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Observational Learning of an Intraverbal Response with Pairs of Multiply Handicapped Young Adults

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OBSERVATIONAL LEARNING OF AN INTRAVERBAL RESPONSE WITH PAIRS OF MULTIPLY HANDICAPPED YOUNG ADULTS

by

Margaret C. Harkness

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

Western Michigan University
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Without the help of many friends, this research would never have been completed. Everything I learned and the enjoyment of my stay in Kalamazoo was possible through the help of Dr. Howard Farris. He was there to save the day on numerous occasions, and always demonstrated his faith in me. My familiarity with behavioral research began with my first contact with Dr. Wayne Fuqua and Dr. Cheryl Poche at Psychological Services Component, and their advice has always proved invaluable. My knowledge of verbal behavior has been shaped by Dr. Jack Michael.

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Margaret C. Harkness
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Theories of learning have focused on operant conditioning as the major paradigm of response acquisition. According to the operant model, a response is made by an organism in the presence of specific stimuli, and the following consequence alters the future probability of the response. Not all learning takes place as a result of overt responding that has been reinforced, however. It is possible for an organism to react to a stimulus as though conditioning has taken place, when in fact the particular response has never before been emitted or conseuated. A new response can be added to an organism's repertoire through observation, and imitation of a model performing the response.

The term observational learning has been used throughout the literature interchangeably with a variety of other terms including incidental learning, role-taking, imitation, and vicarious learning (Bandura, 1965; Bandura and Huston, 1961). For the purpose of this paper, a few distinctions will be made between the terms as they are most frequently used in the literature.

Incidental learning was defined by Goldstein and Kass (1961) as "the acquisition of knowledge about stimuli other than those relevant to the directed learning task". Studies of incidental learning generally train appropriate responding to some stimulus, such as the shape of a figure. Responding to another stimulus that was present is then probed. The stimulus could be placement of the figure on
a table, or a different topography of the same stimulus, such as color of the figure.

Imitation was defined by Bandura (1965) as a situation where "the model's responses serve as the occasion upon which another organism is likely to be reinforced for displaying the corresponding patterns of behavior". When matching responses are made which were never trained or reinforced, it is called generalized imitation.

Observational learning, as it will be used here, is responding to a stimulus in the same manner as a model, rather than attending to irrelevant stimuli or matching a model's response. Observational learning is synonymous to vicarious learning, and was chosen for use in this study because it is a simple and descriptive term.

Observational learning is a type of operant behavior called rule-governed behavior. Skinner (1974) classifies behavior as contingency-shaped if the naturally occurring consequences have been experienced and exert control over the behavior, or as rule-governed if the behavior is occurring under the control of a statement of the contingency. The unexperienced contingency controls observational learning although no verbal rule has been given. By observing a model, the learner has knowledge concerning probable reinforcement contingencies, and knowledge about the controlling environmental stimuli. Only the model's behavior has been consequated according to the operant learning paradigm,
but the observer has the information necessary to formulate the rule or contingency involved. The observer may even covertly state the rule. The observer is said to have learned the model's behavior in that he or she emits a similar response to the same stimuli.

Inquiries into the variables which maintain non-reinforced imitative responding, such as occurs as a result of observational learning, have produced two major hypotheses. One proposes that similarity acquires generalized or conditioned reinforcing properties. Behavioral similarity acquires conditioned reinforcing properties through the repeated reinforcement of accurate reproduction of modeling stimuli. A high rate of imitative behavior is strengthened and maintained by the acquired reinforcing value of the response even though the response was never externally reinforced. This position was supported by an experiment by Bear, Peterson, and Sherman (1967) in which three mentally retarded children were taught to imitate. Non-reinforced motor responses were performed at a high rate when interspersed with reinforced responses. Both reinforced and non-reinforced responses decreased when other behaviors were differentially reinforced (DRO schedule), and both increased when the original reinforcement for certain responses was reinstated. Thus, some imitative responses must be reinforced to maintain non-reinforced responding.

Bandura (1969) alternately proposes that a failure to discriminate between non-reinforced and reinforced imitative
responses results in the similar frequencies of their performance. Discriminative responding is established through differential reinforcement for imitation of models of different status, age, etc., or different situational, spacial, or temporal characteristics of the response. A non-reinforced response interspersed with consistently reinforced responses will be imitated at an equal rate as Bandura and Barab (1971) showed using two motor responses. Addition of two more non-reinforced responses, one another motor response and one a verbal response, resulted in the imitation of the motor response but not of the distinguishable verbal response.

A study by Peterson (1968) explored imitation as a response class, i.e. topographically different responses having the same relationship to common controlling stimuli. In one experiment, responding was found on both reinforced and non-reinforced responses even with a high ratio of two or three to one, which should have made the non-reinforced responses easy to discriminate. But, in line with a discriminative difficulty hypothesis, the non-reinforced responses extinguished under massed trials and continued to be emitted when interspersed with reinforced responses. Another experiment was designed to see whether similarity of behavior maintained non-reinforced responding. Non-reinforced and non-imitative responses extinguished under massed trials, but when interspersed with reinforced imitative responses the non-imitative responses were maintained.
The maintenance was therefore not due to similarity to the reinforced responses. The non-imitative responses and imitative responses could be a part of a large response class sharing stimuli such as experimental conditions and experimenter cueing.

