The Development of Generalized Imitation in an Autistic Boy

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THE DEVELOPMENT OF GENERALIZED IMITATION IN AN AUTISTIC BOY

by

Andrew L. Reitz

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

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In writing this thesis, I have benefited from the encouragement, advice, and constructive criticism of Professors Robert P. Hawkins, Jack Michael, and Paul T. Mountjoy. My thanks go to them, as well as to the staff of the School Adjustment Program and to the principal and staff of Parchment Central Elementary School, without whose help and cooperation this work could not have been undertaken. The assistance given by these many people, however, in no way divorces me from the sole responsibility of the content of the thesis.

Andrew L. Reitz
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CHAPTER I

INTRODUCTION

Imitation has long been an important concept in the areas of social psychology and social science. According to Baer, Peterson, and Sherman (1967), "any individual's behavior can be identified as imitative if it temporally follows the behavior of another individual and if its topography is controlled by the demonstrated behavior." Social scientist have used the concept of imitation in their attempts to explain how societies are organized and held together, and how cultures are transmitted from one generation to the next. The clinical and developmental concept of "identification" (e.g., sexual identification) may refer primarily to imitative phenomena. The social importance attached to the concept of imitation and its implications have led to a great deal of systematic discussion of the topic as well as many detailed analyses—the most extensive being that of Dollard and Miller in Social Learning and Imitation (1941).

Recently, however, experimental attention has been directed to the study of imitation more because of its possible practical applications in the teaching of a wide variety of behaviors to pre-schoolers, retardates, autistic children, and others who lack this skill and other skills (particularly expressive language) for which imitation may be a prerequisite. Using imitation, it is often possible to teach whole chains of complex responses in a very short time compared to the often long and tedious method of shaping successive approximations to the desired behavior.
Recent experiments which studied the teaching of imitative behavior (Baer and Sherman, 1964; Metz, 1965; and Lovaas, 1966) led to general agreement that: (1) successive responses which received training required fewer and fewer trials to be learned and (2) imitative behaviors that were never reinforced or trained also increased as long as some imitations were still being reinforced. This second finding, assumedly based on the occurrence of generalization during the training of imitation, led to more research based on the idea that imitation could become a functional response class and that modifying certain members of the class could therefore produce changes in the entire response class. Studies by Risley (1968), Baer, Peterson, and Sherman (1967), and Garcia, Baer, and Firestone (1971), however, seemed to indicate that imitation is not one large response class, but rather, that it is made up of many topographically distinct subclasses, which thus limit the possible generalization effects. Some of the subclasses which have been suggested in the literature are large motor, fine motor, short vocal, long vocal, and facial responses (Risley, 1968; and Garcia, Baer, and Firestone, 1971).

The purpose of the present study was both practical and theoretical. It was to utilize previous findings on the nature and generalizability of imitation and its topographic subclasses to develop an effective method for increasing the imitative repertoire of a ten year old autistic boy. By developing imitation within a response class that had utilitarian value, it was hoped that the boy's ability to learn further socially significant skills would be enhanced. An attempt was also made to replicate previous findings on the generalization of imitative behavior and its subclasses.
CHAPTER II

METHOD

Subject

The subject of the study, Alan, was a 10 year old student in an elementary classroom in the School Adjustment Program (Hawkins and Hayes, 1974), a behaviorally oriented special education program for "emotionally disturbed children." Alan had no physical impairments and he responded well to simple verbal commands. He also possessed some verbal skills—being able to name a large number of objects, use simple complete sentences, and respond verbally to simple questions—as well as some imitative skills. Alan was selected for this study after observation by the experimenter showed that he was either left out entirely or unable to perform at even a minimal level in many activities at school (gym class, classroom games, cooperative play, etc.) primarily because he could not imitate the behaviors required to enable him to participate, yet no one had the time to teach him these specific behaviors. It was felt that improving Alan's imitative repertoire would have the direct effect of improving his ability to learn new socially important responses with minimal further training or even through observing peers, and that this new learning would enable him to participate in more games and activities with other children. This increased participation could lead to two additional positive effects:

(1) Since many of the activities in which Alan could not participate were potentially reinforcing activities—games such as tag,
kick-ball, etc.—it would increase the range of possible reinforcers, which could in turn be used effectively to teach new responses. This was considered especially important since there were few effective reinforcers available for the teacher to use with Alan.

