GENERALIZATION OF ARTICULATION TRAINING IN PICTURE NAMING WITH MENTAL RETARDATES

by

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CHAPTER I

INTRODUCTION

The training of articulation skills is often viewed by speech clinicians as a simple task. The training of this behavior holds much importance in as much as Johnson, Darley, Spriesterbach (1963) estimate that 80 to 90 percent of the clinician's time is spent correcting articulation defects. It is also of importance when one realizes the extent to which an individual's articulation facility is a major determiner of his intelligibility. Gordon (1974) explains that "unacceptable speech attracts negative attention to itself for a variety of reasons: (1) your incorrect speech is unfavorably conspicuous, (2) it interferes with effective oral communication, (3) it is inappropriate to your present social or vocational situations. Your speech becomes a handicap." (p. 4)

Clinicians have suggested that it is often the case in articulation training, as well as in other behavioral training, that after effecting behavioral change in rate of an articulation topography, no change is observed outside of the immediate training environment. Inconsistency in the definitions of generalization may confuse the issue. In one of the earliest works, Travis (1931) used the term maturation process to refer to generalization. When used presently, the term "maturation process" refers to the normal speech development in a child. In 1939, Van Riper referred to techniques for habituation of the response, but in 1958 Van Riper and Irwin

changed the term to stabilization. Ainsworth (1948) used the term carryover which has been widely used. Transfer was the choice of Berry and Eisenson (1956). Two of the most recent terms reflect the influence of operant conditioning procedures--generalization and stimulus generalization.

Referring to all behavioral changes, Baer, Wolf, and Risley (1968) explained that "A behavioral change may be said to have generality if it proves durable over time, if it appears in a wide variety of possible environments, or if it spreads to a wide variety of related behaviors." (p. 96) While the terms themselves are not completely interchangeable, the large number of different terms used to describe the phenomenon indicates the concern with which clinicians view the problem of generalization. Baer et al.(1968) stressed that ". . . generalization should be programmed rather than expected or lamented." (p. 97) These sentiments were confirmed empirically by Wahler (1969) who demonstrated that contingency operations performed in the homes of two children were followed by changes in the children's disruptive behavior within these settings. However, the childrens behavior in the school setting was unaffected by these operations until similar contingency operations were performed in the school setting. Thus, the need for programmed generalization appears to be a major variable of concern for the clinician.

To meet this need, authors over the years have suggested methods and techniques to attain generalization (carryover, habituation, stablization, etc.) The recommendations of

Van Riper in 1939 can be compared with those he presents in 1963. His early book stated a need for definite speech periods at home and school, speaking situations outside the training environment, checking devices and penalties for errors, and negative practice. By 1963, he had developed operational levels of training: isolation practice, syllable use, word use, and sentence practice. He stated that the client must go through each level before the clinician could expect generalization. Oral reading of material in which the newly acquired phoneme was underlined followed by oral reading without such markings was offered by Fairbanks (1940) as a means of generalization. Ainsworth (1948) believed that often most young children would require only informal practice whereas older clients needed drill. Backus and Beasley (1951) suggested training in which life-like situations were employed. Generalization was a natural outgrowth of the social skills utilized in the training. Similar to Backus and Beasley, Berry and Eisenson (1956) wrote that the client must build the response into "total speech synergy". To attain "total speech synergy" the client made spontaneous corrections and criticized his own efforts. Powers (1957) said that carryover was largely a problem of the client's motivation and stressed the importance of the choice of materials. Along the same line, Sutton suggested that materials should be drawn from the school's language arts curriculum. Marquardt (1959) developed a "speech pals" program based on the premise that children learn more rapidly from their peers. He chose "popular"

students without speech problems and trained them to listen for the correct phoneme production. He believed that meeting once a day with a "popular" student would be rewarding for the child in speech therapy and that his speech would improve rapidly. McDonald (1964) recommended a speech notebook in which the client's own words and sentences were recorded. In this way the client automatically graded material to his own level.

Engel et al. (1966) provided a review of suggestions for obtaining generalization. The authors considered four aspects (attitudes and motivation; in-training activities; involvement of persons from the client's environment; and checking devices.) They listed 35 suggestions which could be employed. Gerber (1973) offers a wide variety of stimulus material and "game" ideas to be practiced both in therapy and at home. Wing and Heimgartner (1973) developed five target levels of behavior to be reached during home practice. Based on a continuum of ordered speech activities, the parents are given the responsibility for generalization of the previously trained response.

The foregoing suggestions are by no means inclusive but merely representitive. Unfortunately, none have been empirically tested for effectiveness; it is as Mowrer notes in his 1971 review of similar literature:

> "The suggestions and opinions, while interesting and perhaps useful to the clinician inexperienced in devising carryover strategies, are of questionable value. Clinical hunches and pragmatic innovations based on an 'it works for me' philosophy often do not stand up under the rigor of empirical investigation. Frequently, a variable identified as important turns out to be totally irrelevant to task acquisition. However, clinical suggestions

> based upon limited observational data should not necessarily be discarded altogether.' Many of these suggestions could serve as important starting points for empirical validation and testing." (p. 441)

A few studies have tried to empirically measure articulation generalization. Sommers (1962) and Sommers et al. (1964) studied the use of mothers in the training program. As a part of each study, each child received a pre- and post-McDonald Deep Test of Articulation. All of the children showed improvement. In the 1964 study, a third test was administered two months subsequent to the end of training and it was found that clients whose mothers were trained to assist in training had fewer articulation errors than those clients whose mothers were not trained.

Winitz and Bellerose (1963) found that, in normal children, the phonemic unit of the test and training stimuli influenced generalization and that stimulus generalization generally could be maintained with reinforcement. In a similar vein, Elbert, Shelton, and Arndt (1967) studied the effect of training for the /s/ on the phonemes /z/ and /r/. They found that the subjects improved on /s/ and to a lesser degree on its cognate /z/ but not on the /r/ which is phonetically dissimilar. With respect to training procedures, both of these studies reported using reinforcement of correct productions of articulatory target behavior although neither study reported utilization of the imitation paradigm combined with reinforcement as the training procedure.

McLean (1970) studied response generalization of articu-

lation production with mentally retarded children. He found that by utilizing four different stimulus conditions during training (echoic, picture, printed word, and sentence completion), generalization was promoted to new items and to different phoneme placement. He found that three of his four subjects showed complete generalization to new word items when the trained phoneme was in the corresponding initial position, complete generalization to new word items in which the initial sound was the substituted sound for the trained phoneme originally (over-generalization), and no generalization to the medial position . The fourth subject did not generalize at all. A probe one week later indicated that the subjects retained the trained phoneme.