Non-reinforced imitative responding was found to be very durable, continuing in nine different conditions designed to weaken it, in a study by Peterson and Whitehurst (1971). Social reinforcement, tokens, back-up reinforcement, experimenter presence, and instructions were presented in various combinations and with different contingencies. A slight decrease in responding noted when the experimenter left the room following modeling the response was explored further. Responding was high when the experimenter remained in the room, but dropped when he or she left. Experimenter presence was thus suggested to function as a setting event to be accounted for in the control of imitation.

Many studies have explored variables affecting the learning of a response which has been observed but never reinforced. Bandura (1969), and Peterson and Whitehurst (1971) have provided summaries of factors that should be considered. These include setting events, experimenter presence, instructions, observer characteristics, availability of component responses, and motivational variables. Characteristics of the model, and consequences applied to the model are also important. Other variables are the
discriminative stimuli involved in the demonstration of a specific response.

Imitation and reinforcement techniques have been developed into procedures for training speech for the autistic, or others with echolalic or deficient speech, or without speech. A typical program (Hartung, 1970; Risley and Wolf, 1967) begins by shaping attending and eye contact, and progressing from imitation of gross motor responses, to fine motor responses, to verbal responses. Once the subject is able to imitate words or sounds, he or she is trained to name by pairing a picture with a verbal prompt and fading the prompt. Imitation and fading then may be used to train answers to simple questions (How are you? Fine.), or fill-ins for phrases (I want ___, My name is ___.). Functional speech is begun at this point using similar techniques to train speech which is followed by its natural consequence rather than a reinforcer such as a spoonful of food. Commands such as "Open the door." are followed by the door being opened, and an answer to a question such as "Where are you going?" results in being able to go there. Though Risley and Wolf (1967) found speech to generalize to other people and settings, generalization is always suggested to be specifically programmed.

To train language effectively, the contingencies which control it must be understood. Skinner's (1957) analysis of language explores verbal behavior's controlling variables.
Verbal behavior occurs in the presence of certain stimuli and its future probability is affected by its consequences, like all behavior. Unlike non-verbal behavior, however, the consequence of verbal behavior is mediated by another person, the listener. The listener must have a history such that he or she is under the social control of the speaker's behavior, and can respond appropriately to the sounds or motions produced by verbal behavior. Instead of getting a glass of water, a speaker could emit the behavior of saying, "Get me a glass of water.". The speaker is reinforced by the listener getting the glass and bringing it to him or her.

Verbal behavior is categorized on the basis of the controlling stimuli for a response. Language training programs generally begin by training the subject to imitate a sound, word, or sign. The production of a topographically similar verbal response is echoic behavior. This is exemplified when a trainer says, "Say dog." and the subject says, "Dog.".

The next thing to be trained typically is to name a picture. Naming is a type of tact, or verbal response evoked by a non-verbal stimulus of an object, event, or property of an object or event. To say "telephone" in the presence of a telephone is socially reinforced, "That's right!". It can also be reinforced by the listener's action with respect to the tact. If the speaker answers
a phone call for the listener and calls out, "Telephone!", the listener is then able to act appropriately by coming to the phone.

The training of intraverbal responses is begun with training question answering and sentence completion. An intraverbal is a verbal response controlled by a verbal stimulus which lacks point-to-point correspondence. The stimulus or the response can be of any vocal, manual, or written form. Point-to-point correspondence exists in an echoic response "dad" where the units d-a-d are controlled by corresponding units in the stimulus "dad". No point-to-point correspondence is shown with an intraverbal response such as the word "mom" given in response to the stimulus "dad" in a word association test. Intraverbal responses are socially reinforced like the echoic response or tact. When a subject learns to complete the stimulus, "My name is ___" with his or her name, he or she is told, "That's right!". Education is designed to strengthen the tendency for certain responses to be emitted to certain stimuli. Only the response "Two." is reinforced when the stimulus "One plus one equals ___" is presented. The effectiveness of conversational language is facilitated through having a variety of responses at strength for a given stimulus. When talking about dinner, it is useful to have responses such as plate, fork, or eat present in the verbal repertoire. This reinforced use of certain words together is called "contiguous usage" by Skinner (1957).
The answer to a question, "How are you?", is trained as an intraverbal. "Fine" is the response given initially regardless of how the subject feels since it is trained and controlled only by the verbal question. Gradually the response is shaped by the verbal community to be largely controlled by internal, non-verbal stimuli. It is then predominantly a tact when the subject discriminates appropriately between the responses fine, awful, or whatever, and an intraverbal in that the response is only emitted when the discriminative stimulus question occurs.

