

THE UNIVERSITY OF MANITOBA

THE EFFECTS OF SYSTEMATIC EXTINCTION  
AND ADDITIONAL CUES ON GENERALIZED  
IMITATION OF RETARDED CHILDREN

by

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the University of Manitoba in partial fulfillment of the requirements  
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## ABSTRACT

This study consisted of two experiments and several experimental probes designed to examine possible controlling variables in generalized imitation. Six experimentally naive mentally retarded boys served as subjects. Imitative responses were gross motor responses.

Experiment I was designed to investigate the intermittent reinforcement hypothesis of generalized imitation by systematically decreasing the density of reinforcement for imitative responding from reinforcement for 8/10 imitative responses to complete extinction over 5 experimental conditions. Experiment II also varied reinforcement density from continuous reinforcement for 8/10 responses to extinction for all responses over 6 experimental conditions. In addition, Experiment II attempted to investigate the failure to discriminate hypothesis by pairing a stimulus light with responses undergoing extinction in the experimental conditions.

Results indicated some support, though tentative, for the intermittent reinforcement hypothesis. Although no subjects indicated differential responding in the presence of the stimulus light and thus all failed to discriminate reinforced from non-reinforced responses it was not felt that this result was supportive of the failure to discriminate hypothesis in that subjects continued to respond correctly at high rates over several hundred trials when all responses were on extinction. A more viable explanation for these results would seem to be offered by the social control hypothesis in terms of experimental history and experimenter effects.

A series of experimental probes were conducted with five of the subjects after they had completed Experiment I and Experiment II to further investigate controlling variables in generalized imitation. These probes consisted of instructions not to imitate, a verbal punisher and continued extinction contingencies for imitation<sup>ve</sup> responding. Results of the experimental probes were generally consistent within subjects but varied somewhat across subjects. The social control hypothesis again offered the best explanation for these results.

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## CHAPTER I

### INTRODUCTION

Imitation refers to the production of a response by an observer which is topographically similar to that of a model and follows the model's response closely in time. Recent psychological literature on imitative behavior has been very broad and imitation has been the subject of several review papers which have examined the phenomena of imitation as it has been interpreted by various learning theories (Bandura, 1969a; Bandura & Walters, 1963; Gewirtz & Stingle, 1968; Flanders, 1969; Mercer & Algozzini, 1977; Mowrer, 1950). Imitation is considered to be an important concept in the area of child development with particular relevance to the areas of language acquisition (Bricker & Bricker, 1974; Guess & Baer, 1973b; Guess, Sailor, & Baer, 1974; Holdgrafer, 1975; Lutzker & Sherman, 1974; Sherman, 1971; Slobin, 1968) and the development of social behaviors such as aggression (Bandura, 1973), identification (Gewirtz & Stingle, 1968), and moral judgements (Bandura, 1969b).

Although the importance of imitation to development is conceded by most researchers, the nature and establishment of imitative behavior is not fully understood and has recently been the subject of intensive experimental activity. The present understanding of imitative processes has developed gradually over the years as the result of prominent learning theorists' interpretations of imitation in both laboratory and natural settings.

#### Early Learning Theory

Bandura (1969a) traces imitation as far back as Morgan and McDougall in the late nineteenth century. Their interpretation of

imitation was in terms of an instinctive framework which Bandura felt discouraged empirical investigations for several years. As instinct theory became less popular, imitation was accounted for from a Contiguity Theory model. Bandura, in interpreting the writings of Humphrey (1921) and Holt (1931) suggests that these authors felt that imitative behavior could be explained in terms of the "temporal contiguity between modelling stimuli and the imitator's matching response" (Bandura, 1969a, p.121.).

Miller and Dollard (1941) reported a series of studies investigating what they labelled as matched-dependent behavior. Matched-dependent behavior served to describe those situations where an individual would match exactly the behavior of a "more intelligent associate" for the specific purpose of obtaining the rewards the behavior of the associate or model had gained. Miller and Dollard emphasized the similarity between matched-dependent behavior and imitation and experimentally investigated this behavior. They devised a series of two choice discrimination tasks in which an observing child watched as an adult went to one of two boxes located in opposite corners of an empty room and deposited a candy treat in a randomly chosen box. The children accurately "matched" the adult's behavior and reliably retrieved the bits of candy. Additional experimentation examined various stimuli that were thought to be important variables in matched-dependent behavior. Miller and Dollard's analysis was in terms of a Hullian drive-reduction framework. Imitative learning involved drive (the subject wants something), cues (the subject notices something), responses (what the subject does), and rewards (what the subject gets).

Mowrer (1960) was in agreement with the Miller and Dollard model and expanded on it to include the concept of secondary reinforcement. Mowrer illustrated his theory using a talking bird as an exemplar. The model "makes a particular noise and the bird gets fed, water, or in some other way rewarded. The result is inevitable: the stimulus consequences of (the model's) action, as they impinge on the bird, take on secondary reinforcement, and the bird when properly motivated, tries to recreate them -- in short, 'imitates.' This, when one thinks of it, is a remarkable phenomenon: what is at first a stimulus produces a response which reproduces that stimulus" (1960, p. 112). Mowrer argued that secondary reinforcement was able to account for the motivation of the subject to imitate in both immediate and delayed situations whereas Miller and Dollard's (1941) explanation could not account for delayed imitation in the absence of either the modelled behavior or extrinsic reinforcement.

### Social Learning Theory

With the exception of Miller and Dollard's work, imitation was relatively unexplored in the laboratory until the early 1960's. Bandura and his colleagues (Bandura, Ross & Ross, 1961, 1963a, 1963b) demonstrated and defined many of the variables operating in imitation.

Most of the studies conducted by this group followed fairly similar procedures. The subject, usually a young child, was exposed to some initial treatment (e.g., watching a movie in which confederate performed specific acts) after which some other variable was manipulated (e.g., mildly frustrating the child), and finally the child's degree of imitation was measured in a situation similar to the one in the first phase (ie. the child was introduced to the situation viewed in

the movie). Age, sex, and prestige of the model variables were demonstrated to be important (Bandura 1969a).

Bandura defined the acquisition process of imitation as "observational learning" which occurred through stimulus contiguity and mediational processes. He further explained the maintenance of imitative behavior through "vicarious reinforcement" which denotes an individual experiencing reinforcement by observing another individual being reinforced. Vicarious reinforcement was hypothesized to take place by both stimulus contiguity and symbolic mediation, both central to Bandura's theory.

#### Imitation in Operant Conditioning

An operant conditioning analysis of imitation (Baer & Sherman, 1964; Skinner, 1953), has attempted to explain imitation using only conditioning principles and in addition arguing that the addition of the terms "observational learning" and "vicarious" reinforcement were unnecessary. Research on imitation in the operant model has led to the introduction of an alternative methodological approach to the experimental investigation of imitation. Central to this approach is an avoidance of organized theory and a concentration upon simple stimulus-response functional relations derived from single subject research designs (Baer, Wolf & Risley, 1968; Hersen & Barlow, 1976; Sidman, 1960) in which subjects are studied under highly controlled experimental conditions.

The research paradigm employed in operant experimentation is known as "generalized imitation".

## CHAPTER II

### REVIEW OF THE LITERATURE

Generalized imitation from an operant conditioning or behavioral analysis point of view has been studied using two experimental paradigms. In one paradigm it has been repeatedly demonstrated that the operant level of behaviors modelled to subjects can be raised to very high rates in the absence of reinforcement ( $S^A$  responses) by contingently reinforcing other similar responses ( $S^D$  responses) if they are imitated subsequent to the experimenter modelling them (Baer & Sherman, 1964; Bry & Nawas, 1972; Garcia, 1971; Hekka & Freeman, 1978; Marsberg, 1974). A second paradigm focuses on the maintenance of imitative responses already in the subject's repertoire through reinforcement and/or instructions and the addition of other responses (generalized imitative responses) which are never reinforced (Brigham & Sherman, 1968; Peterson & Whitehurst, 1971; Steinman, 1970a).

The strategy followed is to manipulate instructional and/or reinforcement components in order to decrease the usually high rates of imitation typically obtained in both of these models. Experimental results obtained by controlling these sets of independent variables and analyzing subsequent response rates have led to the formation of several hypotheses concerning the control of generalized imitation. This review will examine the four major hypotheses that have developed from an operant conditioning frame-work by emphasizing the data supportive of each of the four major positions.

### Behavioral Similarity to the Model Hypothesis

Generalized imitation was first described by Baer and Sherman (1964). In this experiment eleven young children served as subjects. Children were seen individually in an experimental situation in which each subject was seated in front of a small stage. A hand puppet was located on the stage and a speaker through which the experimenter could communicate was located within the stage. Both the subject and the puppet had a bar pressing apparatus in front of them. In the experimental phase subjects were socially reinforced by the puppet if they imitated the puppet's behaviors of mouthing, head nodding, and saying unusual verbal statements. The generalized imitative response in this experiment was bar pressing and subjects were never reinforced for imitating this behavior.

Results indicated that although all subjects imitated the reinforced behaviors only seven of the subjects reliably produced the bar pressing response. Baer and Sherman were also able to demonstrate a reduction to operant level of imitative responding under conditions of extinction and time out (T0).

Baer, Peterson, and Sherman (1967) replicated these findings utilizing an adult experimenter and three mentally retarded children who had no prior imitative skills. This experiment consisted of three phases in which imitative behavior was trained, correct imitative behavior was reinforced and generalized imitative responses were introduced. In the generalized imitative response phase the subjects produced ratios of reinforced to unreinforced responses ranging from 8:1 to 125:5.

Baer and his associates explained these results in terms of a conditioned reinforcement hypothesis. This hypothesis argues that behavioral similarity to a model immediately prior to external reinforcement becomes a discriminative stimulus for reinforcement on subsequent trials. The "similarity to a model" stimulus via pairings with positive reinforcement develops conditioned reinforcement properties of its own and can maintain imitative responses not followed by reinforcement.

Brigham and Sherman (1968) used the behavioral similarity to a model hypothesis to account for the results they obtained with three 4 year old boys. Subjects in this study had either English or Russian words modelled for them by an experimenter. Imitating English words resulted in positive reinforcement while the imitation of Russian words (generalized imitative responses) were never reinforced. Imitation of Russian words correlated highly with the imitation of English words in all phases of this experiment.

Brigham and Sherman (1968) suggested that "Since vocal matching (similar auditory stimuli) preceded and was discriminative for reinforcement, it may have become a conditioned reinforcer." (p. 158)

The Brigham and Sherman (1968) study was based on a study conducted by Lovass, Berberich, Perloff and Schaeffer (1966) in which two autistic children were reinforced for the imitation of English words but not for imitating Norwegian words. Lovass et al. explained the imitation of Norwegian words on the basis of conditioned reinforcement.

Further support of the behavioral similarity to a model hypothesis has been offered by Parton and Fouts (1969). Similarity of colors was



demonstrated to be an effective conditioned reinforcer for the children in this study which employed a Matching to Sample procedure. In a subsequent study Parton (1970) further investigated the behavioral similarity to a model hypothesis using the same experimental setting and apparatus as the Baer and Sherman (1964) study. The results of this study indicated that generalized imitation occurred in only 19 out of 100 kindergarten children. Furthermore, imitative responses decreased as the experimental session progressed. Since it would be expected that the reinforcing properties of similarity to the model should increase over trials as should the frequency of imitation this evidence would seem to be negative as far as the Baer et al. (1967) hypothesis is concerned. However, these results may have been due to the experimental design used in this study. Unlike the Baer and Sherman (1964) single-subject methodology in which only 11 children were employed for up to seven sessions Parton used a repeated measures group design in which only one session was required for each of the 100 subjects.

Steinman (1970a) has criticized the conditioned reinforcement explanation of generalized imitation. He argues that if differential reinforcement in other operant situations develops stimulus control then it should also develop stimulus control for generalized imitations. Conversely if the response produced stimuli in the generalized imitation paradigm act as conditioned reinforcers then why do the response produced stimuli in all operant situations not act as conditioned reinforcers.

In an experiment with a 12 year old retarded girl Peterson (1968) obtained results which also question the validity of behavioral similarity to a model as an explanation for generalized imitation. In one

condition of this study the subject was taught a set of non-imitative responses as well as a set of imitative responses. The non-imitative responses were controlled by the experimenter through discriminative stimuli. These non-imitative responses were non-reinforced but were maintained when interspersed among reinforced imitations. Under extinction all responses decreased, "indicating that reinforcement was necessary to maintain the response-class organization, but not confirming an essential role for 'similarity' as such" (p. 225).

Although the behavioral similarity to a model hypothesis seemed to be a reasonable explanation of generalized imitation when first discussed by Baer et al. (1967) it has failed to stand up to empirical investigation as the result of studies such as Peterson (1968) and Parton (1970), and presently is discussed in the literature more from a historical perspective than a viable explanation.

#### Failure to Discriminate Hypothesis

Bandura has offered an alternative explanation for the generalized imitation phenomena (Bandura 1968, 1969 a b; Bandura & Barab, 1971). Imitation for Bandura (1968) is a product of observational learning. As a result of the observational learning process symbolic representations of modelled behavior are established. Performance of the imitative response is reinforced by vicarious reinforcement, direct reinforcement or self-administered internal reinforcement.

Bandura (1969 a) discounts the conditioned reinforcement explanation of generalized imitation stating that rather than similarity to a model being the primary dimension of reinforcement it was the utilitarian value of the behavior that maintained imitation. He explained general-

ized imitation as a failure by the observer to discriminate reinforced from non-reinforced responses. In the imitation paradigm all responses, both reinforced and non-reinforced, differ in many of their stimulus characteristics but also have many similar characteristics. Because the situation is complex the observer simply cannot discriminate the reinforced from the non-reinforced behaviors. Bandura predicted that over trials a discrimination between the reinforced and non-reinforced trials would be acquired resulting in a reduction in generalized imitative behavior, rather than an increase in generalized imitative behavior as would be predicted from the conditioned reinforcement explanation.

In the Parton (1970) study discussed above some subjects did in fact reduce generalized imitative responding as the study progressed. This offered support for the discrimination hypothesis as a result of the procedure which may have facilitated discrimination. This procedure specified blocks of three trials (two reinforced responses and one non-reinforced) separated by 20 seconds of puppet interaction.

Steinman (1970a) investigated the discrimination hypothesis using a novel procedure which involved "choice trials". The usual procedure followed in studies on generalized imitation was to present subjects with the instruction "do this", after which the experimenter modelled a behavior which was followed by the subject's response. This procedure was repeated on each trial. Steinman's innovation involved training subjects initially with this type of "single presentation trial procedure" then to provide the subject with a choice of imitations on each trial. Subjects on each trial of this procedure had a choice of imitating

one  $S^D$  response or one  $S^A$  response modelled by the experimenter. Steinman's rationale was that a choice of responses on each trial would facilitate discrimination for subjects and differential responding should result with  $S^D$  responses being imitated more frequently. Steinman's investigation was comprised of three experiments.

