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A Program to Teach Multiple Verbal Relations Involving a Small Number of Response Forms

Kimberly Lou Richter  
Western Michigan University

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A PROGRAM TO TEACH MULTIPLE VERBAL RELATIONS
IN VOLVING A SMALL NUMBER OF RESPONSE FORMS

by

Kimberly Lou Richter

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
April 1984
A PROGRAM TO TEACH MULTIPLE VERBAL RELATIONS INVOLVING A SMALL NUMBER OF RESPONSE FORMS

Kimberly Lou Richter, M.A.
Western Michigan University, 1984

As a consequence of reviewing the results of non-behavioral and behavioral approaches to language training for the language deficient, further development of an alternative approach seemed warranted. This study attempted to develop a procedure for training a functional verbal repertoire involving a new language system which consisted of originally meaningless words and symbols. Young "normal" children participated as a first step in developing this procedure. Two preschoolers were taught a few verbal responses, each controlled by several different variables. A new verbal response was then taught under the control of a few variables. Transfer of the new verbal responses under the control of the remaining variables without specific training was noted. A functional verbal repertoire was successfully trained as well as a transfer effect observed.
ACKNOWLEDGEMENTS

Immense gratitude goes to Al Neal for teaching me so much about behavior analysis that I wanted to continue my education at the graduate level; to Jack Michael for his interest and help throughout this study, as well as his guidance during my graduate training; and my co-workers at the Child Development Center for giving me the opportunity to attain my career goals and enrich my life as a whole. Mary Wierman'ski's help in completing this manuscript is extremely appreciated. Neil Kent is to be commended for his careful editing of the final revisions of this thesis. Sue Kent is credited for her professional abilities in typing the final copy. I am truly grateful to Joel, family, and friends for their support in helping me meet the demands of the past three years. For two people who have been with me forever, no words could ever express the appreciation, respect, and love I have for my mother and father.

Kimberly Lou Richter
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A language repertoire is essential for effective human function. Unfortunately, many individuals possess only a deficient language repertoire and many others struggle to acquire necessary skills. For some reason, they do not acquire language as a consequence of typical social interaction, such as parents talking to the child or playing with other children. This does not mean, however, that they would not be able to develop some form of language if given special training.

The best known behavioral approach to language is that of Skinner (1957). Skinner conceptualizes verbal behavior as consisting of several elementary relations between controlling variables and types of behavior: echoic, tact, mand, textual, intraverbal, taking dictation, copying a text, and the audience relation. These relations are shown in Table 1.

One implication of Skinner's approach would be to determine if a verbal repertoire could be developed by deliberately training the various elementary relations. This approach has been employed in some research but none has attempted to train all of the elementary verbal relations. These studies have produced positive results in developing and maintaining verbal repertoires with respect to each elementary relation for those who were language deficient.

Bradford (1980) was able to teach mands* to two non-verbal retarded

*Technical terms are defined in Appendix A.
### TABLE 1

**SKINNER'S ELEMENTARY VERBAL RELATIONS**

<table>
<thead>
<tr>
<th>Elementary Relationships</th>
<th>Controlling Variables</th>
<th>Verbal Responses</th>
<th>Point to Point Correspondence</th>
<th>Formal Similarity</th>
</tr>
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<tbody>
<tr>
<td>Echoic</td>
<td>Prior Auditory Verbal Stimulus</td>
<td>Vocal</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tact</td>
<td>Non-verbal Stimulus</td>
<td>Verbal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mand</td>
<td>Establishing Operation</td>
<td>Verbal</td>
<td></td>
<td></td>
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<tr>
<td>Textual</td>
<td>Response Product of Prior Writing Behavior</td>
<td>Vocal</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Intraverbal</td>
<td>Verbal Stimulus</td>
<td>Verbal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking Dictation</td>
<td>Response Product of Prior Vocal Verbal Behavior</td>
<td>Vocal</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Copying a Text</td>
<td>Response Product of Prior Writing Behavior</td>
<td>Writing or Printing</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Audience</td>
<td>Audience</td>
<td>Group of Response Forms</td>
<td></td>
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</tr>
</tbody>
</table>
persons by employing a combination of imitative and item-use prompts.
Tacting behavior subsequently occurred without specific training.
Generalization and maintenance of effects were observed after training was terminated.

Hall (1979) was able to teach a mand repertoire to individuals before tact training was given. She used procedures to transfer stimulus control from echoic to tact, then to the establishing operation which controlled the mand. This procedure also resulted in generalization and maintenance of effects after training.

Bell (1980) attempted to establish the beginnings of a verbal repertoire in three non-vocal hearing children by implementing mand training early in his procedure. The procedure of first teaching an echoic repertoire, then tacting, and finally, manding resulted in more rapid acquisition of each subsequent verbal element. In most cases different objects were taught for each repertoire. One subject's echoic and tacting behavior was weak before mand training. During mand training immediate results were observed. The mand repertoire was successfully acquired and the echoic and tact repertoires were strengthened. This researcher reported incidents of untrained mands occurring, as well as continued progress for these children acquiring intraverbal and textual repertoires.

Sundberg (1980) used sign language, instead of vocal behavior, to develop the verbal repertoires of subjects who had a wide variety of handicaps, such as autism and retardation. They were taught echoic, mand, tact, and intraverbal repertoires as well as more complex mands and tacts. A procedure to transfer stimulus control from imitative
to mand, to tact, and to intraverbal contingencies was implemented. The objective was to bring a single response under as many different controlling variables as possible. All the subjects involved in the study acquired a fairly large sign repertoire in a short period of time. Their vocal articulation was clearly improved. There appeared to be a concomitant decrease in their inappropriate behavior. The occurrence of unprompted mands and tacts was reported. This result suggests generalization of these repertoires to the natural environment.

Kent (1974) developed a language acquisition program for the retarded or multiply-impaired. Her program emphasized echoic, tact, and mand compliance, but minimized mand training. Thus, although her procedures appeared to be quite sound, they were incomplete with respect to mand training. Mand training may well be the most functional of all the verbal relations since it appears to facilitate acquisition of the other relations. Certainly verbal behavior directly benefiting the speaker, as in the case of the mand, should be more easily trained (Hartung, 1970; Sundberg, 1978).

During an investigation of the acquisition of an integrated complex verbal repertoire, Wiermanski (1984) trained mand, tact, and mand compliance repertoires in language deficient, developmentally delayed individuals. A topography based language which involved signing and a stimulus selection based language which involved pointing to lexigrams were both taught. A few verbal elements were trained for all the relations in either a topography based or stimulus selection based language. These verbal elements consisted of either a specific key
name or a specific lexigram. In neither language did the verbal elements transfer from one relation to another without specific training. The observation was made, however, that during stimulus selection based training when a new verbal element was introduced into the mand and tact relation, it was acquired with little or no training.

