus which was ranked third in the preference ordering was trained second, etc. Training continued until the subject responded reliably to at least four mand or four tact stimuli.

During Phase 1 stimuli trained as mands were presented as tacts for Subject 1 during two sessions and for Subject 2 during four sessions in order to assess responding in the repertoire not trained. Stimuli presented as tacts
were presented as mands for Subject 3 in three sessions. No responses were modelled. Correct responses were consequeated according to the trial. No consequeation occurred for incorrect responses. The order of mand and tact trials was random.

**Baseline 2.** Three stimuli from the previous training phase and three novel stimuli were presented in randomly ordered mand and tact trials. Either 24 or 48 baseline trials were presented. No responses were modelled. Correct mand and tact responses were consequeated as before.

**Phase 2.** Two subjects participated in 24 or 48 trials per session. For Subject 2, correct mand responses to novel stimuli were modelled and correct imitative responses were followed by receipt of the object manded. Correct responses to novel stimuli on tact trials were not consequeated except the light was turned off. The procedure was similar for Subject 3 except that tact responses were modelled and correct imitative responses were reinforced. Criterion for completion of this phase was five consecutive correct responses to each of the novel mand or tact stimulus presentations.

**Baseline 3.** The three novel stimuli used in Phase 2 and three additional stimuli were presented in randomly ordered mand and tact trials. Either 24 or 48 baseline trials were presented. Correct mand and tact
responses were consequated as before.

**Phase 3.** In this phase, training conditions were reversed. For Subject 2, correct tact responses to new stimuli were modelled and correct imitative responses were reinforced by receipt of one of ten toys to play with for 30 seconds. Correct responses to new stimuli on mand trials were not consequated except the light was turned off. The procedure was similar for Subject 3 except that mand responses were modelled and correct imitations were reinforced. Criterion for completion of this phase was met with five consecutive correct responses to each of the novel mand or tact stimulus presentations.
CHAPTER III
RESULTS

Phase 1

For Subject 1, the following responses were modelled and reinforced with the object manded during mand trials in six sessions: car, dog, ball, juice. In two of these sessions tact responses were assessed. Correct tact responses were consequated by receipt of a generalized reinforcer. Correct mand responses increased from 10% during baseline to 100% over six training sessions. Correct tact responses increased from 25% during baseline to 40% during mand training. The subject acquired all four mand responses but only responded appropriately on tact trials to two stimuli (see Figure 2). Subject 1 was removed from the school and did not participate in the remainder of the study.

For Subject 2, the following responses were modelled and reinforced with the object manded during mand trials in seven sessions: ball, raisin, boat, cracker, milk. In four of these sessions tact responses were assessed. Correct tact responses were consequated by receipt of a generalized reinforcer. Correct mand responses increased from 50% during baseline to 78% over seven training sessions. No reliable increase in correct tact responding during mand training was observed. The subject acquired four of the five mand responses but only responded appropriately on
tact trials to two stimuli (see Figure 3).

For Subject 3, the following responses were modelled and reinforced by receipt of a generalized reinforcer during tact trials in seven sessions: cracker, milk, popcorn, dog, boat. In three of these sessions mand responses were assessed. Correct mand responses were conseuated by receipt of the object manded. Correct tact responses increased from 53% during baseline to 83% over seven training sessions. Correct mand responses increased from 56% during baseline to 65% during tact training. The subject acquired four of the five tact responses and responded appropriately on 75% of the mand trials. Note, however, that responses corresponding to the objects chosen on mand trials were the same as those reliably emitted as tacts (see Figure 4).

In general, the results of Phase 1 indicated an increment in tact responding as a result of mand training and an increment in mand responding as a result of tact training.

**Phase 2**

For Subject 2, the following responses were modelled and reinforced with the object manded during randomly ordered mand trials: lion, giraffe, apple. Correct tact responses to the novel stimuli were assessed but were never modelled or reinforced. The criterion for correct mand responding to the stimulus
Figure 3. Percent correct mands and tacts as a function of mand training (Phase 1), mand training (Phase 2), and tact training (Phase 3) for Subject 2.
Figure 4. Percent correct mands and tacts as a function of tact training (Phase 1), tact training (Phase 2), and mand training (Phase 3) for Subject 3.
"lion" was met in six sessions; the criterion for correct tact responding was met in eight sessions. The criterion for training completion to the stimulus "giraffe" was met in eight sessions for both mand and tact responding. The response "apple" was acquired as a mand in four sessions but was reliably emitted as a tact within two sessions. There appeared to be no significant difference between the acquisition of mands and tacts during mand training for Subject 2 (see Figure 3).

For Subject 3, the following responses were modelled and reinforced by receipt of a generalized reinforcer during randomly ordered tact trials: lion, giraffe, camel. Correct mand responses to novel stimuli were assessed but were never modelled or reinforced. The criterion for correct tact responding to the stimulus "lion" was met in eight sessions; the criterion for correct mand responding was met in nine sessions. The response "giraffe" was acquired as a tact in eight sessions and as a mand in twelve sessions. The response "camel" was acquired as a tact in fourteen sessions and as a mand in fifteen sessions. There appeared to be no appreciable difference between the acquisition of tacts and mands during tact training for Subject 3 (see Figure 4).

In general, the results of Phase 2 indicated
that mand training facilitated the acquisition of tact responses. Tact training facilitated the acquisition of mand responses but not to the degree evidenced when mand training occurred and tact responses were assessed.