The last step of language training programs is functional speech, or manding. The mand, unlike other types of verbal behavior is controlled by an establishing operation. Often called motivational factors, establishing operations include any operation which increases the value of an object or event as a reinforcer, and also increases the probability of any behavior which has been followed by that reinforcer. Thus, if a training subject wishes to leave the room due to some establishing operation, he or she is trained to emit the mand, "Open the door." in order to have the door opened and be able to leave the room.

Combining observational learning techniques with language training is suggested as efficient and desirable for two reasons. First, language programs such as Hartung (1970) describes employ a one-on-one student-teacher ratio. If observational learning enables two or more students to be trained simultaneously by one teacher, staff time is
halved for the same results. This possibility follows from the many studies in which non-reinforced imitative responding was observed (Bear et al., 1967; Bandura and Barab, 1971; Peterson, 1968; Peterson and Whitehurst, 1971). Two students being trained simultaneously on two separate responses could serve as models for each other. It has been shown that an imitative response which has never been reinforced will be emitted if interspersed with reinforced imitative responses. A student being reinforced for imitation of a verbal response would thus be expected to imitate a verbal response which another student is being trained to make. This is especially likely since both are being trained on topographically similar responses (Bandura and Barab, 1971), and the teacher is present throughout (Peterson and Whitehurst, 1971). A second reason for using observational learning with language training is that it is a simple way to program for generalization of responding to other people. A response is made in the presence of not only a teacher, but a fellow student. Also, the teacher and student both function as models. Language is by definition (Skinner, 1957) behavior whose reinforcement is mediated by another person. Therefore, maintenance of verbal behavior can only be accomplished if it is emitted in the presence of other people so the natural reinforcement can occur. Training with two students permits responding in the presence of more than one person to enhance general-
ization, plus it provides the necessary stimulus situation for spontaneous verbalizations to be responded to as in normal conversation.

A study by Biberdorf and Pear (1977) investigated the efficiency of the traditional one-to-one student-teacher ratio versus a two-to-one ratio utilizing observational learning in tact training. It should be noted that the authors used the term incidental learning, but their method fits the definition being used in this paper for observational learning, and so the word observational will be substituted. As Hartung (1970) pointed out, tacts are typically trained as soon as the student masters word imitation in language training by presenting a picture and fading verbal prompts. In this study, five pairs of mentally retarded children were trained individually and as part of a group to name pictures. The children were trained on different sets of pictures in the individual and group conditions, and the partner in the group condition also had a different set. While in a group, a child was only reinforced for responding to his or her own pictures. Hence, each child in the group condition was trained and observed his or her partner being trained. Training pairs of children proved to be more efficient than training individually. It was found that in groups more pictures were correctly named, more training trials were initiated, and less time was lost due to inattention of the children.
Another result was that the children were also able to name the pictures on which their partner had been trained and they had only observed.

A second experiment was designed to equate the two conditions by ignoring the child in the individual condition for the amount of time spent training the other child in the group condition. Results similar to the first experiment were obtained, indicating superior efficiency of training in groups which was due to the presence of the second child rather than a difference in time allocation with a second child present. Again, observational learning of the partner's trained picture names occurred with children trained together.

Tacting such as Biberdorf and Pear (1977) taught, naming a non-verbal picture stimulus, is certainly a useful behavior for the language deficient person. The next phase of language training, however, all involve responding to a verbal stimulus. The student is taught to answer questions, complete sentences, and give commands. Each one of these forms of conversational or functional speech is an intraverbal. In the question, "How are you?", the answer becomes partially controlled by a tact of internal stimuli, but the answer, "Fine" will only be emitted in the stimulus situation where the verbal question is asked. The student learns that stating his or her name will be reinforced if the stimulus "Your name is __." is heard. If the student wants a cookie, or wants a door opened,
an appropriate mand may be made, but the mand will very likely be emitted if the question "What do you want?" is asked. Again, the prior verbal stimulus partially controlled the response. In the natural environment, intraverbal responding is very important in being able to affect the environment and in obtaining reinforcement.

The extension of group training such as Biberdorf and Pear's (1977) to train intraverbal responding is suggested for the same reasons as the combination of observational learning and language training—efficiency and generalization. If two can be taught as efficiently as one, twice as many children can benefit with the same staff-time costs. If the natural reinforcement for intraverbal responding is social, why not have more than one person present to model verbal responding, emit verbal stimuli, and to reinforce intraverbal responses?

The present study will determine if observational learning will occur when pairs of students are trained on as intraverbal response with a procedure similar to Biberdorf and Pear's (1977). The students in this study will be trained to make a verbal word or phrase response to a verbal stimulus of an open-ended sentence. To encourage further conversational use of the newly acquired responses, the sentences will pertain to experiences and places common to the experience of all the students. Several sentences related to one topic will provide words that may be used contiguously in a conversation.
Observational learning can be said to have occurred if an intraverbal response is learned as a function of being present and observing the training of another student on that response. To determine whether this will occur, four multiply handicapped young adults will be trained in pairs to complete open-ended sentences on two different topics. Each student will be trained on only one topic, and only be reinforced for responses to his or her sentences. Training will consist of modeling the correct response and reinforcing correct responding. To assess whether learning of the student's topic and observational learning of the partner's topic is occurring, individual baseline probes of all topics will be made, and then individual daily probes of both the trained and observed topics will be made following training.
METHOD

Subjects

Four students at the Kalamazoo Valley Multihandicap Center served as subjects for this study. All had fair receptive language abilities, but were deficient in expressive use of language.