A more subtle implication of Skinner's work involves integrated repertoires consisting of the different elementary verbal relations but related to the same stimulus or stimulus object. The "normal" individual with a highly functional language has a repertoire consisting of interlocking elementary relations. For example, "water" as a vocal response is a mand which has been strengthened with water reinforcement. "Water" is also a tact made in the presence of water, perhaps in answer to the question "What is this?" and in the presence of other objects and events that have been associated with water. "Water" is also an intraverbal which becomes strong in the presence of the auditory stimuli produced when someone else says "drink" or "wet". It is also part of the echoic relation and is thus strong when someone else says "water". If the person is literate it is also strong in the presence of the visual stimulus consisting of the printed or written word "water," the textual relation.

The general importance of this type of integrated repertoire has not been elaborated upon in the language training literature. Possibly this is because it is only Skinner who conceived of language as composed of multiple elementary relations. Even behaviorally-oriented language research has not directly addressed the issue of whether such integrated repertoires should be directly trained or allowed to develop
without specific training. It is clear that the "normal" child does acquire such integrated repertoires without any deliberate training. This fact does not negate the possibility that individuals with no language or delayed development would not benefit from such direct training.

Sundberg's research appears to more directly apply Skinner's analyses than any other. In several of his studies, subjects were taught all of the various elementary relations between the same object. The results of this work do not clearly indicate, however, that training all the verbal relations with a few objects facilitated acquisition of the verbal relations when new objects were introduced, either with or without training.

The basic notion underlying this research takes several points into consideration. It suggests that a functional language can be developed by training single response forms for all the elementary verbal relations. Thus an individual would have a repertoire for each relation involving all the responses trained. It also suggests that each time a new response which involves only a few relations is trained, it may be readily emitted in the remaining relations with little or no training.

A strategy to test this hypothesis would be to train for all the elementary relations in establishing verbal repertoires in children or adults who have no language. It is quite possible that such individuals would acquire a functional verbal repertoire more rapidly if it was integrated in the manner described above than learning many tacts, much mand compliance, and little else. It would also be
interesting to see, however, what effect such integrated repertoire
development has on the language of a "normal" young child or a child
who had not yet acquired any language. Since this would raise many
ethical concerns in the latter case, subjects for such an investiga-
tion would be selected who met the following criteria: (a) a child
with enough language so that adding a few verbal relations in this
integrated way would not alter the child's normal language development,
and (b) a child so young that it had not yet developed a language about
language, or any appreciable rule-governed behavior regarding the rela-
tionships between objects and their names. Children from the ages of
2 to 5 years would seem to fit this category.

The purpose of this study was to determine if, with young "normal"
children, an integrated verbal repertoire involving a few response forms
emitted under different controlling variables could be trained. A
functional verbal repertoire was trained by teaching an individual a
few verbal responses under different controlling variables. An attempt
was also made to provide for further economy and efficiency in training
by teaching additional verbal responses under a few controlling vari-
ables. It will also be determined if a transfer of those verbal re-
sponses occurred under the control of other variables with little or
no training. For example, four objects and lexigrams were trained
for several verbal relations. Then an additional object and symbol
were trained in only a few of those relations. It was proposed that
responses involving the new object and symbol would be readily emitted
in the other verbal relations with little or no training. The informa-
tion obtained in this process of training such a repertoire should be
useful in similar work with children and adults who have no language and in further work with even younger normal children.
CHAPTER II

METHOD

Subjects

Two children participated as subjects in this study. They were both 2 year, 2 month old males who were enrolled in the preschool program at the Child Development Center in Kalamazoo, Michigan. They were selected because of their age and their availability. Their parents were fully informed about the study and gave consent for their children to participate.

Setting

The study was conducted in a relatively small area of one of the regular classrooms. The area was partitioned off from the remainder of the classroom by bookcases already present in the classroom. A small table and two chairs, used by the experimenter (trainer) and the participants during the course of the study, were placed in the experimental area.

Materials

The materials used in the study consisted of four red plastic (toy tool) boxes, 20.3 cm wide, 12.7 cm deep, and 414 cm high. A rectangular section was removed from the top of each box and replaced with clear plastic in order that the contents of each box were visible.
when the top was closed. A hasp was attached to each box so that
the top could be locked in the closed position.

Five identical padlocks were used to lock the boxes. Each pad­
lock and its corresponding key was identified with a unique color
pattern. These color patterns were glued on the locks and also glued
to pieces of 3 cm x 10 cm poster board which was attached to each key
with a piece of string. The same four colors were used in each of
the five patterns so that the stimulus objects could not be identified
by color alone. Each pattern was arbitrarily assigned a consonant­
vowel-consonant nonsense syllable name. The names used were wif,
meg, sot, puz, and zul.

Finally, in terms of stimulus materials, lexigrams were drawn in
black ink upon sturdy white construction paper. These lexigrams are
shown in Figure 1. Attention is called to the fact that the lexigram
patterns were entirely different from the color patterns that identi­
fied the locks and keys.

As will be noted later in the Procedure section, beads and self­
adhesive, odorized stickers were given to the child as reinforcers for
correct responding during acquisition training. The stickers were
pictures of children's characters or food. These objects were chosen
as reinforcers because of their demonstrated effectiveness in the
classroom.

Sessions

Two sessions were conducted daily, Monday through Friday, when­
ever possible. One was conducted early in the morning; the other late
FIGURE 1. Lexigrams

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in the afternoon. The average length of the sessions was approximately fifteen minutes.

Procedure

General

The procedure consisted of (a) a series of pretraining trials, during which the child learned to manipulate the locks and keys; (b) a sequence of trials to train eight different verbal repertoires; and (c) a series of probe trials, during which testing for transfer effects occurred.

The general orientation followed in developing the training procedures was that of the experimental analysis of behavior. The trainer relied on prior experience to initially attempt a particular training procedure with the first child. If, after a reasonable number of trials the procedure was not working, major changes were made in the procedure. There were five such major procedure changes. These changed procedures were subsequently used in training the second child so that in his case, there were no major procedure changes. The training protocols for the two children are detailed in Appendix B. An examination of these protocols will provide the reader with considerably more detail than is feasible to present in the body of this report.

Pretraining

The goal of pretraining was to teach the child to open a box by
inserting a key into a lock, allowing the trainer to turn the key (since the child did not have the strength to do so), pulling out the key, removing the lock, and opening the box. Pretraining was terminated when the child could perform the above sequence successfully for five consecutive trials.

The trainer began pretraining by modeling the manipulation of the key to remove the lock while simultaneously saying, "This is what I want you to do. Can you do that?" A correct response made a sticker reinforcer inside the box available to the child. This was supplemented by social approval from the trainer. If the child responded incorrectly, the trainer taught the child the sequence backwards using physical guidance (Bradford, 1980). After the child was able to manipulate the key to open the lock, a reinforcer was placed inside the box and the key was placed with others to determine if the child would select the correct key and open the box.