In the first experiment blocks of single presentation trials were alternated with blocks of 10 choice trials twice each session. In the first six sessions only  $S^D$  responses were used in both types of trials.  $S^A$  responses were introduced to both types of trials during the seventh session. Both subjects imitated both types of responses during single presentation trials. The results were conflicting for the choice trial procedure as one subject reliably showed differential responding as predicted while the other subject generated a response pattern in which the most recently modelled response was imitated regardless of its consequences.

In the second experiment Steinman tested the discrimination hypothesis by manipulating discrimination difficulty. In this procedure half of the  $S^A$  responses were similar to the  $S^D$  responses in that they involved imitating gross motor movements of the hands. The other half of the  $S^A$  responses were of low discriminability involving imitation of foot movements. The results of the previous experiment were replicated as all four subjects imitated both  $S^D$  and  $S^A$  responses on the single presentation trials. On choice trials more of the high discrimination difficulty  $S^D$  responses were imitated than low difficulty  $S^A$  imitative responses. This data suggests at least qualified support for the discrimination hypothesis.

In the third experiment Steinman investigated another variable of discrimination by manipulating instructions given to subjects preceding experimental sessions. In the first three sessions subjects were told not to do the imitations they didn't get a bead for. Before sessions 4, 5, and 6 they were told that it didn't matter if they didn't do the imitations they didn't get a bead for. The instructions for sessions 7, 8, and 9 were the same as those given for the first three sessions. In session ten the subjects were asked to watch the experimenter perform a behavior and then state whether or not they had previously received a bead for performing that response.

The results of this experiment indicated that instructions were effective in altering the performance of imitations. Sessions preceded with the first instruction resulted in a decrease in  $S^A$  responses. The degree of difficulty of the discrimination was also evident in the results of this experiment. On trials involving a choice, three of the four subjects never imitated the unreinforced imitations that were highly discriminable with a less pronounced effect with less discriminable responses. The results were relatively the same on single presentation trials. Sessions preceded by the second instruction resulted in data which was relatively the same as that reported for the second experiment. The results of the session in which subjects were asked to identify verbally which responses were reinforced and which were not, were consistent with subjects performance in the previous nine sessions. The three subjects who showed differential performance were consistently able to verbally label those responses which were followed by reinforcement and those which were not. The results of these experi-

ments support the failure to discriminate hypothesis under conditions of low discriminability between  $S^D$  and  $S^A$  responses, and with greater support using a "choice trial" procedure than a "single presentation trial" procedure.

A further study by Steinman (1970 b) replicated and extended the findings of the above study. Using the same procedures of single presentation trials and choice procedures Steinman again varied instructions which preceded the experimental session but in addition employed two experimenters. One experimenter was always associated with  $S^D$  responses and one was always paired with  $S^A$  responses. Six girls between the ages of seven and nine served as subjects. During single presentation trials the appropriate experimenter entered the session room, ran a trial and then left the room immediately following the trial. After five seconds either the same or the second experimenter, depending on the type of trial, entered the room to initiate the next trial. On choice trials both experimenters remained in the session room seated in front of the subject. Initiation of a trial involved one experimenter saying "Do this" and modelling a response. The second experimenter gave the same instruction and modelled a response immediately following the modelled response by the first experimenter.

The results showed that the subjects modelled all responses on single-presentation trials but discriminated  $S^D$  from  $S^A$  responses on choice trials. When instructed not to perform imitations for which they didn't get a bead all subjects stopped imitating  $S^A$  responses. Although the results suggest that subjects were able to discriminate  $S^D$  from  $S^A$  responses under certain conditions Steinman also suggested that further

research on generalized imitation might investigate social setting events as a factor responsible for generalized imitation. This suggestion was based on Steinman's observations of the influence of the model in the experimental setting. The model provides instructions and consequences to the subject and "demands" a certain amount of compliance from the subject.

Steinman and Boyce (1971) tested the failure to discriminate hypothesis using essentially the same procedures previously described (Steinman, 1970 a b). The four 5 year old girls who served as subjects demonstrated discrimination only on choice trials. A novel manipulation in this study was to reverse the reinforcement contingencies in one phase such that previously non-reinforced imitations received reinforcement and reinforced imitations did not. On choice-trials subjects continued to discriminate correctly but on single-presentation-trials responding was not affected as all subjects continued to imitate all responses whether reinforced or not.

Although these results again indicate qualified support for the failure to discriminate hypothesis the authors have suggested that generalized imitation may be more a function of the procedures employed than a failure to discriminate.

Bufford (1971) tested the failure to discriminate hypothesis in a systematic replication of Steinman (1970a; 1970b). Monosyllabic English and German nouns were reinforced or not reinforced respectively if imitated. The number of  $S^D$  responses was systematically decreased from 20 to 1 while the number of  $S^A$  responses remained constant at 10. Bufford's hypothesis was that as the number of reinforced responses

presented decreased the ease of discrimination should increase and if the failure to discriminate hypothesis was correct the number of imitations of the German nouns should decrease. In 55 single presentation trial sessions and two subsequent sessions of choice trials no differential responding was observed in the subjects. Thus Steinman's findings were not replicated although highly discriminable responses were used.

In a second experiment instructions were manipulated as subjects were told not to "verbally" imitate those words for which they were not reinforced. Differential responding occurred which supports Steinman (1970a) but which again fails to support the failure to discriminate hypothesis.

Using the subjects from the first experiment and the procedure of the second experiment Bufford examined the interaction of long experimental histories with instructions not to respond. Instructions resulted in a reduction of responses on  $S^A$  trials but not nearly as dramatic as the results of experiment two. This result would suggest that instructional control may decrease as subjects generalized imitative history increases.

Sherman, Saunders, and Brigham (1970) demonstrated that generalized matching and generalized mismatching behavior could be developed using procedures similar to procedures used in imitation studies. Subjects reinforced for matching several sample stimuli reliably matched probe stimuli in the absence of reinforcement. Other subjects who were reinforced for mismatching sample stimuli also consistently mismatched novel samples in the absence of reinforcement.



Saunders and Sherman (1974) attempted to test the failure to discriminate hypothesis by replicating Steinman (1970a) using a match to sample procedure. Three moderately retarded adolescents served as subjects in this experiment. Consistent with Steinman's results subjects demonstrated no differential responding on single-presentation trials, but showed a preference for reinforced responses on choice trials although they continued to respond to some probe samples never associated with reinforcement. In the final condition of this experiment when single-presentation trials were reinstated subjects again responded to stimuli which they had discriminated on previous choice trials.

In all of the studies which have attempted to evaluate the failure to discriminate hypothesis three results have been consistent:

1. When given a choice of which response to imitate subjects are able to make appropriate discriminations and show differential responding in favor of those imitations which produce reinforcement.
2. Subjects have not reliably demonstrated that they are able to discriminate reinforced from non-reinforced responses on single-presentation trials even when the discriminability of reinforced and non-reinforced responses is facilitated.
3. Subjects are reliably able to make discriminations when instructed not to respond to those responses that do not produce reinforcement if imitated.

### Intermittent Reinforcement Hypothesis

An interpretation of the generalized imitative response based on intermittent reinforcement has been offered by Gewirtz (Gewirtz & Stingle, 1968; Gewirtz, 1968; 1971). In this hypothesis the imitative repertoire is viewed as a response class (i.e., operant) made up of diverse but functionally equivalent behaviors maintained by extrinsic reinforcement on an intermittent schedule. Gewirtz used a conditional discrimination matching-to-sample paradigm to explain how generalized imitation might develop. He proposed that when faced with a particular stimulus situation that calls for an imitative response, the subject is required to match his behavior to that of the model's, selecting from his repertoire of matching responses. Since the subject must base his response on the basis of several environmental stimuli the discrimination is conditional.

Gewirtz offered no data of his own to support this hypothesis. His analysis was based on the data of Baer and his associates (Baer & Sherman, 1964; Baer et al., 1967) and emphasized extrinsic reinforcement rather than the intrinsic reinforcement suggested by the conditioned reinforcement elements of the behavioral similarity to the model hypothesis. Gewirtz stated that although the intermittent reinforcement hypothesis could include the conditioned reinforcement assumptions it (intermittent reinforcement) was a much simpler explanation which did not require the addition of hypothetical constructs.

Sherman et al. (1970) took issue with Gewirtz analogy between generalized imitation and matching-to-sample. They noted that the topography of a matching-to-sample response is highly restrictive across

matches (e.g. a button press) whereas imitative responses cover a much wider range of topographies. In addition, in matching-to-sample the matching stimulus is usually available at the time of the matching response which is not the case in generalized imitation where first the experimenter models a response and then the subject responds. Despite these criticisms Sherman et al. (1970) employing a match-to-sample procedure demonstrated results similar to generalized imitation studies and thus supported the matching-to-sample analogy discussed by Gewirtz.

Gewirtz's intermittent reinforcement explanation of generalized imitation has not generated much research to directly investigate this interpretation. Although there have been no studies which have directly tested this hypothesis some evidence is available on schedule effects from a variety of experiments.

Extinction Baer and Sherman (1964) reported decreases in responding of both reinforced and non-reinforced imitations with both subjects for which extinction procedures were applied. Using an ABA design (Sidman, 1960) subjects showed high stable response rates for all imitations under reinforcement procedures, dramatic decreases in response rates under extinction conditions, and return to high stable response rates when reinforcement procedures were reintroduced.

Peterson (1968) demonstrated that all imitative responses decreased with a retarded child when subjected to extinction. This effect held true for previously reinforced imitations, non-reinforced imitations, and non-reinforced non-imitative behavior.

Waxler and Yarrow (1970) report similar results with 39 children, 4 and 5 years of age. Their results indicate that extinction was most rapid when subjects were also released from instructions to respond. Non-contingent reinforcement was found to prolong responding.

Extinction was used in some phases of an experiment by Martin (1972) to investigate the role of instructional variables on generalized imitation. Responses only decreased with severely retarded subjects under extinction conditions if instructions "Don't do this" preceded demonstrations modelled by the experimenter. When the instruction "Do this" preceded the demonstration by the model extinction was not effective in decreasing imitative responding.

DRO Because extinction often produces undesirable side effects such as emotional behaviors (Skinner, 1953) and with young children may be aversive to the point where they no longer wish to continue in an experiment some researchers have used DRO (Differential Reinforcement of Other Behaviors) schedules to demonstrate the importance of response-contingent reinforcement.

Since reinforcement is not contingent on imitation when DRO schedules are in effect imitation of both  $S^D$  and  $S^\Delta$  responses would be expected to decrease. DRO effects have not been consistent however.

In three studies using severely retarded subjects (Baer et al., 1967; Martin, 1971, 1972) DRO has produced very substantial reductions in imitative responding. In the Baer et al. (1967) study one of the three subjects was not responsive to DRO 30-seconds (as were the other two subjects) or DRO 60-seconds but decreased responding under a DRO

0-seconds schedule. Burgess, Burgess, and Esveltd (1970) obtained similar results with mentally retarded subjects. A DRO 0-seconds schedule successfully reduced responding to zero where as DRO schedules ranging from 3 to 90 seconds were not effective.

Brigham and Sherman (1968) were successful in eliminating imitative responding in normal preschoolers with a DRO 5-second schedule. Steinman (1970 a) and Steinman and Boyce (1971) were unable to significantly decrease responding using DRO 15-second and 0-second schedules. Peterson and Whitehurst (1971) using a DRO 20-second schedule were also unable to decrease imitative responding with normal children.

Acker, Acker, and Pearson (1973) were successful in decreasing imitative responding in first and second grade school children by employing a DRO 20-second schedule.

Although results using DRO schedules have been inconsistent it appears that this type of procedure has been most effective in decreasing imitative responding with retarded children.

Punishment Schedules Martin (1972) demonstrated that a conditioned punisher in the form of a verbal reprimand (a loud "No!") was effective in decreasing imitative responding. In this particular condition the subject was also instructed ("Do this") to imitate on each trial. In all three retarded subjects the percentage of both previously reinforced and non-reinforced imitations diminished rapidly.

Acker et al. (1973) reported rapid deceleration for imitative responding in normal children using punishment in the form of verbal reprimands ("No! ") and reinforcer withdrawal. Subjects had one piece

of previously earned candy taken away following each imitative response. This procedure was effective for all twelve children involved in this procedure.

Punishment in the form of brief Time Outs has also been demonstrated to be effective in decreasing imitative responding (Baer & Sherman, 1964; Lupercio & Ribos, 1976).

Although many researchers (e.g. Baer & Sherman, 1964; Garcia, 1971; Garcia, Baer, & Firestone, 1971; Furnell & Thomas, 1976; Peterson, 1968) have demonstrated that reinforcement is an important variable in the explanation of generalized imitation no data has been presented to date in which schedules or reinforcement have been systematically decreased from high to low densities using a single-trial-presentation procedure. Consequences have been altered by switching from reinforcement to extinction, DRO, or punishment schedules as reviewed above. Because of the inconsistencies in achieving schedule control especially with DRO schedules some researchers have argued that failure to obtain schedule control is supportive of a setting events or social control explanation of generalized imitation (Martin, 1971, 1972; Steinman & Boyce, 1971).

#### Social Control Hypothesis

Bufford (1971) first elaborated the position of a setting event or social control hypothesis. He argued that a variety of setting events or demand characteristics inherent to the experimental situation offered a stronger explanation for the generalized imitation effect than behavioral similarity to a model, failure to discriminate or intermittent reinforcement explanations. This hypothesis has been very fruitful in producing research which has examined a variety of setting events.

These include: instructional control (Martin, 1971, 1972; Steinman 1970a, 1970b; Waxler & Yarrow, 1970), presence or absence of the experimenter (Peterson, Merwin, Moyer & Whitehurst, 1971; Peterson & Whitehurst, 1971; Wilcox, Meddock & Steinman, 1973) experimental history effects (Acker, et al. 1973, Bufford, 1971; Oliver, Acker & Oliver, 1977; Smeets, Striefel & Gast, 1974). Research examining this hypothesis has been conducted with a variety of populations ranging from the severely retarded (Munsdorff, 1977; Redd & Birnbrauer, 1969) to nursery school children (Barrett, 1977; Epstein, Peterson, Webster, Guanieri & Libby, 1973) and normal children (Acker et al. 1973; Greenberg, 1979; Long, 1975; Peterson et al, 1971).

Instructional Effects Waxler and Yarrow (1970) demonstrated the effects of instruction upon extinction in generalized imitation. Extinction was introduced under four conditions after imitation of both SD and S<sup>Δ</sup> responses had reached 100% in a training phase. In the first condition contingent reinforcement was replaced with non-contingent reinforcement. In the second condition all reinforcement was withheld. The third and fourth conditions were replications of the first and second conditions respectively except that subjects in these conditions were told that they did not have to do anything if they did not want to. The most rapid decreases in responding were in these later two conditions in which there was an "instructional release" from responding. Reinstatement of reinforcement in a third phase showed that subjects who underwent the first two conditions returned to 100% performance of imitations more quickly than subjects in the third and fourth conditions.