The first pair were two mentally retarded females. Subject 1 was a 26 year-old epileptic who spoke with disconnected words; simple full sentences required considerable prompting. Subject 2 was a 23 year-old with hydrocephalus, cerebral palsy, and fair speech, although it was emitted at a low rate.

The second pair were two males. Subject 3 was 24 years-old and diagnosed as having chronic brain syndrome with birth trauma and psychotic reaction. He possessed a large vocabulary, but functional speech was quite limited and often required prompting. Subject 4 was a mentally retarded 17 year-old who was also speech impaired and emotionally disturbed. His speech was largely echolalic, although he did have some functional speech with very rigid sentence patterns.

Materials

Training was conducted in the classroom, with both subjects sitting across from the trainer at a table. Each subject had a token can and 25 tokens in front of him.
or her. The trainer had data sheets and a list of 10 sentences for each topic to be trained (see Appendix A).

**Procedure**

**Baseline.** The intraverbal responses trained were one or two word responses completing open-ended sentences, for example, the name of a book is its...title. There were 10 sentences for each of several topics. The selected topics covered situations likely to be encountered by the students to provide potential opportunities for effective usage of the intraverbals. If the subject emits an intra-verbal about malls while on a mall trip, he or she will be affected by the natural contingencies surrounding verbal behavior.

A minimum of three probes were conducted and additional probes were made until stable responding was obtained. Probes for Pair 1 (S1 and S2) covered all 10 sentences for each of two topics, and for Pair 2 (S3 and S4) they covered four topics. The probe itself consisted of the trainer orally presenting a verbal discriminative stimulus ($S^D$), the beginning of the open-ended sentence, individually to each subject. The subject gave a vocal verbal response completing the sentence. If no response was made to the $S^D$, the subject was prompted to take a guess, and finally to say, "I don't know.", if no other response was made. Tokens were dispensed for appropriate behaviors unrelated
to answer content, such as speaking clearly or paying attention. All the students had been previously established on token systems, and were able to obtain various edibles or activity privileges for 25 tokens.

Student responses were recorded verbatim and scored as correct or incorrect by the trainer and by a reliability observer on 43% of the probes for Pair 1 and 66% for Pair 2. A correct response was scored if the subject's answer was the one which was to be trained.

Training. The subjects were trained in pairs daily for approximately 30 minute sessions. During a phase, the subjects were trained on separate topics, for example, S1 was trained on banks while S2 was trained on grocery stores. Pair 1 was trained once, while Pair 2 went through two training phases.

As in baseline, the trainer presented the $S^D$ consisting of the beginning of an open-ended sentence to one of the subjects for his or her topic. If a correct response was made, the subject received descriptive praise such as, "That's right, the person who works in a bank is a teller.", and a token. If an incorrect response was made, the correction procedure was as follows. The trainer modeled the entire sentence including the correct word or phrase completing it. The subject was required to make the echoic response of repeating the correct word or words. The $S^D$ was then again presented, and if necessary the correction
procedure was repeated until the student emitted the correct response to the $S^D$. The correct response was reinforced exactly the same whenever it occurred. If a student responded with a word appropriate to all the stimuli of the sentence, but not the one counted as correct, the trainer responded, "Yes, that's right, but you could also say..." and then modeled the complete sentence as in the correction procedure.

After a correct response was made by one subject, the trainer then presented an $S^D$ to the other subject for his or her topic and proceeded as above until a correct response was emitted. Training continued to alternate between subjects until each had been presented with all 10 $S^D$s for his or her topic. The order of presentation of $S^D$s was randomized to insure responding as a function of the verbal $S^D$ rather than a memorized sequence of responses. The subjects were reinforced only for responding to their own $S^D$s.

Data were kept during training for each trial, defined as each presentation of an $S^D$ and its correction procedure. The response was scored as correct or incorrect as in the baseline probe. During correction procedures, the subject's response to the modeled statement as well as to repetitions of the $S^D$ was scored as correct or incorrect.

Probes. Immediately following training, the subjects were separated and individually probed on both the topic.
he or she had just been trained on and the topic of his or her partner. The procedure was identical to the baseline probes with the trainer presenting the $S^D$ and recording the subject's response. Reinforcement consisted of dispensing the remaining 15 tokens (10 had been given during the training procedure for correct responses) and praise for unrelated behaviors. Reliability data were obtained for 28% of the probes during each training phase, with no more than three sessions between reliability checks.

**Experimental Design**

A reversal design of the form ABA was used for Pair 1. The treatment phase, B, showed training on one topic and simultaneous observational learning on the other topic for each subject. Reliability was obtained for 25% of the second set of probes following the treatment phase.