Training the Verbal Repertoires

The first child was taught the eight verbal relations in the following order: topography based tact (TT), topography based mand compliance (TMC), stimulus selection based tact (SST), stimulus selection based mand compliance (SSMC), topography based intraverbal (TI), stimulus selection based intraverbal (SSI), topography based mand (TM), and stimulus selection based mand (SSM). The second child was taught the same relations but in the following order: SST, SSMC, TT, TMC, SSI, TI, SSM, and TM.
Toporgraphy Based Tact (TT) Training

The goal of this training was to teach the child to articulate the correct name of a key when the key was shown to the child and he was asked, "What is this?"

The initial attempt made to train this verbal repertoire began with the trainer displaying the wif key to the child and saying, "This is a wif. Say wif." After the child learned to respond correctly the verbal prompt was changed to "What is this?" A correct response was followed by a bead reinforcer and social approval. An incorrect response produced a "No." and negative shake of the head from the trainer. This was followed by a re-presentation of the previous prompt procedure, ("This is a wif. Say wif.")

After three consecutive correct trials, training was begun with the meg key. The same training procedure was followed.

After three consecutive correct trials, one or the other of the wif or meg keys was randomly chosen and presented. The child was asked, "What is this?"

After many training trials, the child was unable to reach criterion, so that further attempts to train this verbal relation were discontinued until training topography based mand compliance (TMC) with wif, meg, sot, and puz was completed. The TMC training procedure is described in the next section below. The termination of TT training prior to the child reaching the criterion of 90% correct responding for two consecutive sessions and proceeding to TMC training constituted the first major procedure change.

After the child was TMC trained to criterion with all four
elements, the trainer returned to TT training using a modified procedure. This changed procedure was the third major procedure change. (The second major procedure change was made during TMC training, a description of which is given in the following section.)

In the new procedure, the wif and meg keys were placed in a bag. One was randomly selected, withdrawn, and displayed to the child. The trainer asked, "What is this?" The trainer prompted the child by saying, "Look carefully." and/or, "Think big." Training was continued until the child reached the 90% correct—two consecutive session criterion. Then the sot and puz keys were trained in the same manner. Finally, all four keys were placed in the bag, randomly withdrawn one at a time, displayed to the child, and the question, "What is this?" asked.

### Topography Based Mand Compliance (TMC) Training

The goal of TMC training was to teach the child to correctly point to a specific key in an array of all four keys in response to a mand such as, "Point to the wif." Training was initiated by placing the wif key on the table in front of the child. The trainer emitted the mand and immediately prompted the child by pointing to the key. Over a series of trials, the non-verbal prompts were systematically eliminated until the child reached the criterion of three successful compliance trials without a prompt. The child was then trained on the meg key utilizing the same procedure. Finally, a series of trials was given during which both keys were simultaneously displayed. The trainer said, "Point to the meg." or "Point to the wif." Correct
responses to the trainer's mand were not occurring sufficiently often. A procedure change was made. This was the second major procedure change.

In the new procedure the trainer moved from sitting beside the child to a position across the table. The wif and meg keys were placed in a box which was presented to the child. The trainer said, "Find me the wif." or "Find me the meg." Prompts such as, "Look carefully." and/or, "Think big." were frequently given to the child during a trial. Sequencing was randomized. Correct responses were reinforced with a bead. The child accumulated the beads on a holder which, when filled, could be exchanged for a more powerful reinforcer. When the child had mastered wif and meg, sot and puz were trained in the same manner. The final stage of training consisted of presenting all four keys in the box and giving the random sequence of mands, "Find me the ___." When the 90% correct-two consecutive session mastery criterion was met, the trainer returned to TT training using this modified procedure.

**Stimulus Section Based Tact (SST) Training**

The goal of SST training was for the child to correctly select a lexigram from an array to match a key. The wif and meg lexigrams were placed in front of the child. The trainer displayed the wif key, asked the child, "Look at this. Which one?" and immediately pointed to the wif lexigram. If the child hesitated, his hand was manually guided to the wif lexigram. Physical guidance and prompts were faded out as the child became more proficient. Both lexigrams and both keys were
used in this series of trials. The sequence of key presentations and the placement of the lexigrams were randomized.

Since the above procedure did not result in the child's meeting criterion with the wif and meg lexigrams, the procedure was changed such that the lexigrams were covered until the child was told, "Look at this." The child was given more time to look at the keys before responding. Additional prompts, such as, "Look carefully." and, "Think big." were given. The classroom window shades were closed and the training area was made more enclosed to further reduce distractions. A verbal explanation was given which demonstrated that one key went with one lexigram. Even with these changes, however, it did not appear that much progress was being made. The decision was made to immediately proceed to stimulus selection based mand compliance (SSMC) training and to return to SST training after SSMC training was completed. This was the fourth major procedure change.

**Stimulus Selection Based Mand Compliance (SSMC) Training**

The goal of this training was for the child to identify the correct key when a lexigram was displayed and the child was told, "Find me the (lexigram shown)." Training was initiated by placing the wif and meg keys in front of the child. The trainer then displayed either the wif or the meg lexigram and manded, "Find me the (lexigram shown)." and immediately pointed to the correct key. The child was manually guided if he did not respond. Correct responding was reinforced with a bead. The procedure was repeated until the child picked up and gave the correct key to the trainer for three consecutive
trials; then another key and lexigram were added to the training sequence. This was continued until the four keys and the four lexigrams were trained.

After the child reached criterion on SSMC training with all four verbal elements, the trainer returned to SST training with wif and meg and proceeded to train all four elements in the manner described immediately above. This was the fifth major procedure change.

Review of Prior Training and Probe for Transfer

For the next two sessions, the topography based tact (TT), the topography based mand compliance (TMC), and the stimulus selection based mand compliance (SSMC) repertoires were reviewed in that order. A probe indicated that no training was necessary for the SST repertoire. During the next session, the order was reversed such that SST occurred prior to SSMC. When all four repertoires were occurring with 90% or greater accuracy, the next procedure was implemented.

Topography Based Intraverbal (TI) and Stimulus Selection Based Intraverbal (SSI) Training

The session began with a review of the TT, TMC, SSMC, and SST repertoires. The TI and SSI repertoires were probed.

A correct TI response consisted of the child emitting a specific topography under the control of a specific lexigram shown to him. All of the lexigrams were placed in a box and randomly withdrawn one at a time. As the lexigrams were successively displayed to the child, he would respond, "meg", "sot", and so forth.
A correct SSI response occurred when the child identified a specific lexigram in an array in response to a specific topography emitted by the trainer. All of the lexigrams were displayed in front of the child. The trainer emitted the name of one. The child pointed to the lexigram named.

It was not necessary to train either of the intraverbals. The 90% correct-two consecutive session criterion was achieved in two sessions.

Topography Based Mand (TM) Training

The goal of this training was for the child to mand a specific key in the presence of a locked box containing a visible reinforcer when no keys were present (establishing operation).

