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The Effects of a Transfer of Stimulus Control Procedure, Probes, and Reinforcement on the Acquisition and Generalization of an Intraverbal Repertoire

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THE EFFECTS OF A TRANSFER OF STIMULUS CONTROL PROCEDURE, PROBES, AND REINFORCEMENT ON THE ACQUISITION AND GENERALIZATION OF AN INTRAVERBAL REPERTOIRE

by

Steven John Braam

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

Western Michigan University
Kalamazoo, Michigan
December 1980
A deaf, mentally-impaired youth was trained to emit intraverbal responses within the same response class to verbal stimuli which were presented in daily probe sessions (e.g., "food" evoked "apple", "bread", "hot dog", etc.). Training consisted of a transfer of stimulus control procedure. If an incorrect response was made, the therapist would re-present the verbal training stimulus and immediately present a non-verbal prompt (picture) which evoked a verbal response. Since the transfer procedure was only implemented contingent upon incorrect responding, it resulted in longer delays to trade-in for back-up reinforcers in sessions where mistakes were made. Correct responding increased only as training occurred for each verbal stimulus. Generalization was observed to occur between training and probe sessions and across responses within the same class. In addition, token reinforcers were introduced in probe sessions to facilitate the generalization of trained behavior across therapists and settings.
ACKNOWLEDGEMENTS

This research was supported by the Kalamazoo Valley Intermediate School District. I would like to express my gratitude to Mark Sundberg, Jack Michael, R. Wayne Fuqua, Alan Poling, and Brian Iwata for their guidance in preparing this material. My appreciation goes to the staff of the Multihandicap Center who were instrumental to the completion of this project, especially Cassandra Braam, David Ray, Mark Stafford, Alberta Krzyston, Doris Mosier, Howard Shaw, Michael Daeschlein, Thomas Rueber, Thomas Thompson, Stephen Stang, Edna Myers, and Margaret Barkman. Gerald Shook has my respect and admiration for providing an environment conducive to the understanding of complex human behavior. Finally, I'd like to thank the students of the Multihandicap Center for their help in my study of verbal behavior.

Steven John Braam
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CHAPTER I

INTRODUCTION

B.F. Skinner (1957) defines intraverbal behavior as a form of verbal behavior in which an antecedent verbal stimulus is followed by a verbal response which lacks point-to-point correspondence\(^1\) with that stimulus. Consequent stimuli (both reinforcing and punishing) are considered important in the development and maintenance (or non-development and non-maintenance as the case may be) of the intraverbal repertoire, however, they should always be considered as operating in conjunction with antecedent stimuli.\(^2\) Examples of intraverbal behavior might be: hearing someone say "black" and you say "white"; seeing someone write "mom" and you write "dad"; hearing someone say "fat" and you write "skinny"; or seeing someone

\(^1\)Point-to-point correspondence refers to the situation where each letter or phonemic unit of a verbal stimulus controls each letter or phonemic unit of a verbal response. When you say "boat" and someone else says "boat" point-to-point correspondence exists.

\(^2\)The distinctive feature of Skinner's analysis of verbal behavior is that of the importance of antecedent stimuli in conjunction with consequent stimuli in the development of language. These antecedent stimuli can be divided into three general classes: 1) motivational variables, 2) non-verbal stimuli, and 3) verbal stimuli. A complete description is beyond the scope of this paper, however, the interested reader is urged to consult Skinner (1957) and Peterson (1978).
write "shoes" and you say "socks". Traditionally known as "word associations", the preceding examples are not usually observed under ordinary circumstances. More common examples of intraverbal behavior may be observed in a school setting where children learn to rote count, sing simple songs (e.g., "Old MacDonald"), recite nursery rhymes or poems, recite the alphabet, or say the names of different animals, clothes, colors, foods, or vehicles. These are chains of intraverbal behavior in which verbal stimuli have a tendency to evoke responses which lack point-to-point correspondence with those stimuli.