(2) Since many of the activities in which Alan could not participate were situations in which social interaction occurred, his increased participation would result in a great deal more normal social interaction, an important prerequisite condition for the learning of still more socially important responses.

Setting

The trainer met with Alan individually for one 15 to 30 minute session, five days per week. The sessions were conducted at 9:00 each morning in an unused classroom in Alan's school building and consisted of a series of discreet training trials (50-80 per session). At the beginning of each trial the trainer and Alan stood approximately three feet from each other in the middle of the room, facing the same direction. A table was positioned directly behind the trainer. The items used in the experiment were placed on the table or positioned around the room. When an observer was present, she sat slightly in front of and to Alan's left so that she had an unobstructed view of both the trainer's demonstration and Alan's responses.

Response Definition

An experimental trial consisted of the trainer's saying, "Alan, do this," and performing the behavior to be imitated. There were three possible
response levels—"correct," "attempted-incorrect," and "not attempted." If Alan's response was "correct" or "attempted-incorrect," another response was demonstrated by the trainer ten seconds after Alan's response. If Alan's response was "not attempted," a further demonstration was presented ten seconds after the previous demonstration.

A "correct" response was scored when Alan made a response which accurately matched the trainer's demonstration and was completed within ten seconds of the completion of the demonstration. A response was not scored as "correct" if Alan made a correct response after the ten second interval had elapsed. An "attempted-incorrect" response was scored when Alan made a response within ten seconds which resembled the trainer's demonstration but did not match it accurately. For example, if the demonstration by the trainer was of hopping on one foot, and Alan responded by hopping on both feet, an "attempted-incorrect" response would have been scored. A "not attempted" response was scored when Alan exhibited no behavior which contained the critical aspects of the demonstrated behavior within ten seconds. For example, if the demonstrated behavior was hopping on one foot, and Alan stood still and smiled for ten seconds, a "not attempted" response would have been scored.

Because there were so many different behaviors used during the study, and because previous studies have shown very high reliability using definitions similar to the ones given above, more precise definitions of the responses were not considered necessary, even though it is possible to imagine many responses that would be difficult to classify using the above definition. Rather, frequent reliability checks were made throughout the study by an independent observer to insure that experimenter bias did not
not affect the results.

Recording and Reliability

Data were recorded for each session by the trainer, using the three response levels discussed above. A tally sheet was placed on the table directly behind the trainer and positioned so that the scoring took a minimum of time. Each response was scored immediately following the ten second response interval and just prior to the presentation of the next demonstration.

As previously stated, specific definitions or criteria for correctness were not given for each behavior studied. This made the independent assessment of the trainer's accuracy particularly essential in order to test for experimenter bias as a possible explanation for the results. This was accomplished by having a second observer independently record the subject's behavior. These reliability checks were made periodically during all phases of the study. In all, reliability checks were made during 17 sessions of the study—four during the pre-test, eight during training and maintenance sessions, and five during probe sessions. The observer was given written and oral instructions concerning the three types of responses which could be made—"correct," "attempted-incorrect," and "not attempted"—and all questions were answered prior to the first reliability session. The written instructions given to the observer are presented in Appendix A. The observer was not informed as to the purpose of the experiment and neither feedback on accuracy nor further instructions were given for the remainder of the study. Romanczyk, Kent, Diament, and O'Leary (1973) have demonstrated the importance of such precautions in an
experiment which showed that an observer's recording was significantly changed in the direction of the primary data collector if he is given feedback on his accuracy.