Steinman (1970a; 1970b) reported essentially the same results when instructions were manipulated in much the same way. When subjects were told "Today, don't do the ones you don't get a bead for" (1970a, p. 93) non-reinforced imitations were substantially reduced while the instruction "Today, it doesn't make any difference whether you do the ones you don't get a bead for or not. I don't care ..... It's up to you" (1970a, P. 93) also reduced non-reinforced imitative responding but not as drastically as the first instruction.

Martin (1971) designed an experiment to determine whether modelling was necessary to obtain generalized imitative behavior. Using four severely retarded boys as subjects an experimenter modelled one set of motor behaviors and verbally instructed subjects to engage in a second set of motor behaviors. The design had the modelled and instructional sets of behaviors counterbalanced such that for two subjects modelled behaviors were reinforced and instructional behaviors were not if imitated and vice-versa. Martin reported no appreciable differences in response rates for the two sets of behaviors across phases of the experiment. Reinforcement of one set resulted in the other set being performed equally well. Martin concluded that generalized imitation can be at least partially accounted for on the basis of "generalized instruction following" since modelling need not be present for the effects to appear.

Martin (1972) replicated and extended these findings in a study designed to investigate the interaction between instructions and consequences. Three retarded boys served as subjects and two sets of motor behaviors were modelled. The experiment consisted of 13 phases in which



Set A behaviors were consequted in one of the following ways: reinforcement, extinction, DRO 0-seconds, DRO 15-seconds, or a verbal reprimand (described above). Set B responses were never reinforced or consequted in any way. Each phase varied as to the consequences of the Set A behaviors and the instructions given within each phase. Depending upon the phase the Experimenter would precede each behavior he modelled with the instruction "Do this" or "Don't do this." In several phases, the instructions and the consequences were incongruent allowing for an analysis of the relative control exerted by both variables (e.g. "Do this", subject performs response; response is verbally reprimanded, "No").

Consequences of imitative behavior were found to control imitative behavior under the following experimental conditions: (1) "Don't do this" - Set A reinforced, (2) "Do this" - Set A verbally reprimanded. (3) "Do this" - Set A under DRO - 0 seconds or DRO - 15 seconds. When no reinforcement was available and subjects were instructed to imitate, no differences in percent of behavior imitated occurred between Set A and Set B behaviors. That is although instructions were shown to control imitation under some conditions, there were no differential effect of instructions upon non-reinforced imitative responses when reinforcement was available. Martin concluded that consequences could override the effects of incongruent instructions.

As discussed earlier, Bufford (1971) reported results that indicate that instructional control may decrease as subjects generalized imitative history increases.

Experimenter effects Another demand characteristic that has been shown to influence generalized imitation is related to the control exerted by the model in the experimental situation. Peterson and Whitehurst (1971) varied consequences for imitative behavior and whether or not the experimenter was present immediately after he modelled the behavior. After several sessions in which consequences were manipulated the 3 young children serving as subjects were told that the experimenter did not want the subject to do anything until after the experimenter had left the room. After saying "Do this" and modelling a behavior, the experimenter left the room and returned after 20 seconds to model the next behavior. The subject was observed through a one-way mirror and no reinforcement was dispensed in this condition. The following phase was identical except that the experimenter remained present in the room. The absence of the experimenter produced a dramatic reduction in imitative responding although there was a considerable amount of variability in the rate with which this decrease occurred. Imitative behavior quickly returned to its previous high rates in the subsequent experimenter present phase.

Peterson et al. (1971) systematically replicated this study using a pool of gross motor behaviors with four preschool children. In the first condition with the experimenter present but no reinforcement available all subjects performed between 90% and 100% of the behaviors. In the next condition, experimenter absent, and no reinforcement available, imitated behaviors decreased rapidly to less than 10% for all subjects. In the third phase, the experimenter was absent again, and a

differential reinforcement procedure was introduced. Three of the subjects imitated at rates nearly as high as those in the experimenter present condition and also began to show differential responding to reinforced and non-reinforced behaviors. When the experimenter remained in the room during the next phase the two subjects in this condition immediately regained their previously high imitative response rates and ceased responding differentially. Peterson et al. (1971) concluded that the presence of the experimenter tends to disrupt the ability of the subject to discriminate reinforced from non-reinforced responses.

Wilcox et al. (1973) were unsuccessful in replicating these results with four pre-school children on a non-imitative, successive imitation task. An interesting result of this experiment, however, was differential responding to stimuli associated with reinforcement after subjects viewed the experimenter differentially responding on the experimental apparatus.

History effects Recently some attention has been focused on the role of behavioral history and how such histories can interact with variables later introduced into the setting.

Bufford (1971), as discussed earlier, varied instructions across several phases of generalized imitation in an attempt to replicate the instructional control demonstrated in an earlier phase of the study. Using subjects from the first experiment, Bufford was able to show some degree of control although the effects were not nearly as pronounced as with the subjects from the second phase of the experiment who had considerably fewer experimental sessions. There is some evidence,

therefore, for a history effect in which instructional control decreases with an increasing number of sessions.

Adams and Hamm (1973) exposed subjects to a pre-experimental phase in which the experimental group received token reinforcement for matching responses to that of the experimenter and the control groups matching was not consequated. It was found that after being exposed to a film displaying aggressive acts, those subjects who had received token reinforcement in the pre-experimental phase imitated more of the aggressive behavior than did the non-reinforced controls. The authors concluded that the reinforced matching history enhanced later imitative behavior even though different adults were involved in the two phases.

Acker et al. (1973) systematically varied history to determine what effects would occur on generalized imitative physical affection responses. Eighteen first and second grade children were randomly assigned to one of three initial conditions: physical contact, verbal affection or verbal aggression. Eight responses similar in topography were involved in each condition. Six of these responses were reinforced and two were not reinforced. In a child's game-play situation, the adult model interacted with a stuffed teddy bear. Behaviors in the physical-contact condition involved contact with the teddy bear and several gross motor responses (e.g. touch nose of animal). Behaviors in the verbal affection group did not require physical contact but were statements of praise for the teddy bear (e.g. "You're wonderful teddy bear"). Behaviors in the verbal aggression condition also required no physical contact and were depreciative (e.g. "What ugly eyes you have, teddy bear"). None of the subjects showed any instances of imitation

during a baseline phase. A training phase resulted in generalized imitation with all subjects emitting both reinforced and non-reinforced imitative responses. Following this a generalization phase was introduced that was identical to the training phase except for the addition of two affection probes (e.g. hugging the animal) and two aggression probes (e.g. punching the animal in the stomach) which were modelled several times but were never consequated for any subject.

Results showed that only the subjects having received the physical contact exposure were inclined to imitate these four new non-reinforced responses. Since this group had already been reinforced for behaviors involving contact with the teddy bear, it is reasonable to expect that new behaviors similar to ones previously reinforced in the experimental setting would be more likely to be imitated. Those subjects previously reinforced for verbal interactions with the teddy bear did not show any generalization indicating that behavioral history can be an important factor.

More recently Oliver et al. (1977) have extended these findings with a study designed to evaluate the effects of prior reinforcement histories for compliance and non-compliance on generalized imitation. Using elementary school children as subjects reinforcement histories were manipulated by either reinforcing subjects for following or not following a series of instructions or providing no reinforcement histories. In subsequent experimental conditions results indicated that subjects who were previously reinforced for following instructions showed greater tendencies to generalized imitation than control subjects (no reinforcement history). Those subjects who were reinforced for not

following instructions showed a decreased tendency to generalized imitation compared to controls in the second experiment of this study.

Several other studies have provided additional support for history effects as an important variable in the control of generalized imitation. Durrell and Weisberg (1973) found that prior history with models and schedules of reinforcement represented a significant history variable as subjects exposed to a distinctive model who reinforced all matching responses showed more generalized imitation than subjects exposed to a non-distinctive model who did not reinforce all matching responses. Epstein and Price (1970) report similar results with subjects on an auditory matching task. Smeets and Striefel (1974) varied the order in which retarded subjects received single presentation trials and choice trials analagous to the format employed by Steinman (1970a, 1970b). Results indicated that the order in which subjects were introduced to these phases affected discrimination of reinforced from non-reinforced responses. Subjects who had choice trials introduced first had much more difficulty acquiring the discrimination than subjects introduced to single presentation trials first.

From the evidence reported in the studies discussed above it is clear that demand characteristics or social control in the experimental setting is an important determinant of generalized imitation.

## CHAPTER III

### STATEMENT OF THE PROBLEM

Research on generalized imitation has accounted for many of the variables that exert control over generalized imitative responding. These variables include instructions (Klauck, 1969; Martin, 1972; Steinman, 1970a); presence or absence of the model (Peterson et al. 1971); Peterson & Whitehurst, 1971); discrimination difficulties (Steinman, 1970a; Steinman & Boyce, 1971); reinforcement schedules (Baer & Sherman, 1964; Martin, 1971, 1972; Peterson, 1968); and experimental history (Acker et al., 1973; Bufford, 1971; Oliver et al., 1977). These variables have been included in four distinct hypothesis to explain generalized imitation: behavioral similarity to a model (Baer et al., 1967); failure to discriminate (Bandura, 1968, 1969ab); intermittent reinforcement (Gewirtz & Stingle, 1968); and social control (Bufford, 1971). No one hypothesis has been able to satisfactorily account for all of the findings and although many variables have been identified as being important many questions have been left unanswered.

Of the four hypothesis on generalized imitation the position most actively investigated in recent studies has been the social control hypothesis. One major reason for the interest in setting events is the characteristics of subjects used in research on generalized imitation. Subjects are usually pre-schoolers and elementary school children (ages 4 to 9) who are perhaps more sensitive to instructions and expectancies in the experimental setting than they are to aspects of discrim-

ination and reinforcement. Whatever the model says to do the subject does despite consequences. Conversely, of the studies reviewed, those employing retarded children (e.g., Baer et al., 1967; Martin, 1972) have shown more control in responding through manipulation of consequences than instructions and other demand characteristics.

In general, the literature has indicated that when imitations maintained on a schedule of reinforcement are subjected to a schedule of extinction all responses including generalized imitative responses decrease. However, no studies have systematically attempted to extinguish imitative responses one or two at a time, thus lowering the density of reinforcement on an intermittent schedule or conversely making those responses not receiving reinforcement more easily discriminable.

The literature also cited no studies which support the discrimination hypothesis without changing the basic paradigm by modifying instructions or the presentation of stimuli from single presentation to choice trials. Very few attempts have been made to facilitate discrimination by providing additional cues to the experimental setting and then testing in the absence of these cues. Those studies reporting such investigations (Bucher & Bowman, 1974; Furnell & Thomas, 1976) have produced inconclusive evidence for this hypothesis because of confounding variables.

The present study had two major objectives. The first objective was to investigate the intermittent reinforcement hypothesis by systematically decreasing the density of reinforcement for imitative responding with retarded children. It was predicted that the response rates of subjects



would be maintained at high rates through conditions A, B, C, and D, and would decrease rapidly to near zero levels in condition E of this experiment. The second objective was to examine the failure to discriminate hypothesis by providing additional discriminative cues to the experimental situation. The expectation of this experiment was that subjects would respond differentially to the responses paired with the cues over successive experimental conditions. That is, subjects would continue to emit those responses which were reinforced and paired with the stimulus light. The purpose of this strategy was to ascertain if differential responding on the basis of a discrimination was possible with retarded children in a single presentation trials paradigm.

## CHAPTER IV

### METHOD

#### Subjects

The subjects in this research were six mentally retarded boys between the ages of four and ten. All subjects attended Winnifred Stewart School, a private school for mentally retarded children in Edmonton, Alberta. Prior to this study none of the subjects had previously participated in any research. The ages, number of years attending Winnifred Stewart School, and medical characteristics of the subjects are summarized in Table 1.

Subjects were chosen in consultation with the school counsellor on the basis of having severe delays in language but also having been observed to have at least some imitative skills. The six subjects were from four different classrooms in the school where they were taught basic developmental skills appropriate to their functioning levels. Two of the subjects attended a program at the University of Alberta two mornings per week. This program was conducted by the Department of Physical Education and was designed to improve the children's gross and fine motor skills. Three of the children regularly received speech therapy sessions at school. All children lived at home and were bused to school each day arriving at approximately 9:00 AM and leaving at 3:00 PM.

#### Setting

All experimental sessions were conducted in a spare classroom on

TABLE I

## Subject Characteristics

| SUBJECTS | DIAGNOSIS                                              | CURRENT AGE<br>YEARS | AGE<br>MO. | # OF YEARS<br>AT SCHOOL | I.Q.                                                                  |
|----------|--------------------------------------------------------|----------------------|------------|-------------------------|-----------------------------------------------------------------------|
| 1        | Microcephaly<br>severely mentally<br>retarded          | 9                    | 5          | 1                       | M.A. 2 yrs. 10 mo.<br>I.Q. 24                                         |
| 2        | Down's Syndrome<br>severe speech and<br>language delay | 9                    | 3          | 1                       | M.A. 2 yrs.                                                           |
| 3        | Down's Syndrome<br>speech and lan-<br>guage delay      | 8                    | 1          | 4                       | No recent tests                                                       |
| 4        | Brain damage at<br>birth<br>speech delay               | 4                    | 2          | 1                       | I.Q. Borderline<br>73-Leiter<br>International<br>Performance<br>Scale |
| 5        | Down's Syndrome<br>speech and lan-<br>guage delay      | 10                   | 5          | 4                       | No recent tests                                                       |
| 6        | Down's Syndrome                                        | 6                    | 10         | 1                       | M.A. 2 yrs. 6 mo.                                                     |

the first floor of the school. The dimensions of the room were approximately 9m by 8m and windows were located along the outside wall. The room was modified with a portable room divider to allow two sessions to run concurrently with minimal distractions. Figure 1 illustrates the experimental setting. One experimenter sat in a corner of the room with her back to the corner and a subject sat in front of her. The subject's back was to the portable divider as well as to the open area of the classroom. As indicated in Figure 1 experimenter 2 sat in another corner of the room such that a second subject sat facing him with his back also to the portable room divider as well as to the open area of the classroom. Next to each experimenter was a table which was used to hold any materials or equipment needed for a particular session.

In the open area of the classroom a 2.5m x 1m table was located such that a third experimenter when seated at this table could conduct reliability checks of sessions being conducted by either experimenter 1 or experimenter 2. This table also served to hold the various data sheets and materials for each experiment as well as individual files for each subject which summarized progress in the study.