In a pilot study, Bankson (1970) utilized a procedure which "automatized" the correct production of /s/ for a girl twelve years of age. The study involved contingent reinforcement for correct /s/ production in words and for reading a list of training words within a prescribed time. Increased speed in subsequent readings of the stimulus material was required. Training was accomplished in fifteen sessions. Tape recorded samples of conversational speech were made after each session by the experimenter and again the same evening by the parents. After one week of training the subject achieved 90 percent or higher correct /s/ production in both training and home environment probes. Two months subsequent to training the subject was producing a correct /s/ 100 percent of the time in both settings. Five months after training ended, a

probe found that "automatization had been maintained." (p. 13)

In a second study, Bankson (1970) investigated the effects of phoneme usage in conversational speech of a training technique similar to that of the pilot study. Conversational speech was tape recorded immediately after each training session, in the home by parents, and in a simulated home environment. Bankson did not find complete generalization outside the experimental environment although the learning curves suggest some generalization from the training to the home environment for four of the five subjects. A different phoneme, used as a control, was followed in one subject. This phoneme did not reflect the improvement noted for the target phoneme.

Freilinger (1973) conducted an investigation of phoneme generalization with two groups. A control group received traditional training based on Van Riper (1963) strategies, and the experimental subjects received a paired-associates training. Recordings were then made of spontaneous speech at end-training and at six weeks post-training in the training environment and in the home. It was observed that both groups used the target phoneme in both environments although the experimental group showed a mild regression at six weeks post-training. Spontaneous speech scores from the training environment were significantly better than those from the home when groups were combined for analysis.

Two studies from the applied behavior analysis literature demonstrate the use of multiple-trainers for achieving generali-

zation of a social greeting response. Kale, Kaye, Wheelan, and Hopkins (1968) developed and maintained the generalization of a social greeting response in adult schizophrenics. Reinforcement was given to the subjects contingent upon speaking with an experimenter. The reinforcement was faded and the response came under the control of the experimenter's presence. However, low or zero response rate was seen in the presence of a second experimenter not involved in the previous training. Five new trainers then reconditioned the social behavior, fading the reinforcement as before to bring the response under the control of the experimenters' presence. Subsequently, high rates of behavior were then seen in the presence of even neutral experimenters and continued to be seen three months later.

Similarly, Stokes, Baer, and Jackson (1972) promoted generalization of a greeting response with four retarded children. The response was trained by one trainer; however, little or no generalization was evidenced by a multiple number of other individuals in probe situations. The addition of a second trainer was sufficient to increase the rate of responding in probe situations to above 80 percent in three out of four cases.

In summary, generalization is one of the most important aspects, if not the most important aspect, of the clinical process. One need only review texts in the field of speech pathology to verify this statement. The various terms used to describe correct use of the phoneme in spontaneous speech

as well as the many and diverse suggestions to achieve generalization depict the concern and importance given to generalization. In the bulk of literature pertinent to generalization, one finds little evidence for generalization of new articulation behaviors outside of the training environment although extremely limited data are available. Most authors offer only observations and hunches from clinical experience. The data which do exist, however, indicate the possibility that generalization over time and environments may occur in some instances. In the literature of applied behavior analysis, one finds data supporting the hypothesis that generalization may be related to the number of trainers involved in the clinical process although numerous other variables may be influential.

PURPOSE OF THE STUDY:

It is theoretically and clinically important to study the degree to which newly acquired articulation responses generalize to settings outside the training environment. Specifically, the present investigation was focused on the following questions:

(1) Do newly acquired articulation responses generalize over time, environments, and novel stimuli in the absence of the trainer?

(2) What is the effect of the addition of a second trainer on the generalization of the trained response in the designated probe settings?

CHAPTER II

PROCEDURE

Components of the present investigation are described under the following headings: Subjects, Setting, Design, Training and Reinforcement, Baseline and Probes, Phoneme Selection, and Response and Reliability.

SUBJECTS:

The three subjects who were selected for the study resided at Kansas Neurological Institute. All possessed multiple articulation errors and were receiving no articulation training at the time of the study. The subjects were enrolled in language classes which they attended daily during the course of the study. None of them had any significant hearing loss or visual impairment. The experimenter administered the Goldman-Fristoe Test of Articulation to each subject prior to phoneme selection; Peabody Picture Vocabulary Test scores were obtained from subjects' files.

S-1 was a 16 year old retarded boy with an Adaptive Behavior Level of -4 and a Mental Intelligence Level of -3. He scored a receptive language of 2 years, 2 months on the Peabody Picture Vocabulary Test. He had eight misarticulated phonemes in the initial position (/j/, /ʃ/, /l/, /r/, /dʒ/, /θ/, /v/, /z/) as recorded on the Goldman-Fristoe Test of Articulation. The phonemes selected for training were /l/ and /r/.

S-2 was an 11 year old retarded girl with an Adaptive Behavior Level of -2 and a Mental Intelligence Level of -3.

She scored a receptive language age of 2 years, 8 months on the Peabody Picture Vocabulary Test and had four misarticulated phonemes in initial position (/l/, /v/, /s/, /z/) as recorded on the Goldman-Fristoe Test of Articulation. The phonemes selected for S-2 were /l/ and /s/.

S-3 was a 10 year old retarded boy with an Adaptive Behavior Level of -3 and a Mental Intelligence Level of -4. Three Peabody Picture Vocabulary Tests were attempted with S-3, but no results were obtained. He had five misarticulated phonemes in initial position (/p/, /m/, /h/, /b/, /t/) as recorded on the Goldman-Fristoe Test of Articulation. The phonemes selected were /t/ and /h/.

The Adaptive Behavior Levels and Mental Intelligence Levels were obtained from the files of the subjects.

SETTING:

The training environment was a room near the language classrooms. It contained one small table and two straight-backed chairs. The experimenter was seated directly across the table from the subjects during the entire training session. None of the subjects had been in the training room prior to this study.

DESIGN:

The experimental design was a multiple baseline with probes to test for generalization. Two misarticulated phonemes were selected for each subject. The four experimental training conditions were as follows: Condition I was E-1 training the first phoneme (A) until a criterion of 90 percent correct

responding occurred on three consecutive days. Condition II was E-1 training as in Condition I, and E-2 training the same phoneme in a different setting until the criterion was met. Condition III was E-1 training the second phoneme (B) under identical conditions as Condition I. Condition IV was E-1 continuing training of phoneme B and E-2 training the second phoneme under identical conditions as Condition II.

Probes for generalization were to be administered between each experimental condition of the study. They were carried out by the language class instructor during class time and by neutral experimenters on the subjects' living units. The neutral experimenters were research assistants whom the subjects had not seen prior to the probe. All responses to picture stimuli presentation during probes were tape recorded (Wollensak, model 401) to permit data for reliability checks at a later time.