During a reliability session, the observer sat in the experimental room to the left and slightly in front of Alan and the trainer, in order to ensure an unobstructed view of both the demonstration and Alan's response. Since reinforcement, which was clearly visible and audible to the observer, was given for correct responses during some conditions, and since this would interfere with independence of recording by indicating to the observer the trainer's assessment of the response, additional steps were taken to ensure the observer's independence. To eliminate the possibility that the observer could hear the trainer verbally praising Alan, she wore earphones through which continuous white noise was played. To eliminate the possibility that the observer could see the trainer giving Alan tokens, token delivery was delayed until after the observer had scored the response and turned away. The observer signaled the trainer when she had turned away, using a "bug-in-ear" device, and the token was then dispensed. When the observer turned back, after five seconds, the next trial was begun.

Despite these precautions, it seemed possible that the observer could observe subtle cues preceding or following the verbal praise (e.g., Alan's looking at the trainer, smiling, etc.) to determine whether or not the trainer had judged a particular response as correct. To assess this possibility, a test, using 25 behaviors (each presented twice) which Alan had performed correctly on the pre-test, was administered prior to the beginning of the experiment. The trainer reinforced Alan's responses non-contingently on a random basis and the observer was to attempt to determine
whether or not the trainer had rewarded Alan. If the observer could tell when reinforcement was given, she should have been correct on only approximately 50% of the trials.

Procedure

Selection of behaviors

Pre-experimental observations of Alan showed that he was capable of rather extensive vocal imitation, but that his motor imitative skills were quite limited. For example, Alan could accurately repeat entire sentences such as "I want to go outside" or "It is a fish" following the teacher's demonstration of the desired behavior. Alan's motor imitative skills were limited to behaviors such as clapping hands or kicking a ball, behaviors which Alan had undoubtedly already learned in other contexts. His imitation of novel motor behaviors was observed to be quite limited.

These observations of Alan's existing imitative skills led to the conclusion that the study should focus on motor rather than vocal behaviors. Using this criterion, a list of 102 behaviors was compiled for use in the study. The list was comprised exclusively of motor behaviors and was taken from studies by Baer, Peterson, and Sherman (1967), Metz (1965), and Garcia, Baer, and Firestone (1971), as well as from a list compiled by the experimenter.

Pre-Test

The purpose of the pre-test was to determine the extent of Alan's existing imitative skills, so that time would not be wasted in training, maintaining, and probing responses that Alan already had in his repertoire. To do this, an informal diagnostic test, consisting of the list of behaviors
described above, was administered. The behaviors were presented as described earlier, with reinforcement given for each correct response. Reinforcement consisted of verbal praise such as "That's right," "Good," or "That's a good imitation," and a token (poker chip) which could be spent at a later time for a variety of articles or activities, such as candy, toys, and playing outside. Each behavior was demonstrated twice, and only those behaviors which Alan consistently failed to imitate correctly (either an attempted-incorrect and a not attempted response) were considered eligible for use in the experiment.

Behaviors used in the study

Of the 102 behaviors presented in the pre-test, approximately 50 met the criterion for inclusion in the study. These behaviors were divided into two categories--those that required left-right discriminations and those that did not. Thirty "training behaviors" and ten "probe behaviors" for the study were then chosen randomly from each group. A list of the behaviors used in the study is presented in Table 1.