### Apparatus

A stimulus light 40 cm in height and illuminated by a red 40 watt bulb was located on the table to the right of each experimenter. Each light was operated by a hand held switch. Ten tokens (plastic poker chips) were also located on the table as was a small dish which was used to hold the tokens as subjects earned them throughout a session.



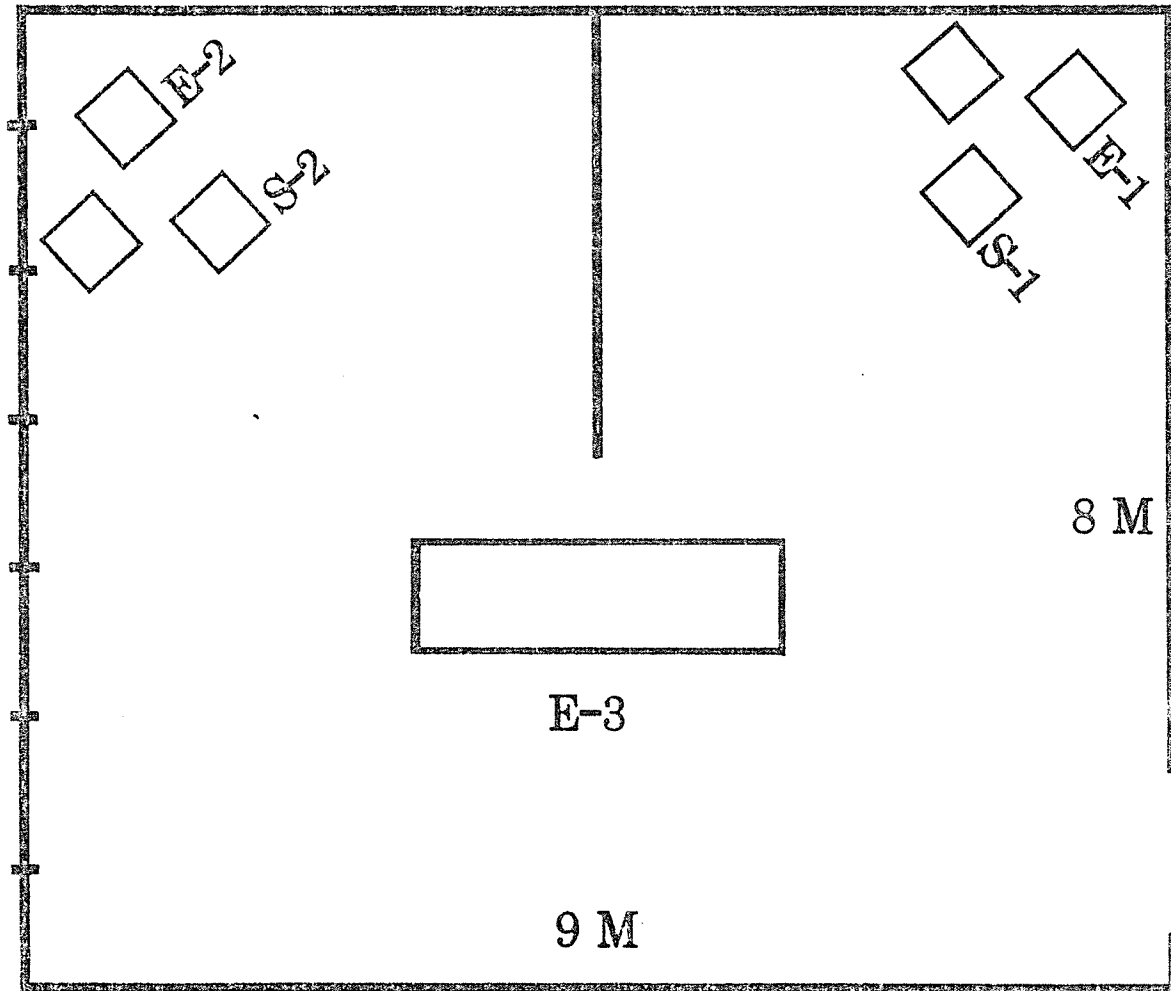


Figure 1

Illustration of Experimental Setting

A data sheet and pencil were also located on the table so that the results of each trial could be recorded by the experimenter immediately.

The portable room divider mentioned above served two purposes. First, it divided the room to minimize distractions while at the same time allowing another experimenter to observe sessions and/or record reliability data. Second, it was used to attach the list of imitations used for a particular session depending on the subject, experiment, and experimental phase. This allowed the experimenter to model the imitation specified for each trial correctly and with a minimum of interruption in the session.

A blackboard at the back of the classroom was used to list the scheduling of subjects and sessions in the study.

A clock located above the blackboard was used to time the duration of sessions.

A variety of backup reinforcers were kept out of sight of subjects during sessions in cupboards located to the left of each experimenter. These backup reinforcers included soft drinks, candies, puzzles and small toys such as plastic guns and cars.

### Procedure

Baselines Prior to the study, baselines were conducted with the six subjects to determine their imitative repertoires. Each subject was tested on two occasions using imitative responses to be used in the study with the exception that those responses designated as generalized imitative responses for a given subject were not tested with that individual. On the first occasion each imitative response was modelled once, while in the second baseline session each imitative response was modelled twice.

Subjects were seated directly across from the experimenter and when the subject made eye contact with the experimenter the experimenter said "Do this" and modelled a response (e.g. experimenter touched his nose). If the subject performed the response in a topographically similar manner within 10 seconds it was considered to be a correct response and a ✓ was recorded on the data sheet. If the subject attempted the response but did not complete it (e.g. subject raised his hand to touch his nose but did not complete the action) it was recorded as an approximation ∩. If the subject responded incorrectly (e.g. subject touched his mouth instead of his nose) an X was recorded and if the subject did not respond at all within 10 seconds a 0 was recorded. Subjects were not reinforced for imitating during the baseline. However, reinforcement in the form of social approval was given for attending and sitting quietly following approximately every fifth trial during baseline.

Pre-experimental Training Following baseline, subjects 1 and 4 were taught the appropriate imitations using a graduated guidance technique (Foxx & Azrin, 1972) until they could reliably perform all of the imitations. This took 1 session (6 trials) for subject 1 and 3 sessions (51 trials) for subject 4. Each subject was trained using the 8 S<sup>D</sup> imitations that would be used in the experiment that he would be participating in first and each response was immediately followed by social reinforcement.

Experimental Design The imitative responses chosen for this study were the twenty motor responses specified in Table 2. These particular

TABLE 2

Imitative Response Lists

LIST 1

1. Touch Head
2. Touch Ear
3. Touch Nose
4. Touch Chin
5. Clasp Hands
6. Touch Arm
7. Touch Leg
8. Touch Toes
9. Extend Arm Over Head
10. Touch Cheek

LIST 2

1. Touch Shoulders
2. Touch Stomach
3. Touch Knee
4. Touch Mouth
5. Touch Eye
6. Touch Head
7. Touch Neck
8. Extend Arm Sideways
9. Pat Desk
10. Touch Elbow



twenty responses were chosen from lists compiled of those motor responses used in other generalized imitation studies (e.g., Garcia et al., 1971; Peterson & Whitehurst, 1971). These responses were further divided into two pools of 10 responses each matched on the basis of topographical similarity and difficulty of the response.

Response lists were then assigned to either Experiment I or Experiment II for each of the six subjects such that three subjects (3, 4, 5) had List 1 paired with Experiment I and List 2 paired with Experiment II while the other three subjects (1, 2, 6) had List 2 matched with Experiment I and List 1 matched with Experiment II. Experimental conditions were further counter-balanced across sessions such that half of the subjects participated in Experiment I first and half participated in Experiment II first. Subjects were assigned to these experimental conditions randomly. In addition, two female community college students who served as experimenter/models for the subjects throughout most of the experiment were randomly assigned to subjects. This basic experimental design is summarized in Table 3. It was felt that this method of counterbalancing would equalize for any effects on the data caused by experiment, response lists, and models.

General Procedure. Prior to each session the experimenter would arrange the appropriate data sheets and other materials for the session. The experimenter picked up the subject in his home classroom and walked back to the experimental room with him. During this time the experimenter engaged in some play and chatter with the subject.

TABLE 3

Order of Experiment and Imitative Response Lists for each Subject:

|           |                         |                         |
|-----------|-------------------------|-------------------------|
| Subject 1 | Experiment II<br>List 1 | Experiment I<br>List 2  |
| Subject 2 | Experiment II<br>List 1 | Experiment I<br>List 2  |
| Subject 3 | Experiment I<br>List 1  | Experiment II<br>List 2 |
| Subject 4 | Experiment I<br>List 1  | Experiment II<br>List 2 |
| Subject 5 | Experiment II<br>List 2 | Experiment I<br>List 1  |
| Subject 6 | Experiment I<br>List 2  | Experiment II<br>List 1 |

Sessions were timed from the moment the subject was seated in a chair directly across from the experimenter. A session consisted of 60 trials in which each of the 10 responses from the appropriate response list was modelled 6 times in a randomized sequence. A trial began when the subject was attending to the experimenter. Attending was defined as making eye contact. The model then demonstrated the response for the subject (e.g., the experimenter touched his/her nose). The subject had 10 seconds within which to respond. If the subject responded correctly (ie. topographically matched the model's response) and the response was to be reinforced ( $S^D$  trial) the experimenter immediately socially reinforced the subject (e.g., "Good boy, that was good touching your nose"). Following social reinforcement subjects were given a token which they placed in the token dish. An incorrect response, failure to respond within 10 seconds, an approximation to a response, or a correct response if reinforcement was not scheduled ( $S^\Delta$  trial) was unsequated. Following each trial the model recorded the subject's response for that trial during a 5-second intertrial interval. When subjects had earned 10 tokens they were allowed to cash the tokens in for a favorite backup reinforcer. Subjects were allowed 2 minutes for cashing in tokens and engaging in or consuming backup reinforcers. Sessions were scheduled to last a maximum of 20 minutes.

Subjects were returned to their classrooms by the experimenter immediately following each session. The experimenter then returned to the experimental room to file the data sheet and make arrangements for

the next subject. Subjects were engaged in from one to three sessions per day depending on their schedule and availability.

### Experiment I

Experiment I was designed to test the intermittent reinforcement hypothesis of generalized imitation. Subjects proceeded through five conditions in this experiment. These conditions are summarized in Table 4.

In condition A the experimenter demonstrated the ten responses following the procedure outlined above. Eight  $S^D$  responses were on a continuous reinforcement schedule (CRF) if performed correctly while the remaining two  $S^A$  responses were never specifically consequted whether or not they were performed correctly. The two responses not specifically consequted were the generalized imitative responses. Ninety percent correct imitation over two consecutive sessions was established as a stability criterion in this and all other conditions of this experiment. In addition, a maximum of five sessions was conducted in any one condition.

In condition B two of the  $S^D$  responses previously on a CRF schedule in condition A were put on an extinction schedule. In conditions C, D, and E the six remaining  $S^D$  responses were systematically put on a schedule of extinction at a rate of two responses per phase.

The order in which particular imitative responses were to undergo extinction by condition were pre-determined and varied across subjects as a measure to control for the idiosyncratic effects of any particular imitative response.

TABLE 4

## Experiment I - Experimental Conditions

IMITATIONS

|            | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------|---|---|---|---|---|---|---|---|---|----|
| Conditions |   |   |   |   |   |   |   |   |   |    |
| A          | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 0 | 0  |
| B          | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ⊘ | ⊘ | 0 | 0  |
| C          | ✓ | ✓ | ✓ | ✓ | ⊘ | ⊘ | ⊘ | ⊘ | 0 | 0  |
| D          | ✓ | ✓ | ⊘ | ⊘ | ⊘ | ⊘ | ⊘ | ⊘ | 0 | 0  |
| E          | ⊘ | ⊘ | ⊘ | ⊘ | ⊘ | ⊘ | ⊘ | ⊘ | 0 | 0  |

Key

- ✓ - Imitative responses on a continuous schedule of reinforcement
- ⊘ - Imitative responses on a schedule of extinction after previously being on a continuous reinforcement schedule
- 0 - Generalized imitative responses.

## Experiment II

Experiment II was designed to test the failure to discriminate hypothesis of generalized imitation. Experiment II was comprised of six conditions which are summarized in Table 5. The stability criterion and maximum length of sessions per condition for Experiment II was identical to those described above for Experiment I.

Condition A in this experiment was the same as condition A in Experiment I. Eight  $S^D$  responses were reinforced on a CRF schedule and two  $S^A$  responses were generalized imitative responses and were never specifically reinforced if imitated.

In condition B a stimulus light was introduced for two of the responses, one  $S^D$  response and one  $S^A$  generalized imitative response. The  $S^D$  response was put on extinction at the same time as the light was introduced.

In condition C two additional  $S^D$  responses were paired with the stimulus light and introduced to the extinction condition.

Conditions D and F were replications of condition C (two  $S^D$  responses introduced to extinction) and condition E was a replication of condition B (one  $S^D$  response on extinction and one  $S^A$  generalized imitative response).

## Experimental Probes

In order to investigate the control of subjects responding under possible setting of instructional control a series of experimental probes were conducted following completion of the two experiments. These probes were similar to those employed in the study described by Martin, (1972).

TABLE 5

## Experiment II - Experimental Conditions

IMITATIONS

|            | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------|---|---|---|---|---|---|---|---|---|----|
| Conditions |   |   |   |   |   |   |   |   |   |    |
| A          | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 0 | 0  |
| B          | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ⊗ | ● | 0  |
| C          | ✓ | ✓ | ✓ | ✓ | ✓ | ⊗ | ⊗ | ⊗ | ● | 0  |
| D          | ✓ | ✓ | ✓ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ● | 0  |
| E          | ✓ | ✓ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ● | ●  |
| F          | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ● | ●  |

Key

- ✓ - Imitative responses on a continuous schedule of reinforcement
- 0 - Generalized imitative responses
- ⊗ - Imitative responses paired with a stimulus light and on a schedule of extinction after previously being reinforced
- - Generalized imitative responses paired with a stimulus light

Probe sessions consisted of 60 trials using the list of responses most recently experienced by each subject. Thus, if a subject had just completed Experiment II working through the List I imitative responses List I was again used in the Probe sessions. Except for verbal instructions presented by the experimenter and verbal feedback in some conditions, all sessions were conducted in the same manner as that described above.

In the first probe condition when the subject was attending the experimenter gave the subject the instruction "Don't do this" immediately prior to the response being modelled. If the subject modelled the response correctly he was given no positive feedback in any way. The experimenter simply waited the full ten seconds and began the next trial.

The second probe condition added a verbal punisher "No", which was stated by the experimenter in a loud crisp voice, immediately following a matching response, and a brief T0. The T0 was a 5 second period of time in which the experimenter turned away and ignored the subject.