TRAINING AND REINFORCEMENT:

The subjects were seen for 30-minute sessions daily during their regularly scheduled language class period. Stimulus pictures were presented one at a time and E asked, "What is this?" If a correct response followed within five seconds, E praised the subject and provided tangible reinforcers appropriate to the subject. If no response or an inappropriate response occurred within five seconds of the stimulus presentation, E replied, "(Name), say (Model)," which if followed by a correct response from S, was reinforced; if no correct response followed the model, E waited 10 seconds and then

presented the next stimulus picture. Criterion was 90 percent correct responding without requiring presentation of a model for three consecutive days.

The stimulus pictures used during training were the same pictures as used for probes; half of the pictures were trained and the other half left untrained for use during probes.

Correct responses were reinforced on a continuous schedule with praise; each subject also received the type of reinforcer being used in the respective language class. S-1 and S-2 received tokens which could be exchanged in the classroom, and S-3 received primary reinforcers of candy, cereal, etc.

BASELINE AND PROBES:

Baseline data were obtained by the language class instructor in the language classroom and by neutral experimenters in the subjects' living units. All stimulus pictures were presented individually and accompanied by the question, "What is this?" If no response or an inappropriate response occurred within five seconds of stimulus presentation, the instructor presented a model of the desired response. If an appropriate response was given, the instructor repeated the correct response. Probes were also administered by the language class instructor and neutral experimenters. The same procedure of stimulus presentation was followed in obtaining probe responses as was outlined for baseline. Baseline and probe data were tape recorded and scored later by the experimenter; reliability checks were made by an independent listener at a later time.

PHONEME SELECTION:

Training phonemes were selected on the basis of three needs: (1) the phonemes, when tape recorded, were audible and distinct; (2) phonemes were produced by the subject correctly in less than 40 percent of the stimulus pictures during baseline; and (3) the subjects could produce the phonemes correctly when given a model by E prior to training. Two phonemes were selected for each subject.

RESPONSE AND RELIABILITY:

The desired response was correct phoneme production in initial position in picture naming. Responses were evaluated by the experimenter from tape recordings and reliabilty checks were made by an independent listener. The listener had no knowledge of the purpose of the research or the nature or sequence of the respective probe conditions. A total of 33 probes were recorded. Of these, the independent listener scored 13 tapes. E did not have prior knowledge of which tapes the listener would score.

CHAPTER III

RESULTS

RELIABILITY:

Each of the 13 probe tapes scored by the independent observer contained 50 stimulus presentations providing a total of 650 inter-observer reliability checks. Each stimulus presentation was scored correct (x) or incorrect (0). Of these 650 presentations, E scored 582 as correct and 68 as incorrect. For the correct response category, the independent observer agreed with E 99 percent and agreed 92 percent with the responses E scored as incorrect. Since a total disagreement totaled less than one percent of the combined opportunities, it appears that the data herein reported are acceptable for analysis.

SUBJECT 1:

The baseline data of phoneme A are graphically presented in Table I. S-1 responded with 16 percent correct initial /l/ responses to the 25 stimulus pictures. The results of training of phoneme A (Figure 1) indicate that six sessions were required before the criterion of 90 percent correct responding on three consecutive days was met. The total number of trials required for the 13-word block of training pictures was 42. Figure 1 data are the results of an unreinforced, random assortment of training pictures presented by E at the end of each training session. The results (Table I) of probes administered in the language class and living unit after train-

ing of phoneme A, indicate that generalization was achieved by S-1 in both settings and fluctuated from 84-96 percent during the three weeks after training was discontinued. The six incorrect responses that were recorded during the probes were all in response to untrained picture stimuli when no model was presented by the teacher or the neutral experimenter. After training of phoneme B (Table I), 100 percent generalization of phoneme A was seen to continue during post-baseline probes in both settings.

In the initial baseline data of phoneme B (Table II), 8 percent or 2 of the responses showed a correct /r/ in initial position. After training of phoneme A, however, an increase was seen in the baseline rate of phoneme B which rose to 72-80 percent in the three weeks prior to training of phoneme B. Training of phoneme B as pictured in Figure 1 was completed in six sessions; in four of the sessions S-1 achieved 90 percent or better in rate of responding. The total number of training trials required for the 13-word block of stimulus pictures was 40. The results of the probes (Table II) administered after training of phoneme B showed 100 percent generalization to both the classroom and living unit. A slight decrease of 88-76 percent correct responding was evidenced in probes recorded two weeks after training. Most of the incorrect responses after training of phoneme B occurred consistently in the same words in each probe.

SUBJECT 2:

The baseline data of phoneme A are graphically presented

TABLE I

DATA FROM BASELINE AND PROBES OF SUBJECT 1:
CORRECT AND INCORRECT PRODUCTION OF PHONEME A, /l/

	Baseline	Train. A	Class 1 week	Unit 1 week	Class 2 weeks	Unit 2 weeks	Class 3 weeks	Unit 3 weeks	Train. B	Post-Baseline	Post-Baseline	Post-Baseline	Post-Baseline
Trained Pictures													
lamp	o		x	x	x	x	x	x		x	x	x	x
lady	o		x	x	x	x	x	x		x	x	x	x
look	o		x	x	x	x	x	x		x	x	x	x
loud	x		x	x	x	x	x	x		x	x	x	x
light	x		x	x	x	x	x	x		x	x	x	x
lollipop	o		x	x	x	x	x	x		x	x	x	x
laugh	o		x	x	x	x	x	x		x	x	x	x
lake	o		x	x	x	x	x	x		x	x	x	x
lid	o		x	x	x	x	x	x		x	x	x	x
lettuce	o		x	x	x	x	x	x		x	x	x	x
listen	o		x	x	x	x	x	x		x	x	x	x
lick	o		x	x	x	x	x	x		x	x	x	x
lily	o		x	x	x	x	x	x		x	x	x	x
Percent Correct	15		100	100	100	100	100	100		100	100	100	100
Untrained Pictures No Model Presented													
leaf	o		x	x	x	x	o	o		x	x	x	x
lemon	o		x	x	x	x	x	x		x	x	x	x
legs	x		x	x	x	x	x	x		x	x	x	x
lunch	o		o	x	x	x	o	o		x	x	x	x
letter	o		x	x	x	x	x	x		x	x	x	x
lips	o		x	x	x	x	x	o		x	x	x	x
Percent Correct	17		83	100	100	100	67	50		100	100	100	100
Untrained Pictures Model Presented													
lion	o		x	x	x	x	x	x		x	x	x	x
lock	o		x	x	x	x	x	x		x	x	x	x
little	x		x	x	x	x	x	x		x	x	x	x
left	o		x	x	x	x	x	x		x	x	x	x
line	o		x	x	x	x	x	x		x	x	x	x
ladder	o		x	x	x	x	x	x		x	x	x	x
Percent Correct	17		100	100	100	100	100	100		100	100	100	100
Total Percent Correct Phoneme A, /l/	16		96	100	100	100	92	88		100	100	100	100
Percent Correct Phoneme B, /r/	8		76	76	80	72	72	80		100	100	84	76

