THE UNIVERSITY OF MANITOBA

A COMPARISON OF THREE METHODS OF WORD IMITATION TRAINING

WITH DOWN'S SYNDROME CHILDREN UNDER SIX YEARS OF AGE

by

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ABSTRACT

The present study had two main purposes: first, to compare the

relative effectiveness of three procedures for teaching verbal imitat-

ion skills to young non-institutionalized children; and second, to

determine if a procedure for teaching word imitation can have a facili-

tating effect on the later acquisition of more functional language

skills.

The subjects were six Down's Syndrome children between the ages

of 2½ - 6. All were participating in an early education project in

an elementary school, and all but one were residing at home. The

children were each taught to imitate a minimum of 10 functional nouns.

The nouns were taught, two at a time, in one of three possible condi-

tions. Approximately the same number of nouns were taught in each

condition.

The conditions were as follows: Imitation Alone in which the

child was taught to imitate a noun after presentation of the stimulus

word; Imitation plus Prompts in which the child was taught to imitate

a stimulus word while physical and verbal prompts were systematically

faded out; and Imitation plus Signs in which the child was taught to

imitate a stimulus word paired with the appropriate manual sign. The

object appropriate to the stimulus word was present in all three con-

ditions.

The relative effectiveness of the three procedures was judged

on the basis of the average trials to criterion for words learned,

generalization of words learned to a new setting and a new teacher, and maintenance of words learned over a minimum of 5 weeks. In addition, daily probes were presented in each of the conditions in order to determine the generalization of each procedure to untaught items.

Following this study, the children were placed on a language program designed by Guess, Sailor and Baer (1976). Trials to criterion for Step 1 and Step 2 of this program were examined to determine if prior imitation training might have a facilitating effect on the acquisition of functional language.

Results indicated that the overall most effective procedure to teach verbal imitation to these children was the simplest procedure - Imitation Alone. However, individual results varied from child to child. All three procedures were effective on the basis of generalization and maintenance data.

Results also indicated that the imitation procedures, taken as a whole, had a facilitating effect on the later acquisition of labelling and receptive language skills as assessed by performance on Steps 1 and 2 of the Guess, Sailor and Baer Language Program.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

viii.

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

The development of language skills is a primary concern of educators and researchers in the field of Mental Retardation. This is not at all surprising, given the high incidence of language disorders in the retarded population and the importance of language in many areas of human endeavor.

Specific approaches to the study of language acquisition with the retarded are many and cut across a variety of disciplines. Bricker and Bricker (1974) suggested an integration of the best features of the various approaches within an applied behavior analysis framework: linguistic theory could specify the content or "what" of the instructional program while an applied behavior analysis framework could specify the instructional procedure.

The following research is concerned with the instructional programming of language skills and will deal mainly with an applied behavior analysis approach to language acquisition. Studies employing operant conditioning procedures to teach language skills are certainly not new. Given the premise that verbal behavior, like any other behavior, is under environmental control (Skinner, 1957), language training has been conducted with a variety of subjects including psychotics (Sherman, 1965; Isaacs, Thomas & Goldiamond, 1960), autistic children (Martin, England, Kaprowy, Kilgour & Pilek, 1968; McLean & McLean, 1974), severely retarded children (Guess, Sailor, Rutherford & Baer, 1968; Stephens, Pear, Wray & Jackson, 1975), and mildly

retarded children (Bondy & Erickson, 1976).

In a recent review of language training strategies for the retarded, Snyder, Lovitt and Smith (1975) came to four significant conclusions:

1. There is a need for increasing emphasis on antecedent conditions in language research.

2. More attention must be paid to variables affecting maintenance and generalization of language skills.

3. There is a need for investigation of younger subjects (under 8 years of age) in non-institutional settings.

4. There should be increased consideration of a broad range of reinforcing contingencies.

The following research was concerned with the development of a verbal imitative repertoire in non-verbal children and attempted to deal with the first three points. Verbal imitation may be considered as an antecedent condition to functional language acquisition. Maintenance and generalization data was collected on three methods of training verbal imitation. Finally, all of the children were under 6 years of age and all but one resided at home.

CHAPTER II

REVIEW OF THE LITERATURE

A. The Role of Imitation in Language Training

Language acquisition has been considered as either a comprehension-based or imitation-based process (Holdgrafer, 1975). One group of researchers in the area of language acquisition maintain that children do not learn generative or rule-governed verbal behavior through imitation of adult models. Slobin (1968) noted that children learned verbal behavior that they could not have heard before (usually involving the application of misrules, e.g., "goed" instead of "went"). He concluded that something other than imitation must have been involved in that instance of learning. Slobin and others are of the opinion that normal children learn language through comprehension of their parents' speech. Children come "pre-wired" or pre-disposed to extract rules from the language of those about them, then apply these rules to novel instances.

Within the applied behavior analysis framework, a comprehension-based view of language acquisition is not acceptable for at least two reasons. In the first place, if a child is indeed "pre-wired" to extract rules from his environment, then little can be done for the child who fails to learn language. These children may be viewed as permanently barred from acquiring language, since they lack a genetic makeup for language development (Guess, Sailor & Baer, in press). This does not seem to be a viable attitude for anyone in the business of teaching language to language-deficient children. In the second

place, it has been demonstrated that generative speech may be taught

as a direct result of imitation training (Schumaker & Sherman, 1970;

Sailor, 1971; Clark & Sherman, 1975).

Bricker and Bricker (1974) and Rees (1975) labelled issues such

as "language as a comprehension-based process vs. an imitation-based

process" as pseudo-issues. If everyone could agree that imitation

may not be a necessary condition in normal language acquisition but

it may be an effective tool in teaching language production to lang-

uage-deficient children, then all concerned could concentrate their

efforts on developing effective language intervention programs. This

author is in complete agreement with the latter position. Imitation

training is an effective technique for remediating language deficien-

cies and research to support this position is presented in the fol-

lowing section.

B. Imitation Research

Imitation training has been used for some time as an effective

technique for remediating language deficiencies (Garcia & DeHaven,

1974; Snyder et al., 1975; Rees, 1975). These authors agree that

imitation training is the precursor to functional speech for non-

verbal individuals. Guess et al. (in press) found that of all entry

skills to their language program, verbal imitation skill was the

highest predictor of success in training. Approximately 40% of the

children who entered the program with no verbal imitation skills

failed to progress through the steps of the language program. Of

the 60% who progressed through the steps, the majority required

nearly two years of imitation training before acquiring generalized
verbal imitation skills. It seems clear that the importance of imi-
tation training in language development cannot be overestimated.

Guess, Sailor and Baer (1974) specified three major procedures
for developing imitative speech in essentially non-verbal children:

1. consecutive motor and vocal imitation;

2. concurrent motor and vocal imitation;

3. direct vocal imitation.

The behavioral research in the area of verbal imitation training will
be presented using the above three categories as a format.

1. Consecutive Motor and Vocal Imitation Training

In this procedure, the child is trained to imitate a number of
gross and fine motor behaviors prior to working on verbal imitation.
The number of gross motor behaviors trained prior to vocal training
varies with the researchers. Baer, Peterson and Sherman (1967) train-
ed over 100 motor imitations, some of them very complex, before moving
on to sound imitation; Bricker and Bricker (1970) trained 20 gross
motor imitations and an unspecified number of fine motor imitations
before moving on to sounds; Kysela, Daly, Hillyard, McDonald, Butt,
Ahlsten, McDonald and Smith (1976) trained only four gross motor imi-
tations and four fine motor imitations before moving on to sounds.
To date, no research could be found that would suggest an optimal
number of motor behaviors to train prior to introducing the child to
vocal imitation training.

In a recent review of teacher modelling and student imitation,

York, Williams and Brown (1976) found that nine out of the 10 language programs studied began initial speech training with motor imitation training. The subjects involved in these language programs were non-verbal prior to speech training and motor imitation training provided a good starting point, so that in the beginning, they experienced some success in the language training environment.

There are some who question the validity of training motor imitation prior to vocal imitation, since there is no evidence that generalized motor imitation skills will facilitate the acquisition of vocal imitation skills. Garcia, Baer and Firestone (1971) conducted a study to determine whether or not motor imitation training would generalize to the learning of vocal imitative responses. They found that motor imitation training generalized to similar untaught motor responses, but it did not generalize to vocal imitation responses. However, Guess et al. (1974) pointed out that the motor imitation training conducted prior to the vocal training may facilitate the learning of vocal responses even though no direct generalization from the motor training may be traced.

The consecutive approach to the training of vocal imitative behavior may be a slow and frustrating process, depending upon the number of motor behaviors taught and the skill of the teacher and teaching program. The transition from motor imitation to vocal imitation is rarely an easy one, and some children never make this transition.