The behaviors used in the study were generally complex chains having at least two or three obviously separate behavioral components, each of which was often complex in itself. For example, "throw the ball up and catch it before it bounces" required that Alan walk to the ball, pick it up, throw it into the air, and catch it before it bounced. Similarly, "move paper from the basket to the table" required that Alan walk to the basket, pick the paper out of the basket, walk to the table, and place the paper on the table. The only behaviors that did not require this chaining were those that required a left-right discrimination--"put left arm behind back"--or a multiple left-right discrimination--"tap left knee with right
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<tr>
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<th>PROBE BEHAVIORS</th>
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<tr>
<td>*Tap left knee with left hand</td>
<td>*Tap right knee with left hand</td>
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<tr>
<td>*Tap left knee with right hand</td>
<td>*Walk and tap head with left hand</td>
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<tr>
<td>*Walk and tap head with right hand</td>
<td>Throw ball up and catch it before it bounces</td>
</tr>
<tr>
<td>*Raise left arm above head</td>
<td>Scribble on blackboard</td>
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<td>*Put left arm behind back</td>
<td>Jump over box</td>
</tr>
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<td>*Tap right shoulder with right hand</td>
<td>Put towel over head</td>
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<tr>
<td>Move wastebasket</td>
<td>Move can from one end of table to the other</td>
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<td>Turn lights off, then on again</td>
<td>Sit in chair and cross legs</td>
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<tr>
<td>Work egg beater</td>
<td>Wrap scarf around neck</td>
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<tr>
<td>Squat and tap floor</td>
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<td>Walk and hold book on head</td>
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<tr>
<td>Bang two spoons together</td>
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<td>Move hat from table to counter</td>
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<td>Put paper in pocket</td>
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<tr>
<td>Throw box</td>
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<td>Sit in chair, arms extended</td>
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<td>Stand in corner</td>
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<td>Open cupboard in counter</td>
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<td>Stand toy soldiers up</td>
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<td>Lie on floor with feet on chair</td>
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<tr>
<td>Move paper from basket to table</td>
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<tr>
<td>Sweep block with broom</td>
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<tr>
<td>*Tap chest with left hand</td>
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<td>Move toy car on table</td>
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<tr>
<td>*Arms extended, touch left foot with right hand</td>
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<tr>
<td>*Tap table with left hand</td>
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<tr>
<td>Put towel over block</td>
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<tr>
<td>Place box on chair</td>
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<tr>
<td>Bounce ball once and catch it</td>
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**TABLE 1**

A List of All Training and Probe Behaviors Which Were Employed During the Study. The Behaviors Marked With an Asterisk Are Those Which Required a Left-Right Discrimination.
hand"—which Alan found quite difficult to master.

The training behaviors were dealt with in pairs and each pair went through the following conditions:

1. Training to criterion for a pair of behaviors
2. Maintenance for all previously learned behaviors
3. V-R-3 schedule of reinforcement for the pair just trained
4. V-R-3 continued, probe administered, and
5. Training on the next pair of behaviors.

Training

Training for a pair of target behaviors was the first step in the procedure. Training consisted of modeling two of the target behaviors alternately and reinforcing every correct response with verbal praise and tokens. Verbal and physical prompts were used when necessary to obtain the correct response. If a prompt was necessary, the response was not scored as "correct," but as "attempted-incorrect" or "not attempted," whichever was appropriate. All prompts were slowly faded until Alan imitated correctly with only the trainer's demonstration of the behavior. The criterion for completion of training on a particular response was three consecutive correct responses without prompting. If one of the behaviors in a pair reached criterion before the other, the behaviors continued to be presented alternately until the second behavior had also reached criterion. The training was conducted with successive pairs of target behaviors until the first twenty target behaviors had been learned to criterion.

This phase provided data for the replication of the previous finding that successive responses trained required fewer and fewer trials to be learned. This effect, coupled with the improvement in performance obtained during the training of a response, also provided evidence that the development of the subject's imitative skills was primarily a result of the
specific training and not some other process, such as maturation. Also, since each new training behavior was an unreinforced, untrained response on its first presentation, it provided data that would test the degree to which generalized imitation had developed.

**Maintenance**

When a pair of responses had reached the training criterion, the maintenance phase was initiated. The purpose of this procedure was to ensure that all previously learned responses continued to be emitted correctly, despite the fact that they might be similar to other responses taught later. This phase consisted of presenting each previously learned response twice and reinforcing every correct response.

As the experiment progressed, more and more behaviors had to be maintained. This required an excessive amount of time, and since there had been no difficulty in maintaining accurate responding with the previously learned responses, the maintenance procedure was shortened to include only the ten most recently learned behaviors, each presented twice.