The intraverbal repertoire appears to be most important in conversational verbal behavior where a well-developed intraverbal repertoire allows rapid and prolonged speaking. This skill of maintaining verbal interactions with another person has been validated as one of the skills of an effective conversationalist (Minkin, Braukman, Timers, Fixsen, Phillips, & Wolfe, 1976). Skinner (1957) introduced the concept of "contiguous usage" to explain this reinforcing effect of the intraverbal repertoire. That is, it is advantageous to the speaker to emit many responses from his/her verbal repertoire which are thematically related and have

3 Spradlin and Girardeau (1970) explain that "the discriminative stimuli controlling speech...often have multiple functions serving both as discriminative stimuli for the speaker's responses to follow and as reinforcers for his previous responses."
a history of reinforcement when they occur in close temporal proximity with one another. For example, in a conversation between two people, the verbal stimulus "guitar" might evoke only one intraverbal response, e.g., "music", from one person. However, the second person may emit several intraverbal responses to the stimulus "guitar" such as, "fret", "string", "chord", and the names of famous guitar players and their songs. In this case, it is the second person with the larger intraverbal repertoire about guitars who has an increased probability of maintaining the conversation and the accompanying social contact which is, presumably, reinforcing. Of course, there are other sources of control and reinforcement in conversations, such as asking and answering questions and delivering verbal conditioned reinforcers (Polirstok and Greer, 1977). However, these behaviors are controlled by multiple stimuli of which only some are verbal.

Multiply-controlled stimuli present many problems in language training. The difficulty is due to the fact that the same word or sign language response may be emitted under many different stimulus conditions. As a result, we find children who may have learned to say "cookies" when someone else says "cookies", when cookies are wanted, or when cookies are seen. Yet, these same children may not respond to such stimuli as "milk and ___" or "What do you like to eat?". The correct response, "cookies", doesn't
require the training of a new response form, rather, it involves the transfer of stimulus control to a stimulus that previously didn't evoke the response.

Transfer of stimulus control language training procedures for some of the verbal relationships described by Skinner (1957) have already been developed by Raymore and McLean (1972), Bell (Note 1), Braam, Daeschlein, and Braam (Note 2), Hall (Note 3), Rueber, Sundberg, and Legg (Note 4), Sundberg and Michael (Note 5), and Sundberg, Milani, and Partington (Note 6). Sundberg, Milani, and Partington (Note 6) were concerned with teaching a total verbal repertoire. These researchers taught intraverbal behavior by transferring stimulus control from one verbal stimulus (echoic) to another verbal stimulus (intraverbal). That is, when the therapist presented the verbal stimulus "shoes and ___" an echoic stimulus ("socks") was presented as a prompt to evoke a correct response on the student's part. Although successful in training intraverbal relationships, the authors expressed the need for continued research to develop a more precise procedure and data collection system for teaching intraverbal behavior.

Raymore and McLean (1972) reported a case study which employed a transfer of stimulus control technique to teach intraverbal relationships to a child in speech training. Their training procedure consisted of the presentation of a verbal stimulus (printed sentence
such as, "I sit on a ___." As the child read the sentence, the therapist presented a non-verbal stimulus (picture of a chair). Upon presentation of the non-verbal stimulus, the child could correctly complete the sentence with the response "chair". When the child could correctly respond without the presentation of the non-verbal stimulus, intra-verbal responding had been acquired. The verbal response "chair" was controlled by the verbal stimulus "I sit on a ___," and lacked point-to-point correspondence with it. Training was effective in facilitating that transfer of stimulus control from the non-verbal stimulus (picture) to the verbal stimulus (printed sentence). Following training, the child could correctly emit the same response ("chair") to two different types of stimuli.

The purpose of Raymore and McLean's (1972) study was to train effective speech articulation across several of the verbal operants. This strategy led to the teaching of specific intraverbal relationships (one stimulus - one response). The purpose of the present study is to extend Raymore and McLean's (1972) and Sundberg, Milani, and Partington's (Note 6) work by training intraverbal relationships in which a single discriminative stimulus evokes multiple, thematically-related responses. Using the example above, multiple responses to the printed verbal stimulus, "I sit on a ___," may be "chair", "stool", and "couch". The training of multiple responses is analogous
to Skinner's (1957) concept of "contiguous usage". Again, "contiguous usage" refers to a speaker's repertoire of many responses which are thematically-related and have a history of reinforcement when they occur in close temporal proximity to one another. Besides its theoretical importance, this particular type of verbal skill is socially important to teach because similar types of skills are assessed in norm-referenced intelligence tests. For example, in the *McCarthy Scales of Children's Abilities* (McCarthy, 1970) a "Verbal Fluency" subtest asks children to list different animals, things to eat, things to wear, and things to ride. This is again consistent with "contiguous usage".
CHAPTER II