  2. Concurrent Motor and Vocal Imitation Training

In concurrent imitation training, the vocal imitation training does not follow the motor imitation training. The two are carried on simultaneously. There are at least two ways to concurrently train motor and vocal imitation. The first method pairs motor imitation with vocal imitation with the hope that the motor response will act as a facilitator to the vocal imitation. Baer et al. (1967) taught a severely retarded girl to imitate sounds by imbedding a vocal response in a chain of imitative motor responses that the girl had already learned. In a more recent study, Stewart (1972) taught nonverbal preschool retarded children to imitate a gross motor response (e.g., raising an arm) paired with a vocal response (e.g., the word "arm"). In the first condition only the imitative motor response was reinforced regardless of whether or not the child accompanied the motor response with a vocal response. In the second condition, the imitation of motor and/or vocal behavior was reinforced. The author concluded that one should reinforce any verbal behavior emitted during imitative motor training or the verbal responses would extinguish during training sessions and would be more difficult to train later. These two studies represent a form of concurrent imitation training in which the motor and vocal responses are taught simultaneously or almost simultaneously imbedded in the same response chain.

A more common form of concurrent imitation training pairs the vocal response with a manual gesture or sign corresponding to that verbal response. Teachers of the deaf have known about this procedure for some time and refer to it as "total communication" (Stuckless & Birch, 1966). The spoken word and the manual sign corresponding to

that word are always paired during language training, hence the term "total communication".

Fouts (1972) brought sign language out of the domain of deaf education when he demonstrated that sign language could be taught to a chimpanzee. At about the same time, Bricker (1972) used sign language as a facilitator for receptive language training with "low functioning children". The manual sign for an object was paired with the object and the verbal label of the object prior to the child responding on a two-choice discrimination problem. For example, the teacher would show a toy rake, say "rake", and complete the manual sign for rake. The child was then required to point to the rake out of a possible two objects. Bricker concluded that the inclusion of the manual sign facilitated the discrimination in this receptive language procedure.

Manual signs have also been used concurrently with verbal behavior to facilitate expressive language development. A number of studies have been done using the "total communication" approach to teach expressive speech to non-verbal autistic children (Fulwiler & Fouts, 1976; Bonvillian & Nelson, 1976). In all of the studies encountered, the manual sign was taught using fading and shaping procedures until the child would consistently imitate any sign demonstrated. During training the approximate verbal response always accompanied the manual sign. For example, the teacher might say "car", move her hands in front of her as though she were steering a car, and then give the necessary prompts until the child imitated the sign. Closer and closer approximations to the desired response would be reinforced, and the

teacher would gradually fade out all prompts until the child would imitate the sign without the use of guidance. Some studies reported that the children not only learned to functionally use manual signs for communication using this procedure, but they also began to imitate the words accompanying the signs (Miller & Miller, 1973; Fulwiler & Fouts, 1976). As soon as a child began to imitate the word accompanying the sign, the sign was gradually faded out, until the child responded to verbal imitation. Other studies have indicated that the children learned to imitate the manual signs and use them expressively, but they failed to learn to imitate the accompanying words (Webster, McPherson & Sloman, 1973; Bonvillian & Nelson, 1976). In these studies manual signing was viewed as an alternate method of communication training for the children, although the authors continued to use the verbal responses in the hopes that the children would one day begin to imitate the words.

Concurrent manual sign and vocalization training has also been used successfully with retarded children (Owens & Harper, 1971). As with the autistic children, some children were reported to learn verbal imitative skills as well as the manual signs following concurrent imitation training (Stremel-Campbell, Cantrell & Halle, 1976; Grinnell, Detamore & Lippke, 1976). Other children appeared to learn only the imitative manual signs (Topper, 1975; Kopchick, Romback & Smilovitz, 1975).

The general concensus seems to be that the manual signs used in concurrent manual sign and verbal training may serve to facilitate the

imitation of verbal responses for some children, and in all cases, do not interfere with the development of verbal speech (Snell, 1974; Larson, 1971; Stremel-Campbell et al., 1976). This is in agreement with some of the research conducted on the use of "total communication" with the deaf. Stuckless and Birch (1966) found that the intelligibility of speech of deaf children using a total communication approach did not differ significantly from deaf children who were not taught sign language but only verbal communication skills. Concurrent manual sign and verbal imitation training, then, appears to facilitate the development of a verbal repertoire in some children, and serves to give other children a method of communication to be used until such time as a verbal repertoire develops.

A second method of concurrent motor/verbal imitation involves the simultaneous though separate training of imitative motor and verbal responses. Daly, Doxsey-Whitfield, Hillyard, McDonald, McDonald, Taylor and Kysela (1976) used such a procedure to teach verbal imitation skills to young retarded children under six years of age. During imitation training, one gross motor response was presented on a randomly-alternating schedule with one verbal response (sound). For example, a child might be working on the imitative motor response "push car" at the same time that he was working on the sound "oh". During a session, the action and the sound would be randomly alternated on a schedule posted on the data sheet. The number of gross motor imitative responses learned during sessions was not important. As soon as a motor response reached criterion, it was replaced by

another motor response. However, as soon as the child reached criterion on a sound, all motor training was eliminated from the language sessions and the child began to work on two sound imitations. This method of concurrent training appears to be a short cut procedure. Children taught verbal imitation using this procedure had fewer trials to criterion than similar children taught to imitate motor and verbal responses consecutively (Daly et al., 1976).

To summarize the concurrent method of teaching verbal imitation, this procedure involves either the simultaneous training of a verbal and motor response (may or may not be a manual sign) where the verbal response is paired with the motor response and the motor response is gradually faded out; or, the simultaneous training of a verbal and a motor response where the verbal and motor responses are taught at the same time but separately and the motor responses are eliminated as soon as the student begins to imitate verbal responses. As with consecutive imitation training, concurrent imitation training has been used mainly with children who have little or no vocal behavior and are essentially non-verbal prior to training.

3. Direct Vocal Imitation Training

The final procedure for developing imitative speech to be discussed is direct vocal imitation training. This procedure completely bypasses the training of imitative motor behavior and moves directly to vocal imitation training. Unlike the first two procedures, direct vocal imitation training is used mostly with children who already have some verbal skills. The problem with these children is to bring these

verbal skills under imitative stimulus control. Two studies (Risley & Wolf, 1967; Lovaas, Berberich, Perloff & Schaeffer, 1968) were conducted with echolalic autistic children and both were successful in bringing vocal behavior under imitative control. Additional studies involving verbal imitation training attempted to teach such skills as verbal inflections (Schumaker & Sherman, 1970), question asking (Twardosz & Baer, 1973; Bondy & Erickson, 1976), descriptive sentence usage (Lutzker & Sherman, 1974; Garcia, Guess & Byrnes, 1973), correct articulation (Bennett & Ling, 1972), and size and color adjectives (Martin, 1975). The children in these studies were retarded, "normal", hearing impaired, autistic, and disadvantaged. In all cases, the imitative training was used to teach the subject the required response so that the response could then come under control of more natural contingencies without imitative prompts.

York et al. (1976) found only one language program out of the ten reviewed that bypassed motor imitation training and moved directly on to vocal imitation.

It appears that the direct vocal imitation training is only done with an already-verbal population. This is in contrast with the first two methods of verbal imitation training which were used with essentially non-verbal children.

At this point in time, although there has been substantial literature on the role of imitation in speech training and on the three methods of developing imitative speech, there has been little research on specific variables involved in imitation training. Most studies

have mentioned the fact that shaping and fading procedures were used

to teach the imitative behavior (Garcia & DeHaven, 1974). Striefle

(1974) broke down the shaping and fading procedures into discreet

steps. Unfortunately, no one to date has compared various shaping

and fading procedures in order to find the most economical way of

teaching a child to imitate.

Several studies have attempted to analyse the components of

imitation training. Schroeder and Baer (1972) compared the efficiency

of training single words to criterion during imitation training, vs.

training three words concurrently. They found that there was no

difference in the total number of trials to criterion for the two

methods, however, concurrent training had consistently better probe

accuracy than serial training. Risley and Reynolds (1970) conducted

a study with six disadvantaged children. The children were required

to imitate short sentences in which varying numbers of words were

emphasized. They found that the children were more likely to imitate

the words that were emphasized than the words that were not emphasized,

especially when only a few words were emphasized. Carpenter (1976)

compared acquisition rates of motor imitation items with and without

manipulable consequences. He found that the subjects were more likely

to imitate a motor response that involved manipulation of an object

than a response of a similar topography which did not involve object

manipulation. Garcia and Trujillo (1977) systematically removed ex-

perimenter facial orientation during imitative training. They found

that the imitative responses of their subjects was dependent upon the

presence of experimenter facial orientation.

The studies presented above give some valuable clues to efficient methods of teaching motor and verbal imitation. If a motor response is being trained, as many of the responses as possible should involve object manipulation and responses should perhaps be taught concurrently rather than sequentially. If a verbal response is being taught, the specific verbal response desired should be stressed. In addition, teacher facial orientation to the student at all times is probably a necessary component in the imitative training procedure whether the response is motor or verbal. It is hoped that more studies of this nature will be forthcoming in the near future.