The training session began with all four boxes and locks present. The child watched the trainer place a reinforcer in the wif box and lock it. The keys were not present. If the child did nothing, he was prompted to look at the lock. The trainer then asked, "Can you say wif?" When the child emitted the echoic response, the wif key was given to him. This gave him access to the reinforcer. If no echoic response was made, the child was prompted until one occurred, at which time he was given the wif key. The various boxes whose patterns (wif, meg, sor, and puz) were displayed on the locks, were baited in a random sequence such that each was baited twice. The location of the baited box in the array of boxes varied randomly.
Stimulus Selection Based Mand (SSM) Training

The goal of this training was for the child to mand, or ask for, a specific key by pointing to its lexigram, which was presented in an array of lexigrams. A reinforcer was visible in a locked box during this presentation.

The training session began with all four boxes and locks placed in front of the child. The child observed the trainer place a reinforcer inside the wif box and lock it. The lexigrams were randomly arranged in front of the boxes. No keys were visible to the subject. If necessary, the trainer prompted the child to look at the lexigrams. If the child pointed to the wif lexigram, he was given the wif key which gave him access to the reinforcer. If an incorrect response was made, he was asked, "Are you sure?" If the child still responded incorrectly, the trainer modeled or physically prompted the correct response. Each box was baited twice. The sequence of pattern presentations and the location of the baited box within the array of boxes was randomized. Training was terminated when the 90% correct-two consecutive session criterion was met.

Testing for Transfer Effects

The topography based tact (TT) and topography based intraverbal (TI) were trained utilizing a new stimulus, zul, which had its unique stimulus pattern on the lock and attached to the key. The same training procedures previously described were employed to train the zul element. The session began with the new element and then,
on each consecutive trial, an old element was added until all five were involved. When the child achieved the 90% correct-two consecutive session criterion, the remaining repertoires were probed.

An attempt was made to increase the motivational variable in the probe trials by placing a reinforcer above the key, or the lexigram, or the box, depending upon the type of trial. The probe consisted of trials for each element in each of the verbal relations.

Topography Based Tact (TT)

All keys were placed in a box that was on its side, had a small hole in the bottom that faced the trainer, and the top was completely taken off and faced the child. The trainer would reach in the box through the small hole, pick up the key, and without looking at it, say to the child, "What is this?" A response from the child resulted in the trainer asking if he was sure. A correction was permitted for and if the subject did so, he was again asked if he was sure. The trainer would then pull the key through the hole and look at it.

Topography Based Mand Compliance (TMC)

The box was utilized with the lexigrams placed inside. The trainer would emit the mand and ask the child to put the lexigram through the small hole if he was sure he had the right one.

Stimulus Selection Based Tact (SST)

The trainer would hold up the key and say to the child, "Look at this. Which one?" pointing inside the box where the lexigrams were

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placed. The child was asked to put it through the small hole if he was sure he had the right one.

**Stimulus Selection Based Mand Compliance (SSMC)**

This condition was done as in the topography based mand compliance testing, but the keys were placed in the box and a lexigram was shown.

**Topography Based Intraverbal (TI)**

The lexigrams were placed in the box. The trainer would reach in, pick up and show a lexigram to the child. After the child emitted a response, the trainer would ask if he was sure. The lexigram was then looked at.

**Stimulus Selection Based Intraverbal (SSI)**

The lexigrams were placed in the box. The trainer gave the name of a key and the child responded by picking up the lexigram.

**Topography Based Mand (TM)**

Four boxes were arranged in front of the child. One of the boxes contained a visible reinforcer. The child asked for the key to the box by name. Since only four boxes were used, one stimulus was always omitted from a trial.

**Stimulus Selection Based Mand (SSM)**

Four boxes were placed in front of the child. One of the boxes...
contained a visible reinforcer. The child asked for the key by pointing to the correct lexigram displayed with the others in an array. Since only four boxes were used, one stimulus was always omitted from a trial.
CHAPTER III

RESULTS

Two children were successfully taught a unique collection of interconnected repertoires as can be seen in Figures 2 and 3. All verbal relations were trained with all five elements.

In most cases, as new verbal elements were added to each repertoire, training trials were either approximately the same or less. This is true in particular for Participant 1 as shown in Figure 2. In starting with the topography based mand compliance relation and looking at the next two relations, the wif element took the most trials to reach the criterion of mastery. The meg took fewer trials, and the sot and puz took even fewer trials each.

This was not particularly true for Participant 2 as shown in Figure 3. All of the verbal elements in many relations (stimulus selection based mand compliance, topography based mand compliance, stimulus selection based mand, topography based mand) took about the same number of trials to meet criterion. During the stimulus selection based tact and topography based intraverbal relations more trials were required to train the first two verbal elements, wif and meg, than the last two, sot and puz. For the topography based tact relation, the first two verbal elements, wif and meg, required half or fewer training trials than the last two verbal elements, sot and puz.

For Participant 1, there appeared to be a trend where each
Verbal Relations and Objects for Each Repertoire in the Order of Training (with the exceptions of procedure changes and *)

FIGURE 2

Participant 1. Verbal Relations and Objects
Participant 2

$T$ = Transfer (no training)

$N$ = No transfer

 Trials where verbal prompt "get ready" was used and where consistent sessions were run after four days of not running sessions

Verbal Relations and Objects for Each Repertoire in the Order of Training

FIGURE 3

Participant 2. Verbal Relations and Objects
verbal relation taught required fewer trials overall. This can be seen in Figure 2. Such a trend was not particularly evident for Participant 2. The first two relations taught, stimulus selection based tact and mand compliance, required fewer training trials than the next relation taught. The topography based mand compliance and stimulus selection based intraverbal relations required less training than the next relation. This may be seen in Figure 3.

With Participant 1, after training the first four verbal relations, the topography and stimulus selection based intraverbal relations were probed to see if they transferred without any training. Such transfer appears to have occurred. Both repertoires were readily available without specific training as can be seen in Figure 2. This did not occur for Participant 2. Both intraverbal relations required training.

After all the relations were trained with all four verbal elements, the new element, zul, was introduced. For each child it was trained in only two different verbal relations. For Participant 1, training occurred in the topography tact and topography intraverbal relations as seen in Figure 2. Testing for transfer showed the new verbal element to be readily available in the other verbal relations.

For Participant 2, training of the new verbal element, zul, occurred for the stimulus selection based tact and the stimulus selection based intraverbal relations as seen in Figure 3. Testing for transfer showed the new verbal element to be readily available only in the relations where a stimulus selection based language was involved (stimulus selection based mand compliance and mand) and in the
topography based mand compliance relation where the trainer emitted the topography. Transfer of the new verbal element did not occur for the topography based tact, intraverbal, and mand, where the child had to emit the specific topography.
CHAPTER IV

DISCUSSION

Through the completion of this study a workable procedure has been developed as an alternative to the traditional way of training a functional verbal repertoire in young "normal" children. The study suggests several interesting points which may lead to refinement and improvement of the procedure developed.