In the third probe condition the stimulus light was turned on at the same time as the instruction "Don't do this" was given by the experimenter. In all other respects this condition was the same as the first probe condition.

The fourth probe condition was a replication of condition F in Experiment II. No instructions were presented and the stimulus light was turned on immediately preceding the response modelled by the experimenter. All responses by the subject were on a schedule of extinction (i.e., were not specifically consequted).



### Inter-Observer Reliability

Inter-observer reliability (IOR) checks were conducted on approximately 10% of the sessions. IOR was conducted by having an additional experimenter sitting at a table in the center of the experimental room, but to the back of the subject, recording each response the subject made for a specific session. The location of this observer was such that the subject did not notice the experimenter's interest in him.

Inter-observer reliability was calculated by dividing the number of agreements between the two experimenters by the number of agreements plus disagreements and multiplying by 100.

Of 29 IOR checks only three were less than 90% and in almost all other cases were above 96%.

## CHAPTER V

### RESULTS

The results of Experiment I, Experiment II, and Experimental Probes have been summarized in three ways. First: Results have been summarized as percent correct imitations per session for each individual subject, in each condition, of each experiment and experimental probe condition. These results have also been summarized according to the ordering of experiments for individual subjects. These results are presented in Figures 2 through 7. Second: Results have been summarized as mean percent correct imitations for each individual subject in each condition. These results are contained in Figure 8 and Table 6. Third: Results have been summarized as mean percent correct imitations for individual subjects in each condition of each experiment in terms of imitations which were reinforced, undergoing extinction, generalized, or paired with a stimulus light (Experiment II only). These results are contained in Table 7.

Results are considered first by individual subject for each experiment and second by experiment.

#### Individual Results

Subject 1 The results of Subject 1 are presented in Figure 2. This subject began the study with Experiment II on List 1 imitations. Results of baseline indicate that this subject could imitate at a proficient level prior to the experiment (85% and 75% imitation during baseline). A training session produced 68% imitation and the maximum 5 sessions in Condition A varied from 70% to 83% ( $\bar{X}$  77%) correct responding.

SUBJECT 1

Experiment II  
Conditions

Experiment I  
Conditions

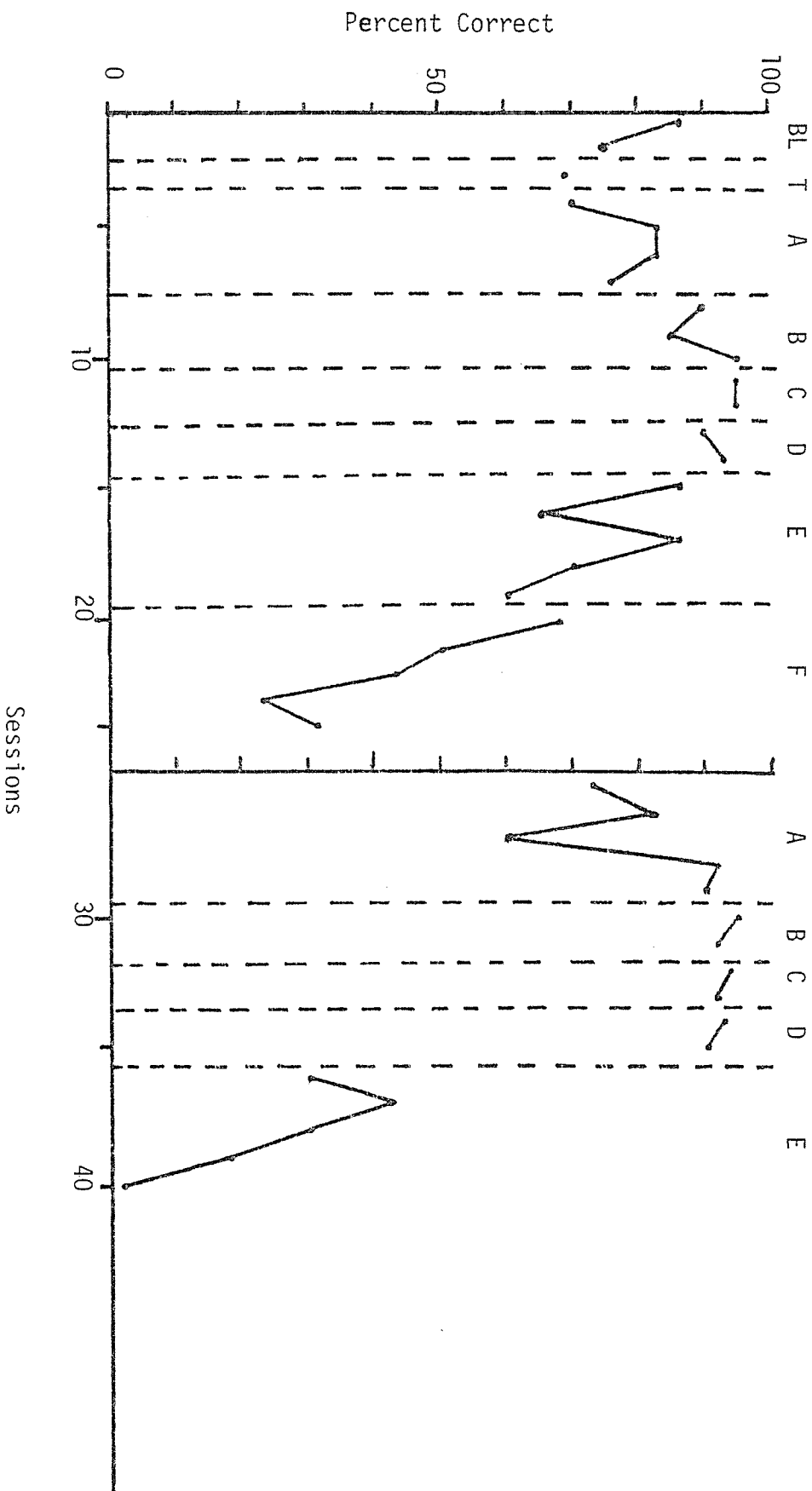


Figure 2  
Percent Correct Imitative Responses for Subject 1  
in each Session in each Condition of Experiment I  
and Experiment II

Condition B took 3 sessions to reach criteria while Conditions C and D each met criteria after 2 sessions. In Condition E correct responses decreased over the maximum 5 sessions from 87% to 60%. Correct responses in Condition F decreased to 32% over the maximum 5 sessions.

In Experiment I Condition A required 5 sessions although correct responses were above 90% for the last two sessions in this condition. Conditions B, C, and D all resulted in criteria being met within 2 sessions. In condition E correct responses dropped off dramatically over the 5 sessions from 28% to 0% in the last session.

This subject was not available for experimental probes.

Subject 2 This subject also experienced Experiment II with List I imitations first. The mean percent correct number of imitations for each session across all experimental conditions in Experiment I, Experiment II and Experimental Probes for Subject 2 are presented in Figure 3. This subject responded correctly at extremely high rates in baseline and Conditions A, B, C, D, and E for Experiment II. In Condition F responses over the first 4 sessions decreased from 98% correct responses to 7% correct responses then increased again to 62% in session 5 and 96% correct in a sixth session. It was decided to conduct the extra sixth session in this condition because of the increase in responses in session 5 after a low performance in session 4.

In Experiment I Subject 2 was well above the criterion of 90% correct responding over two consecutive sessions in Conditions A, B, C, and D. The last Condition, E, in which all responses were on an extinction schedule, again lasted six sessions rather than five because of the variability being displayed by this subject. Correct responding in

SUBJECT 2

Experiment II

Experiment I

Experimental Probes

Conditions

Conditions

Probes

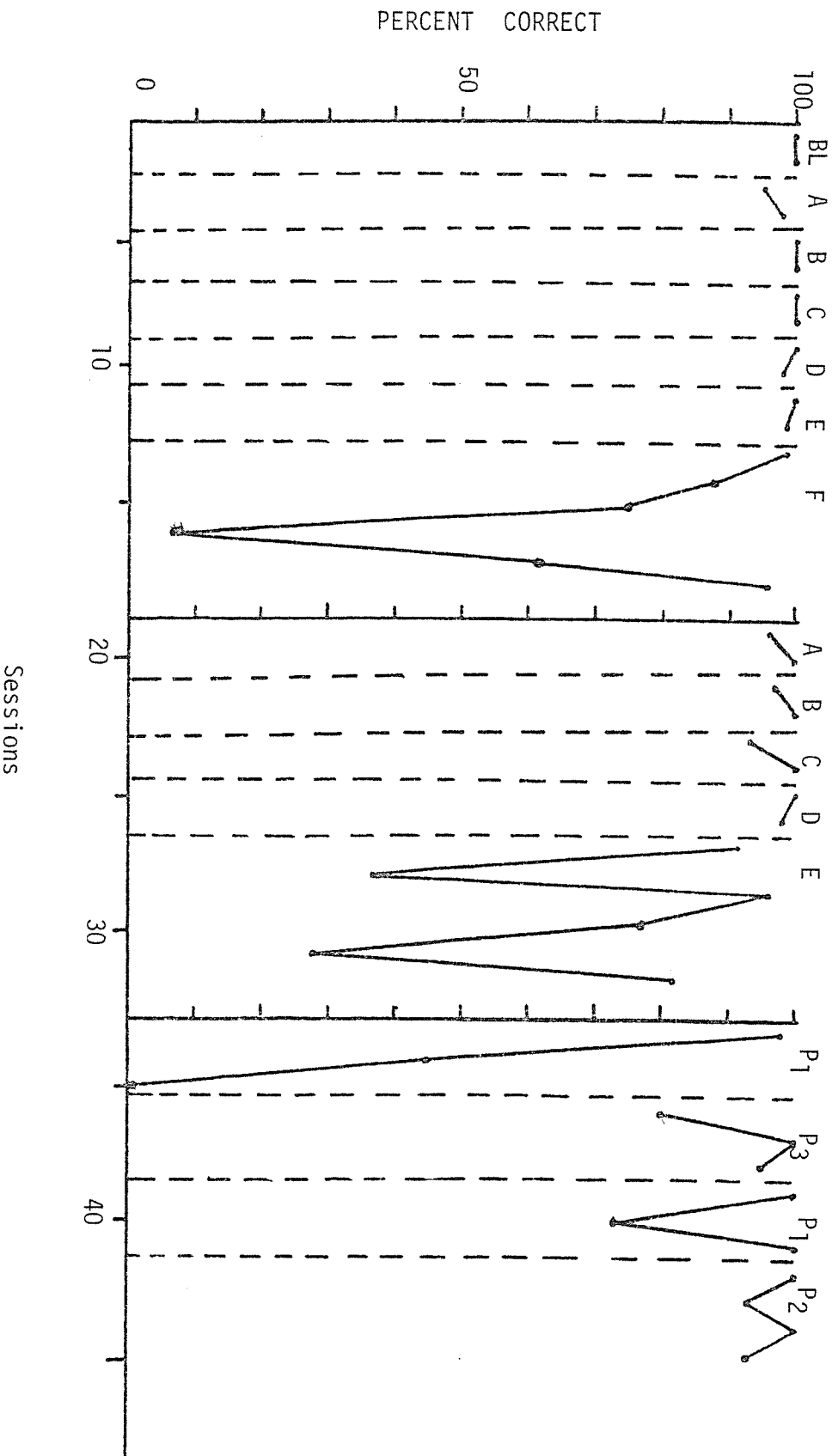


Figure 3  
Percent Correct Imitative Responses for Subject 2 in each Session in each Condition of Experiment I, Experiment II and Experimental Probes

this condition ranged from a high of 97% to a low of 28%.

Following Experiment I Subject 2 underwent 13 sessions in which three types of probes were used in an effort to disrupt imitative responding. In Probe Condition 1 the instructions "Don't do this" preceded each response modelled. No reinforcement was provided for correct responding. Correct responses in this phase decreased over three sessions from 98% to 9%. The next probe condition implemented with this subject was Probe Condition 3. This condition was identical to Probe Condition 1 except the stimulus light was turned on at the same time as the instructions "Don't do this" were given to the subject. Correct responding increased to previous high rates (80%, 100%, 95%) over the three sessions in this phase. The next three sessions involved a return to Probe Condition 1. Correct responses did not decrease in this condition except in the middle session where they dropped to 72%. In the first and third sessions Subject 2 responded at a level of 100% correct. Probe Condition 2 was attempted for the last four sessions. This condition was the same as Probe Condition 1 except that a conditioned punisher "No" and a brief T0 followed each correct response. Correct responses for each session in this condition were 100%, 93%, 100%, and 92%, indicating that this "punisher" was not effective in reducing correct responding.

Subject 3 The results for Subject 3 are presented in Figure 4. This subject experienced Experiment I on List 1 first. As can be seen in Figure 4, Subject 3 responded at very high correct response rates through baselines and Conditions A, B, C, and D, of Experiment I. Correct response rates for these sessions were never less than 95%. For

SUBJECT 3

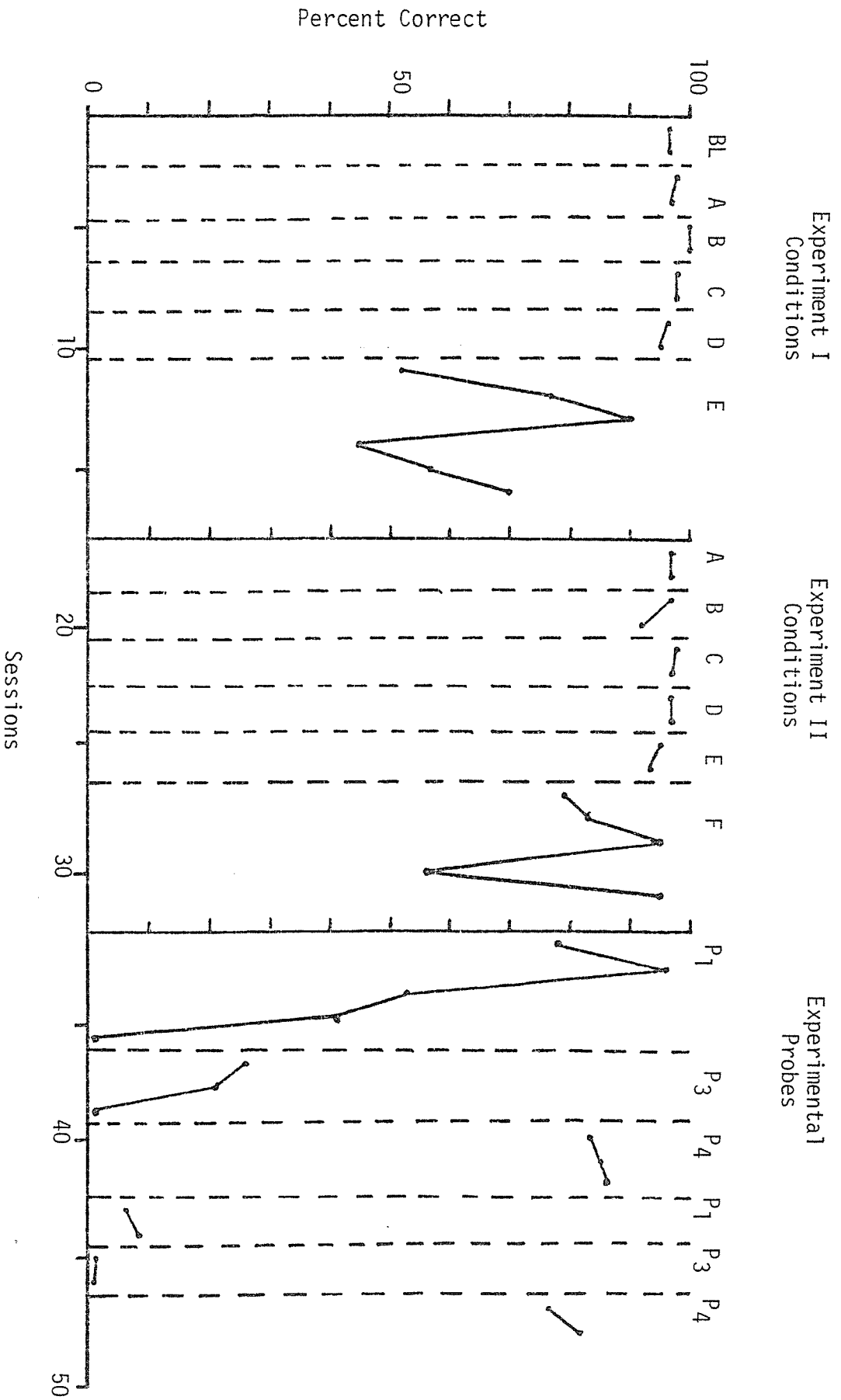


Figure 4 Percent Correct Imitative Responses for Subject 3 in each Session in each condition of Experiment I, Experiment II and Experimental Probes

reasons of variability Condition E lasted six sessions. Correct response rates in this condition fluctuated between 90% and 45%.