CHAPTER III

STATEMENT OF THE PROBLEM

The major purpose of this study was to investigate the relative effectiveness of three procedures to teach word imitation to six non-institutionalized Down's Syndrome children under six years of age. The first procedure was an imitation procedure with no additional cues other than the appropriate object being present during training. The second procedure was identical to the first with the addition of a manual sign as a facilitator to the acquisition of verbal imitation skills. The final procedure included fading of additional verbal and physical cues, in addition to the presence of the appropriate object during training. The relative effectiveness of each procedure was determined on the basis of average trials to criterion for words learned, generalization of words learned to a new teacher and a new setting, and long term maintenance of words learned. In addition, the generalization to untaught probes was examined for each procedure.

The second purpose of this study was to determine if a particular imitation procecure could have a facilitating effect on the subsequent acquisition of more functional language, namely labelling and receptive language skills as assessed by the first and second steps of the Guess, Sailor, and Baer (1976) Language Program.

CHAPTER IV

METHOD

Subjects

Six Down's Syndrome children between the ages of 2½ and 6 served
as subjects. All but one resided at home, and all attended a special
classroom in an elementary school four to five half days per week.
Prior to the start of the classroom program in November, 1975, only
one of the children, Danny, had been involved in a program. Danny
received an individual language session at a university clinic one
hour per week and a group language session with two other children
once a week.

Over the course of the first year of classroom training, the
children had learned a variety of self-help, motor, cognitive, soc-
ialization, and language skills (Daly et al., 1976). In the area of
language, all children had learned to imitate gestures, sounds, and
a minimum of two words in individual language sessions. As soon as
a child learned to imitate his/her second word in the language ses-
sion, he/she immediately was eligible for this study. In addition
to the above skills, the children had been taught to sit quietly at
a table or desk and attend to an "attending signal" (Becker, Engle-
man & Thomas, 1975). The teacher gave the attending signal by saying,
"(Child's name), look" and placing her left hand next to her face
with the palm outward. All children had been responding consistent-
ly to the attending signal for a minimum of eight months prior to
this study. At the time of this study, the "hand component" of the

attending signal had been faded out and the children were attending
to their name plus the instruction "Look". Table 1 summarizes the

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Insert Table 1 about here

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normative assessment results of the children.

Materials

Experimental sessions were conducted in a separate area of the
classroom enclosed on three sides by a wall and two 4-foot high room
dividers. The fourth side, which faced away from the other children
in the room, remained open so that the sessions could be videotaped
for inter-observer reliability checks. Dimensions of the area were
approximately 1.3 m by 1.3 m.

The child sat on an adult-size straight-back chair facing the
teacher. The teacher sat on a child-size chair directly opposite
the child so that both the teacher and the child were at the same
eye level. Primary reinforcers were kept on a small table to the
teacher's right. The data sheets were kept either on the same
table as the reinforcers or in a binder on the teacher's lap. Ob-
jects used during the imitation training were kept in a small box
out of the child's view when not in use, and kept in the teacher's
lap during a trial. Sessions of 10-minute duration were timed with
a conventional stop watch.

Procedure

Baseline. Prior to the experimental condition, the children

Table 1

Normative Assessment Results

| Name | Test 1 | | | Test 2 | | | Test 3 | | | Change from Tests 1-3 | |
	CA	MD	MD/CA	CA	MD	MD/CA	CA	MD	MD/CA	CA	MD
Shannon	59	14	.24	67	17	.25	72	22*	.30	13	8
Patrick	21	12	.57	30	19	.63	35	24*	.69	14	12
Robert	31	14	.45	37	19	.51	42	19	.45	11	5
Danny	60	–	–	66	22	.33	68	28*	.41	8	6
Tracy	35	18	.51	41	–	–	47	27*	.57	12	9
Gordie	22	10	.45	30	19	.63	36	23	.63	14	13
$\overline{X}$	38	14	.44	45	19	.47	50	24	.51	12	9

CA — Chronological Age in Months

MD — Mental Development Age Equivalents in Months from the Baley Scales of Infant Development

MD/CA — Ratio of Mental Development Age to Chronological Age

* — Indicates mental age equivalent from Stanford-Binet Intelligence Scale, L – M, (1960 Norms)

were tested on 30 functional one and two syllable nouns. A list of

30 nouns appears in Table 2. A functional noun was defined as any

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Insert Table 2 about here

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noun representing an object that might be intrinsically reinforcing

to the child (e.g., candy), or an object that was present in the

classroom and/or home (e.g., table, hat, dog).

The 30 nouns were tested in a random order on three separate

occasions over a period of three to five days. For each trial, the

teacher gave the attending signal as previously described, then gave

the instruction (e.g., "Say ball"), while holding up the appropriate

object (a ball). The children were not reinforced for correct imi-

tative responses, but were reinforced after every fifth response for

other appropriate behavior. The teacher recorded correct responses,

incorrect responses, no responses, and approximations. An approxi-

mation was scored if the child responded with any part of the stimu-

lus word (e.g., "all" for "ball"). The teacher recorded the exact

approximation that she heard. A word was not taught during the ex-

perimental condition if the child made at least one correct imitative

response to the stimulus word, or if the child made three consistent

approximations to the stimulus word.

General Procedure. The 30 functional nouns were randomly assign-

ed to three pools of ten words, ensuring that there were an equal

number of two syllable words in each pool (see Table 2). The three

Table 2

30 Functional Nouns

Pool 1	Pool 2	Pool 3
1. doll	1. juice	1. pen
2. ball	2. boat	2. soap
3. cup	3. hat	3. bed
4. chair	4. spoon	4. fork
5. knife	5. book	5. car
6. shoe	6. sock	6. horse
7. cat	7. dog	7. egg
8. apple	8. baby	8. candy
9. cookie	9. flower	9. table
10. button	10. wagon	10. cracker

pools of words and the three experimental conditions were counter-
balanced across subjects (see Table 3).

Insert Table 3 about here

Two of the three conditions were randomly selected for each
child to begin training. The child then began working on two words
simultaneously, each randomly chosen from the pool associated with
the two conditions chosen. For example, if condition 2 and condition
3 were randomly chosen for Gordie, then one word from pool 1 and one
word from pool 2 would be chosen for initial training. The teacher
chose a word by drawing a piece of paper out of the appropriate pool
of ten words written on individual slips of paper. If a word chosen
for a particular child was ineligible for training because it had
been correctly imitated or consistently approximated during the
baseline, the word was replaced and another slip of paper was drawn.
If the two words chosen were phonetically very similar (e.g., "hat"
and "cat"), one word was replaced with another word from the same
pool that was not phonetically similar (e.g., "ball" to replace "cat").

Each time a word reached criterion, the teacher randomly select-
ed one of the three conditions and replaced the criterion word with
a word from the pool appropriate to the new condition. For example,
if Shannon was working on a word from condition 1 and that word
reached criterion, the teacher might randomly select condition 3 to
replace condition 1. She would then replace the criterion word with

Table 3

Assignment of Word Pools to Conditions Across Children

Conditions

Name	Condition 1 Imitation Alone	Condition 2 Imitation & Signs	Condition 3 Imitation & Prompts
Shannon	Pool 1	Pool 2	Pool 3
Tracy	Pool 2	Pool 3	Pool 1
Gordie	Pool 3	Pool 1	Pool 2
Danny	Pool 3	Pool 2	Pool 1
Patrick	Pool 1	Pool 3	Pool 2
Robert	Pool 2	Pool 1	Pool 3

a word randomly selected from pool 3 (the appropriate pool for condition 3 for Shannon).

The following constraint was in effect. For each group of five words worked on for a particular child, there could be no more than two words from any one condition. If a condition was drawn more than twice in a series of five words, the teacher would draw again. This ensured that for each group of five words taught, two words were from each of two conditions, and one word was from the third condition.

A word was replaced during training only if the child failed to make a correct response or a consistent acceptable approximation over five consecutive sessions. If this occurred, the word was replaced by another word from the same pool and the condition being used remained unchanged. During the daily 10-minute sessions, the two words being taught were randomly alternated according to a prearranged schedule used by Guess et al. (1976). The schedule was printed directly on the data sheet. Each trial began with the attending signal. Once the child was attending, the teacher gave the instruction (e.g., "Say ball"), and held up the appropriate object (in this case a ball) in her left hand. Imitation training was given with the appropriate object present in all three conditions. Carpenter (1976) suggested that imitative behavior is acquired more rapidly with the appropriate object present, than when the object is not present. In addition, Guess et al. (1976) stressed the importance of making imitative response training as functional to the student as possible. When the child imitates a verbal label in the presence of the appropriate stimu-

lus object, he/she is receiving some receptive language training in addition to the expressive training.