**Variable ratio reinforcement**

The variable ratio reinforcement phase was initiated immediately following the maintenance procedure. The purpose of this phase was to create a tolerance for intermittent reinforcement so that the probe could be administered, as described below, with little risk of the child's becoming unresponsive due to a sudden shift on the reinforcement schedule. This was accomplished gradually by alternately presenting the last pair of training behaviors to reach criterion, beginning on a fixed ratio one or continuous schedule, then moving to a fixed ratio two schedule, a
variable ratio two schedule, and finally, a variable ratio three schedule. The criterion for moving from one schedule of reinforcement to the next was six consecutive correct responses. The criterion for completion of this phase was six consecutive correct responses on the variable ratio three schedule of reinforcement.

Probe

The probe was administered after a pair of responses reached criterion on the variable ratio phase. The purpose of the probe was twofold. It was to provide data for replication of the previous finding that imitative behaviors that were never reinforced or trained increased as long as some imitative responses were still being reinforced. It also provided data on the possibility that behaviors which required a left-right discrimination may be a topographically distinct subclass from those behaviors that do not. Evidence for the first finding would be found if the number of correct responses on the probe increased as the study progressed. Evidence for the second finding would be found if teaching of behaviors requiring the left-right discrimination resulted in an increase in correct responding to left-right responses that had not been taught, accompanied by no change in behaviors that did not require the left-right discrimination. In order to test this possibility, the training behaviors had to be ordered so that the responses which required the left-right discrimination were grouped together. This was necessary so that the differential effects on Alan's responding to behaviors that required the left-right discrimination could be analyzed after training had occurred for only behaviors requiring the left-right discrimination.

The probe consisted of the ten probe behaviors listed in Table 1,
and was administered by maintaining the variable ratio three schedule of reinforcement from the previous phase, and inserting the probe behaviors into the unreinforced positions in the schedule. Each probe behavior was presented twice. No two probe behaviors were presented consecutively and probe responses were never reinforced, regardless of their accuracy. Following completion of a probe administration, training was begun with the next pair of target behaviors.

A pre-training probe was administered prior to any training, as a baseline measure with which to compare later probe results. To ensure that the administration of the pre-training probe was similar to the administration of later probes, two behaviors which Alan had performed correctly on the pre-test were selected and maintained (criterion of six consecutive correct responses) on a variable ratio three schedule of reinforcement. The pre-training probe was then administered as described above. Training of the first pair of responses followed the pre-training probe.

Training stereotyped probes

The normal sequence was interrupted after training on the first twenty target behaviors to correct a problem that had developed. Six of the ten probe responses were still being performed incorrectly. The subject had developed a consistent, but incorrect response to each of these six demonstrations. To eliminate the possibility that these incorrectly performed responses might have some negative effect on future learning of other responses, the same procedure (training, maintenance, and V-R-3) was followed with these six probe behaviors, as previously described for the training behaviors, with the exception that the probe was no longer administered.
Training II

After the corrective training of the stereotyped probe behaviors was completed, the remaining ten target behaviors were placed in random order and the same procedure was followed as in training the stereotyped probes.
CHAPTER III

RESULTS

Reliability

The results of the test on the independence of the observer showed that she correctly detected that Alan had been rewarded on only 52% of the trials presented. Since a score of 50% could be expected by chance, it was concluded that the precautions employed did assure independent recording by the observer.

Reliability measures for the study were computed as the number of agreements divided by the total number of trials—agreements plus disagreements \( \frac{A}{A+D} \). An agreement was scored only if both observers scored a particular response at the same response level (e.g., both observers scored the response as "correct"). A disagreement was scored any time the observers scored a particular response at different response levels (e.g., one observer scored the response as "correct" while the other scored it as "attempted-incorrect"). Since there were three possible response levels, an inter-observer agreement for the study was 95.4%, with a range from 90.3% (during one phase of the pre-test) to 100%. Reliability during pre-test sessions averaged 93.1%, during training and maintenance sessions, 96.5%, and during probe sessions, 95.0%. Agreement remained approximately stable throughout the study. Data obtained by the observer are shown on Figures 4 and 5 to allow assessment for observer bias toward particular experimental effects, as recommended by Hawkins and Dotson (in press).
Training