(x) correct phoneme production (o) incorrect phoneme production

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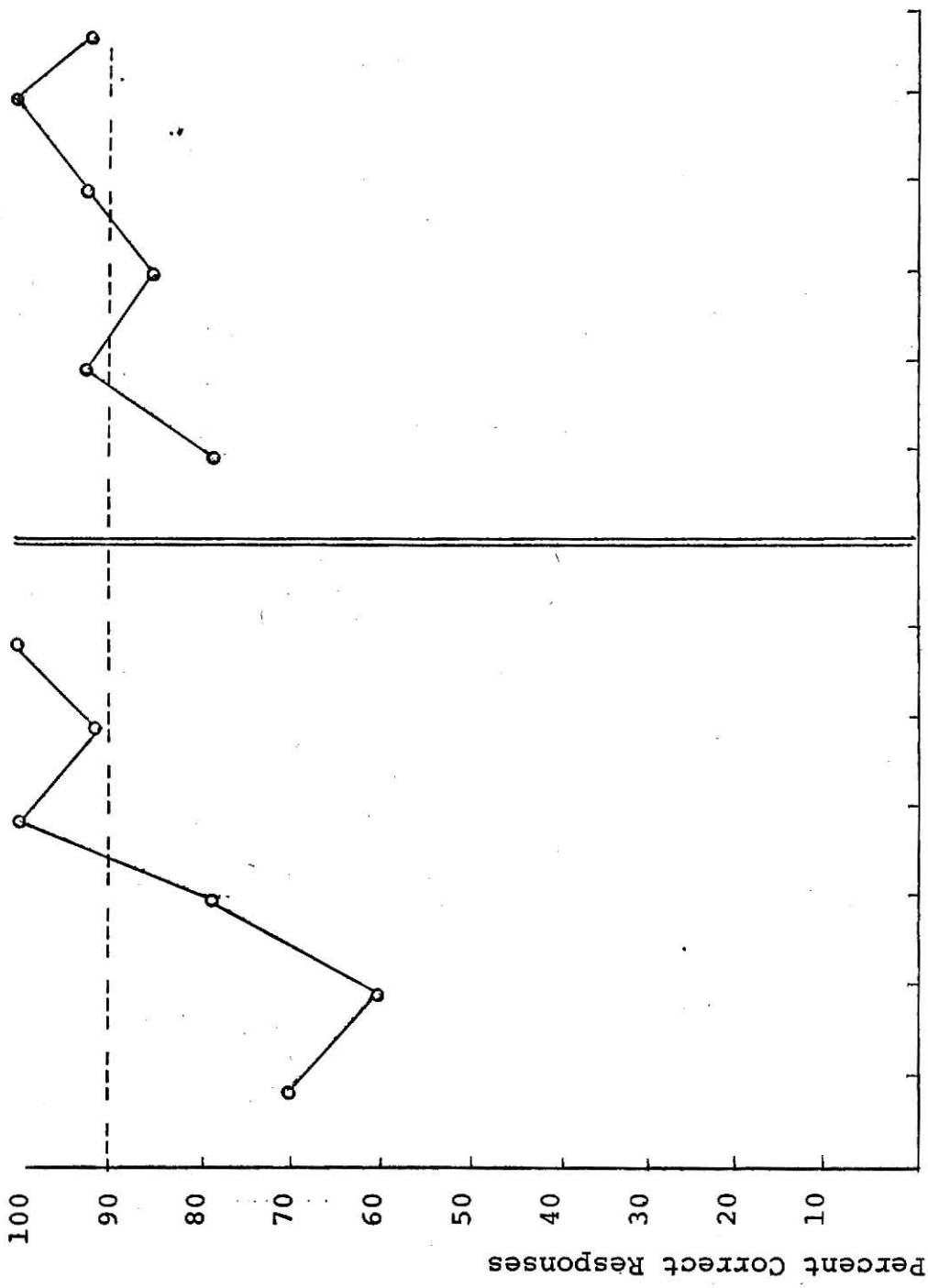

Figure 1. Percent Correct Responses During Training Sessions of Subject 1

TABLE II

DATA FROM BASELINE AND PROBES OF SUBJECT 1:
CORRECT AND INCORRECT PRODUCTION OF PHONEME B, /r/

	Baseline	Train. A	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Train. B	Class 1 week	Unit 1 week	Class 2 weeks	Unit 2 weeks
Trained Pictures													
river	o		x	x	o	o	o	x		x	x	x	x
robin	o		x	x	x	x	x	x		x	x	x	x
radish	o		x	o	x	o	x	x		x	x	x	x
roar	o		x	x	x	x	x	x		x	x	x	x
roast	o		o	o	x	o	o	o		x	x	o	o
rose	o		x	x	x	o	o	o		x	x	x	o
railroad	o		x	x	x	x	x	x		x	x	x	x
write	o		o	x	o	o	o	o		x	x	o	o
rooster	o		x	x	x	x	x	x		x	x	x	x
rhino	o		x	x	x	x	x	x		x	x	x	x
rope	o		x	x	x	x	x	x		x	x	x	x
refrigerator	o		x	o	o	x	o	x		x	x	x	x
read	o		o	x	o	x	x	x		x	x	x	x
Percent Correct	0		77	77	69	61	61	77		100	100	85	77
Untrained Pictures No Model Presented													
ring	o		x	x	x	x	x	x		x	x	x	x
run	o		x	o	x	o	x	x		x	x	x	o
radio	o		o	o	o	o	o	x		x	x	o	o
red	x		x	x	x	x	x	x		x	x	x	x
rug	o		x	x	x	x	x	x		x	x	x	x
rain	o		o	x	x	o	o	o		x	x	o	o
Percent Correct	17		67	67	83	50	67	83		100	100	67	50
Untrained Pictures Model Presented													
rabbit	x		x	x	x	x	x	x		x	x	x	x
rat	o		x	x	x	x	x	x		x	x	x	x
rocks	o		x	x	x	x	x	x		x	x	x	x
room	o		o	x	x	x	x	o		x	x	x	x
roof	o		x	x	x	x	x	x		x	x	x	x
road	o		x	o	x	x	x	x		x	x	x	x
Percent Correct	17		83	83	100	100	100	83		100	100	100	100
Total Percent Correct Phoneme B, /r/	8		76	76	80	72	72	80		100	100	84	76
Percent Correct Phoneme A, /l/	16		96	100	100	100	92	88		100	100	100	100

(x) correct phoneme production (o) incorrect phoneme production

in Table III. S-2 responded with 4 percent correct initial /l/ responses to the 25 stimulus pictures. The results of training of phoneme A (Figure 2) indicate that five sessions were required before the criterion of 90 percent correct responding on three consecutive days was met. The total number of trials required for the 13-word block of training pictures was 37. Figure 2 data are the results of an unreinforced, random assortment of training pictures presented by E at the end of each training session. The results (Table III) of probes administered in the language class and living unit after training of phoneme A indicate that 100 percent generalization was achieved by S-2 in both settings and was stable during the three weeks after training was discontinued. After training of phoneme B, 100 percent generalization of phoneme A was seen to continue during post-baseline probes in both settings.