**Phase 3**

For Subject 2, the following responses were modelled and reinforced by receipt of a generalized reinforcer during randomly ordered tact trials: pen, cheese, zebra. Correct mand responses to the novel stimuli were assessed but were never modelled or reinforced. The response "pen" was acquired as a tact in seven sessions. However, it was acquired as a mand in only two sessions. "Cheese" was acquired as a tact in three sessions but was acquired as a mand in only two. The response "zebra" was acquired as a tact in five sessions and was acquired as a mand in four sessions. In all cases the criterion for correct mands was met before the criterion for correct tacts (see Figure 3).

For Subject 3, the following responses were modelled and reinforced with the object manded during randomly ordered mand trials: pen, cheese, zebra. Correct tact responses to novel stimuli were assessed but were never modelled or reinforced. Two mand responses met the criterion; only one tact response did. Mand responses met the criterion before tact responses in all cases (see Figure 4).
In general, the results of Phase 3 indicated that tact training facilitated the acquisition of mands and that mand training facilitated the acquisition of tact responses.
CHAPTER IV

DISCUSSION

The results of the present study demonstrated that mand training facilitated the acquisition of tact responses and vice versa. In all cases, responses in the repertoire being trained generalized to the repertoire which did not receive training. These data seem to question Skinner's separation of mand and tact repertoires. The conclusion that the repertoires are not separate is, however, not warranted at this time.

The operational definitions and procedural manipulations for the mand and tact training conditions were consistent with the distinction proposed by Skinner. The question arises as to whether the conditions were functionally distinct as well. Though this possibility was not explicitly tested, observation of subject behavior during different training conditions supports the contention that the differences were indeed functional. For example, during tact training subsequent to a correct response the subjects chose a toy to play with for a brief period. This, coupled with verbal praise, appeared to function as a reinforcer, i.e., the rate of correct tact responses increased.

The stimulus conditions corresponding to mand and tact trials should have been sufficiently distinct to rule out generalization of response due to lack of discriminability. However, the reinforcement conditions
were such that on any given day a subject had the opportunity to receive reinforcement on at least 50% of the trials and up to 75% of the trials. The density of reinforcement was sufficiently high to affect the probability of unreinforced responses. For example, during Phase 2 for Subject 2, correct tact responses to novel stimuli were never modelled or reinforced. However, these stimulus presentations only accounted for 25% of the trials while the probability of reinforcement could have been as high as 75%.

In addition, Skinner states that the topographical similarity between a given mand and tact response will facilitate the acquisition of whichever response is not specifically trained. "One connection may arise from the fact that events which reinforce a mand often resemble the discriminative stimuli which control a tact. The milk which a child gets with the mand 'Milk!' resembles the milk which controls the tact 'milk' in response to the question 'What is that?'" (Skinner, 1957, p. 189). Thus, it appears that density of reinforcement and topographical similarity affected the probability of correct responses in the repertoire which was not directly reinforced.

The presence of the experimenter as an audience also affected the strength of verbal behavior on the part of the subjects. "An audience...is a discriminative stimulus in the presence of which verbal behavior is characteristically strong" (Skinner, 1957, p. 172). The
experimenter was part of the occasion upon which verbal behavior was reinforced and "therefore becomes part of the occasion controlling the strength of the behavior" (Skinner, 1957, p. 172). Thus, although mands are primarily under the control of deprivation conditions, the presence of the experimenter as a discriminative stimulus is not irrelevant and will affect the strength of a particular response even if it is not directly reinforced. "Another possible bridge may arise from the fact that the presence of the reinforcing object is an optimal condition for reinforcement. Thus the presence of milk constitutes part of the optimal occasion upon which the mand 'Milk!' will be reinforced...The mand will be more likely to occur in the presence of milk. This is one step toward the production of a tact which would presumably facilitate the eventual control of the response by such a stimulus under generalized reinforcement" (Skinner, 1957, p. 189). In the present study, responses on the part of the subjects were a function of many variables operating at the same time. Although stimulus conditions were discriminable, the similarities were great enough to affect the probability of response. The fact that response rates were affected by multiple causation does not warrant the conclusion that mand and tact repertoires were overlapping. For each subject the repertoires were clearly separate early in training.
The control exerted by mand contingencies was indeed discernable from that exerted by tact contingencies. During mand training a subject might never choose a particular object thereby precluding the opportunity for modelling and reinforcement. For example, during Phase 3 for Subject 3, the pen was chosen very rarely. This response, then, was modelled and reinforced as a mand on only a few occasions. It was not acquired as a mand nor as a tact. In the tact training situation a subject does not have the opportunity to choose between stimulus objects. Thus, correct responses to all novel stimuli were modelled and reinforced. For Subject 2 during Phase 3, all responses were acquired as tacts and as mands. Investigations concerning the acquisition of mand and tact repertoires using topographically distinct responses might serve to clarify this situation further by increasing the difference between the mand and tact contingencies.

The present study also provided a technological vehicle for the study of verbal behavior. The apparatus is adaptable to investigations concerning any of the elementary verbal operants identified by Skinner (1957). One procedural variation would be to add a "choice" phase after mand training, for example. A divider panel could be set up on the stimulus shelf. A mand condition would be presented on one side and a tact condition on the
other side. The subject would be required to choose a stimulus condition by pushing a button corresponding to a particular condition. This would activate a training trial. In this manner, the strength of the mand contingency versus that of the tact contingency could be compared.
REFERENCE NOTES


REFERENCES