Correct imitative responses made within 5 seconds of the instruction were reinforced with precise feedback (e.g., "Good, you said ball") and a primary reinforcer on a continuous schedule. If an incorrect response or no response occurred within 5 seconds, a trial rerun correction procedure similar to that suggested by Guess et al. (1976) was followed. The trial rerun was simply a representation of the trial with extra emphasis at the point of error (e.g., "Say ballllll" if the child had omitted the "l" in "ball"). If the child had already made at least one correct imitative response to that stimulus word, the rerun would be preceded by the word "No". Initially, when the child may be giving only unacceptable approximations, the conditioned aversive stimulus "No" was omitted to ensure that the rate of verbal responses was kept as high as possible. Hart and Risley (1975) stated that the rate of verbal responses must be kept as high as possible so that the teacher has as many opportunities as possible to differentially reinforce correct responses and approximations to correct responses.

The trial rerun data provided the teacher with a precise record of the nature of the errors being made. Each time the child made an approximation on the rerun, the teacher would record exactly what was heard. After ten consistent (though not necessarily consecutive) approximations to a word, the approximation would be considered a correct response from that time forward, as long as the approximation could be

distinguished from other words and approximations to words that the child had learned.

If at any time the child responded with a better approximation, he/she was required to give ten of the new approximations on the re-run before this response would be scored correct and the old approximation would no longer be acceptable. As soon as the child made a correct response (an exact match) to the stimulus word, no approximations were acceptable as correct responses. As a general rule of thumb for accepting approximations, a substitution was better than an omission, since the child indicated that he heard the sound in the initial or final position (e.g., "dat" is a better approximation than "at" for "cat"). If the child was making a variety of substitutions for a particular word, the teacher would choose one form of the word that could easily be distinguished from other words in the child's reper-toire and would reinforce only that approximation.

A summary sheet was filled out at the end of each session indi-cating the best approximation given that day for both words and the approximations that were to be extinguished from that day forward (see Table 4).

Insert Table 4 about here

In summary, correct responses (exact matches or consistent app-roximations after ten trials) were reinforced on a continuous sched-ule during both trial and reruns. Other approximations were reinforced

TABLE 4

Word Approximation Summary Sheet

Date	Word	Condition	Approximation	Consequence
2/2	ball	S	all	reinforce
			ah	extinguish
	cup	I	up	reinforce
3/2	ball	S	ball	reinforce
			all	extinguish
			ah	extinguish
	cup	I	(up)*	reinforce
5/2	ball	S	ball	reinforce
			all	extinguish
			ah	extinguish
	shoe	P	No acceptable approximation	
7/2	table	I	buble	reinforce
	shoe	P	oo	reinforce
8/2	table	I	table	reinforce
			buble	extinguish
	shoe	P	doo	reinforce
			ooo	extinguish

A change of word indicates that a word was learned on the previous day.

I - Imitation Alone Condition

P - Imitation Plus Prompts Condition

S - Imitation Plus Signs Condition

* A circles word indicates that there were 10 identical approximations on that day and from that time forward, that approximation would be considered a correct response.

during the reruns only if they were the best approximation for that particular word at that point in time.

Correct responses on the trial rerun were socially reinforced and primary reinforcers were delivered on a continuous schedule.

Teachers 1 and 2 conducted sessions with Shannon and Patrick; Teachers 3 and 4 conducted sessions with Danny; and Teachers 1, 2, 3 and 4 conducted sessions with Robert, Tracy and Gordie. This was necessary because the children were in three different classes with three different schedules. All four teachers received the same in-service training on the procedures in this study. Please refer to page 33 for a description of procedural reliability checks conducted throughout the study.

The Recording System. The data sheet used was a modified version of the MIMR Training Session Data Sheet developed by Martin, Murrell, Nicholson and Tallman (1975), (see Appendix A). Details of this recording system may be found in Appendix B.

Conditions. Condition 1 - Imitation Alone. This condition was identical to the general procedure previously described. The teacher gave the attending signal, then presented the instruction "Say ____" while holding up the appropriate object in her left hand. For example, once the child was attending, the teacher gave the instruction "Say car" and simultaneously held up a toy car in her left hand. No additional prompts or cues were given. A word reached criterion and was removed from the teaching session following three consecutive correct responses.

Condition 2 - Imitation plus Signs. This condition differs from condition 1 because of the addition of a manual sign as a facilitator in the teaching of verbal imitation. Manual signs were taken from Talk to the Deaf by Riekhof (1963). After gaining the child's attention, the teacher gave the instruction (e.g., "Say car"), simultaneously gave the manual sign for the word (in this case the hands move from side to side as if on an imaginary steering wheel), and finally held up the appropriate object (a car). The entire sequence took only about 1-2 seconds, so that the object followed the model almost immediately.

The manual sign served as an additional cue to the child, provided that the child was attending to the sign. No attempt was made to fade the manual sign out of this condition if the child began to imitate the sign as well as the word. Stremel-Campbell et al. (1976) indicated that subjects will drop the signs on their own as verbal responses become effective in producing reinforcers. The consequences (social, tangible, and primary) were only contingent upon the appropriate verbal response, and not upon the manual signs. A word reached criterion and was removed from teaching sessions after three consecutive correct responses.

Condition 3 - Imitation plus Prompts. In this condition, three levels of instruction were used to teach verbal imitative responses. Once the child was attending, the teacher gave the instruction plus relevant additional prompts described below, while simultaneously holding up the appropriate object. The levels of instruction used

were a modification of those used by Martin et al. (1975). The only

levels of instruction used in this study were those not involving

hands-on guidance (levels 3-5). These children would already attempt

to imitate words without the use of hands-on guidance. If a child had

trouble with a particular sound, physical guidance was sometimes given

during the retrial. For a complete description of the levels of guid-

ance, refer to Daly et al. (1976). The three levels of instruction used

were as follows:

> Level 3 - The teacher provided an instruction (e.g.,
>
> "Say ball") plus a verbal prompt ("You say it, ball")
>
> plus a physical prompt (the teacher pointed to the
>
> ball with her right hand). The entire sequence took
>
> no more than 2 seconds.
>
> Level 4 - The teacher provided an instruction (e.g.,
>
> "Say ball") plus a verbal prompt ("You say it, ball")
>
> while holding up the ball in her left hand. The ges-
>
> ture to the object was absent at this level. The
>
> entire sequence took no more than 2 seconds.
>
> Level 5 - The teacher provided the instruction (e.g.,
>
> "Say ball") while holding up the ball in her left
>
> hand.

The teacher began teaching each word in this condition at a level

3 and moved to the next level of instruction after three consecutive

correct responses. After three consecutive correct responses at a

level 3, the child moved to level 4; after three consecutive correct

responses at a level 4, the child moved to level 5; after three consecutive correct responses at a level 5, the word reached criterion and was removed from the teaching sessions. Correct responses at all three levels of instruction were reinforced on a continuous schedule (social and edible).

Following an incorrect response or no response within 5 seconds of the instruction, a trial rerun followed. Trial reruns were simply a representation of the trial at the level of instruction that was being worked on at the time of the error or no response. If the child was working at a level 4 of instruction and made a wrong response, the trial was repeated at a level 4 during the rerun. After the rerun procedure, the child was returned to the previous level of instruction. For example, he/she was required to reach criterion on level 3 again before resuming training at level 4.

A word reached criterion following three consecutive correct trials at a level 5. Level 5 instruction was equivalent to a correct response in both the Imitation Alone condition and the Imitation plus Signs condition (except for the presence of the sign). There was one exception to this rule for the Imitation plus Prompts condition. Occasionally, a child would imitate the stimulus word before the teacher had the opportunity to give additional cues appropriate to the level of instruction. For example, if the child was working on a level 4, the teacher would say "Say ball", and the child would respond "ball" before the teacher was able to give the verbal prompt "You say it, ball". If the child scored five responses at a level 5 (without prompts) even

though he/she had been working on another level of instruction, the word would reach criterion and would be removed from the teaching sessions. The above procedure was followed for this condition so that the child would not be penalized in this condition if he/she was able to imitate a stimulus word without the additional prompts at the beginning of training. If this procedure was not followed, a child might imitate a word on instruction alone for nine consecutive trials before reaching criterion (three at level 3; three at level 4; three at level 5).

Review

After a word reached criterion, it was placed on Review and was tested once at the beginning of each of the next five sessions. If the child responded correctly on at least four of the five days (over 80% correct), the word was moved on to Maintenance (discussed below). If the child failed to respond at 80% correct for a particular word, that word was returned to sessions and had to reach criterion once more. If the word failed on Review a second time, that word was eliminated from the results of this study. If the word passed Review the second time, the additional trials to criterion were added to the initial trials to criterion.

Maintenance

After a word reached criterion on Review, it was placed on Maintenance and tested once a week for five weeks. If the child responded correctly on at least four of the five maintenance checks, the word was considered learned.

Generalization Tests

Generalization Across Settings. Once a week, all of the words that had reached criterion, regardless of condition, were tested by the teacher in the free play area without edible reinforcers. Words that reached criterion in the signing condition were tested once with the sign and once without the sign. This was done to determine if the child still required the presence of the manual sign before the word would be imitated. Each word was tested on five separate occasions and then removed from generalization checks. A word was considered to have generalized if the child responded correctly on at least four of the five checks.