In the initial baseline data of phoneme B (Table IV), zero rate of correct responding with /s/ in initial position was observed, and after training of phoneme A, the rate remained at zero. Training of phoneme B as pictured in Figure 2 was completed in ten sessions. The total number of training trials required for the 13-word block of stimulus pictures was 76. The results of the probes (Table IV) administered after training of phoneme B show generalization of 88 and 96 percent to both the classroom and living unit respectively. A decrease to 16 percent correct responding was evidenced in the class and a return to zero rate of responding was seen in the living unit two weeks after training.

TABLE III

DATA FROM BASELINE AND PROBES OF SUBJECT 2:
CORRECT AND INCORRECT PRODUCTION OF PHONEME A, /l/

	Baseline	Train. A	Class 1 week	Unit 1 week	Class 2 weeks	Unit 2 weeks	Class 3 weeks	Unit 3 weeks	Train. B	Post-Baseline	Post-Baseline	Post-Baseline	Post-Baseline
Trained Pictures													
lamp	o		x	x	x	x	x	x		x	x	x	x
lady	o		x	x	x	x	x	x		x	x	x	x
look	o		x	x	x	x	x	x		x	x	x	x
loud	o		x	x	x	x	x	x		x	x	x	x
light	o		x	x	x	x	x	x		x	x	x	x
lollipop	o		x	x	x	x	x	x		x	x	x	x
laugh	o		x	x	x	x	x	x		x	x	x	x
lake	o		x	x	x	x	x	x		x	x	x	x
lid	o		x	x	x	x	x	x		x	x	x	x
lettuce	o		x	x	x	x	x	x		x	x	x	x
listen	o		x	x	x	x	x	x		x	x	x	x
lick	o		x	x	x	x	x	x		x	x	x	x
lily	o		x	x	x	x	x	x		x	x	x	x
Percent Correct	0		100	100	100	100	100	100		100	100	100	100
Untrained Pictures No Model Presented													
leaf	o		x	x	x	x	x	x		x	x	x	x
lemon	o		x	x	x	x	x	x		x	x	x	x
legs	x		x	x	x	x	x	x		x	x	x	x
lunch	o		x	x	x	x	x	x		x	x	x	x
letter	o		x	x	x	x	x	x		x	x	x	x
lips	o		x	x	x	x	x	x		x	x	x	x
Percent Correct	17		100	100	100	100	100	100		100	100	100	100
Untrained Pictures Model Presented													
lion	o		x	x	x	x	x	x		x	x	x	x
lock	o		x	x	x	x	x	x		x	x	x	x
left	o		x	x	x	x	x	x		x	x	x	x
little	o		x	x	x	x	x	x		x	x	x	x
line	o		x	x	x	x	x	x		x	x	x	x
ladder	o		x	x	x	x	x	x		x	x	x	x
Percent Correct	0		100	100	100	100	100	100		100	100	100	100
Total Percent Correct Phoneme A, /l/	4		100	100	100	100	100	100		100	100	100	100
Percent Correct Phoneme B, /s/	0		0	0	0	0	0	0		88	96	16	0