The results of the training sessions are presented in Figures 1, 2, and 3. As Figure 1 shows, the number of trials required to reach the criterion of three consecutive correct responses decreased markedly from over 200 trials when the training was first begun, and remained quite stable at the minimum of three for the final fourteen responses. Figure 1 also shows that Alan had much more difficulty (required many more trials) in learning the responses which required a left-right discrimination than in those responses which did not, at least in the early phases of the study. Later in the study, however, rapid improvement in mastering this discrimination resulted in reaching the criterion level on these behaviors with the minimum number of three responses. Despite random selection of behaviors within the two general classes of left-right and other responses, the first pair of training behaviors were very similar to each other topographically. It appears that the learning of one virtually assured learning the other, for the two reached criterion in the same number of trials.

Figure 2 shows the data on the number of training responses performed correctly on their first presentation throughout the study. The figure shows clearly that the accuracy of Alan's response on the first presentation of a target behavior was very low at first (only two correct of the first thirteen responses) but increase markedly during the later stages of the training phase (fifteen out of the last seventeen responses).

Figure 3 shows the results of training the six stereotyped probe responses which were not being performed correctly at the last administration.
FIGURE 1

The Number of Trials Required for Alan to Achieve Criterion of Three Consecutive Correct Responses for Each Successive Training Behavior.
Cumulative Number of Training Behaviors Performed Correctly on Their First Presentation.

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FIGURE 3

The Number of Trials Required for Alan to Achieve the Criterion of Three Consecutive Correct Responses for Each of the Six Stereotyped Probe Responses Which Were Incorrectly Performed on the Final Probe Administration.
of the probe. As could be expected, none of the stereotyped probe behaviors reached criterion in the minimum number of three trials. However, as the figure shows, the stereotypy was eliminated rapidly during training of these responses. Four of the six behaviors reached criterion in only four trials, while the remaining two reached criterion in five trials.

**Probe**

The results of the consecutive administrations of the probe (ten behaviors, each presented twice) are presented in Figure 4. The number of "correct" responses increased during the training and then appeared to stabilize at eight correct. The number of "attempted-incorrect" responses decreased only slightly from a high of thirteen to ten and was extremely stable.

**Maintenance**

The results of the successive maintenance sessions are presented in Figure 5. They show a range of 90% to 100% of the trials being responded to correctly, with the majority of the sessions showing 100% correct. The number of trials during the maintenance sessions changes. As each pair of target behaviors is trained, the behaviors are included in the maintenance phase. The number of trials was reduced to 20 after nine sessions by maintaining only the ten most recently learned behaviors, each presented twice.
The Number of Correct, Attempted-Incorrect, and Not Attempted Responses Made by Alan on the Successive Probe Administrations.
The Percentage of Previously Trained Responses Performed Correctly During Successive Maintenance Session Throughout the Study. The Number of Trials Presented During Each Session is Also Shown.
CHAPTER IV
DISCUSSION

Earlier studies on imitative behavior (Baer and Sherman, 1964; Metz, 1965; and Lovaas, 1966) have found that successive new responses required a steadily decreasing number of trials to be learned as the training progressed. Figure 1 clearly shows that this did occur in the present study, particularly with responses which required left-right discriminations.

These same studies also found that behaviors which were never reinforced or taught also increased as long as some imitations were still being reinforced. Two sources of evidence for this phenomenon were examined in the present study: (1) the number of responses performed correctly on successive administrations of the probe, and (2) the number of training responses performed correctly on their first presentation throughout the study. The results of the probe, shown in Figure 4, do not clearly demonstrate the development of the generalization phenomenon. The number of unreinforced behaviors performed correctly on the probe did increase from one or two to eight during the study, but Alan was still responding incorrectly on twelve of the twenty probe trials at the conclusion of the study, demonstrating only limited evidence for the development of generalized imitation.