Each additional verbal element and additional verbal relation was acquired more quickly, or in about the same number of trials, as earlier elements and relations. For example, in starting training with the stimulus selection based tact relation, where a key was shown and the child had to select the correct lexigram out of an array, it would be likely that the stimulus selection based mand compliance repertoire, in which the child was shown a lexigram as part of the mand in finding the correct key, would be acquired quickly. When \( A = B \), then \( B = A \), where \( A \) is the key and \( B \) is the lexigram. In teaching a new verbal element in any relation, having a history of responding appropriately with already trained elements would seem to facilitate quicker acquisition of the new elements. For example, in training the stimulus selection based mand compliance relation, reaching criterion mastery responding with two lexigrams and keys is a requirement for training a new lexigram and key. Correct responding should be strong before the introduction of a new key and lexigram pair. It would seem likely that when a new lexigram was shown to the child, he would pick the correct key with little or no training.
because picking the other keys would be weak responses in the presence of the new lexigram. Or, said in a different way, picking the other keys would be stronger responses in the presence of their respective lexigrams.

The order in which relations were trained may have resulted in repertoires being acquired more quickly as the training sequence was followed. For Participant 1, training the two mand compliance relations facilitated more rapid acquisition of the two tact relations. An implication of this would be to train mand compliance relations prior to training tact relations. This relationship was not evident for Participant 2 where the stimulus selection based tact was trained first and both tact relations were acquired without prior mand compliance training. One implication of this result may be that starting off with stimulus selection based training may help facilitate topography based training. An interesting study would be to train the topography based mand compliance before the tact, then the stimulus selection based mand compliance before the tact with one child; with another child, train the stimulus selection based mand compliance, before the tact, then the topography based mand compliance before the tact. The effects of beginning language training with a topography based language as compared to starting with a stimulus selection based language and in keeping the mand compliance relations in the same order could be noted.

For Participant 1, transfer occurred for the topography and stimulus selection based intraverbal repertoires. This was not true for Participant 2. It is unclear as to why the topography and
stimulus selection based intraverbal responses were not readily available for Participant 2 since both children reached criterion mastery in the same first four relations and these relations were reviewed in their respective orders every session.

It is also interesting to note that for Participant 1, when the stimulus selection based intraverbal repertoire occurred before the topography based repertoire, the responses for the latter were emitted without hesitation. In the reverse order (topography based intraverbal, then stimulus selection based intraverbal), responses by the child during the topography based intraverbal were emitted only with hesitation. Whereas for Participant 1 the stimulus selection based intraverbal repertoire facilitated the topography based intraverbal repertoire, that was not true for Participant 2. Again, it is unclear why this may have happened.

In training the new verbal element, zu1, the repertoires that facilitated transfer were those involving teaching the specific topography, as well as the lexigram, as was done with Participant 1. For Participant 2 where training involved the trainer emitting the topography and the child utilizing a stimulus selection based language, transfer did not occur when responses from the child required a specific topography. The child would always approximate (echo) the trainer's stimulus during stimulus selection based intraverbal training. When the child was required to emit the response without an echoic stimulus for the topography based tact, intraverbal, and mand relations, the child's response was a close approximation, however incorrect according to the way he would consistently approximate the
topography. The next step in training would have been to train one of the topography based repertoires, but a time constraint ended the training at that point. It is believed that it would not have mattered which topography based repertoire would be the most beneficial to train in order to facilitate the transfer of the repertoires that did not transfer. What was needed were more trials in shaping and learning the correct topography.

The researcher may have erred in not training a topography based repertoire with the new element for Participant 2. It was assumed that echoic behavior would facilitate acquisition of topography based repertoires. It is true that most "normal" children engage in echoic behavior even without prompts. This study suggests, however, that relying on echoic behavior as an indirect way to teach specific topographies is not necessarily a successful and efficient way to teach verbal behavior. Depending indirectly on echoic behavior to teach the language deficient may prove to be even more inefficient and quite possibly useless.

Several changes were made during training which may have affected the outcome of this study. These changes clearly facilitated Participant 1's acquisition of several verbal repertoires. From the data at hand, however, it is not possible to pinpoint which aspects of the procedure changes can be assigned a causative role.

In retrospect, several changes can be suggested to redefine this procedure. First of all, the acquisition of verbal repertoires may be facilitated by adding new verbal elements one at a time with already trained verbal elements. This was done with Participant 1 during
stimulus selection based mand compliance training with the result that no errors were made as each new element was added.

A slightly different approach which produced the same results occurred during the training of the verbal element zul. A few trials were run with the zul element, either the key or lexigram, by itself. Then one at a time previously trained verbal elements were placed in the array during each new trial. This approach resulted in correct responding with the new verbal element for every trial.

For both children in this study, consistent errors were made in discriminating between two particular key patterns, the meg and the sot. They were frequently interchanged during training of all the repertoires. This leads to the suggestion that all key and lock patterns should be significantly different so as not to generalize responding between them.

Many questions remain unanswered. Further work with "normal" young children seems warranted to further refine this procedure and investigate these questions. A possible next step would be to try this procedure developed in this study with language deficient subjects. It might be possible to train a more functional repertoire to fit the environment in which they live.
APPENDICES
GLOSSARY OF TERMS

Term: **Conditional Discrimination**: the control of a particular stimulus over a particular response is determined by a second stimulus.

Example: Showing the child a particular lexigram strengthens his tendency to select the appropriate key from among an array of keys.

Term: **Establishing Operation**: an environmental event that precedes the response it is functionally related to and (1) increases the effectiveness of a particular stimulus and (2) evokes any behavior that was previously reinforced by that stimulus.

Example: The sight of a locked box containing something a child wants, increases the reinforcing effectiveness of the key that opens that box, and evokes behavior that has resulted in obtaining that key (saying its name).

Term: **Formal Similarity**: a relationship between a stimulus that evokes a response and the product of that response such that the controlling stimuli and response product are in the same sense modality, (e.g., they are both visual or auditory). Their physical pattern or sequences resemble one another, (e.g., they may look or sound alike).
**Example:** The trainer says, "wif" and, as a result of that auditory stimulus, the child says, "wif".

**Term:** **Item-use Prompt:** physical guidance on the part of the trainer is used to teach the manipulation of objects.

**Example:** The trainer molds his hands around the child's hands in helping him to use the key appropriately.

**Term:** **Lexigram:** an arbitrary symbol used in a stimulus selection based language. Each lexigram is a verbal stimulus that corresponds to a vocal response and/or its auditory response product in a topography based language.

**Example:** See Figure 1 of this thesis, page 11.

**Term:** **Point to Point Correspondence:** the relation between verbal response and the stimulus that controls it such that the beginning of the stimulus is responsible for the beginning of the response, the middle of the stimulus is responsible for the middle of the response, etc.

**Example:** There are no examples of this concept in the experiment that are not also examples involving formal similarity. The intraverbal relations, however, are partly defined by the fact that the response and stimulus do NOT have point to point correspondence. Thus, saying "wif" as a result of seeing the wif lexigram does not involve point to point correspondence.

**Term:** **Response Product:** the stimulus that results from a response.

**Example:** The auditory result of saying "wif".
**Term:** Stimulus Selection Based Intraverbal: a tendency to point to a verbal stimulus out of an array of stimuli under the control of another verbal stimulus, and the two stimuli do not have point to point correspondence.