Experiment II demonstrated the same high consistent correct response rates through Conditions A, B, C, D, and E, with all conditions meeting the criteria of 90% correct responding over 2 consecutive sessions. Correct response rates in Condition F of Experiment II remained relatively high although the fourth session in this condition resulted in only 55% correct responses.

Following Experiment II various probe conditions were initiated over 17 sessions. In the first probe condition ("Don't do this") correct responding was reduced to 1.6% over 5 sessions. Low correct response rates also resulted in Probe Condition 3 (light - "Don't do this") with 0% correct responses in the third session of this condition. Three sessions were then conducted with Probe Condition 4 (light alone) and correct responses increased drastically to 83%, 85% and 86% respectively. A return to Probe Condition 1 resulted in an immediate decrease in correct responding to 6.6% and 8.3% over two sessions. A replication of Probe Condition 3 resulted in a further reduction over two sessions to 1.6% and 0% correct responding. A replication of Probe Condition 4 for two sessions again resulted in an increase in correct response rates to 77% and 82% over these two sessions.

Subject 4 Subject 4 followed the same experimental order as Subject 3. Results of each session for this subject are presented in Figure 5. This subject did not imitate well in baseline managing only 7% and 3% correct responding over the two baseline sessions. Three pre-experimental training sessions were successful in raising correct imitative responses to 100%. Condition A in Experiment I resulted in



SUBJECT 4

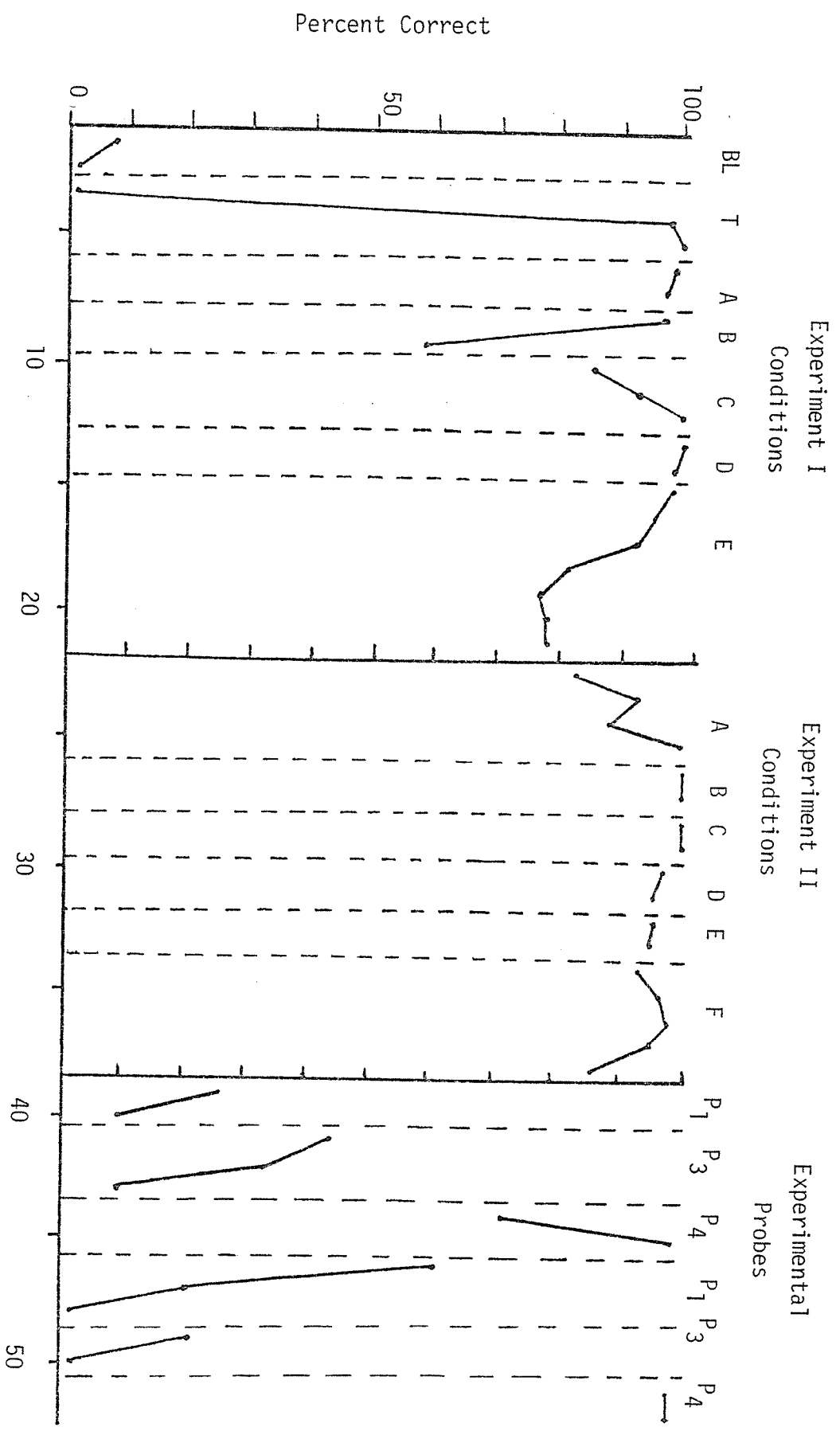


Figure 5 Percent Correct Imitative Responses for Subject 4 in each session in each Condition of Experiment I, Experiment II and Experimental Probes

criteria being met within 2 sessions. In Condition B correct response rates were 97% in the first session but decreased to 58% in the second session. Condition C was initiated by mistake in the following session but because Subject 4 correctly responded at a rate of 85% it was decided not to return to Condition B. Criteria was met within three sessions for Condition C and two sessions for Condition D. Condition E resulted in a very gradual decrease in correct responding from 98% to 77% over the first five sessions. An additional two sessions resulted in no further decrease in correct responding.

Subject 4 responded at consistently high rates through Conditions A, B, C, D, and E, in Experiment II meeting criteria in two sessions in all but Condition A which took five sessions. Correct responding remained high in Condition F with levels above 95% correct in the first four sessions and a slight decrease to 85% in the last session.

Fourteen sessions were conducted with Subject 4 to investigate the effects of experimental probes. Under Probe Condition 1 responding immediately decreased to 25% and 8% over two sessions. Probe Condition 3 resulted in correct responding being maintained at low rates with 8% correct responding in the last session. Probe Condition 4 resulted in an immediate return to high rates of correct responding with 72% and 98% in two sessions. A return to Probe Condition 1 for three sessions produced correct response rates of 60%, 20%, and 2%. This decrease in correct responding was replicated again in a return to Probe Condition 3. When Probe Condition 4 was repeated for the last two sessions correct responses immediately increased once again to 98% over both sessions.

Subject 5 Results for Subject 5 are presented in Figure 6.

This subject experienced Experiment II first with imitation List 2. This subject produced the highest overall correct response rates of any subject. Correct responses during baseline and in all phases of both experiments were always above 90% in every session.

Thirteen sessions were conducted with Subject 5 to investigate the effects of experimental probes. Probe Condition 1 had no effect on correct responding over two sessions. Probe Condition 2 resulted in an immediate decrease in correct responding to 2% by the second session. Probe Condition 3 caused an immediate increase in correct response rates to 100% within 3 sessions. A replication of Probe Condition 1 again had no effect while a replication of Probe Condition 2 immediately reduced responding to 3% in each of 2 sessions. Replication of Probe Condition 3 was consistent with the first application of this condition as correct response rates again rose to 100% and 98% in the two sessions conducted. Thus for Subject 5 only the probe condition featuring a verbal punisher was able to disrupt correct responding in any way.

Subject 6 Results for Subject 6 are presented in Figure 7.

This subject experienced Experiment I on response List 2 first. During baseline this subject demonstrated a great deal of variability imitating only 10% of the responses correctly in the first session but 90% in the second session. Criteria was met for all conditions in both experiments in the minimum number of sessions with very little variability.

Only two Probe conditions were conducted over seven sessions with Subject 5 as he was hospitalized for the remaining time available.

SUBJECT 5

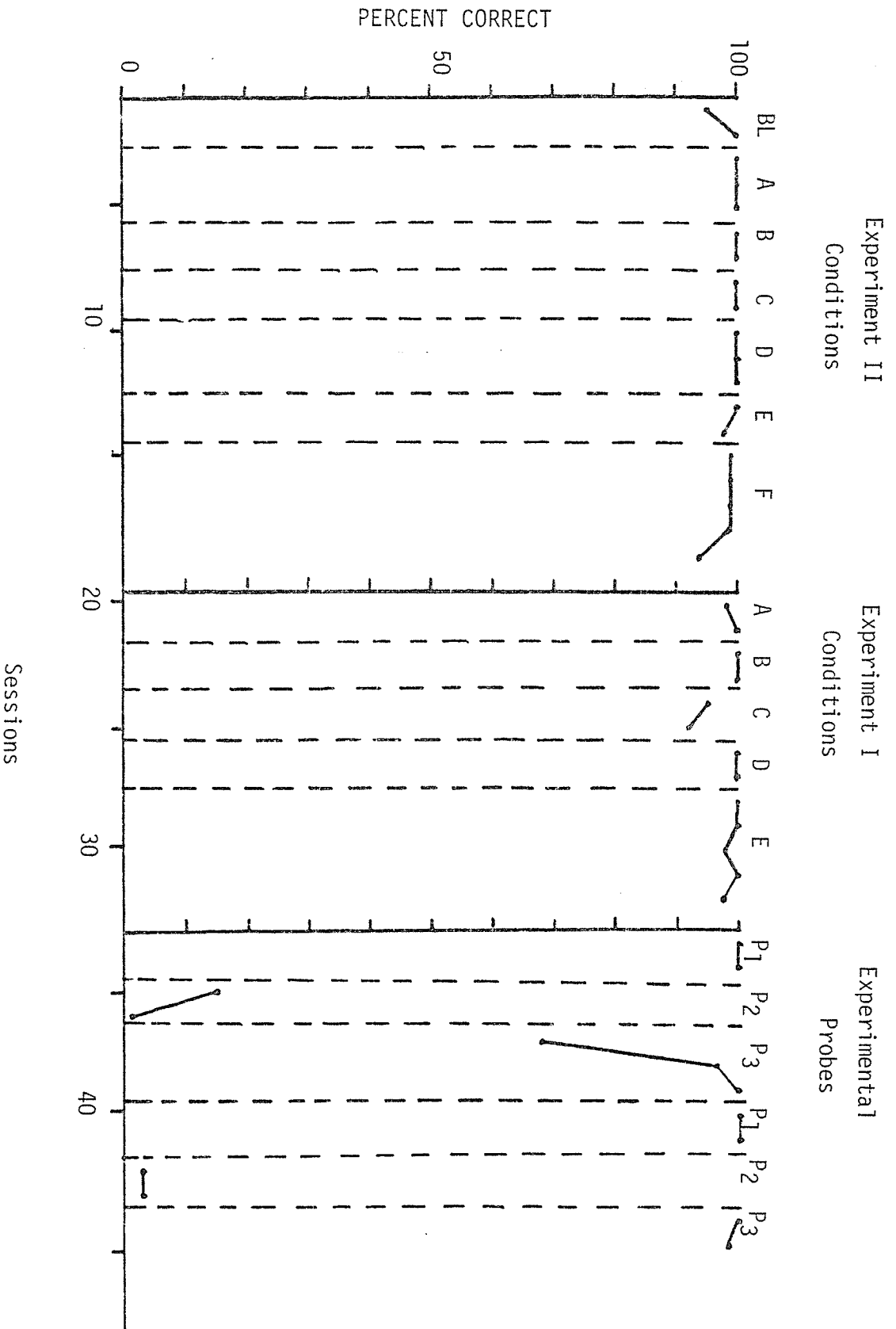


Figure 6  
Percent Correct Imitative Responses for Subject 5 in each session in each Condition of Experiment I, Experiment II and Experimental Probes