METHOD

Subject

Linda, a 17 year-old student at the Kalamazoo Valley Multihandicap Center (KVMC), participated in this study. She was diagnosed as Hearing Impaired and Trainable Mentally Impaired (Stanford-Binet, Form LM I.Q. = 24). Her communication system was the American Sign Language (ASL) of the Deaf. Linda could read approximately 100 English word, print words given a model, and tact approximately 200 pictures and/or objects. She did not emit a large number of mand or intraverbal responses in educational and social situations. One intraverbal response was observed when a therapist signed to Linda, "How are you?". Linda responded, "fine". No correct responses, however, were emitted during the administration of the intraverbal subtest of the Parsons Language Sample (Spradlin, 1963) - a language test designed to measure the elementary verbal relationships described by Skinner (1957).

Linda received 3 hours of daily language and academic instruction. She performed simple addition and subtraction problems and could tell time. She also worked 2 hours per day in the school work activity center completing assembly and sorting tasks with minimal supervision. She earned a
bi-weekly paycheck for the work completed. Linda also emitted disruptive, aggressive, and self-abusive behaviors both at home and at school. Teachers used tokens on a Fixed Ratio 1 schedule for correct academic responses in the classroom.

Personnel

The therapist involved in the daily probing and training of this study was the author. Two graduate psychology students served as observers. The therapist who conducted the Generalization Probe Sessions was a paid, part time staff member. All personnel were skilled in American Sign Language (ASL) and skilled in the interpretation of ASL.

Setting and Apparatus

Probe and training sessions were conducted in a 3x6x2 meter room. This room contained few objects in it other than those apparatus necessary to conduct the study, i.e., a table, chairs, data sheets, tokens, and a variety of back-up reinforcers which were kept out of sight behind a cardboard screen. The absence of excessive non-verbal stimuli in the room was arranged to control for the occurrence of tact responses. The therapist and Linda sat on chairs facing one another. To the therapist's right was a 61x91 cm. table which was used for the presentation of stim-
utili and data recording, Linda received her tokens in a container which she held on her lap. During training sessions, the therapist held a set of pictures face down on his lap. These pictures were taken from the Peabody Language Development Kit, Level 1 (see Table I). Prior to the beginning of this study, these pictures were presented to Linda in random orders on three occasions. She could reliably tact the pictures correctly on all three occasions.

Response Definitions

The dependent variable measured was the percentage of correct, unprompted intraverbal responses which were emitted in probe and training sessions. A correct intraverbal response was an American Sign Language (ASL) response which occurred as a result of the experimenter's ASL stimulus and which differed in its hand configuration (lacked point-to-point correspondence) from the therapist's ASL stimulus. No echoic responses nor gestural/made-up sign language responses were scored as correct. Echoic responses were defined as ASL responses which had point-to-point correspondence with the therapist's ASL stimulus, e.g., Therapist signed "apple" and Linda signed "apple". A correct intraverbal response which was repeated within a session was not scored as correct. In addition, each correct response must have had a history of reinforcement in the verbal community. For example, the verbal stimulus "food" might evoke several
Table I. Pictures from the Peabody Language Development Kit, Level #1, which were available for presentation during training sessions.
TABLE I

Pictures from the Peabody Language Development Kit, Level 1 which were available for presentation during training sessions.