On the other hand, the subject's accuracy on the first presentation of each response provides much clearer evidence for the occurrence of generalized imitation. As Figure 2 shows, the number of target behaviors which Alan performed correctly on their first presentation increased greatly
during the study, from 15% for the first thirteen target behaviors to 88% for the final seventeen target behaviors. These data constitute acceptable evidence for the occurrence of extensive generalized imitation; although before concluding that this was a result of the training provided, it would be desirable to replicate the effect with another response class or other subjects.

In an attempt to determine the cause of these somewhat conflicting results, Alan's responses to both the probe and training behaviors were carefully analyzed. It was discovered that very early in the study, as early as the second or third probe administration, Alan had begun to respond to some of the probe demonstrations in a stereotyped incorrect manner. For example, "tap right knee with left hand" was responded to by Alan's tapping his right knee with his right hand; "throw the ball up and catch it before it bounces" was responded to by Alan's bouncing the ball once and catching it; and "jump over the box" was responded to by Alan's standing on the box and jumping off. These stereotyped incorrect responses, once formed, were emitted on each demonstration of the behavior for the remainder of the study, and were completely unaffected even by the teaching of responses which closely resembled them. The stereotyped responses, though not unintentionally reinforced by the presentation of the next demonstration, which frequently led to a reinforced response. In other words, a chain of behavior may have developed which included the stereotyped behaviors and which was always followed by reinforcement at some point. Observation of Alan and his performance in other areas showed that rapid stereotyping is a major feature of Alan's behavioral repertoire and is frequently reinforced, since it is often in the form of a response which is appropriate for the
immediate situation. This reinforcement of stereotypy probably did occur in the present study, so that it is not surprising that the difficulties developed.

The results of the analysis of Alan's responses to the probe cast serious doubt on the ability of a probe to accurately detect the development of generalized imitation. Since there seemed to be no similar reason to suspect the accuracy of the data on first presentations, as a measure of generalized imitation, it is concluded that extensive generalization did occur.

The difficulty encountered using the probe as a measure has not been previously reported in the literature and may be highly unusual. On the other hand, it may illustrate an inherent weakness in utilizing measures of the probe type, at least in certain situations or with certain subjects. Since probe measures have not been used extensively, further research is necessary in order to answer such questions.

Studies by Risley (1968) and Garcia, Baer, and Firestone (1971) have indicated that imitation may not be one large functional response class, but rather that it is made up of many topographically distinct subclasses which limit the possible generalization effects. This study attempted to gather data to examine the possibility that responses which require a left-right discrimination may constitute a topographically distinct subclass of behaviors. Evidence for the existence of such a subclass could be said to exist if, after training on only behaviors requiring the left-right discrimination, the number of correct probe responses on behaviors which required that discrimination increased, while the number of correct probe responses to other behaviors showed little or no improvement. The probe was the
instrument intended to detect this phenomenon, but analysis of Alan's responses showed that he performed the probe behaviors requiring left-right discriminations incorrectly on every presentation throughout the study, in stereotyped fashion. Thus, the probe affords no evidence for the existence of a topographically distinct subclass.

The data presented in Figure 1 may supply some evidence for the existence of a distinct subclass of behaviors. Alan required far more trials to reach criterion on the behaviors that required the left-right discrimination than for those that did not, particularly at the beginning of the study. This phenomenon could be explained in two ways: (1) the behaviors which required the left-right discrimination may have been intrinsically more difficult, thereby suggesting the existence of a subclass, or (2) the behaviors which required the left-right discrimination may have been of equal difficulty with those that did not. The latter possibility would suggest that training on the left-right behaviors had generalized to the non left-right behaviors (resulting in fewer trials to reach criterion on the latter) and would therefore be evidence against the existence of a subclass, at least in this child.

The present study provides no conclusive evidence for either explanation. However, Figure 2 data on first presentation responses do show that improvement did not occur on the behaviors which did not require the left-right discrimination until 6 of those responses had been trained. Training on left-right behaviors alone was not sufficient to develop correct first presentation responding on non left-right behaviors. This could be considered evidence for the existence of a distinct subclass of behaviors, too, but it may also be the case that generalization cannot be expected
to occur after training on only six responses. If further training on only left-right behaviors had been given, perhaps the generalization would still have occurred. Further study is needed to determine if, for most subjects, behaviors that require left-right discriminations do form a distinct subclass of behaviors from those that do not require such discriminations.