**Example:** In the presence of four lexigrams, the trainer says "wif" and the child points to the correct lexigram.

**Term:** Stimulus Selection Based Language: a system of verbal behavior where behaving linguistically consists in pointing at or touching verbal stimuli (rather than speaking, signing, writing, etc.).

**Example:** The child is shown a key and "names" it by pointing at a visual symbol (the lexigram) for that key.

**Term:** Stimulus Selection Based Mand: pointing at or touching a particular verbal stimulus becomes strong as a result of an increase in the strength of an establishing operation (a tendency to point at the symbol for X as a result of X becoming an effective form of reinforcement—"wanting X").

**Example:** As a result of seeing a locked box with something reinforcing in it, the child asks for the key for that box.

**Term:** Stimulus Selection Based Mand Compliance: a tendency to touch or point to (or pick up, etc.) some non-verbal stimulus or object as a result of contact with a verbal stimulus resulting from someone else's stimulus selection based mand.

**Example:** The trainer says "Find me" and holds up a lexigram for a particular key and the child hands him the relevant key.
Term: **Stimulus Selection Based Tact:** a tendency to point to a particular verbal stimulus (which would ordinarily be called the "name" of that object) as a result of contact with some non-verbal stimulus or object.

Example: The trainer presents a key and the child points to the correct lexigram.

Term: **Topography Based Intraverbal:** a tendency to make a verbal response as a result of contact with a verbal stimulus with which the response does NOT have point to point correspondence.

Example: The child says "wif" on seeing the *wif* lexigram.

Term: **Topography Based Language:** a system of verbal behavior in which the persons responds linguistically by emitting topographies unique to the different controlling variables (speaking, signing, writing).

Example: The child's various tendencies to say the different words (*wif, meg, sot, puz, and zul*) used in this experiment.

Term: **Topography Based Mand:** a tendency to make a verbal response whose form (topography) is under the control of an establishing operation.

Example: As a result of seeing a locked box with a reinforcer in it, the child says the name of the key that opens that box.

Term: **Topography Based Mand Compliance:** a tendency to point to, (touch, pick up, etc.) a non-verbal stimulus or object as a result of contact with a verbal stimulus which resulted from some else's topography based mand.
Example: The trainer says, "Find me the wif" and the child picks up the key with this name.

Term: Topography Based Tact: a tendency to emit a verbal response whose form (topography) is controlled by a non-verbal stimulus.

Example: The trainer holds up the wif key and the child says, "Wif".

Term: Verbal Behavior: B. F. Skinner's term for behavior reinforced through the mediation of someone else's behavior — approximately equivalent to "language behavior".

Example: Any of the child's vocal responses (wif, meg, etc.) or pointing to lexigrams or pointing to (touching, picking up, etc.) the keys used in the experiment when these responses are controlled by the various conditions of the experiment.

Term: Verbal Stimulus: Roughly speaking, a stimulus that results from someone else's verbal behavior.

Example: The auditory result of the trainer saying, "wif"; the visual stimulus constituting the wif lexigram.
APPENDIX B

SUBJECT PROTOCOLS

Participant 1

Manipulation of The Keys and Locks

The child was taught to manipulate a key to remove a specific lock from a box inside of which a reinforcer was placed. Several training procedures were implemented. First, a model was provided to show the child how to manipulate the key to remove the lock while simultaneously saying, "This is what I want you to do, can you do that?". Correct responding was socially reinforced along with the child's obtaining the reinforcer inside the box. If the child was unable to follow the modeled example, the implementation of item use prompts (Bradford, 1980), backward chaining, and fading procedures was then used to train the appropriate responses. The child was physically guided through the use of the key. For each additional trial needed to correctly remove the lock, the trainer would manually guide the behavior. The child would engage in the last response of the chain by himself, then the last two responses, and so on. This is called backward chaining. Manual guidance was faded until the child correctly manipulated the tool to remove the lock for five consecutive trials. It was too hard for the child to turn the key which actually opened the lock. The trainer engaged in that response of the chain. When it was time for the child to turn the key,

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the trainer would announce, "My turn" and turn the key. The child was then told to complete the chain by pulling out the key, taking off the lock, and opening the box.

The purpose of this phase was to: (a) familiarize the child with the trainer, setting, and materials; (b) allow for a high rate of reinforcement in the beginning of training to increase the probability of the child wanting to continue each day; (c) contrive an establishing operation for a mand repertoire to transfer (occur without training) or be trained; (d) probe for some possible verbal repertoires already acquired by the child as stated below; and, (e) set up a matching-to-sample paradigm where a specific patterned key was matched to and unlocked the same patterned lock.

Once this child was able to manipulate the key to open the lock, a box was baited with a reinforcer and the key was placed with an assortment of keys. This was done as a probe trial to see what this child would do.

**Acquisition of The Topography Based Tact**

This verbal relation consists of the child saying the correct name of the key in the presence of a key and the verbal stimulus, "What is this?". The four tacts taught were *wif*, *meg*, *sot*, and *puz*. In using echoic prompts, the trainer held up a key and said, "This is a *wif*. Say *wif*." Repetition of the prompt and shaping of the response continued until the child consistently articulated a close approximation of the topography, or the correct pronunciation. When the child emitted the correct response, or a close approximation,
controlled by the prompts and the key itself, the trainer switched the prompt to "What is this?". Thus, stimulus control was transferred from echoic to tact. A correct response was reinforced with praise and a bead was placed in a cup. An incorrect response resulted in the trainer saying "No", shaking her head, and the presentation of the previous verbal prompt procedure. After three consecutive trials of correct responding, a new key was introduced by itself in the same manner. After three consecutive trials of correct responding, the two were randomly chosen, one at a time, then shown to the child with the trainer asking, "What is this?". All correct responses were reinforced with a token and praise during training for all the verbal repertoires taught. However, when correct responses were initially emitted without prompts, stronger reinforcement was given—more enthusiastic praise and extra beads, and the schedule and intensity were gradually thinned. Incorrect responding always resulted in the trainer shaking her head and saying, "No".

Comments: After approximately 105 training trials and many prompts given to "Look carefully.", the child's accuracy in emitting the correct tact was poor. It was decided to switch to the topography based mand compliance relation in hopes that this training would facilitate the acquisition of the topography based tact. This change constituted Procedure Change (PC) 1.

Acquisition of The Topography Based Mand Compliance

This relation consisted of the trainer emitting a mand involving a specific response form by asking the child to point to one of the
keys and the child complying under the control of the mand and the correct key. A key was placed on the table in front of the child. The trainer emitted the mand "Point to the wif." and immediately pointed to the wif key. The child did nothing, so manual guidance was provided. The procedure was repeated until the child pointed to the correct key for three consecutive trials under the control of the mand and the prompt. The prompt was then delayed 1 second after the mand was emitted. If the child responded incorrectly before the prompt was presented, the trainer returned to the immediate prompt procedure. When the child responded correctly to the prompt for three consecutive trials, the delay between the presentation of the mand and prompt was increased to 2 seconds, and so on. If the child responded correctly to the mand before the prompt, stronger reinforcement was given. After three consecutive trials of complying with the trainer's mand without prompts, the trainer presented a new key alone and trained mand compliance in the same manner as above. The keys were then placed together. Mands involving both keys were randomly emitted for the child to respond to. Key positions were randomly switched.