(x) correct phoneme production (o) incorrect phoneme production

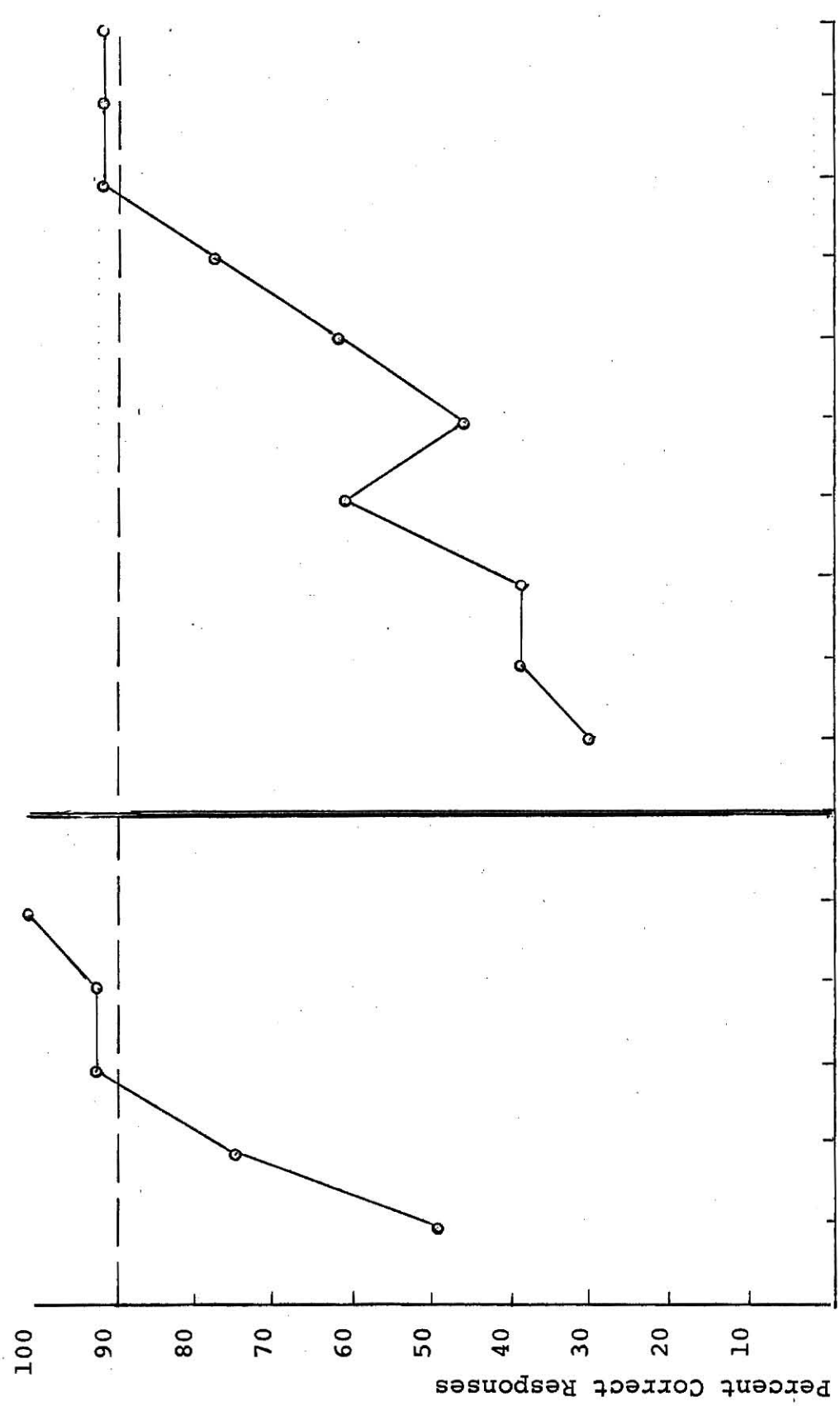

Figure 2. Percent Correct Responses During Training Sessions of Subject 2

TABLE IV

DATA FROM BASELINE AND PROBES OF SUBJECT 2:
CORRECT AND INCORRECT PRODUCTION OF PHONEME B , /s/

	Baseline	Train. A	Baseline	Baseline	Baseline	Baseline	Baseline	Train. B	Class 1 week	Unit 1 week	Class 2 weeks	Unit 2 weeks
Trained Pictures												
sing	o		o	o	o	o	o		x	x	o	o
see	o		o	o	o	o	o		x	x	o	o
cent	o		o	o	o	o	o		x	x	o	o
scissors	o		o	o	o	o	o		x	x	o	o
safety pin	o		o	o	o	o	o		x	x	o	o
sew	o		o	o	o	o	o		x	x	o	o
sink	o		o	o	o	o	o		x	x	o	o
supper	o		o	o	o	o	o		x	x	x	o
suit	o		o	o	o	o	o		x	x	o	o
sail	o		o	o	o	o	o		x	x	o	o
sailor	o		o	o	o	o	o		x	x	o	o
summer	o		o	o	o	o	o		x	x	x	o
sand	o		o	o	o	o	o		x	x	x	o
Percent Correct	0		0	0	0	0	0		100	100	23	0
Untrained Pictures No Model Presented												
soup	o		o	o	o	o	o		o	x	o	o
sun	o		o	o	o	o	o		o	o	o	o
Santa	o		o	o	o	o	o		x	x	o	o
six	o		o	o	o	o	o		o	x	o	o
socks	o		o	o	o	o	o		x	x	o	o
soap	o		o	o	o	o	o		x	x	o	o
Percent Correct	0		0	0	0	0	0		50	83	0	0
Untrained Pictures Model Presented												
sad	o		o	o	o	o	o		x	x	o	o
seesaw	o		o	o	o	o	o		x	x	x	o
sit	o		o	o	o	o	o		x	x	o	o
sick	o		o	o	o	o	o		x	x	o	o
signs	o		o	o	o	o	o		x	x	o	o
sacks	o		o	o	o	o	o		x	x	o	o
Percent Correct	0		0	0	0	0	0		100	100	17	0
Total Percent Correct Phoneme B, /s/	0		0	0	0	0	0		88	96	16	0
Percent Correct Phoneme A, /l/	4		100	100	100	100	100		100	100	100	100

(x) correct phoneme production (o) incorrect phoneme production

SUBJECT 3:

The baseline data of phoneme A are graphically presented in Table V. S-3 responded with 32 percent correct initial /t/ responses to the 25 stimulus pictures. The results of training of phoneme A (Figure 3) indicate that nine sessions were required before the criterion of 90 percent correct responding on three consecutive days was met. The total number of trials required for the 13-word block of training pictures was 45. Figure 3 data are the results of an unreinforced random assortment of training pictures presented by E at the end of each training session. The results (Table V) of probes administered in the language class and living unit after training of phoneme A, indicate that generalization was achieved by S-3 in both settings and fluctuated from 84-96 percent during the three weeks after training was discontinued. The incorrect responses that were recorded during the probes were missed repeatedly in many probes. Most were in response to untrained picture stimuli when no model was presented by the teacher or neutral experimenter. After training of phoneme B, generalization of phoneme A was observed to continue from 88-96 percent during post-baseline probes in both settings.

In the initial baseline data of phoneme B (Table VI), 4 percent or one of the responses showed a correct /h/ in initial position. After training of phoneme A, however, an increase was seen in the baseline rate of phoneme B which rose to 72-80 percent in the three weeks prior to training phoneme B. Training of phoneme B as pictured in Figure 3 was completed in five sessions. The total number of training trials required

TABLE V

DATA FROM BASELINE AND PROBES OF SUBJECT 3:
CORRECT AND INCORRECT PRODUCTION OF PHONEME A, /t/

	Baseline	Train. A	Class 1 week	Unit 1 week	Class 2 weeks	Unit 2 weeks	Class 3 weeks	Unit 3 weeks	Train. B	Post-Baseline	Post-Baseline	Post-Baseline	Post-Baseline
Trained Pictures													
toys	x		x	x	x	x	x	x		x	x	x	x
toothbrush	x		x	x	x	x	x	x		x	x	x	x
tomato	o		x	x	x	x	x	x		x	x	x	x
tongue	x		x	x	x	x	x	x		x	x	x	x
tie	o		x	x	x	x	x	x		x	x	x	x
turkey	o		x	o	x	x	x	x		x	x	x	x
toilet	o		o	o	x	o	o	o		x	x	x	x
talk	o		x	x	x	x	x	x		x	x	x	x
truck	o		x	x	x	x	x	x		x	x	x	x
train	o		x	x	x	x	x	x		x	x	x	x
turtle	o		x	x	x	x	x	x		x	x	x	x
time	o		x	x	x	x	x	x		x	x	x	x
towel	o		x	x	x	x	x	x		x	x	x	x
Percent Correct	23		92	85	100	92	92	92		100	100	100	100
Untrained Pictures No Model Presented													
two	x		x	x	x	x	x	x		x	x	x	x
toe	o		x	o	x	x	x	o		x	x	x	o
tail	x		x	x	x	x	x	x		x	x	x	x
TV	x		x	x	x	x	x	x		x	x	x	x
telephone	o		x	x	x	x	x	x		x	x	x	x
toast	o		o	x	x	x	o	o		x	x	o	o
Percent Correct	50		83	83	100	100	83	67		100	100	83	67
Untrained Pictures Model Presented													
tack	o		x	x	x	x	x	x		x	x	x	x
tiger	o		o	o	o	o	o	x		o	o	o	o
tree	o		o	x	x	x	x	x		x	x	x	x
table	o		x	x	x	x	x	x		x	x	x	x
tub	x		x	x	x	x	x	x		x	x	x	x
teeth	x		x	x	x	x	x	o		x	x	x	x
Percent Correct	33		67	83	83	83	83	83		83	83	83	83
Total Percent Correct Phoneme A, /t/	32		88	84	96	92	88	84		96	96	92	88
Percent Correct Phoneme B, /h/	4		72	80	68	68	72	68		100	96	80	80