Generalization Across Teachers. A practicum student who was familiar with the children, but had never conducted language sessions, tested each child once on all words that had reached criterion. The student tested the children in a third area of the classroom and did not use edible reinforcers or manual signs. Prior to the testing of each child, the student was informed of the acceptable approximations for each word on the list, and the approximation was written under each word (if applicable). A teacher listened on random trials for each subject to ensure that the student was accepting the same approximations that the teachers had accepted.

Generalization to Untaught Probes. At the end of each language session, the teacher probed the child on two untaught words. Each of the words was taken from a pool appropriate to the condition of the words currently being worked on. For example, if Shannon was

working on one word from the Imitation Alone condition and one word

from the Imitation plus Signs condition, then she would be probed on

one untaught word from pool 1 and one untaught word from pool 2 (see

Table 3). When a word reached criterion and was replaced by a word

from another condition, one of the probe words was removed (the one

appropriate to the criterion word) and a new probe word appropriate

to the new condition became the new probe. Using this procedure, the

two words being probed reflected the conditions of the two words being

worked on during sessions. Probe words associated with the signing

condition were accompanied by the appropriate manual sign.

Inter-Observer Reliability

Reliability checks were taken on both dependent and independent

measures in this study. Reliability on dependent measures was taken

by the teachers themselves on approximately 10% of all sessions done.

A matrix was set up of all possible combinations of each teacher as

(1) experimenter conducting a reliability check, and (2) teacher con-

ducting the session. Twenty combinations were randomly chosen and

reliability checks were done accordingly. When a teacher did a relia-

biliby check, she sat off to one side of the session area and simul-

taneously recorded child responses on the same data sheet that the

teacher was using. After five minutes, the two sheets were compared

for perfect agreement on all dependent measures (including responses

made on the reruns and no responses). Reliability coefficients were

computed using the formula

$$\frac{\text{agreements}}{\text{agreements plus disagreements}} \text{ X } 100.$$

Reliability on dependent measures averaged 87% with a range from 60% to 100%. The 60% was extremely low compared to the other scores and resulted when a child had just started working on two new words and was making very gross approximations.

Reliability measures (or, more accutately, proficiency measures) were taken by independent observers using a video tape system and a recording form called the Behavior Analysis System (B.A.S.) developed by Kysela, Hillyard and Davis (1977). With the use of the video system, each of the teachers were scored on the accuracy with which they carried out the procedures specified in the three conditions. Types of errors that could be made using this scoring system included timing errors (the teacher waited too long between prompts or failed to hold up the object simultaneously when giving the stimulus word), inclusion errors (the teacher gave the manual sign, said the stimulus word, then pointed to the appropriate object in her hand), and exclusion errors (at a level 3 instruction the teacher gave the stimulus word and pointed to the object forgetting to include the verbal prompt). Proficiency data taken on the independent measures using the B.A.S. indicated that the teachers were procedurally correct 96.5% of the trials observed for the Imitation Alone condition. They were procedurally correct 86.5% of the observed trials for the Imitation plus Prompts condition, and 89.5% of the observed trials for the Imitation plus Signs condition. These results reflect the relative difficulty of carrying out the three procedures, since Imitation Alone was the simplest, Imitation plus Signs was more difficult because of the in-

clusion of the sign, and Imitation plus Prompts was most difficult

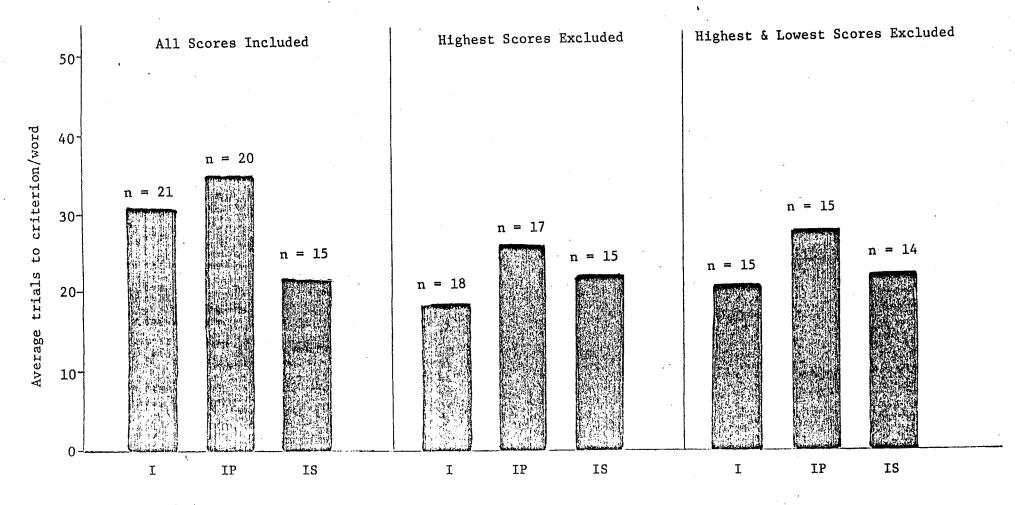because of the three levels of instruction within the procedure.

CHAPTER V

RESULTS

Trials to Criterion

The trials to criterion data for all children averaged over conditions is presented in Figure 1. The mean trials to criterion was

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Insert Figure 1 about here

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calculated three different ways in order to determine if extreme scores affected the outcome of the results: (a) including all scores for words learned in each condition; (b) excluding the single highest score for each child regardless of the condition in which the word was learned; and (c) excluding the single highest and single lowest scores for each child regardless of condition(s) in which the two words were learned. When all of the data was included, the Imitation plus Signs condition required fewer trials to criterion than the other two conditions. However, if the single highest score for each child was eliminated, the Imitation Alone condition required fewest trials to criterion. Finally, if the single highest and single lowest scores for each child was eliminated, the Imitation Alone and Imitation plus Signs condition required approximately the same number of trials to criterion. The only consistent result across the three calculations was that the Imitation plus Prompts condition always required slightly more trials to criterion. A Kolmogorov-Smirnov Two-Sample Test was carried out on the mean trials to criterion for the Imitation

Figure 1. Average trials to criterion across conditions computed three ways.

I — Imitation alone condition

IP — Imitation + prompts condition

IS — Imitation + signs condition

plus Signs and the Imitation Alone conditions; and for the Imitation plus Signs and the Imitation plus Prompts conditions. The three most extreme scores were eliminated from the tabulations (177, 100 and 96). There was no significant difference between the means at the .05 level for a two-tailed test.

Half of the children (Shannon, Robert, and Gordie) required fewest average trials to criterion in the Imitation plus Signs condition, however, only Gordie's data shows a relatively large difference in the average trials to criterion from the other two conditions (see Figure 2). This result held true whether or not the extreme scores

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Insert Figure 2 about here

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were included. It is interesting to note that of these three children, Robert never imitated the manual sign, and Gordie and Shannon did not learn a word in this condition until they stopped trying to imitate the sign. If the presence of the sign did have a facilitating effect for these children, it did not require that the childrem themselves imitate the sign, only that they attend to the teacher modelling the sign. The mean percentage of trials on which manual signs were imitated was 17% (see Table 5). In general, progressively

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Insert Table 5 about here

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smaller percentages of the signs were imitated with subsequent words

Figure 2. Children's trials to criterion per word across conditions.
White bars indicate words that reached criterion but
failed Review.

TABLE 5

Manual Sign Imitation

Subject	Words Learned in Order	% of Trials Signs Imitated	Mean % Trials Signs Imitated
Tracy	bed	27%	18%
	pen	26%	
	candy	7%	
	table	12%	
Shannon	wagon	79%	30%
	boat	39%	
	dog	0%	
	baby	0%	
Gordie	cracker	9%	
	cup	18%	
	ball	0%	5%
	shoe	0%	
	doll	0%	
Robert	apple	0%	
	cookie	0%	0%
	cat	0%	
	shoe	0%	
Patrick	horse	0%	
	table	5%	3%
	car	0%	
Danny	baby	74%	
	flower	43%	47%
	bird	27%	
	tree	44%	

$$\overline{x} = 17\%$$

in this condition (if the children started to imitate the signs). This
is not surprising since the children were never reinforced for manual
sign imitation.

Tracy required fewest average trials to criterion in the Imitat-
ion Alone condition and this remained unchanged when the extreme scores
were eliminated.

The remaining two children's results varied with the inclusion
of extreme scores. Danny required fewest average trials to criterion
in the Imitation Alone condition if one extremely high score (the first
word reaching criterion) was eliminated. Patrick's trials to criter-
ion were the most inconclusive of all the children and varied with
the inclusion of extreme scores.

There seemed to be no pattern to the type of errors that appear-
ed in the approximations of words reaching criterion. The children
did not tend to make more omission or substitution or combination
errors at any particular point in training. Instead, the type of
errors were randomly distributed over words reaching criterion for
all children.