<table>
<thead>
<tr>
<th>Food</th>
<th>Clothes</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td>*apple</td>
<td>*boots</td>
<td>ball</td>
</tr>
<tr>
<td>bacon</td>
<td>*coat</td>
<td>blocks</td>
</tr>
<tr>
<td>*banana</td>
<td>*eyeglasses</td>
<td>*book</td>
</tr>
<tr>
<td>*bread</td>
<td>*gloves</td>
<td>*bus</td>
</tr>
<tr>
<td>butter</td>
<td>*hat</td>
<td>*children</td>
</tr>
<tr>
<td>cake</td>
<td>*pants</td>
<td>clock</td>
</tr>
<tr>
<td>*candy</td>
<td>shirt</td>
<td>flag</td>
</tr>
<tr>
<td>carrot</td>
<td>*skirt</td>
<td>**KVMC</td>
</tr>
<tr>
<td>cookie</td>
<td>*socks</td>
<td>*ruler</td>
</tr>
<tr>
<td>corn</td>
<td>*shoes</td>
<td>scissors</td>
</tr>
<tr>
<td>eggs</td>
<td></td>
<td>slide</td>
</tr>
<tr>
<td>grapes</td>
<td></td>
<td>*teacher</td>
</tr>
<tr>
<td>*green beans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gum</td>
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<td></td>
</tr>
<tr>
<td>*hot dog</td>
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<td></td>
</tr>
<tr>
<td>ice cream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*meat</td>
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<td></td>
</tr>
<tr>
<td>milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*orange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*peach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*peanut butter</td>
<td></td>
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<td>pie</td>
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<td>salad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>spaghetti</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*sandwich</td>
<td></td>
<td></td>
</tr>
<tr>
<td>strawberry</td>
<td></td>
<td></td>
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</tbody>
</table>

*picture cards actually presented during training
▲printed on a plain, white, 7.5mm x 12.5mm index card
common responses such as, "lunch", "hamburger", or "ice cream" which are typically reinforced ("understood") by the verbal community.

A second dependent variable was the cumulative number of untrained responses which were emitted by Linda in response to verbal stimuli throughout the course of the study. An untrained response was defined as a correct response (as described above) which had not been specifically trained in an intraverbal relationship throughout the duration of the study.

Data Collection and Inter-Observer Agreement

The exact English word translation of each ASL stimulus and response trial was written on a data sheet by the therapist during probe and training sessions.

On days when inter-observer agreement checks occurred, the observer sat 5 meters to the left of Linda and the therapist. This allowed the observation and recording of responding in the sessions without the observer's access to the therapist's data. The therapist and observer scored only the first ASL response emitted by Linda to the therapist's ASL stimulus. At the end of the sessions, the exact words which were recorded by the observer were checked with those recorded by the therapist. The formula for calculating inter-observer agreement = (\#Agreements/ \#Agreements + \#Disagreements) X 100. Inter-observer agreement checks occurred on probe sessions 1, 3, 39, and 49 with respective
scores of 83%, 100%, 100%, and 100%. The average score was 96% for these probe sessions. Inter-observer agreement checks occurred on training sessions 10 (100%), 16 (100%), and 23 (100%). The average score for training sessions was 100%.

Experimental Design

This study's design consisted of a multiple baseline across stimuli, similar to that reported by Striefel, Bryan, and Aikens (1974). The "Baseline" condition of the design refers to probe session results obtained prior to training. The "Training" condition refers to probe session results obtained while training sessions were ongoing, and the "Follow-Up" condition refers to probe session results obtained after training for a particular stimulus had been completed. In most cases, one probe session was conducted each day during "Baseline", "Training", and "Follow-Up" conditions.

Procedures

Probesessions. The therapist began a probe session by presenting ASL instructions to Linda. Literally translated, they were: "We sign now. I sign .... you sign different. Get token." (She was then shown a token and the back-up reinforcers). Next, the therapist established eye contact with Linda, presented a verbal stimulus, and then started to silently count out ten seconds. The first
verbal response Linda emitted within 10 seconds was followed by a neutral response on the therapist's part such as, "O.K.". The response was recorded and scored as correct or incorrect. If no response occurred within 10 seconds the response was also scored as incorrect. The same verbal stimulus was then re-presented to Linda and scored according to the same guidelines. This procedure continued until 5 consecutive trials with each of the three verbal stimuli ("food", "clothes", and "school") had been conducted. Therefore, there were a total of 15 trials in each probe session. It took approximately 5 to 8 minutes to conduct each probe session. The order of stimulus presentation during the probe was varied for each session and no reinforcers were delivered nor were correction procedures implemented during probe sessions.