SUBJECT 6

Experiment I  
Conditions

Experiment II  
Conditions

Experimental  
Probes

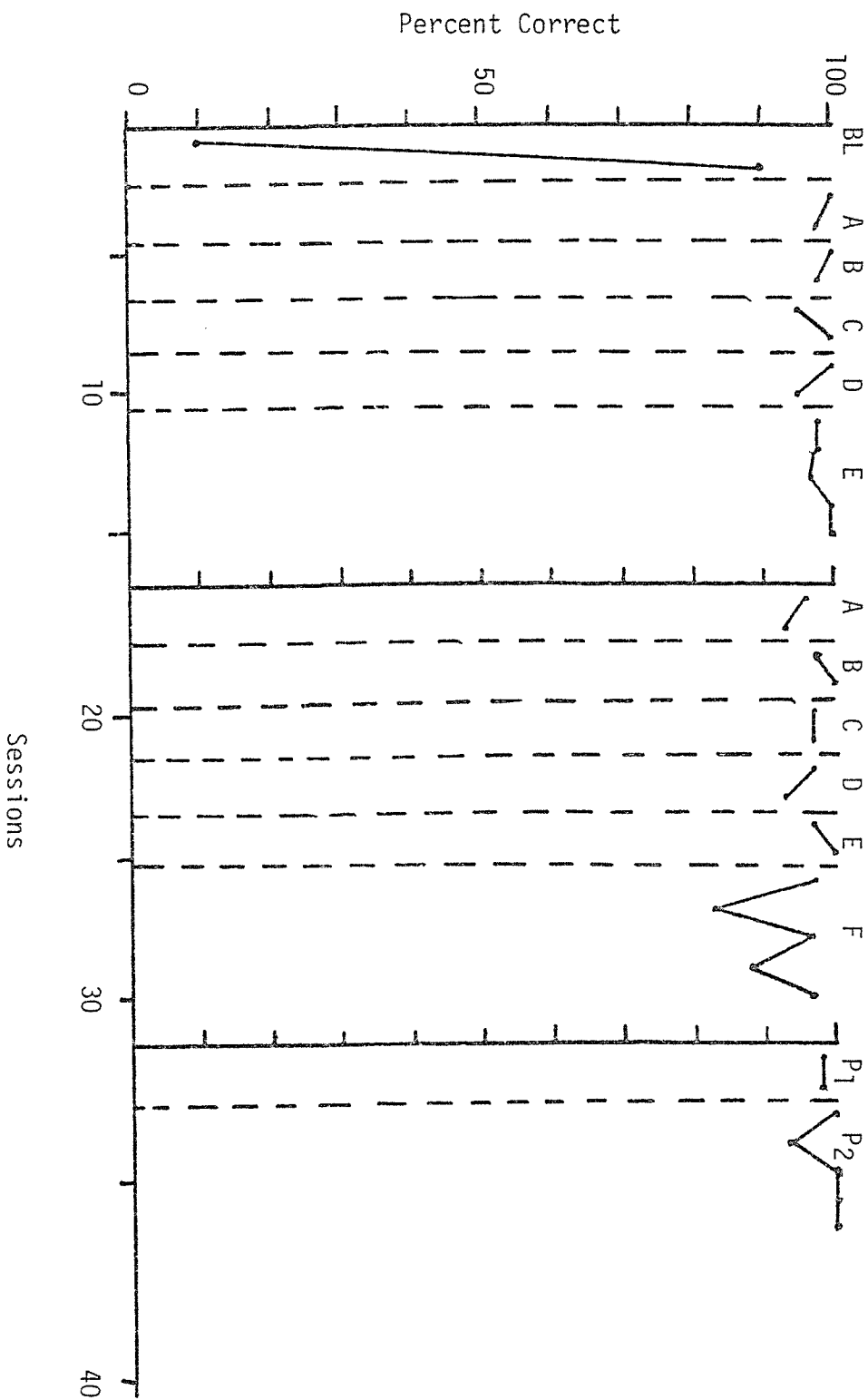


Figure 7 Percent Correct Imitative Responses for Subject 6 in each session in each Condition of Experiment I, Experiment II and Experimental Probes.

During 2 sessions in Probe Condition 1 and 5 sessions in Probe Condition 2, correct responding remained at high consistent rates.

### Experimental Results

Mean percent correct imitative responses for each condition in each experiment and experimental probe condition for each subject are presented in Figure 8 and Table 6. Experiment I and Experiment II are presented consecutively for each subject in order to facilitate visual comparisons although Subjects 1, 2, and 5 in actuality participated in Experiment II first.

Experiment I Experiment I was designed to test the intermittent reinforcement hypothesis by systematically reducing the number of responses receiving reinforcement from 8/10 in Condition A to 0/10 in Condition E. Figure 8 shows that no differences in correct responding occurred between any subject or between any of the first four conditions (A, B, C, and D) in Experiment I. All six subjects responded at extremely high rates whether the reinforcement schedule was 8/10 responses being reinforced or 2/10 responses reinforced. Subjects 4, 5, and 6 also showed extremely persistent and high response rates when all responses were on a schedule of extinction in Condition E. Subjects 1, 2, and 3 mean correct response rates in Condition E decreased to 25%, 69%, and 66%, respectively. This represents a substantial decrease in correct responding for these subjects in this condition.

Experiment II Experiment II was designed to test the failure to discriminate hypothesis by providing additional cues (stimulus light) for those responses not being reinforced. In this experiment the schedule

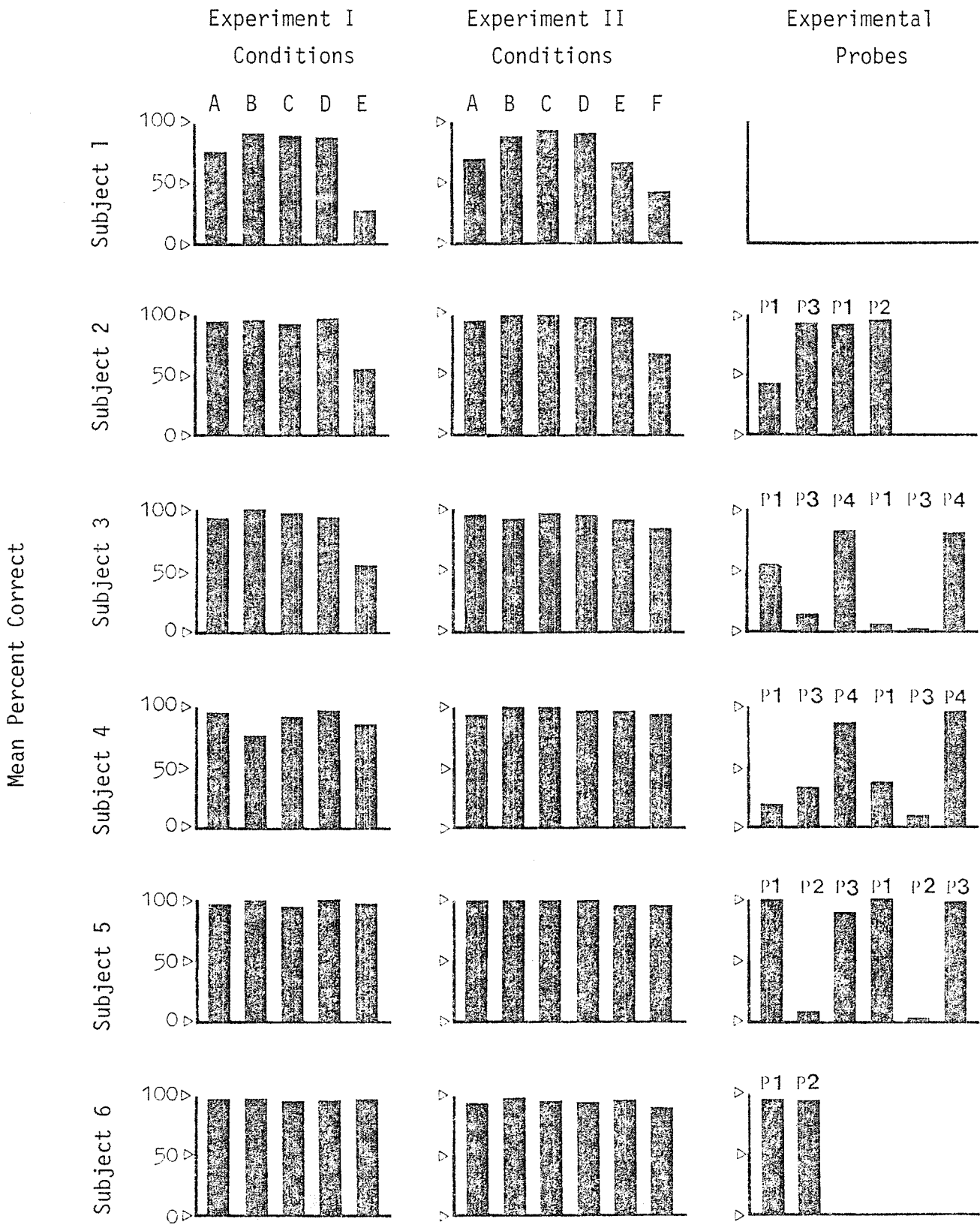


Figure 8 Mean Percent Correct responses for Individual Subjects in each Condition of Experiment I, Experiment II and Experimental Probes

TABLE 6

Mean Percent Correct Responses for Individual Subjects in Each Condition of

Experiment I, Experiment II and Experimental Probes

| SUBJECT | <u>Experiment I</u> |     |    |     |    | <u>Experiment II Conditions</u> |     |     |     |    | <u>Experimental Probes</u> |                |                |                |                |                |                |                |                |    |
|---------|---------------------|-----|----|-----|----|---------------------------------|-----|-----|-----|----|----------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----|
|         | A                   | B   | C  | D   | E  | A                               | B   | C   | D   | E  | F                          | P <sub>1</sub> | P <sub>2</sub> | P <sub>3</sub> | P <sub>4</sub> | P <sub>1</sub> | P <sub>2</sub> | P <sub>3</sub> | P <sub>4</sub> |    |
| 1       | 79                  | 93  | 93 | 92  | 25 | 77                              | 90  | 97  | 92  | 72 | 43                         |                |                |                |                |                |                |                |                |    |
| 2       | 98                  | 98  | 97 | 99  | 69 | 97                              | 100 | 100 | 99  | 99 | 71                         | 48             |                |                | 92             |                | 90             |                | 96             |    |
| 3       | 98                  | 100 | 98 | 96  | 66 | 97                              | 95  | 98  | 98  | 94 | 81                         | 54             |                | 16             | 85             | 9              |                |                | 1              | 80 |
| 4       | 98                  | 78  | 93 | 100 | 88 | 91                              | 100 | 100 | 96  | 96 | 93                         | 17             |                | 28             | 85             | 28             |                |                | 12             | 99 |
| 5       | 99                  | 100 | 94 | 100 | 99 | 100                             | 100 | 100 | 100 | 99 | 99                         | 100            |                | 9              | 88             | 100            |                | 3              | 99             |    |
| 6       | 99                  | 99  | 99 | 99  | 99 | 96                              | 99  | 99  | 96  | 99 | 93                         | 99             |                | 99             | 99             |                |                |                |                |    |



of reinforcement was also gradually reduced from 8/10 responses being reinforced to 0/10 responses being reinforced over successive experimental conditions.

The results of Experiment II were consistent with results of Experiment I. All subjects with the exception of Subject 1 performed imitations at high rates through Conditions A, B, C, D, and E as reinforcement was reduced from 8/10 responses to 2/10 responses. As in Experiment I, Subjects 4, 5, and 6 continued to respond at consistently high levels in the absence of any reinforcement in Condition F. Subject 1 showed a decrease in Condition F to 43%. Subject 2 showed a decrease in responding in Condition F (71%) about equal to that of the last condition in Experiment I. Subject 3 also showed a decrease in responding in Condition F although not as substantial as that shown in the last condition of Experiment I.

Experimental Probes. A series of probes followed the two experiments in an attempt to reduce high rates of correct responding. Subject 1 was not available for probe conditions as he was still completing Experiment I as a result of having been away from school during many session days. Probe Condition 1 ("Don't do this") was implemented for the five remaining subjects. It was effective in reducing responding in its first application for Subjects 2, 3, and 4 and in a subsequent application for Subjects 3 and 4. Probe Condition 1 did not reduce correct responding in a second application with Subject 2, in either of two applications with Subject 5, or the single application with Subject 6.

Probe Condition 2 which consisted of the instructions "Don't do this" before the experimenter modelled the behavior and a verbal punisher ("No") followed by a brief T0 if the subject modelled the behavior was effective in reducing responding with Subject 5 in each of two applications but was not effective in 5 sessions when employed with Subject 6.

Probe Condition 3 ("Don't do this" - light) was not effective in maintaining reduced correct responding in one application with Subject 2 or two applications with Subject 5. It was shown to be effective, however, in maintaining reduced responding during 2 applications with Subject 4.

The fourth probe condition which consisted of the light alone and was exactly the same as Condition F in Experiment II was not effective in maintaining reduced correct responding with two applications for each of Subjects 3 and 4.

Response Differences. Table 7 summarizes results by the type of designated response in each condition of each Experiment for each subject. It would appear that the contingencies programmed for particular responses did not alter whether or not responses would be imitated for any subjects as no evidence of differential responding to any type of response is evident.

TABLE 7

Mean Percent Correct Imitations for each Subject in each Condition of each Experiment by Type of Imitative Response

| SUBJECT   | Experiment I               |     |     |     |     | Experiment II              |     |     |     |     |     |    |
|-----------|----------------------------|-----|-----|-----|-----|----------------------------|-----|-----|-----|-----|-----|----|
|           | Type of Imitative Response |     |     |     |     | Type of Imitative Response |     |     |     |     |     |    |
|           | A                          | B   | C   | D   | E   | A                          | B   | C   | D   | E   | F   |    |
| SUBJECT 1 | 1                          | 78  | 93  | 95  | 87  | 1                          | 78  | 93  | 98  | 90  | 81  |    |
|           | 2                          | 78  | 93  | 91  | 93  | 2                          | 66  | 83  | 100 | 92  |     |    |
|           | 4                          | 79  | 93  | 93  | 92  | 3                          | 80  | 91  | 93  | 71  | 43  |    |
|           |                            |     |     |     |     | 4                          | 73  | 90  | 95  | 92  | 73  | 43 |
| SUBJECT 2 | 1                          | 98  | 97  | 92  | 100 | 1                          | 100 | 100 | 100 | 100 | 96  |    |
|           | 2                          | 100 | 100 | 97  | 99  | 2                          | 86  | 100 | 100 | 100 |     |    |
|           | 4                          | 98  | 98  | 97  | 99  | 3                          | 100 | 100 | 98  | 100 | 71  |    |
|           |                            |     |     |     |     | 4                          | 97  | 100 | 100 | 99  | 99  | 71 |
| SUBJECT 3 | 1                          | 99  | 100 | 98  | 96  | 1                          | 99  | 95  | 97  | 96  | 100 |    |
|           | 2                          | 92  | 100 | 99  | 96  | 2                          | 87  | 83  | 100 | 92  |     |    |
|           | 4                          | 96  | 100 | 98  | 96  | 3                          | 96  | 96  | 98  | 97  | 93  | 81 |
|           |                            |     |     |     |     | 4                          | 97  | 95  | 98  | 97  | 94  | 81 |
| SUBJECT 4 | 1                          | 96  | 80  | 94  | 100 | 1                          | 89  | 100 | 100 | 92  | 96  |    |
|           | 2                          | 100 | 73  | 92  | 99  | 2                          | 96  | 100 | 100 | 100 |     |    |
|           | 4                          | 98  | 78  | 93  | 99  | 3                          | 100 | 100 | 96  | 96  | 94  |    |
|           |                            |     |     |     |     | 4                          | 91  | 100 | 100 | 96  | 96  | 94 |
| SUBJECT 5 | 1                          | 99  | 100 | 96  | 100 | 1                          | 100 | 100 | 100 | 100 | 100 |    |
|           | 2                          | 100 | 100 | 92  | 100 | 2                          | 100 | 100 | 100 | 100 |     |    |
|           | 4                          | 98  | 100 | 93  | 100 | 3                          | 100 | 100 | 100 | 98  | 98  |    |
|           |                            |     |     |     |     | 4                          | 100 | 100 | 100 | 100 | 98  | 98 |
| SUBJECT 6 | 1                          | 100 | 99  | 100 | 96  | 1                          | 96  | 99  | 98  | 94  | 95  |    |
|           | 2                          | 96  | 100 | 96  | 96  | 2                          | 96  | 100 | 83  | 100 |     |    |
|           | 4                          | 99  | 99  | 98  | 98  | 3                          | 100 | 98  | 94  | 99  | 93  |    |
|           |                            |     |     |     |     | 4                          | 95  | 100 | 97  | 95  | 99  | 93 |