Comments: It was not clear whether the child's response was controlled by the different key patterns or by the previous key positions. Suggestions were made to change the mand from "Point to the ____." to "Find me the ____." The keys were placed in a box and the mand given. After every trial, the key positions were shuffled. This was done so that responding would more likely come under the control of the key pattern and not under the control of the previous correct
key position. Decisions were also made to train the repertoires using several keys at a time letting every trial be a new random stimulus. This same line of reasoning was the basis for a change in the topography based tact training. The keys were placed in a bag and pulled out at random. The trainer would then ask, "What is this?" Prompts were frequently given during both types of training to "Look carefully." and to "Think big." This is an expression used at the Child Development Center to encourage the children to try hard. Changes made during the training of the topography based tact and mand compliance showed a marked improvement in responding with both repertoires reaching 100% accuracy in 1 to 3 sessions.

Additional changes were made in the procedure. The trainer repositioned herself by sitting across from the child rather than next to him. This made it easier for the child to see the stimulus. Motivational variables were increased by having the child earn beads that would go onto several paper wrapped wires referred to as token holders. If the child filled up the token holder, he would then get the special prize he had selected prior to the session. These changes constituted Procedure Change (PC) 2 and were continued throughout the study.

When responding during the topography based mand compliance relation for all four verbal elements reached criterion, topography based tact training resumed. This constituted Procedure Change (PC) 3.

Once the topography based mand and tact compliance were occurring at 90% or greater accuracy with the wif and meg keys, the sot and puzz keys were taught following the procedures as modified above. When both verbal relations were occurring at 90% or greater accuracy with all
four keys, a tool manipulation trial was run with one key. This in­
volved using the key to open a locked box. This was done to provide
a more recent history involving the matching-to-sample paradigm. Then,
an establishing operation was contrived by placing a reinforcer in a
box, putting a lock on, and hiding the keys. An observation was made
to see if the child would mand for the correct key by emitting the
correct topography. The child did not respond appropriately. The
session was terminated due to aggressive behavior on the part of the
child. This was possibly due to the inability to obtain the reinforcer.
If the child had correctly manded, the key would have been given and
he would have been allowed to obtain the reinforcer. A trial would
have then been run again using a different key and lock. If the child
had made no responses, or an incorrect response, a new trial with a
different key and lock would have occurred, or the session terminated
in order to reduce or eliminate the aversiveness of the situation.

**Acquisition of The Stimulus Selection Based Tact**

This relation consisted of the child being able to point correctly
to a specific lexigram out of an array under the control of the pre­
sence of a key and that lexigram. Two lexigrams were placed on the
table. The trainer presented a key and said, "Look at this. Which
one?" and immediately pointed to the correct lexigram. If the child
did nothing, the pointing response to the symbol was manually guided.
A correct response was reinforced. The procedure was repeated for
both keys, which were randomly chosen, until the child pointed to the
correct lexigram for three consecutive trials under the control of the
prompt and the key. Lexigram positions were also randomly switched. The prompt of pointing was then delayed 1 second after the presentation of the key and the verbal stimulus. Incorrect responses before the prompt resulted in a return to the immediate prompt procedure. Correct responses occurring currently with the prompt for three consecutive trials resulted in a 2-second time delay between the presentation of the prompt and the key and verbal stimulus, and so on. Correct responding before the prompt resulted in stronger reinforcement.

Comments: As with the topography based tact relation it was not clear that the child's pointing was controlled by the lexigrams rather than the previous lexigram position. Several changes were made to help the child acquire this relation. Additional prompts were given to "Look carefully" and to "Think big". The window shades were closed and the training area was made more enclosed to help prevent distractions. This occurred throughout the rest of the study. The lexigrams were covered until after the verbal stimulus "Look at this" was given and the child had ample time to look at the keys before pointing to a lexigram. This was done to reduce random responding. An explanation was even given showing that one key went with one lexigram. This explanation showed improvement for that session but the behavior change was not maintained until the next session even with the repetition of this explanation. Correct responding was believed to be due to the fact that only one key was worked with even though two lexigrams were present and randomly switched.

Even with these changes, progress was slow. Consequently, these changes were discontinued. In looking at the past data, training the
topography based mand compliance repertoire with the new mand "Find me the ___." seemed to facilitate acquisition of the topography based tact. It was decided then to train the stimulus selection based mand compliance. This change constituted Procedure Change (PC) 4.

**Acquisition of The Stimulus Selection Based Mand Compliance**

This relation consisted of the child finding the correct key under the control of the trainer's mand and the lexigram shown during the mand. Two keys were placed on the table. The trainer emitted the mand "Find me" presenting a lexigram and immediately pointing to the correct key. Manual guidance was provided if the child did not respond. Correct responding was reinforced. The procedure was repeated until the child pointed to the correct key for three consecutive trials under the control of the verbal stimulus and the prompt. The lexigram and key position were randomly alternated every trial. The prompt was then delayed 1 second after the mand was emitted. Incorrect responses before the prompt resulted in a return to the immediate prompt procedure. Correct responding to the prompt for three consecutive trials resulted in a 2-second time delay between the prompt and the presentation of the lexigram with the verbal stimulus, and so on. Compliance to the mand before the prompt resulted in stronger reinforcement. When correct responding occurred for three consecutive trials, a new lexigram and key were added to the training sequence and trained in the same manner as above. This was done until all four lexigrams and keys were trained. A return to the stimulus selection based tact training occurred as described below.
and constituted Procedure Change (PC) 5.

For the next two sessions the topography based tact, topography based mand compliance, and the stimulus selection based mand compliance repertoires were reviewed in that order. The stimulus selection based tact repertoire was probed with no training. Almost perfect responding occurred. During the next session the order was reversed where the stimulus selection based tact occurred prior to the stimulus selection based mand compliance relation. The child had some problems with the stimulus selection based tact repertoire. After presentation of the key, the child hesitated briefly before pointing to the lexigram. It is interesting to note that the stimulus selection based mand compliance repertoire seemed to facilitate acquisition of the stimulus selection based tact repertoire.

When all four repertoires were occurring with 90% or greater accuracy, the next procedure was implemented.

Acquisition of The Topography Based Intraverbal

This relation consisted of the child emitting a specific topography under the control of a specific lexigram shown to him.

Acquisition of The Stimulus Selection Based Intraverbal

This relation consisted of the child pointing to a specific lexigram out of an array under the control of a specific topography emitted by the trainer and the lexigram itself.