(x) correct phoneme production (o) incorrect phoneme production

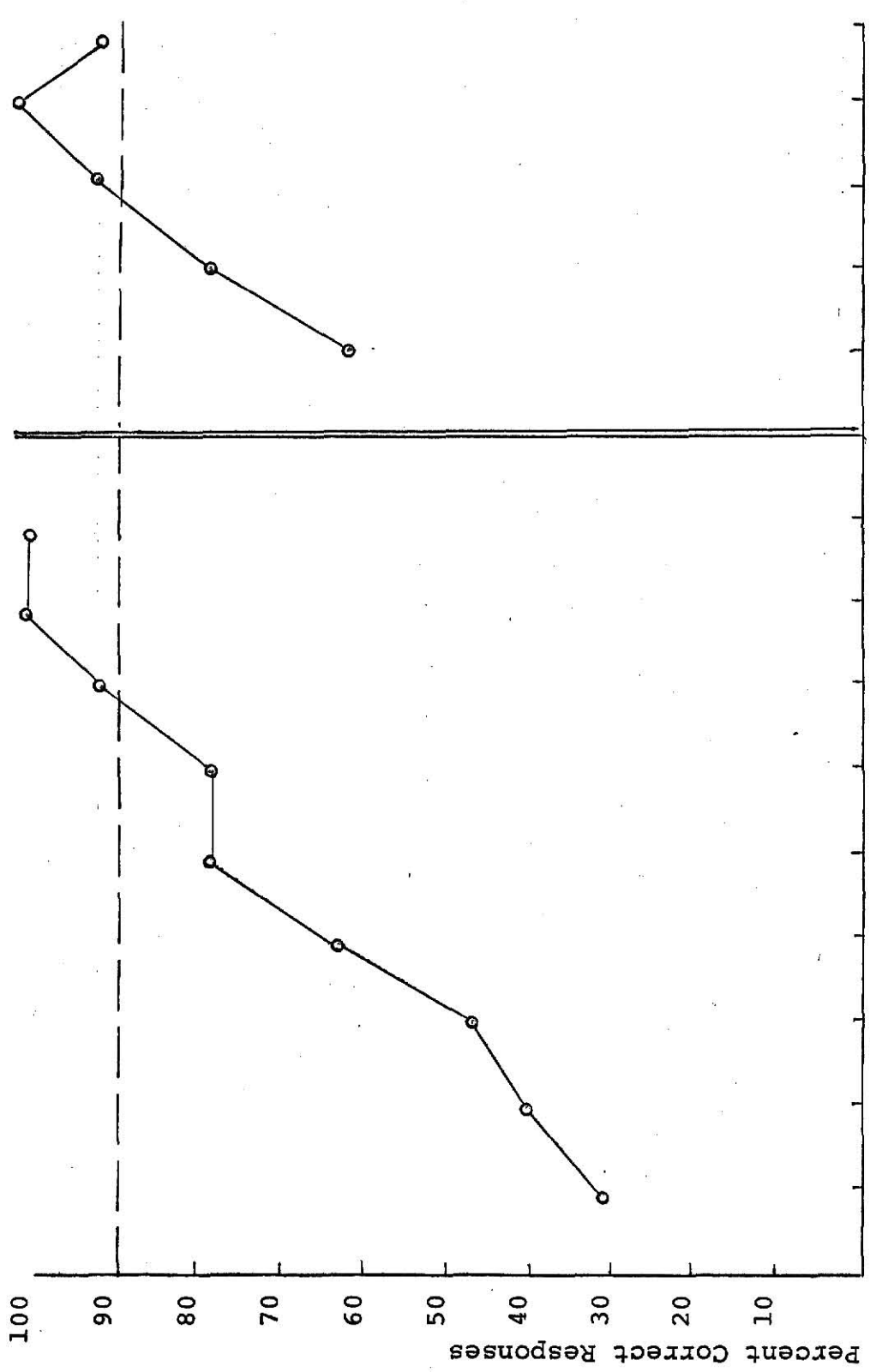

Figure 3. Percent Correct Responses During Training Sessions of Subject 3

TABLE VI

DATA FROM BASELINE AND PROBES OF SUBJECT 3:
CORRECT AND INCORRECT PRODUCTION OF PHONEME B, /h/

	Baseline	Train. A	Baseline	Baseline	Baseline	Baseline	Baseline	Train. B	Class 1 week	Unit 1 week	Class 2 weeks	Unit 2 weeks
Trained Pictures												
hip	o		x	x	o	x	x	x	x	x	x	x
hurt	o		x	x	x	o	x	x	x	x	x	x
helmet	o		o	x	x	o	x	o	x	x	x	x
look	o		x	x	x	x	o	x	x	x	x	x
hood	o		x	x	x	x	x	x	x	x	x	x
hay	o		x	x	x	x	x	x	x	x	x	x
hill	o		x	o	x	x	o	x	x	x	x	x
horns	o		x	x	x	x	x	o	x	x	x	x
hippo	x		x	x	x	x	x	o	x	x	x	x
heart	o		o	o	x	o	x	x	x	x	x	o
hole	o		x	x	x	x	x	x	x	x	x	x
hang	o		o	x	x	x	x	x	x	x	x	x
Halloween	o		o	o	o	o	o	o	x	x	x	x
Percent Correct	7		69	77	85	69	77	69	100	100	100	92
Untrained Pictures No Model Presented												
house	o		x	x	x	x	o	x	x	x	x	x
hammer	o		x	x	x	x	x	x	x	x	x	x
hand	o		x	o	o	o	x	o	x	o	o	o
hair	o		x	x	x	x	x	o	x	x	o	o
hat	o		x	x	x	x	o	x	x	x	o	x
happy	o		x	x	o	o	x	x	x	x	x	x
Percent Correct	0		100	83	67	67	67	67	100	83	50	67
Untrained Pictures Model Presented												
horse	o		x	x	x	o	o	x	x	x	x	x
hoe	o		x	x	x	x	x	x	x	x	x	x
hen	o		x	x	o	x	x	o	x	x	o	o
head	o		o	x	o	x	x	x	x	x	x	x
her	o		o	o	o	o	o	o	x	x	o	o
hop	o		x	x	x	x	x	x	x	x	x	x
Percent Correct	0		67	83	50	67	67	67	100	100	67	67
Total Percent Correct Phoneme B, /h/	4		72	80	68	68	72	68	100	96	80	80
Percent Correct Phoneme A, /t/	32		88	84	96	92	88	84	96	96	92	88

(x) correct phoneme production (o) incorrect phoneme production

for the 13-word block of stimulus pictures was 24. The results of the probes (Table VI) administered after training of phoneme B showed 100 percent and 96 percent generalization to the classroom and living unit respectively. A decrease to 80 percent correct responding was evidenced in the probes recorded two weeks after training. Most of the incorrect responses after training of phoneme B occurred in response to untrained picture stimuli.