Training sessions. During training, the therapist had all the pictures Linda could reliably tact, which were thematically related to the verbal training stimulus, out of sight (on his lap and underneath the table at which the session was conducted). A training session began immediately after the daily probe session was completed. Upon making eye contact with Linda, the therapist began by presenting the first training stimulus. If Linda emitted a correct intraverbal response within 10 seconds, a picture corresponding to her verbal response was presented (e.g., if she responded to the verbal stimulus "food" with the verbal
response "apple", the therapist would place a picture of an apple on the table). Following presentation of the picture, a token was delivered along with descriptive praise. Tokens were delivered on a Fixed Ratio 1 schedule of reinforcement for each correct response and could be exchanged at the end of the training session for back-up reinforcers such as edibles or preferred activities. A typical training session lasted for approximately 10 to 15 minutes.

If Linda made an incorrect response or made no response within 10 seconds, the transfer of stimulus control (correction) procedure was implemented.

**Transfer of stimulus control procedure.** If Linda emitted an incorrect response or failed to respond within 10 seconds in a training trial, the therapist would turn his head away for five seconds in order to break eye contact and record the data. Neither tokens nor praise were delivered in such cases. Eye contact was then re-established and the identical verbal stimulus was presented again and immediately followed by the therapist placing a non-verbAl stimulus (picture) on the table. If Linda's response was now correct (she emitted the verbal response which corresponded to the presented picture) she was reinforced with a token and descriptive praise; e.g., "Good, you showed me different sign". If her response was incorrect or she failed to respond within 10 seconds, the transfer of stimulus control procedure began again.
Training criteria. A training trial ended after a correct response had been emitted to a verbal training stimulus. Each training session consisted of 5 training trials. Training sessions for an individual verbal stimulus were discontinued when Linda emitted five correct, unprompted intraverbal responses in five trials of presenting the verbal stimulus (100% accuracy) for three consecutive sessions. Training on the next verbal stimulus was begun after a probe session was conducted across all verbal stimuli.

Generalization probe sessions. These sessions were conducted in exactly the same manner as probe sessions, but were conducted in Linda's regular classroom with a different therapist as opposed to the training setting and training therapist.
CHAPTER III
RESULTS

Baseline

Figure 1 shows the results across all conditions. Linda consistently made one correct intraverbal response out of five presentations (20% accuracy) of each of the three verbal stimuli presented in baseline probe sessions. The stimulus "food" resulted in the response "bread", "clothes" resulted in "pants", and "school" evoked the response "KVMC". Linda's additional responding in baseline consisted of repeating her initial response each time the stimulus was presented. This pattern of responding did not change until training began.

Training

Linda received eight training sessions (40 trials to criterion) with the "food" stimulus, five training sessions (25 trials to criterion) with the "clothes" stimulus, and seven training sessions (35 trials to criterion) with the "school" stimulus. In the cases of the stimuli "food" and "clothes", she was emitting one correct intraverbal response to each of the five stimuli (100% accuracy) which were presented in probes at the end of training.
Figure 1. The percentage of correct, unprompted responses emitted by Linda during Baseline, Training, and Follow-Up conditions.
sessions 13 an 18, respectively. At the end of training for "school" (session 31) she only emitted three correct responses to the five probe stimuli (60% accuracy). During training for "school", some training sessions occurred in excess of the usual one per day.

Follow-Up

Linda maintained her responding in the follow-up condition for the "food" stimulus at 100% accuracy for eight out of nine sessions. The one exception occurred on the first follow-up probe session (#14) for the verbal stimulus "food" when she emitted three correct responses to the five probe stimuli. Linda's responding was also maintained in the "clothes" and "school" stimulus conditions at 100% accuracy for four and one session(s), respectively.

Graph point 37 shows Linda's correct responding was maintained at 100% accuracy 41 days after training ended for the "food" stimulus, 34 days after training ended for the "clothes" stimulus, and 13 days after training ended for the "school" stimulus. Generalization probe sessions had been conducted by another therapist on each school day during this time period. No additional training was conducted by the training therapist in the interims.