Both of these repertoires were probed to see if they would occur without training. The session started with a review of the first
four verbal repertoires. An error was made by the trainer in that the stimulus selection based intraverbal repertoire was probed before the topography based intraverbal. This was not a major error, but it was a departure from the prescribed sequence for this child's training. During the next session, no review occurred. Further probing of the topography based intraverbal, then the stimulus selection based intraverbal, and then again the topography based intraverbal occurred. In probing these two repertoires, the child was able to emit the correct responses without training. An interesting observation that resulted from the error was that when the stimulus selection based intraverbal repertoire occurred before the topography based intraverbal repertoire the latter repertoire was well learned as indicated by no hesitation and immediate responding. When the topography based intraverbal repertoire occurred first, the child hesitated before responding but the responses were correct.

It should also be noted that if these two repertoires did not transfer, they could have been trained following the minimal errorless training and the matching-to-sample procedures in the same manner as the previous verbal relations.

Responding during the two intraverbal repertoires with 90% or greater accuracy for two sessions resulted in probing for the transfer of the two mand repertoires.

A key manipulation trial was conducted first to provide a more recent history of the matching-to-sample paradigm.
**Topography Based Mand**

This relation consisted of the child manding for a key by emitting a specific topography, the name of the key, under the control of the establishing operation.

**Stimulus Selection Based Mand**

This relation consisted of the child manding for a key by pointing to the appropriate lexigram out of an array under the control of the lexigram and the same establishing operation.

All boxes were present and locked, with only one baited at a time. The child did not respond appropriately for any of the keys, or in the presence of the lexigrams. The session was terminated. Correct responding would have resulted in the key being given to the child. The next session resulted in training for both mand repertoires.

**Acquisition of The Topography Based Mand**

All boxes were present. The child observed the trainer bait and lock a box. The keys were hidden. If the child did nothing, a prompt was given to look at the lock. The trainer then prompted further by saying, "Can you say wif?" The child emitted the echoic response and the key was given. Both prompts were given if the child did not emit the correct response. Correct responses resulted in the key being given. Each baited box with patterned lock was presented randomly switching box positions each trial so that each pattern was presented twice.
Acquisition of The Stimulus Selection Based Mand

Again, all the boxes were presented and the child observed the trainer bait and lock one of them. The keys were hidden. All the lexigrams were placed in front of the boxes. Box and lexigram positions were randomly alternated each trial. If the child did nothing, the trainer prompted the child to look at the lexigrams. Incorrect responses were responded to with "Are you sure?" (The correct lexigram was usually chosen next.) A further incorrect response resulted in the trainer training the correct response, either by modeling or the use of a physical prompt. Correct responses resulted in giving the key. Each baited box with patterned lock was presented randomly by switching box positions each trial so that each pattern was presented twice.

Responding at 90% or greater accuracy for two sessions for both repertoires resulted in training of the new stimulus.

The topography based tact and intraverbal were trained with the new stimulus key named zul, which rhymes with rule. The same training procedures as stated previously were followed beginning with the new key or lexigram alone, then for each consecutive trial adding another key/lexigram until both repertoires were occurring with all keys or lexigrams present.

Responding at 90% or greater accuracy for two sessions resulted in probing for transfer of the new stimulus in all the repertoires it was not specifically trained in.
Testing for Transfer

The probe trials where testing for transfer occurred dictated some procedure changes to be sure the responses were not occurring because of some sort of unintentional cue from the trainer or that they were not occurring due to chance. For example, during the topography based mand compliance training, when the trainer asked the child to find a specific key and give it to her, the child may learn that he has the correct key by a certain expression on the trainer's face. He may learn that when the trainer's eyes widen he has touched the right key. Or, if the trainer showed no expression, he has touched the wrong key. The changes made did not allow the child to respond to trainer cues because the trainer was not allowed to determine accuracy until the child made the response required. This way there was assurance that responding was due to acquisition and not environmental cues. In all cases, key and lexigram positions were alternated for every trial, responses were consequented accordingly, and a correction by the child was allowed for prior to the trainer determining accuracy. No prompts were given.

Topography Based Tact

All keys were placed in a box that was on its side, had a small hole in the bottom that faced the trainer, and the top was completely taken off and faced the child. The trainer would reach in the box through the small hole, pick up the key, and without looking at it,
say to the child, "What is this?" A response from the child resulted in the trainer asking if he was sure. A correction was permitted for and if the subject did so, he was again asked if he was sure. The trainer would then pull the key through the hole and look at it.

**Topography Based Mand Compliance**

The box was utilized with the lexigrams placed inside. The trainer would emit the mand and ask the child to put the lexigram through the small hole if he was sure he had the right one.

**Stimulus Selection Based Tact**

The trainer would hold up the key and say to the child "Look at this. Which one?" pointing inside the box where the lexigrams were placed. The child was asked to put it through the small hole if he was sure he had the right one.

**Stimulus Selection Based Mand Compliance**

This condition was done as in the topography based mand compliance testing, but the keys were placed in the box and a lexigram was shown.

**Topography Based Intraverbal**

The lexigrams were placed in the box. The trainer would reach in, pick up and show a lexigram to the child. After the child emitted a response, the trainer would ask if he was sure. The lexigram was then looked at.
Stimulus Selection Based Intraverbal

The lexigrams were placed in the box. The trainer said the name of a key; the child would pick up a lexigram and the trainer would ask if he was sure. The lexigram was then shown to the trainer.

The two mands were done as stated previously.

To help increase the motivational variables, a bead was placed above the key or lexigram when it was shown, or above the box when the stimulus was only vocal. One trial for each verbal element in all the verbal relations occurred. In controlling for correct responding by chance, it would have been ideal to run two or more random trials each, but due to a time constraint, this was not possible.

Participant 2

Experimental conditions for Participant 2 were similar to those used with Participant 1. The changes made with the first child were implemented from the start with the second child. The following differences occurred.

The order for training the verbal repertoires was changed to the following: stimulus selection based tact, stimulus selection based mand compliance, topography based tact, topography based mand compliance, stimulus selection based intraverbal, topography based intraverbal, stimulus selection based mand, and topography based mand.

After training the manipulation of the key, the box was baited with the keys present and then with them absent. The child picked the correct key but did nothing with it in the first situation. When the
keys were absent he did nothing.

During stimulus selection based tact training, when correct responding occurred with the wif and meg, the sot and puz keys were then trained together for one session. During the next session, they all were trained together.

The topography based tact and mand compliance repertoires were trained with just the wif and meg, then all four were trained together. The sot and puz keys were not trained together, separate from the first two as in the above training.

Stimulus selection and topography based intraverbals were probed with the latter being not well developed. Training for that repertoire involved telling the child the correct response and requiring him to repeat it. It should also be noted that in the middle of training this repertoire, a four-day school break occurred. When sessions resumed, appropriate responding showed a decrease. Training was continued with a further prompt emitted prior to the presentation of each lexigram. The trainer would say "get ready" then show the stimulus. The child had a history with this prompt which was used in DISTAR training, an academic program used at the preschool, to require the child's attention. The prompt helped the child acquire this repertoire, as well as sessions occurring consistently without long periods of time between them.

The new stimulus was trained in the stimulus selection based tact and intraverbal repertoires. The same training procedures previously mentioned for the first child were followed. Testing for transfer of the new verbal element also occurred in the same manner as stated above.
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