A modified multiple probe design (Horner and Baer, 1978) was used for Pair 2 since there was no reason to anticipate learning on the Phase 2 topics until training began, and so daily probes on all four topics would be unnecessary. Therefore, after the three baseline probes on all four topics, daily data were kept for only the two topics being trained in Phase 1. Upon reaching a criterion of at least 90% correct responding for two consecutive days for both subjects on their topic, a second set of three probes was taken for all four topics. Reliability was taken for 66% of these probes. Daily data were then
begun on the Phase 2 topics when training was initiated. A third set of probes across all topics was made following Phase 2 training, and reliability obtained for 75% of these probes.

**Reliability**

Reliability observers were therapists at the school present during probes, or other psychology paraprofessionals listening to tape recordings of probes. All observers were unaware of the stage in training and which topic the particular subject had been trained on. They were instructed to record the subject's response to the $S^D$ as accurately as possible, phonetically spelling any response which they didn't recognize as a word. The response was to be scored as correct if it matched the underlined word or words completing the sentences on a copy of the training sheet. Reliability was calculated as the number of agreements divided by the number of agreements plus disagreements times 100. An agreement was scored if both observers recorded the response to an $S^D$ as correct, or both scored it as incorrect.

Very high agreement was reached consistently. The average reliability score for Pair 1 was 97.5% and the range was from 85 to 100% agreement. The average for Pair 2 was 99.3%, with a range from 95 to 100%.
Ethical Considerations

Letters explaining the study and the subject's rights were sent to the legal guardians of the subjects. Their written consent for the subjects to participate and for public disclosure of the results was obtained.

It was desired that all subjects benefit from the acquisition of the intraverbals, and so if observational learning failed to reach the same criterion as the trained topics, remedial training was later provided so that each subject was able to respond with 90% accuracy on all topics for two consecutive days.

RESULTS

The data show that through modeling and reinforcement all subjects learned their trained topics, responding correctly during probes to at least nine sentences for two consecutive days. Learning also took place on observed topics for all subjects. Probes revealed correct responses ranging from four to nine as a result of observing a partner's training. Correct responding during follow-up probes maintained at or above the range of correct responses for the last training probes for S1, S2, and S4 on both observed and trained topics. A slight decrease in responding on all topics was shown by S3 during the last follow-up probes.

During five initial baseline probes on Banks and Grocery Stores, S1 and S2 emitted no more than one correct
intraverbal response per session, as shown in Figure 1.

Insert Figure 1 about here

Student 1 reached criterion of two consecutive days of at least nine correct responses in 15 sessions on Banks when training was begun, and S2 similarly reached criterion on her trained topic, Grocery Stores, in 14 sessions. The break between the eighth and ninth session during training indicates a one-week vacation period. Follow-up probes approximately one week following the end of training show responding maintained within the range of the last three days of training. Student 1 made eight or nine correct responses on her trained topic, and S2 made nine or 10 correct responses on hers.

Student 1, while being trained on Banks, was present while S2 was trained on Grocery Stores during alternate trials. From a baseline of one correct response, S1 reached a maximum of eight correct responses on Grocery Stores. The acquisition curve for this topic where training was observed is quite similar to the training curves. Student 2 observed S1 being trained on Banks. From a baseline of no correct responses on four of five probes on Banks, S2 made a maximum of four correct responses. Though correct responses were acquired, S2 acquired fewer than on the trained topic, or S1's maximum of eight on
her observed topic. Follow-up probes of observed topics showed S1's responding to maintain at six or seven correct responses like had been made during the last three sessions of observing S2's training. Student 2's responding increased slightly during follow-up, making four correct responses twice while four had been reached only once while training was still being observed.

The number of correction trials required by S1 and S2 per training session is shown in Figure 2. Both S1 and S2 needed over 10 correction trials per session at first, and fewer as more responses were learned. In all, S1 required 89, and S2 required 103 correction trials. During each training session, all 10 sentences were presented at least once. Thus, if correct responses were given to each sentence, no correction trials were initiated that session.

No correct responses were made by S3 or S4 during three baseline probes on the first topics to be trained, Library and Doctor, as shown in Figure 3. Student 3 reached criterion on his trained topic, Library, after 17 sessions making nine and 10 correct responses in consecutive
sessions. The break between the 12th and 13th session of training indicates a one week school vacation. Student 4 reached criterion on his trained topic, Doctor, after only six sessions, and maintained a perfect 10 correct responses thereafter. Probes immediately following the end of training showed responding to maintain at nine or 10 correct responses for S3 and at 10 correct for S4. Three other follow-up probes one month later showed a slight decrease for S3 to seven or eight correct, but S4 continued to respond correctly to all 10 sentences.