Generalization Tests

Generalization to a new setting appeared to be independent of
the condition in which the word was taught. When the percentage of
words to a new setting for all children was averaged across all con-
ditions, Imitation plus Prompts condition shows slightly better
generalization; however, the difference in absolute percentages was
negligible since all three were over 80%. The individual results

indicated that generalization of a word to a different setting was
specific to the child. For example, Shannon failed to generalize
the first two words reaching criterion. Robert failed to generalize
to a new setting when signs were paired with the stimulus word in
the Imitation plus Signs condition, but did show generalization when
the same words were tested without the signs. Gordie and Danny gener-
alized all words reaching criterion to a new setting. Tracy and Pat-
rick each failed to generalize one word. In both cases, the word
had been difficult to teach and the child returned to an unacceptable
approximation during generalization testing.

All children but Tracy and Shannon showed 100% generalization to
a new teacher in a new setting. Both children failed to generalize
one word learned in the Imitation plus Signs condition. The fact
that the new teacher did not use the manual signs with the stimulus
word during testing in this condition may or may not have affected
the generalization results since both children did generalize other
words learned in this condition with the new teacher, even though
the manual signs were absent. Danny did not receive a generalization
check with a new teacher because she left before Danny had completed
his sessions.

Generalization to untaught probes was virtually non-existent
since none of the children reached criterion on a probe word (three
consecutive correct responses).

Maintenance

As with generalization, maintenance of learned words was over

80% regardless of the specific condition in which the words were
taught. Three of the children maintained all of the words learned
for a minimum of five weeks. Robert and Gordie each failed to main-
tain one word in the Imitation Alone condition, and Tracy failed to
maintain one word in the Imitation plus Signs condition. All of the
children maintained all words learned in the Imitation plus Prompts
condition.

Words Eliminated from the Study

Words were eliminated from this study for the following two rea-
sons: (1) the child failed to make an acceptable response to the
word for five consecutive sessions; (2) the child failed to achieve
80% on Review for the second time.

Words were eliminated for the first reason in all three conditions.
Danny and Robert both had a great deal of difficulty learning words
in the Imitation plus Prompts condition and both had four words elim-
inated after five days of no acceptable approximations. Danny also
had three words eliminated in the Imitation plus Signs condition for
the same reason. In general, Danny had the most difficulty reaching
criterion on words, regardless of condition in spite of the fact that
he was receiving speech training in a clinic prior to this study and
throughout the course of this study. The remaining four children
had one or two words eliminated in each of the three conditions be-
cause they were giving an approximation that they had already used
for another word (e.g., "at" for "cat" after reaching criterion on
"at" for "hat"), or the word used proved too difficult (e.g., "fork"

for Gordie).

Danny, Robert, and Patrick each failed to pass one word on their second try at Review. Danny's word was in the Imitation plus Signs condition and it was previously mentioned that he had difficulty learning words in that condition. The same was true for Robert who lost one word in the Imitation plus Prompts condition. Patrick lost one word in the Imitation Alone condition when he began to say "dog" when a toy cat was held up even though he had previously correctly imitated the word "cat" with the approximation "dat".

Learning to Learn Effect

There appeared to be a "learning to learn" effect with only two of the six children. Figure 3 shows that the number of trials to

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Insert Figure 3 about here

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criterion for words learned follows a general downward trend regard-less of the condition in which the words were learned for both Danny and Shannon. The other children do not show this trend in their data. There are at least twice as many trials to criterion for the first word learned averaged across children, however, there is no orderly downward trend for words 1-10 averaged across children.

When words learned are looked at in the order in which they were learned over time for each child, the children took a much longer time to learn the first five words than they did to learn the last five words (see Figure 4). The only exception is Danny. He had a 12-week
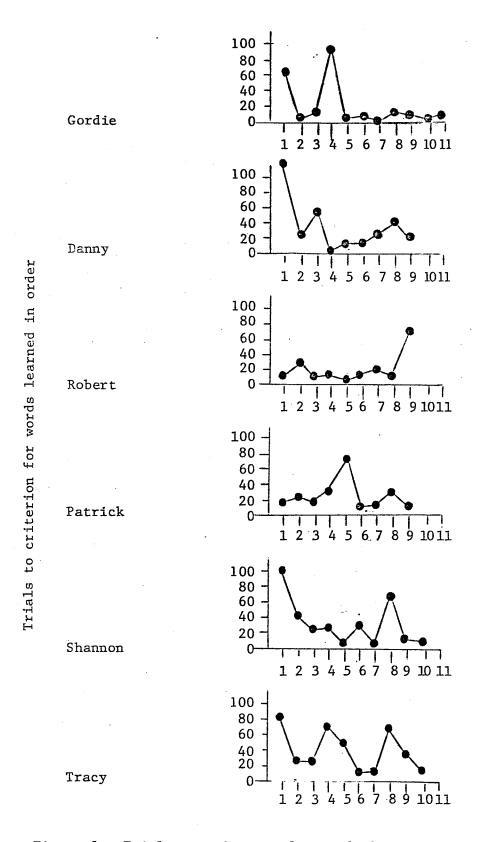
45.

Figure 3.   Trials to criterion for words learned in order
            for all children.

Insert Figure 4 about here

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period at the end of training in which no words reached criterion.

Danny was quite sick during this interval and received only half as

many sessions as he did during the first 14 weeks of sessions. In

addition, Figure 4 indicated that children tended to require retrain-

ing on a word or experienced a word that could not be retrained either

at the beginning of training (Shannon and Robert) or at times when

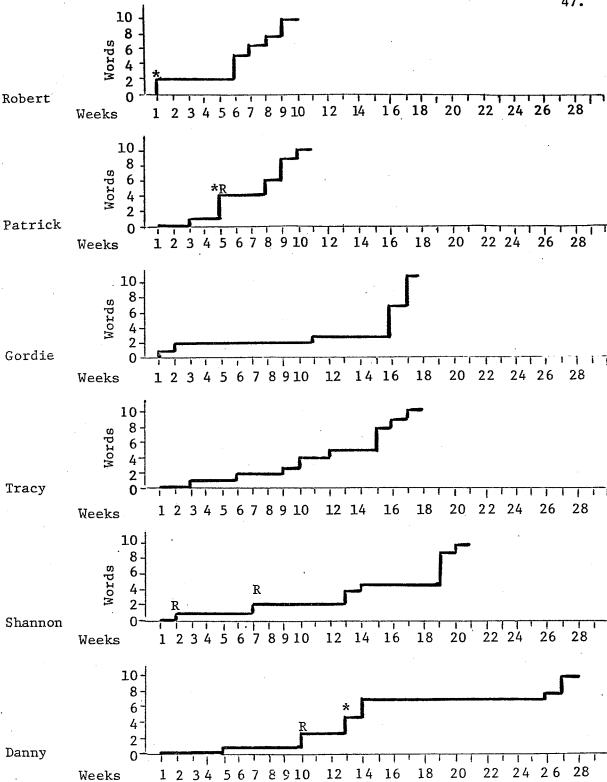more than one word was learned in a short period of time (Patrick

and Danny).

Facilitating Effect for Labelling and Receptive Language Skills

The verbal imitation program as a whole seemed to have had a

facilitating effect on the learning of Steps 1 and 2 of the Guess,

Sailor and Baer (1976) Language Program. This program was not a part

of this study, however, sessions were carried out in the same setting

by the same teachers with procedural reliability over 80%. Step 1

involved the labelling of 16 common objects and Step 2 required the

child to pick each of the 16 items respectively out of a set of four

items. Table 6 summarizes the sessions to criterion for the verbal

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Insert Table 6 about here

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imitation program (regardless of the conditions) and the sessions to

criterion for Steps 1 and 2 of the language program. The children

R - Word failed on review, but was retrained.

* - Word failed on review that was never retrained.

Figure 4. Words learned over time for all children.

TABLE 6

Sessions to Criterion for Imitation Program and Steps 1 and 2 of

Guess, Sailor, and Baer Language Program

| | Word Imitation Program | | | Guess, Sailor, Baer Language Program | |
| | | | | Step 1 | Step 2 |
Name	Total Words Learned	Time Spent in Program	Sessions to Criterion	Sessions to Criterion	Sessions to Criterion
Danny					
Shannon	10	5 months	36	15	-*
Tracy	10	4 months	39	12	1
Gordie	11	4 months	28	1	1
Patrick	9**	2½ months	29	2	1
Robert	9**	2 months	29	7	6
$\bar{x}$ =	10	3 months	32	7	2

* Shannon left the project prior to entering Step 2.

** Indicates an addition word that reached criterion but failed on Review.

Danny's data was excluded from this table because he had not moved on to

the Guess, Sailor, Baer Language Program when the results were summarized.

were moved into this language program after reaching criterion on
ten words in the imitation program. Gordie reached criterion on 11
words because he mastered two words on the last training day. It is
interesting to note that the two children who took the greatest num-
ber of sessions to criterion for the verbal imitation program also
required the greatest number of sessions to reach criterion on Step 1.