CHAPTER IV

DISCUSSION

The immediate success in achieving generalization in the probe settings with all three subjects obviated the addition of a second trainer in the training environment. The resulting generalization was not concurrent with the prevailing theories that generalization needs to be programmed over time and settings or the "carryover strategies" suggested by speech clinicians as necessary in obtaining generalization. As a general rule, this study was in agreement with two recent studies with subjects of normal intelligence (Bankson, 1970 and Freilinger, 1973) which observed generalization in settions outside the training environment without benefit of programming such generalization. The training procedures and desired response utilized in both studies were different from those employed by this experimenter. Bankson trained by contingently reinforcing reading of a list of words in a prescribed interval of time if correctly produced; the probed response was correct production of the trained phoneme in conversational speech. Freilinger trained two groups of subjects using two different techniques--a paired-associates technique and a traditional Van Riper strategy. The probed response was conversational speech in the home environment. Although training procedures and desired response varied, the final result of generalization was similar in both studies to the results obtained in this investigation.

Linguistic theory offers the suggestion that distinctive feature analysis may hold the key to articulation errors and training (McReynolds, 1974). The fact that a specific phoneme is a composit of many features indicates that an omission or substitution of a specific feature will cause a misarticulated phoneme. Along the same line, it is assumed that by training a phoneme of specific features, a clinician enhances the ability of the subject to produce other phonemes containing the same specific features. Elbert et al. (1967) studied the effects of training for /s/ on the /z/ and /r/. Improvement was observed on the cognate of /s/, /z/, but not on the phonetically dissimilar /r/. In the present study, however, the sets of phonemes for S-1 and S-3 were phonetically dissimilar (/l/ and /r/; /t/ and /h/) but dramatic increase in baseline rate was observed in the /r/ and /h/ after training of /l/ and /t/. This may suggest to some that factors other than those of similar distinctive features influenced the results.

A possible explanation that may be drawn from the results of this study is that due to the training procedure used, the phenomenon of generalized imitation was observed rather that the generalization of a specific articulation topography. The training involved continuous reinforcement of the correctly produced phoneme following presentation of a model by E. Therefore, correct imitation of the model was also reinforced. This explanation is further substantiated by the sudden increase observed in the baseline rates of two of the untrained phonems (B) after training of the first phonemes (A). S-1

increased from 8 percent baseline rate prior to training of phoneme A to 76 percent baseline rate after training of phoneme A. S-3 increased in baseline rate from 4 percent to 72 percent. The baseline could, therefore, be viewed as a measure of the subjects' imitative behavior rather than soley articulation behavior. It is also interesting to note that S-2 was the only subject who was observed to have a zero baseline rate for either phoneme (/s/); that is, the articulation behavior of production of /s/ was not in S-2's repertoire of articulation topographies. This same phoneme was the only second phoneme not to be effected by training of phoneme A, indicating that generalized imitation may control imitative behaviors already present in the subject's repertoire but that new behaviors may require specific training for retarded children.

Numerous other variables may have aided in the success of generalization. The short duration of the response (one phoneme) and the density of reinforcement available for correct production enhanced the speed of training and undoubtedly influenced the amount of generalization observed. The stimulus cards from the training session were also used in the probe situations; however, novel stimuli were also introduced in the probes and showed high generalization. The tape recorder used in all probes was identical and definitely a variable which might aid in generalization.

There are many unanswered questions arising from this investigation which subsequent reaseach might seek to answer.

Whether the imitative model presented in training influenced the generalization more that a training procedure which did not utilize a model is not evident from this study. It is also unclear whether the imitative paradigm combined with reinforcement as a training procedure may override the influence of similar distinctive features on untrained phonemes. The use of a response different from the response trained in the training sessions, for example, conversational speech as opposed to picture naming, in the probe situations is another possibility to be explored.

Subsequent research may provide the clinician with the knowledge to understand the phenomenon of generalization. In this way the clinician's time could be used more effectively and efficiently, and it would not be necessary to rely on untested suggestions and hunches.

SUMMARY

Generalization of a newly trained response to environments outside the training environment has been considered a major problem by speech clinicians. The need to program this phenomenon has been empirically demonstrated with disruptive and social greeting behaviors in the applied behavior analysis literature. A multiple baseline design with probes for generalization was used in training three mentally retarded children at Kansas Neurological Institute. The probes were administered in the language class by the teacher and in the living unit by a neutral experimenter. After administering the Goldman-Fristoe Test of Articulation, E selected two misarticulated phonemes to be trained in picture naming for each subject. They were as follows: S-1, /l/ and /r/; S-2 /l/ and /s/; S-3, /t/ and /h/. Phoneme A was trained and phoneme B observed as a baseline, and after achieving generalization with phoneme A, phoneme B was trained. In the original design, a second E was to retrain each phoneme after E^1 had trained it to promote additional generalization; however, due to the exceedingly high rate of responding in probes of all three subjects after training by E^1, the second trainer was not introduced. Generalization was seen not only with trained picture stimuli but also with novel untrained picture stimuli both in the presence and absense of a model by the teacher or neutral experimenter. A high increase was also evidenced in the baseline rates of phoneme B in two of the three subjects after training of phoneme A and prior to training of phoneme B. These results may

indicate that not only was generalization achieved with these three subjects but that the trained articulation response was generalized from a specific topography to an imitation of the initial phoneme presented by E, the teacher, or a neutral experimenter.

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GENERALIZATION OF ARTICULATION TRAINING IN PICTURE NAMING WITH MENTAL RETARDATES

by

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B. S., Kansas State University, 1973

AN ABSTRACT OF A MASTER'S THESIS

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Generalization of a newly trained response to environments outside the training environment has been considered a major problem by speech clinicians. The need to program this phenomenon has been empirically demonstrated with disruptive and social greeting behaviors in the applied behavior analysis literature. A multiple baseline design with probes for generalization was used in training three mentally retarded children at Kansas Neurological Institute. The probes were administered in the language class by the teacher and in the living unit by a neutral experimenter. After administering the Goldman-Fristoe Test of Articulation, E selected two misarticulated phonemes to be trained in picture naming for each subject. They were as follows: S-1, /l/ and /r/; S-2, /l/ and /s/; S-3, /t/ and /h/. Phoneme A was trained and phoneme B observed as a baseline, and after achieving generalization with phoneme A, phoneme B was trained. In the original design, a second E was to retrain each phoneme after E^1 had trained it to promote additional generalization; however, due to the exceedingly high rate of responding in probes of all three subjects after training by E^1, the second trainer was not introduced. Generalization was seen not only with trained picture stimuli but also with novel untrained stimuli both in the presence and absense of a model by the teacher or neutral experimenter. A high increase was also evidenced in the baseline rates of phoneme B in two of the three subjects after training of phoneme A and prior to training of phoneme B. These results may indicate that not only was generalization

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