Student 3 observed training on the Doctor topic and his responding reached a maximum of nine correct. The initial acquisition of his observed topic, Doctor, was at a similar rate to his trained topic, Library. To reach five correct, Doctor required six sessions and Library took five sessions. In subsequent sessions, the trained topic continued to slowly increase, but the observed topic did not show an improvement over five correct for five more sessions. Student 4 observed training on Library and made a maximum of eight correct responses after 17 sessions. Probes immediately following the end of training showed S3's responding on his observed topic to maintain at seven or eight correct, but to decrease to six correct in probes one month later. Immediate probes showed S4 to make six or seven correct responses on his observed topic, and five to seven correct after a month.
Two additional topics, Mall and Restaurant, were trained for S3 and S4. Student 3 made no more than one correct response during baseline probes, and S4 made no correct responses. Further probes following training on Library and Doctor, found no correct responses made by S3 or S4 on either Mall or Restaurant sentences. Student 3 was trained on the Restaurant topic and reached criterion with two sessions of nine correct after 15 sessions. After 13 sessions, S4 reached criterion by responding correctly to all 10 sentences for two sessions. Probes following training showed responding by S3 to decrease to only six or seven correct, but S4 maintained perfect responding.

Both S3 and S4 made a maximum of six correct responses during probes on their observed topics. Acquisition was delayed for S4; not until the 10th session was more than one correct response made on his observed topic, Restaurant. Probes following the end of training showed S3 to make three to five correct responses on Mall sentences, a range similar to the last probes during observation of training, but perhaps slightly lower. An increase to seven correct responses was made by S4 on the follow-up probes for his observed topic.

Two slight deviations in the procedure were made in extending the training periods for S3 and S4. The first topics, Library and Doctor, were trained one extra day after both subjects reached criterion to see whether S4's
sudden increase on Library to eight correct would maintain. The training was likewise extended on Mall and Restaurant to see if S3's decrease on his observed topic and S4's increase on his observed topic would maintain. This resulted in S3 dropping to only seven correct on his trained topic, and so two more sessions were run to again obtain criterion of two days of nine correct.

The number of correction trials presented to S3 and S4 is shown in Figure 4. About the same number of correction trials were required for the first three training sessions.

Insert Figure 4 about here

on both sets of topics, but thereafter S4 required fewer correction trials than S3. The total number of correction trials for the first trained topics was 46 for S3 and 26 for S4. The totals for the second topics were higher, 90 for S3 and 53 for S4.

DISCUSSION

The results from this study show that multiply handicapped young adults can learn observationally to make intraverbal responses which complete sentences. The training procedure in which subjects are taught in pairs on separate topics provides a means to train verbal skills in a more efficient manner than one-on-one teacher-student procedures.
Observational learning, however, is not equal to direct training in its rate of acquisition. This must be taken into account in determining the appropriate application of observational learning procedures.

Every subject learned fewer correct responses on his or her observed topic than on a trained topic. The maximum number of correct responses on observed topics ranged from four to nine. Several error patterns emerged on these topics, providing insights to explore regarding problems which must be overcome in observational training procedures.

The lowest score for an observed topic was S2's four on Banks. She had consistent incorrect responses for two sentences with three word answers. She answered "window" instead of "drive-up window", and "National Michigan Bank" instead of "Michigan National Bank". Since all other sentences had one or two word answers, direct training may need to be used for complex responses of three or more words. This will have to be determined by further research, but will likely vary with the student. It is of interest to note that S4 learned both of the same three word responses observationally during a pilot study.

Other responses could be given to a sentence which are plausible and compete with the one answer considered correct. This occurred with only one sentence consistently. For the sentence, "To get money for shopping, you go to the__.", S3 answered "drive-up window" instead of with
the answer S4 was being trained to give, "bank". Student 3 had been trained on the Bank topic during a pilot study, and this seemed to be an appropriate generalization of a learned response. Further development of intraverbal repertoires following training such as this would be to train several answers which correctly complete a sentence. After all, a bank isn't the only place to get money for shopping, and so the student should not just be exposed to other ways, but be able to talk about them.

On the Restaurant topic, S4 emitted very few correct responses until after the ninth training session for S3 on that topic. This apparent delay in observational learning resulted from S4 answering sentences during probes with words related to McDonalds such as hamburger, french fries, and shake. It is impossible to say whether observational learning was taking place during that time, but simply that if it was, it was more reinforcing for S4 to give McDonalds responses than the ones he heard being trained. Speech patterns such as this are a prime target for intraverbal training with sentences. To speak conversationally, the subject must be able to respond under the control of an entire verbal stimulus, not just one word, like McDonalds, which selectively controls all further responses.

The differences in learning on observed topics could be a result of different numbers of correction trials observed during the partner's training. Student 2 observed less trials than S1 and gave fewer correct responses
on her observed topic. For both phases S3 observed fewer trials than S4, but gave one more correct response on his Phase 1 observed topic and the same number of correct responses for his Phase 2 observed topic. These discrepant figures suggest that the number of correction trials observed may not be a decisive factor for learning to take place.