Figure 5 shows the mean sessions to criterion for Steps 1 and 2

Insert Figure 5 about here

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for three groups of children. The first group was the children who
participated in the same project as the first group but did not re-
ceive imitative training prior to moving into the language program.
These children, who were approximately the same age as the first
group, were considered to have at least 16 words that they could
imitate when they began language training, therefore, they were not
given additional imitative training. The last group participated in
the Guess, Sailor, Baer language program in Kansas and data is in-
cluded up to 1975. The average age of this group was much older
than either the first or second groups, although some younger retar-
ded children were apparently included in the sample.

Ignoring the difference in the number of subjects in the third
group compared to the number in the first two groups, the children
who received prior imitative training in this study required substan-
tially fewer sessions to criterion than the other two groups for both
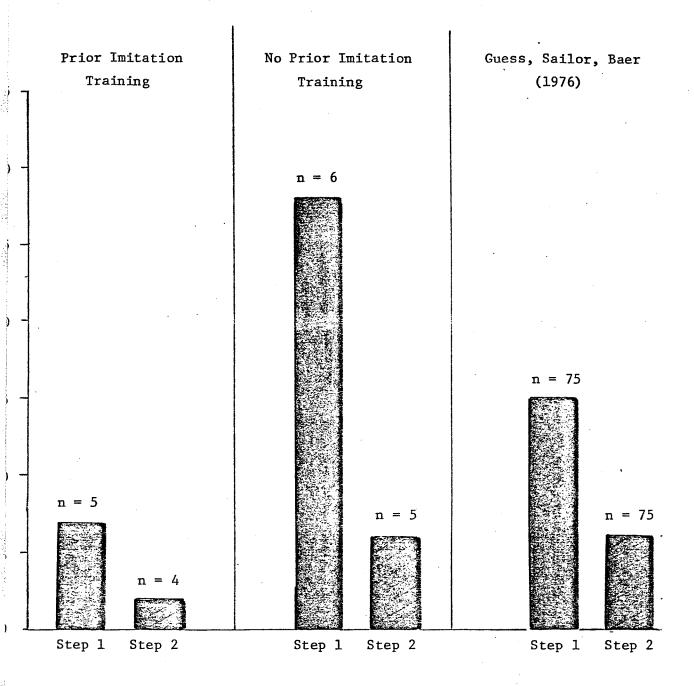
Figure 5. Mean sessions to criterion on Step 1 and Step 2, Guess, Sailor, Baer Language Program (1976).

step 1 (labelling) and step 2 (receptive language).

CHAPTER VI

DISCUSSION

The following conclusions may be drawn from the results presented in this study:

(1) All three methods of teaching imitative verbal behavior to very young Down's Syndrome children were effective. Imitation Alone and Imitation plus Signs conditions required fewer average trials to criterion for words learned; however, words taught in the Imitation plus Prompts condition had slightly better generalization and maintenance results.

(2) The imitation procedures, taken as a whole, had a facilitating effect on the acquisition of Step 1 (labelling) and Step 2 (receptive language) of the Guess, Sailor, Baer Language Program.

The most surprising result of this study was that all three procedures for teaching imitative verbal behavior required approximately the same average trials to criterion for words learned. Although the Imitation plus Signs condition required relatively fewer average trials to criterion, only one of the children (Gordie) had results that indicated a fairly strong facilitating effect of the manual signs. At the start of this study, it was expected that the Imitation plus Signs condition might require fewer trials to criterion since Stremel-Campball et al. (1976) and others stressed the facilitating effect that manual signs have on the acquisition of verbal behavior. On the strength of studies such as these, signs are being paired with verbal

stimuli to facilitate speech acquisition. Clinical use of this pro-

cedure in the province of Alberta is becoming fairly common. Perhaps

a closer look should be taken at the efficiency of such a procedure,

especially with young children who are already exhibiting some ver-

bal imitative skills.

Another interesting finding of this study relating to the use of

manual signs to facilitate speech acquisition in very young children

is that the children who performed best in this condition either

never imitated the sign or learned to imitate a verbal response only

after ceasing to imitate the signs. This is interesting because all

of the studies encountered dealing with manual signs and expressive

language acquisition used shaping and fading techniques to teach

manual sign imitation. Contingencies were placed on the imitation

of the sign and were gradually shifted to imitation of the verbal

response (in some cases) only after the child began to verbally imi-

tate. This is not to suggest that manual signs never be used in con-

junction with verbal stimuli to teach speech, but rather that a

closer look be taken at this procedure in relation to other procedures,

to determine if all speech deficient children will benefit from such a

procedure. Perhaps this is not the most efficient way to teach speech

to young retarded children with some imitative skills.

The Imitative plus Prompts condition required the most average

trials to criterion and one of the children had a great deal of diffi-

culty learning any words in this condition. In appears, then that the

best procedure to teach verbal imitation to this particular group of

children was the simplest procedure - the Imitation Alone procedure.
Three of the six children had difficulty learning words in the condi-
tions with the additional cues until they stopped attending to the
cues (Robert did not learn a word in the Imitation plus Prompts con-
dition until he began responding before the cues; Shannon and Gordie
learned words in the Imitation plus Signs condition only after they
no longer imitated signs).

The generalization and maintenance data favoured the Imitation
plus Prompts condition to a slight degree. No literature could be
found to support or contest this finding. Many studies reported that
prompting and fading procedures were used to teach verbal imitation,
however, none found gave details of the specific procedures. A re-
view of the articles in The Journal of Applied Behavior Analysis deal-
ing with verbal imitation from 1968-1977 indicated that none of the
articles mentioned maintenance of imitative skills and only one re-
ported generalization of imitative skills (see Table 7). Maintenance

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Insert Table 7 about here

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results were probably not presented since the final goal of all lan-
guage procedures presumably is functional speech and not verbal imi-
tation. As long as the child learns to label after verbal imitation
has been established, it is not important that the child is still able
to imitate those stimulus words. It is far more important that the
verbal imitative skill has generalized so that the child may be taught

Table 7

Studies in <u>JABA</u> from 1968-1977 Involving Verbal Imitation

First Author	Year	Population Description	Age	Used imitation as part of the Training Procedure	Studied Primarily Imitation	Response	Generalization of Imitation	Generalization of other Responses Taught	Maintenance
Bondy	1976	8 retarded	x̄ = 10	yes	no	question-asking	no	no	no
Clark	1975	3 retarded 4 disadvantaged	15-17	yes	no	complete sentences answers to questions	no	untaught probes	no
Hart	1975	11 disadvantaged	4-5	yes	no	compound sentences	no	no	no
Martin	1975	2 retarded	6, 8	yes	no	size and color adjectives	no	untaught probes; different settings	no
Stephens	1975	5 autistic or severely retarded	4-11	yes	no	picture-naming	no	no	no
Garcia	1974	2 retarded	12,18	yes	no	conversational speech form	no	untaught probes; different experimenters	no
Hart	1974	12 disadvantaged	x̄ =4	yes	no	color-adjective-noun compound sentences	no	no	no
Stevens-Long	1974	1 autistic	8	yes	no	simple and compound sentences	no	new set of pictures after training	no
Lutzker	1974	3 retarded 2 normal	6-32 2	yes	no	descriptive sentences	no	untaught probes	no
Bennett	1974	2 hearing impaired	4	yes	no	articulation	no	untaught probes	no
Twardosz	1973	4 retarded	16	yes	no	questions	no	untaught probes	no
Guess	1973	4 retarded	11-21	yes	no	plural endings	no	untaught probes; between modalities	no
Garcia	1973	4 retarded	10	no	yes	single/plural nouns	no	transfer of imitation of a model to labelling of trained and untrained items	no
Bennett	1972	1 hearing impaired	3	yes	no	present progressive sentences	no	untaught probes	no
Mann	1971	4 normal	4	yes	no	articulation of words	no	control words	no
Wheeler	1970	1 autistic	8	yes	no	sentence form	no	untaught probes	no
Schumaker	1970	3 retarded	teens	yes	no	verb inflections	no	untaught probes	no
Risley	1970	6 disadvantaged	4-5	no	yes	sentence imitation	no	no	no
Brigham	1968	3 normal	4	no	yes	words	untaught Russian words	no	no
Guess	1968	1 retarded	10	yes	no	plurals	no	untaught probes	no
Hart	1968	15 disadvantaged	4-5	yes	no	adjectives	no	no	no

to label new stimulus words. It is not clear why more studies did
not report generalization data.