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Transfer of Stimulus Control Procedure

The transfer of stimulus control procedure was employed 14 times during training sessions 6-10 for the "food" stimulus, five times in training sessions 14-15 for the "clothes" stimulus, and 10 times during training sessions 22, 23, 27, and 28 for the "school" stimulus.

Generalization Probe Sessions

Figure 2 shows the results of probe sessions which were conducted in Linda's school classroom with a different therapist. Session numbers on the abscissa correspond exactly with those in Figure 1. Though training criteria had been met for each stimulus and responding had been maintained in follow-up probe sessions with the training therapist, no changes occurred in Linda's responding in generalization probe sessions. In session #34, tokens were introduced and delivered contingent upon each correct response in the session. Responding to the "food" stimulus immediately increased to the training criterion level obtained by the training therapist and responding to the other two stimuli increased to the training criterion level by the next probe session. Responding to the "food" and "clothes" stimuli was maintained at 100% accuracy while responding to the "school" stimulus varied between 80-100% accuracy in maintenance.
Figure 2. The percentage of correct responses emitted during generalization probe sessions.
Untrained Responses

Figure 3 shows a cumulative record of untrained intraverbal responses emitted throughout the course of the study. Session numbers on the abscissa correspond exactly with those found in Figures 1 and 2. Linda emitted a total of 14 intraverbals. One untrained response was emitted in baseline probe session #1 to each of the three verbal stimuli. Linda emitted three, three, and zero untrained responses during the training sessions for the "food", "clothes", and "school" stimuli, respectively. She also emitted four untrained responses in the follow-up probe sessions for the "food" stimulus. One untrained response to the "food" stimulus was emitted in generalization probe session #32.
Figure 3. The cumulative number of untrained responses emitted.
CHAPTER IV

DISCUSSION

The transfer of stimulus control procedure and the delivery of conditioned reinforcers contingent upon correct responding were effective in training Linda to emit a different intraverbal response each time an individual verbal stimulus was repeated (for a total of 5 trials). In Follow-Up, each verbal stimulus controlled multiple intraverbal responses as opposed to Baseline where only one discrete intraverbal response per stimulus was emitted.

Intraverbal responding increased only after training had begun with each verbal stimulus. For example, even though the training criterion for "food" had been reached and responding had increased in related probe sessions, no changes were observed in responding to "clothes" and "school" in probe sessions. These results suggest that the transfer of stimulus control procedure was the critical variable responsible for acquisition of intraverbal responding. If reinforcement had been critical, it would not have been necessary to implement the procedure since Linda already emitted one correct intraverbal response without any training. In addition, the obtained stimulus generalization of criterion level responding in probe sessions where reinforcers were not delivered would have been unexpected.
Training time was relatively short during each condition ("food" - eight sessions, "clothes" - five sessions, "school" - seven sessions). The 20 training sessions represent a total training time of approximately 3 hours - which seems to suggest a time-efficient procedure. An important variable in training sessions appeared to have been the elapsed time between the start of the session and the exchange of tokens for back-up reinforcers. Each time an incorrect response was emitted during a session, a five-second local time-out occurred and the transfer of stimulus control procedure was implemented. Both of these consequences added to the total amount of time in session. Thus, correct responding resulted in quicker access to back-up reinforcers.

Since the training probe session data closely corresponded to training session data, it suggests that the probes asures of behavior were representative of behavior changes which occurred in training. The probe sessions had the advantage of assessing generalization of the repertoire without the support of conditioned reinforcers (tokens) or training stimuli (pictures). Although frequent probe sessions appeared to have facilitated the maintenance of trained behavior, they sometimes resulted in Linda’s emission of "emotional" behaviors such as, vocalizations associated with distress and rapid, gestural hand movements which were not verbal (ASL) responses. This could be related to
conducting the probes under extinction conditions. The problem may have been alleviated by conducting probes in which reinforcers were delivered on a time-based schedule and non-contingent upon responding. It has also been suggested that intermittent probing may better facilitate the maintenance of correct responding (Mabry, Note 7).