Factors which predict an individual's ability to learn observationally are unclear from this study. One possible measure, the acquisition rate during training, does not demonstrate a correlation with the acquisition rate during observation. With Pair 1, S1 more quickly acquired correct responses during training than S2. With Pair 2, however, that pattern does not hold. On both trained topics, S4 reached criterion more quickly than S3 and maintained stable responding at 10 correct. But, S3 made more correct responses on his first observed topic, nine correct to S4's eight correct, and both S3 and S4 reached a maximum of six correct on their second observed topic. Thus, on the basis of the present data, the only sure way to predict whether an individual will learn as quickly or nearly as quickly observing training as he or she would being directly trained, is to collect data on both. The most efficient mode of training for someone like S2 may be to train directly, since her learning on her observed topic was considerably less than on her trained topic.
Examination of S3 and S4's second set of topics shows a slower rate of acquisition on both trained and observed topics than on the Phase 1 topics. This could be a function of the difficulty of the stimulus material or to some interfering environmental stimuli. Since both S3 and S4's performance decreased similarly, the influence of the classroom environment is a probable variable. Phase 2 training coincided with the beginning of the school's Spring semester which entailed reduced staff, several new students, and new schedules. These stimulus changes could have had a negative effect on on-going training.

An asset of observational learning is that correct responses maintain as well in probes following the end of training as do responses that were directly trained. All four subjects responded at least within the range of the last three Phase 1 probes during follow-up probes of all topics. This maintenance was again exhibited by S4 a month later on Phase 1 topics, as well as on Phase 2 topics. Interestingly, S4 performed better on his observed topic, Restaurants, during follow-up probes than prior to the end of Phase 2 training. Since this was the topic to which S4 emitted McDonalds responses, the correct responses were being learned. The correct responses were too weak in strength to be emitted at first, but once the entire SD began to control some responses, the whole class of correct responses was strengthened and continued training was not necessary for the additional correct response to be made.
during the follow-up probes. The only instance of decreased correct responding was the slight decrease by S3 across all four topics on the last probe. This was thought to be a result of situational factors rather than a maintenance problem since S3's performance in all other sessions that week was also very poor. He did not earn the needed 25 tokens for a back-up reinforcer during the second probe due to his high rate of inappropriate behaviors, and he aggressed against the therapist and several objects when told he didn't have enough tokens.

The efficiency of observational learning becomes apparent in a comparison with direct training. To train one topic to a criterion of nine correct for two sessions, required the time of a therapist working individually with a subject, and the presentation of a total of 26 to 103 correction trials. With no additional cost except the time to seat a second subject at the table, a second subject learned to give from four to nine correct responses. For subjects such as S2, who only made four correct responses, the time to directly train the remaining six would still be less than if all 10 were directly trained. For the other subjects, it is likely that a few reinforced probes would suffice to raise responding on observed topics to a level equal to the trained topics. Biberdorf and Pear (1977) reported training in pairs to be more efficient than individual training. This study did not include an
individual training condition to make such a determination, but this possibility could be explored.

Generalization of responding and maintenance in the natural environment were two effects proposed in using observational learning with language training. The validity of that claim is supported by the occurrence of many brief conversations during training. When S1 had answered that a locked room for money is a safe, she added that you don't want a robber to get it. One day during training, S2 was told she was going to be asked about grocery stores, and she responded by saying she'd been at the grocery store with her mother the previous evening. Student 3 asked what a cash register was after S4 imitated that response to a sentence. Whenever spontaneous comments like these were made, the therapist responded with praise, and answered the question or tried to elicit further speech by the student with comments or questions.

This study trained intraverbal responding for some things which the student was unable to tact, for example S3 probably could not have named a cash register if he had seen one. A language program such as Hartung (1970) described, trained the student to name things before he or she was taught to verbally respond to it in other ways, like asking for it. All sentences were successfully trained in this study, however, so it was shown unnecessary to establish that the students were able to tact each thing
prior to intraverbal training. After training on Libraries, S3 was asked to identify a dictionary during a visit to the bookmobile. He was unable to do so, but when told, "This is a book that tells what words mean, this is a ___.", he said, "Dictionary". It remains to be established whether it is superior in terms of time and generalization to other types of speech to train a tact before the intraverbal or mand, or whether the opposite is true.

A multitude of questions surround the use of observational learning in training intraverbals. Many factors could be explored in future studies. Group sizes could be increased to see if an even more efficient learning arrangement results. Individual versus group training could be compared as in Biberdorf and Pear's (1977) study. The complexity of responses could be varied, and more than one appropriate response to a sentence could be trained. Data on the acquisition of responses not learned observationally during remedial training would aid in determining if it is still efficient for students to observe training who do not master the responses quickly. Generalization data should be taken to verify that conversational and functional use of the words trained does increase outside of training sessions. And finally, the order of training for various types of speech including the mand, tact, and intraverbal should be explored.
This study shows that multiply handicapped young adults do learn and retain intraverbal responses through the observation of a partner's being trained by imitating a model and being reinforced. At present, it is suggested that students be trained on intraverbals in pairs, and that responses be kept simple—one or two words. A student's acquisition data for an observed topic and a trained topic can be compared to assure that similar learning rates occur and the student is appropriate to be included in group training.
REFERENCES


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FIGURE CAPTIONS

Figure 1. Number correct intraverbal responses across sessions of training and observing training on the topics Bank and Grocery Store for S1 and S2.

Figure 2. Cumulative number of correction trials across training sessions for S1 and S2.