The Imitation plus Prompts condition may have resulted in slightly
better generalization and maintenance because this condition required
more stability before a word reached criterion. A word in the Imi-
tation Alone or the Imitation plus Signs condition would reach cri-
terion after three consecutive responses. A word in the Imitation
plus Prompts condition required five consecutive correct responses
(with no cues) before reaching criterion. Recall that in this condi-
tion, a child would take a minimum of nine trials (three at each of
levels 1, 2 and 3) if he/she did not make an error and waited for the
additional cues. However, if the child responded before additional
cues could be given on five consecutive trials (trials to be indi-
cated by a circled response), then that word would reach criterion.
This skipping procedure was used in the project at the time of this
study. The requirement has since been changed to three consecutive
correct trials for research studies and remains at five for other pro-
grams. In this study, in all but one case, if a child made three
consecutive correct circled trials, he/she then made two additional
consecutive correct circled trials. In other words, the criterion
requirement of five only meant an extra two trials added on to the
trials to criterion. It is difficult to say if the Imitation plus
Prompts condition would have shown slightly better generalization and
maintenance results if the criterion of three had been used. The
criterion of five may have also resulted in the slightly greater

average trials to criterion for this condition.

There appeared to be no generalization to untaught probe items tested at the end of each session, regardless of the condition that the probe item was in. Probes in Imitation Alone and Imitation plus Prompts conditions were conducted in the same way since instruction at a level 5 in the Imitation plus Prompts condition was equivalent to the Imitation Alone condition. Probes in the Imitation plus Signs condition differed only because they were accompanied by the appropriate manual sign. The children may not have generalized to the untaught probes because they were able to discriminate the probes from words being taught. Perhaps the results would have been different if the probes had been interspersed with the training trials within the session, rather than presented at the end of the session. This would have first necessitated taking the children off the continuous schedule of reinforcement and placing them on a variable schedule making the unreinforced probe items more difficult to discriminate (Brigham & Sherman, 1968).

The verbal imitation program alone cannot account for the generalization and maintenance results. An ongoing incidental teaching procedure modified from the procedure used by Hart and Risley (1975), was used outside of language sessions to ensure that words learned in any of the language sessions by all of the children in the project would generalize to the classroom area. This was done independently of this research and could not be controlled for. Undoubtedly, the incidental teaching procedure greatly facilitated generalization and

maintenance of words learned during the imitative language training

as these words were practiced by the children in a variety of settings

in the classroom during the day (Daly et al., 1977).

Perhaps one of the most significant findings of this study was

the facilitating effect that the verbal imitation program as a whole

had on subsequent learning of Steps 1 and 2 of the Guess, Sailor, Baer

Language Program. These authors suggest that a child entering the

program should be able to imitate at least 16 words. They go as far

as to say that the ability to imitate is the single best predictor

of success of a child in their program (Guess et al., in press).

Children in the same project as the children in this study and pre-

sumably with better language skills than the children in this study

spent many more sessions on Steps 1 and 2 than these children. In

fact, if trials to criterion for the Imitation Program and the Lan-

guage Program are added together, they do not greatly exceed the

trials to criterion on the Language Program alone for the group of

children without imitative training. It will be interesting to see

if this facilitating effect is evidenced on subsequent steps of the

program.

Perhaps, if more words had been taught to each child, it would

be easier to make a conclusive statement regarding the outcome of

this study. What may be concluded is that with children such as

these, it may be wise to begin verbal imitation training with as

few additional cues as possible. If a particular child is unable

to learn imitative verbal behavior using this approach, then signs

or additional fading and prompting procedures might be considered.

One final comment should be made regarding the correspondence between gains made in mental age development from tests 1-3 as reported in the "Subjects" section and total sessions to criterion for the Imitation Program as a whole. If the ratio between chronological age gain and mental age gain from tests 1-3 is calculated for each of the children, the ratios are as follows: Gordie - .93; Patrick - .86; Danny and Tracy - .75; Shannon - .62; and Robert - .45. There is a fairly close correspondence between the rank ordering of children here and the rank ordering of the children on the basis of sessions to criterion for the word imitation program: Gordie - 28; Patrick - 29; Robert - 29; Shannon - 36; Tracy - 39; and Danny - 54. In general, Gordie and Patrick made the greatest gains from tests 1 -3 and they required fewest sessions to criterion. Shannon and Tracy made average gains and they required close to the average number of sessions to criterion. Danny and Robert are noteworthy exceptions to the above observation.

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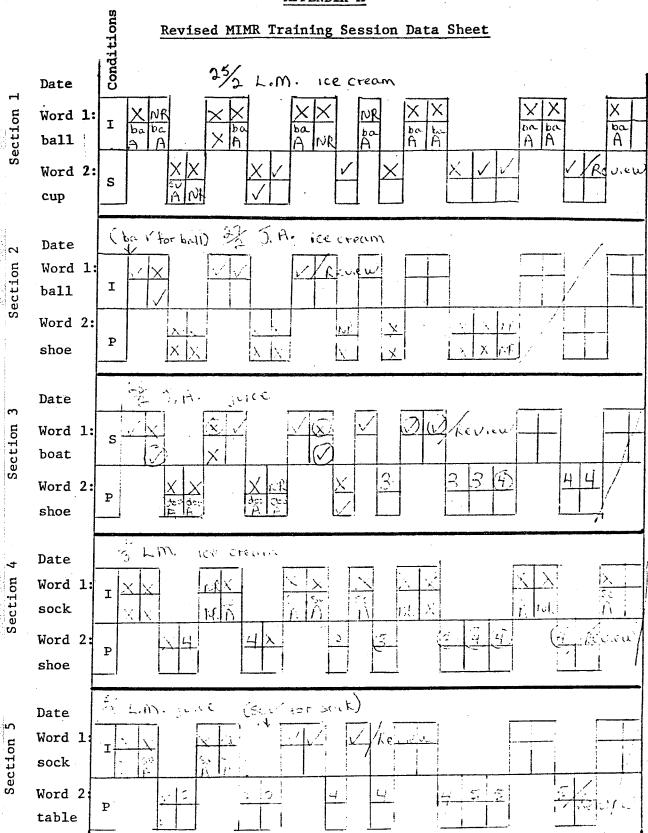Stremel, K. Language training: A program for retarded children. Mental Retardation, 1972, 10, 47-49.

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APPENDIX A

Revised MIMR Training Session Data Sheet

Conditions

Section 1

25/2 L.M. ice cream

Date			
Word 1: ball	I		
Word 2: cup	S		

Section 2

(ba í for ball) 3/3 J.A. ice cream

Date			
Word 1: ball	I		
Word 2: shoe	P		

Section 3

J.A. juice

Date			
Word 1: boat	S		
Word 2: shoe	P		

Section 4

3 L.M. ice cream

Date			
Word 1: sock	I		
Word 2: shoe	P		

Section 5

L.M. juice (sock for sock)

Date			
Word 1: sock	I		
Word 2: table	P		

APPENDIX B

Description of Data-Taking Format

The two words being worked on at any particular time were entered
in the left hand margin. The conditions appropriate to the words
were printed in abbreviated form next to the words (Imitation Alone
- I: Imitation and Signs - S; Imitation and Prompts - P). The teacher
followed the randomly alternating schedule for the words by completing
a trial on word 1 when the set of boxes were below the centre line.
The date, the initials of the teacher conducting the session, and the
reinforcer used was printed above the data. The teacher indicated
the end of trials for a day by making a slash (/) after the final
trials for that day.

For any word being scored, the trial data was recorded in the top
box and the rerun data (if applicable) was recorded in the bottom box.
Trial data was scored as follows:

$\checkmark$ = correct response

NR = no response to the instruction with 5 seconds of the instruction

X = incorrect response

A word reached criterion and was removed from the teaching session af-
ter 3 consecutive correct responses on the trial (see Appendix 1, sec-
tion 1). If the child made an incorrect response or no response within
5 seconds, the appropriate symbol was recorded in the trial box and the
rerun procedure was followed. Once the rerun was completed, the teach-
er recorded the rerun data for that trial directly under the trial

data. Rerun data was scored as follows:

   √ = a response that exactly matched the stimulus word

   A = approximation to the correct response. An approximation

        may be an omission, e.g., "all" for "ball" or a substitution,

        e.g., "gall" for "ball".

 NR = no response within 5 seconds of the instruction

   X = incorrect response

As was previously mentioned, the specific approximation given
during the retrial was written above the "A" (see Appendix 1, Section
1).

Words taught in the Imitation Alone condition were scored exactly
as described above. Words taught in the Imitation plus Signs condi-
tion were scored in the same fashion. However, in addition, the
teacher circled any trial and/or retrial on which the child imitated
the manual sign (see Appendix 1, Section 3).

Scoring during the Imitation plus Prompts condition was quite
different from the other two conditions for the trial data. The tea-
cher scored a number appropriate to the level of guidance that the
child was working on. Appendix 1, Section 3 shows an example of the
word "shoe" being taught in this condition. Section 4 shows the same
word reaching criterion after five consecutive circled trials. The
teacher circled a trial in this condition if the child responded ap-
propriately to the stimulus words before additional cues appropriate
to the level of guidance being worked on could be given. Section 5

shows the word "table" reaching criterion after three consecutive

correct responses at a Level 5 of instruction. Recording on the re-

trial remained the same as the other two conditions.