Generalization across therapists and settings was also examined in this study. The method of probing in Linda's classroom with a different therapist had been designed to assess what variables were necessary to obtain the same results outside of the training situation. Even though criterion had been met in training, and responding was at criterion level in training and follow-up probes, the responding in the generalization probes was all echoic. The variable involved may have been the particular therapist's interactional history with Linda. This therapist had a long history of training echoic behavior with Linda. When token reinforcers were introduced in the generalization probe sessions responding quickly changed to the training criterion level within two sessions. Several authors (Stokes and Baer, 1977; Johnston, 1979) have recently written of the importance of exploring all the variables which may be responsible for generalization or can be manipulated to increase generalization. Along these lines, the results of the present study suggest that careful attention should be
paid to ensure that the trained intraverbal behavior is arranged to occur in different situations, with different people, and that reinforcers be delivered in order to facilitate the generality of a trained intraverbal repertoire.

In addition to stimulus generalization, response generalization was also observed in the present study. In the course of training and in subsequent probes, untrained, correct responses were emitted by Linda. Most of these occurred in response to the "food" stimulus. Pilot data on the emission of untrained responses by another student were consistent with Linda's. One factor which may have influenced these results was the fact that training in the "food" stimulus condition involved the use of more non-verbal stimuli in training and more training trials to criterion than in the other two stimulus conditions. More probable, though, was that the generalization of intraverbal responding was functionally related to the extent of Linda's tact repertoire in response to non-verbal food stimuli. This became evident since she could correctly tact many more pictures of food items than clothes and school items. Since the response topographies had already been established as tacts, once stimulus control had been transferred from non-verbal to verbal stimuli (tact to intraverbal) generalization was likely to occur because of a thematic course of control - all food items
go into your mouth - and a history of reinforcement for these types of verbal responses occurring in close temporal proximity to one another.

The extent of response generalization was easy to assess in Linda's case. The practice of determining which responses were correct and which were incorrect was facilitated by the fact that Linda emitted only three types of incorrect (according to definition) responses. These mistakes were: 1) no response; 2) an echoic response; and 3) a correct intraverbal response which was repeated within the same session. These responses were clearly discriminable as determined by the high inter-observer agreement scores. However, the subject in the pilot study posed several interesting problems for recording data and determining when criteria were met. This subject often emitted responses which were intraverbal, but appeared to be unrelated to the stimulus, e.g., "arm" was emitted in response to "school". The stimulus and response clearly lack point-to-point correspondence, but appear to also lack the thematic source of strength (the history of reinforcement of the response by the verbal community) which was required by definition for a correct response in the present study. Adults were judging the correctness of the responses which may have posed a problem since adults often emit distinctively different topographies of responses as opposed to children who are presented with the same
verbal stimuli (Brown and Berko, 1961). Therefore, in not reinforcing the response "arm" which was evoked by the stimulus "school" a good language therapist could be accused of not developing creative language behavior. Creative behavior has been considered as emitting different responses to the same stimuli (Goetz and Baer, 1973) and as behavior controlled by stimuli which ordinarily don't control the behavior (Sloane, Endo, and Della-Piana, 1980). Although thematic strength in the intraverbal repertoire may be weak, there could be situations when the relationship would be reinforced. For example, when students are taught to write creatively, teaching techniques include the working through of exercises designed to strengthen weak "word associations" or intraverbal relationships (Vargas, 1978). Further studies of the intraverbal relationship might do well to reinforce all untrained intraverbal responses whether they are "correct" or "incorrect". Once the intraverbal relationship has been established and shows evidence of generality, training can occur which will restrict stimulus control to more thematically related stimuli.

In summing up, it is important to demonstrate how the skills which were taught to Linda improved her verbal repertoire. The following informal data were obtained after the present study was conducted (the example is an English translation of ASL):
Therapist: "What food you like?"
Linda: "apple"

Therapist: "Tell me other food."
Linda: "banana"

Therapist: "I eat _" (the ASL responses for "eat" and "food" are the same)
Linda: "hot dog"

Despite the fact that the therapist's stimuli were much more complex than those used in training initial responding, Linda maintained correct responding. Such interactions could be considered rudimentary conversational behaviors. The success achieved in this study by training multiple intraverbal responses suggests that future research should investigate how increasingly more complex verbal stimuli and responses in the intraverbal relationship could be trained.
CHAPTER V

REFERENCE NOTES


CHAPTER VI

BIBLIOGRAPHY


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