Figure 3. Number correct intraverbal responses across sessions of training and observing training on Phase 1 topics, Library and Doctor, and Phase 2 topics, Mall and Restaurant for S3 and S4.

Figure 4. Cumulative number of correction trials across training sessions for Phase 1 and Phase 2 for S3 and S4.
FIGURE 1

NUMBER CORRECT

BANK
Baseline

Trained Sentences
Follow-up

GROCERY STORE

Observed Sentences

SUBJECT 1

SESSIONS

BANK

Observed Sentences

GROCERY STORE

Trained Sentences

SUBJECT 2
SESSIONS

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FIGURE 2

CUMULATIVE NUMBER OF CORRECTION TRIALS

SESSIONS

S2-Grocery Store
S1-Bank

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FIGURE 3

SUBJECT 3

LIBRARY

DOCTOR

MALL

RESTAURANT

NUMBER CORRECT

Observed

Observed

Observed

Observed

10

Trained Sentences

Trained

Trained

Trained

3 9 15 21 27 33 39 45

SESSIONS

Trained

0

Trained

0
FIGURE 4

PHASE 1

S3-Library

S4-Doctor

PHASE 2

S3-Restaurant

S4-Mall

CUMULATIVE NUMBER OF CORRECTION TRIALS

SESSIONS

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APPENDIX 1

Training Sentences
1. The person who works in a bank is called a **teller**.
2. When a bank lets you borrow money you need, it gives you a **loan**.
3. A locked room in a bank where money is kept is called a **safe**.
4. To get money out of the bank, you write a **check**.
5. When you put money in the bank, you make a **deposit**.
6. Your money in a bank is kept separate from everyone else's in your own bank **account**.
7. **Net** spending money is called **saving**.
8. If you go to the bank in a car, and don't want to park and go inside, you can go to the **drive-up window**.
9. When you go to the bank, you walk to an open place at the counter which is called a **window**.
10. The bank Youth Component students keep their money at **Michigan National Bank**.
GROCERY STORE

1. When you pick out some vegetables, you put them in a bag and get it weighed.
2. You ask a butcher if you need meat.
3. A piece of paper that you give to the cashier to get 10¢ off is called a coupon.
4. When the grocery store sells things for less than usual, they're said to be on sale.
5. You use the express lane when you have only a few things.
6. The section where milk, eggs, and cheese are found is called the dairy section.
7. When you buy pop in bottles or cans, you pay extra money called a deposit.
8. The section where fresh bread, rolls, and cake are found is called the bakery.
9. When you are ready to pay for your food, you stand in the check out line.
10. The section where vegetables or fruit are found is called the produce section.
DOCTOR

1. When you are sick you go to see a doctor at his **office**.
2. If you have a very bad cut, a doctor can sew your skin together using **stitches**.
3. If you are well and go to the doctor just to be sure nothing is wrong, it's called a **check-up**.
4. In a hospital, when a doctor puts you to sleep and fixes your body, it's called an **operation**.
5. If you have a broken arm, a doctor will put it in a **cast**.
6. To have red spots on your skin that itch is to have a **rash**.
7. The person at a drug store who gives you medicine is called a **druggist**.
8. If your body is too hot, you have a **temperature**.
9. A car with a siren that takes you to a hospital in a hurry is an **ambulance**.
10. If a doctor wants to see your bones, he'll take an **X-ray**.

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LIBRARY

1. When your book is overdue, you must pay a library fine.
2. A person who works in a library is called a librarian.
3. To take books from a library, you give the person who works there your library card.
4. To take books from a library for a week is called borrowing.
5. In order to not bother people who are reading in a library, you talk very softly.
6. The person who wrote a book is called its author.
7. A small book without a hard cover is a paperback.
8. The name of a book is its title.
9. When you keep a library book too long, the book is overdue.
10. The day you should bring a book back to the library is the date it's due.
1. The person who takes your order and brings you food is a **waitress**.

2. The person who leads you to a table is a **hostess**.

3. You read what food the restaurant has in a **menu**.

4. When you finish eating at a restaurant, you must ask the waitress to bring the **check**.

5. You pay a waitress for helping you by leaving her a **tip**.

6. When you want to eat at a busy restaurant, you don't have to wait for a table if you call and make a **reservation**.

7. To pay for your meal, you get up from the table and bring your check to the **cashier**.

8. To tell the waitress what you want to eat is to **order**.

9. A restaurant where you take food from a counter and put it on a tray is called a **cafeteria**.

10. The sauce that goes on a salad is called **dressing**.
1. A store with all kinds of things like Wards or Penneys is called a department store.
2. A place where a lot of stores are next to each other is called a mall.
3. A cashier puts your money in a cash register.
4. When you buy something, the cashier gives you a piece of paper called a receipt.
5. To get money for shopping you go to the bank.
6. The person who helps you find things at a store is called a clerk.
7. The paper on something telling you what it costs is a price tag.
8. What you pay for something is its cost.
9. To pick out clothes that fit you, you have to know your size.
10. To look in the stores and not buy anything is to window shop.