The generalizability of the results of this study are limited by two very important considerations. First, only one subject was involved; and second, that one subject could certainly not be considered normal. The results do, however, serve as a replication of previous findings with autistic, retarded, and normal pre-school subjects. The generalizability of these findings taken together would seem to be quite high.

No precise data were taken regarding the practical outcome of the study. However, general observation of Alan during gym class and classroom games and activities did provide some indication of these outcomes. During gym class, Alan's behavior did not appear to change. He participated in only a few of the activities and even then, only on a minimal basis. It appeared that training more specific to the situation and on a one-to-one basis would still be required to develop Alan's participation. In small-group classroom games and activities, however, some improvement was observed that may have been a result of the training provided. Alan began to take a significantly greater role in kick-ball games with much less prompting, sometimes running the bases properly with no physical prompting. He also began to play a simple board game with other children occasionally.

The observed improvements outside the experimental situation were small, and even these small changes could not be attributed to the experimental
manipulations with assurance, since there were a great many other occur-
rences which could have caused them. Training in imitation does not appear
to have been sufficient to initiate large changes in Alan's behavioral
repertoire. It is hoped that paired with further training, Alan's new
imitative repertoire will enable him to perform a wide variety of new and
complex tasks, and facilitate his learning from both planned and unplanned
experiences.
APPENDIX A

Written Instructions for the Observer

I am going to demonstrate a series of behaviors to Alan. Your task is to record whether or not Alan accurately imitates the demonstrations that I give. There are three types of responses that you may record:

1. Score a "correct" response (C) if Alan makes a response which accurately matches my demonstration, and completes it within ten seconds of the completion of my demonstration. If he does not complete the response in ten seconds, do not score it as "correct."

2. Score an "attempted-incorrect" response (A-I) if Alan makes a response which resembles my demonstration but does not match it accurately, within ten seconds of my demonstration. For example, if my demonstration is hopping on one foot, and Alan hops on both feet; or if my demonstration is raising my right hand, and Alan raises his left hand, score his response as "attempted-incorrect."

3. Score a "not attempted" response (NA) if Alan makes no response similar to my demonstration within ten seconds. For example, if my demonstration is hopping on one foot, and Alan stands still and smiles; or if my demonstration is raising my right hand, and Alan walks a circle around the room, score his response as "not attempted."

You will be given a score sheet with descriptions of the behaviors to be demonstrated for the session, a microphone, earphones, and a stopwatch. Following my demonstration of the behavior, you are to observe Alan's response for ten seconds, then signal me by lightly tapping the microphone
with your pen and turn away. Then score Alan's response on your sheet, and after five seconds, turn back facing us for the next demonstration. The earphones are to be worn at all times during the session.

If you have any questions about exactly what it is you are to do, you must take care of them prior to the first session, as I cannot answer questions after the study has begun.

Written Instructions for Independence of Observer Test

I am going to demonstrate a series of behaviors which Alan is to imitate. I will be verbally praising some of his responses and ignoring others, regardless of whether they are correct or incorrect. Your task is, by closely observing both Alan and myself, to attempt to determine whether I have praised or ignored Alan following each demonstration. You will record either a "P" or an "I" (praise or ignore, respectively), depending on which you think I did.

You will be given a score sheet with descriptions of the behaviors to be demonstrated for the session, a microphone, earphones, and a stopwatch. Following my demonstration of the behavior, you are to observe both Alan and myself for ten seconds, then signal me by tapping the microphone with your pen and turn away. Then score the response on your sheet, and after five seconds, turn back for the next demonstration. The earphones are to be worn at all times during the session.

If you have any questions about exactly what it is you are to do, you must take care of them prior to the test session, as I cannot answer questions once the session has begun.
REFERENCES