Key 1 - Reinforced Response 3 - Response paired with a stimulus light  
 2 - Generalized Response 4 - Non-reinforced Responses

## CHAPTER VI

### DISCUSSION

The following conclusions may be drawn from the results presented in this study. (1) Experiment I which was designed to test the intermittent reinforcement hypothesis produced data to partially support this hypothesis in three subjects (1,2,3). Results of Experiment II for these same three subjects also provides some evidence in support of the intermittent reinforcement hypothesis. (2) Experiment II which attempted to test the failure to discriminate hypothesis produced results indicating that no subjects were able to discriminate between reinforced and non-reinforced responses in this experiment. Experiment I also produced no instances of differential responding in any condition for any subject. It is suggested that although subjects did not demonstrate discrimination of contingencies in either experiment, the failure to discriminate hypothesis may not be the best explanation of this lack of discrimination. (3) The results for all subjects in both experiments might be best interpreted from the position of the social control hypothesis. (4) The effects of Experimental Probes though they varied across subjects were consistent within subjects, but generally are supportive of a demand characteristic or social control explanation of generalized imitative responding.

In considering the first conclusion, it was expected that evidence in support of the intermittent reinforcement hypothesis would be characterized by high stable response rates through Condition D in Experiment I and rapid decreases in response rates to near zero levels

in Condition E when all responses were on an extinction schedule. It was further expected that this same pattern of responding in Experiment II would be evidence in support of the intermittent reinforcement position. In fact, Subject 1 was the only subject to exhibit this type of response pattern. His imitative responding dropped from 90% in the last session of Condition D to 1.6% in the fifth and last session in Condition E of Experiment I. Subject 1 also exhibited a decrease in responding in Experiment II through Conditions E and F (87% to 32%) although not as severe a decrease as was shown in Experiment I.

Subjects 2 and 3 showed fluctuations in responding in the last conditions of both experiments compared to high steady rates in the previous conditions. Although mean percent correct imitative response rates for both these subjects in the last conditions indicate decreases in responding, an examination of session by session results indicates unpredictable variations from session to session. It is clear that the extinction condition for these two subjects affected their imitative performance in terms of some disruption in responding. However, both subjects were still responding at very high rates in the final condition of both experiments after over 300 extinction trials. Of the other three subjects, only Subject 4 showed a moderate tendency to decrease responding in either experiment. This effect was shown in Condition E of Experiment I but was not substantial as Subject 4 was still responding at 78% after over 400 extinction trials. Subject 4 in the last condition of Experiment II and Subjects 5 and 6 in the last conditions of both experiments responded at an average of more than 90% through five sessions of extinction.

It should be noted that Subject 1 missed many days of school over the course of the study and throughout the school year. His teacher and the school counsellor felt that this contributed to problems encountered with this student in the classroom. These problems were in the areas of attention and compliance. These problems were also noted during the present study as Subject 1 was much less attentive than the other subjects. As reinforcement contingencies were systematically decreased, this subject took a noticeably longer time to attend in corresponding sessions. His behavior was also characterized by grabbing at the experimenter and various experimental apparatus during latter sessions of each experiment. It was felt that this lack of good attending behavior and concurrent non-compliance which was different than the other five subjects might account for response patterns which were different than those of the other subjects.

That Subject 1 performed differently than the other five subjects is most evident when the data presented in Table 6 is examined. Of the 11 conditions in the two experiments Subject 1 had lower mean percent correct responses in every condition compared to every other subject with the exception of Subject 4 in Conditions B and C of Experiment I. It should be noted that Condition B for Subject 4 was the condition in which this subject was accidentally allowed to move on to the next condition (Condition C) without meeting criteria. In Condition C Subjects 1 and 4 had identical mean percent correct responses (93%).

It was felt that even though subjects failed to discriminate

reinforced from non-reinforced responses in both experiments that the failure to discriminate hypothesis could not account for the results for two reasons: First, the purpose of the stimulus light in Experiment II was to indicate responses that were undergoing an extinction contingency. It was hypothesized that differential responding by subjects in experimental conditions in which responses on a schedule of extinction are paired with a stimulus light compared to non-differential responding to responses in previous conditions undergoing extinction but without the additional cue would be indicative of support for the failure to discriminate explanation of generalized imitation. In addition, if subjects exhibited differential responding in Experiment I, as fewer and fewer responses were reinforced and thus perhaps becoming more discriminable to subjects, this would indicate support for this hypothesis as well. Since none of the subjects, including Subject 1 who showed the greatest decreases in responding over the last condition of each experiment, exhibited any differential responding in either experiment, it must be concluded that the results of this study are not tenable in terms of the failure to discriminate hypothesis. Second: One might argue that the stimulus light was not indicative of non reinforcement for the subjects and thus did not facilitate a discrimination as it was intended to. It was obvious that subjects were cognizant of the light being turned on but the data reflect no association between the light and non-reinforcement for any subject. If one were to conclude then that the light was not an effective cue for subjects and responding was due to a failure to discriminate, this hypothesis, because it depends on reinforcement, would further predict

decreases in responding in Condition F of Experiment II when no reinforcement was available for any responses. As discussed above, only Subject 1 exhibited major decreases in responding in this experimental condition. Clearly, other variables must account for continued responding during extinction for these subjects.

These results are consistent with other investigations using retarded children (Bucher and Bowman, 1974; Peterson, 1968) which have shown little evidence of differential responding when reinforced and non-reinforced imitations have been made more discriminable.

Many studies have indicated that consequences control imitative responding in retarded children (Baer et al., 1967; Burgess et al., 1970; Martin, 1971; Peterson, 1968). In these studies a functional relationship was shown between imitative responding and alterations in reinforcement conditions via DRO and extinction procedures. The systematic extinction procedures employed in the present study did not demonstrate this relationship. Subjects did not cease responding as was expected even after more than 400 extinction trials in some cases. This may be due to the procedure employed as the density of reinforcement was gradually decreased through several hundred trials for all subjects instead of a sudden application of extinction contingency as is the usual experimental procedure in generalized imitation research. Because of the gradual decrease in the schedule of reinforcement some perseverance in responding was expected but certainly not to the degree obtained. Perhaps a decrease in responding might have occurred if more sessions in the final condition of both



experiments had been conducted. It seemed that because of the continued high performance of imitations by subjects through both experiments that some clarification of the variables controlling imitative responding for these subjects might best be achieved through a series of experimental probes.

Verbal instructions to indicate responding to the subjects had been purposefully absent from the experimental procedure in this study as the literature had suggested that instructional variables may confound reinforcement variables and may in fact control imitative responding in and of themselves (Martin, 1971, 1972; Steinman, 1970a, 1970b; Waxler & Yarrow, 1970). The presence of the experimenter (Peterson et al., 1971) has also been demonstrated as an important variable in terms of whether or not a subject responds. The experimenter might be conceptualized as a "demand characteristic" in this procedure. The experimenter's behavior when matched by the subject in early conditions of the experiment usually produced reinforcement. In the absence of a verbal instruction the behavior of the experimenter might have been interpreted as an instruction or discriminative stimulus to respond by the subject. As discussed earlier, Martin (1972) suggested that with retarded children instructions control responding when no consequences are available but consequences can override instructions. Martin was successful in decreasing responding when instructions not to respond were given to subjects under conditions of extinction.

In the first probe condition of the present study subjects were instructed not to respond ("Don't do this") under conditions of extinction. The instruction "Don't" was effective in controlling the

behavior of all subjects outside of the experimental setting if used in context. If, for example, a subject was told "Don't touch that candy" he wouldn't. Subjects 2, 3, and 4 decreased responding very rapidly and this effect was replicated with Subjects 3 and 4 and to a small degree with Subject 2. This condition did not affect responding with Subject 5 in two applications or Subject 6 in one application.

Since instructions controlled the responding of Subjects 2, 3, and 4, a further strategy was employed wherein the stimulus light was paired with the instruction not to respond to see if subjects could be maintained at reduced response rates in a subsequent condition (Probe Condition 4) when the light was presented in the absence of instructions. This was identical to the last condition (F) in Experiment II and it was thought that this procedure would facilitate discrimination. Subjects 3 and 4 maintained low rates of responding in the instructions not to respond plus stimulus light condition (Probe Condition 3) but quickly returned to previous high rates under light only conditions. This was replicated with both subjects. These two subjects were evidently under instructional control for not responding but it is still not clear what controlled responding in the absence of specific instructions not to respond.

With Subject 2 Probe Condition 3 ("Don't do this" - stimulus light) quickly produced a return to previously high imitative responding. A return to Probe Condition 1 failed to decrease responding.

Verbal punishers have been shown to be effective in reducing responding in retarded children (Martin, 1972) and normal children (Acker et al., 1973). A sharp verbal "No" was programmed with the instruc-

tions "Don't do this" for those subjects (2, 5, and 6) who did not decrease responding under the first probe condition. This condition was not effective in reducing responding in 4 sessions (240) trials with Subject 2 or 5 sessions (300 trials) for Subject 6. This condition was immediately effective for Subject 5 in two applications. Punishment however did not have any influence on subsequent applications of instructions not to respond with this subject as he immediately returned to previous high rates in Probe Condition 3 when punishment was removed.

Although some control in responding was demonstrated with the addition of specific instructions and conditioned punishment contingencies combined with non-reinforcement, control was not consistent across all subjects in the various probe conditions. It is not clear why some subjects responded to instructions, some to punishment, and some to neither. What is interesting is that all subjects were still responding at extremely high rates through their last probe condition regardless of the type of probe involved. When combined with total extinction in the last condition of either Experiment I or Experiment II this constituted up to 22 sessions or 1320 trials which were non-reinforced for these subjects. Since continued responding in the failure to discriminate, intermittent reinforcement, and behavioral similarity to a model explanation all depend on reinforcement to some degree, it would appear that the only plausible explanation of these results is in terms of the social control hypothesis.

One of the demand characteristics that seems to offer support to these results is the effect of experimental history. Bufford (1971) provided evidence that instructional control (verbal) has a decreasing

influence on imitative responding as the number of sessions increases. Adams and Hamm (1973) further demonstrated that a history of tangible reinforcement for imitative responding facilitates responding when reinforcement is not available. Acker et al. (1973) and Oliver et al. (1977) have also pointed out the importance of prior history of reinforcement on subsequent imitation in the absence of reinforcement. Other demand characteristics that may have influenced these subjects were the experimenter (Peterson et al., 1971; Peterson and Whitehurst, 1971) and perhaps the setting. Sessions were conducted in a classroom and these subjects had a history of complying to adults in this type of setting. The subjects themselves with the exception of Subject 1 were very compliant and enjoyed the individual attention they received before and after the sessions. This may have influenced their responding as opposed to institutionalized non-compliant subjects (Furnell & Thomas, 1976) who may be more influenced by consequences for imitative responding (Martin, 1972). It is suggested that perseverence in responding is primarily due to demand characteristics in this study and specifically experimental history with reinforcement. This could be the emphasis of future research with this type of subject. Although other investigators of generalized imitation with retarded children (Burgess et al., 1970; Martin, 1971, 1972) have argued that demand characteristics can account for at least part of the generalized imitation phenomena no studies with retarded children have empirically isolated or investigated an experimental history variable with the exception of Smeets and Striefel (1974) who indicated a history effect in terms of whether retarded subjects experienced successive or

simultaneous trials first in experimental procedures.

The fact that subjects continued to respond at above 90% correct rates after over a thousand non-reinforced trials suggests that the experimental procedure has important implications as a training strategy. As discussed earlier, the participants in this study were a heterogeneous group in terms of attending and compliance behavior. Baselines indicated variations in imitative ability which ranged from almost no imitative responses to subjects who responded at high rates during baseline. The amount of pre-training required to teach those subjects to imitate who did not imitate during baseline also varied a great deal. Since all of these subjects subsequently imitated correctly at very high rates this would suggest at least some generality in these procedures from a training perspective.

At least two of the subjects demonstrated generality of imitative responding in other situations. Subject 4 was participating in another research study which began shortly after the present study. The investigator of this other study noted on several occasions that whenever he performed an idiosyncratic behavior such as scratching his nose during sessions Subject 4 quickly imitated this behavior. Subject 6 was engaged in speech therapy three times a week and the speech therapist also reported that her idiosyncratic behaviors during therapy sessions were readily imitated by this subject. Generalization of training procedures is important in applied behavior analysis training programs (Baer et al., 1968; Stokes & Baer, 1974) and these

reports though anecdotal indicate that generality in terms of transfer to other exemplars in similar situations might have been a product of the procedures employed in the present study. These procedures might bear examination by personnel who have durability of responding as one of the major objectives of their training programs.

A brief follow-up of the subjects was conducted approximately four months after the completion of this study. Subject 1 and 4 were not attending this school at this time and were not included. Follow-ups were conducted in the subjects' own classroom as well as during free-play sessions. Although subjects imitated readily for the experimenter who had conducted the study in an approximation of the experimental situation under conditions of no instructions and social reinforcement subjects did not respond to the teachers modelled behavior when demonstrations were presented incidentally unless the instruction "Do this" was included. These situations were basically unstructured and any explanations of what was controlling responding would be very tentative at best.

In summary, the results of this study would indicate that generalized imitation for these subjects cannot be accounted for in terms of either the intermittent reinforcement or failure to discriminate hypothesis. A more viable explanation of the results is from the social control hypothesis with experimental history effects and experimenter effects being particularly important. Subsequent research should investigate and clarify the importance of experimental history effects with retarded children. The durable high rates of correct responding in the absence of tangible reinforcement which resulted from the experimental procedures indicate important ramifications for training programs which

have this type of behavior as an objective.

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