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The Use of Symbolic Modeling on Generalized Imitation in Children

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THE USE OF SYMBOLIC MODELING ON GENERALIZED IMITATION IN CHILDREN

by

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To Bernie and to Grayson I dedicate this humble scientific endeavor.

Emmett G. Anderson

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ABSTRACT

The Use of Symbolic Modeling On
Generalized Imitation In Children

by

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Ten experimentally naive children between the ages of six and eight served in three generalized imitation experiments using symbolic models. Subjects were presented videotaped behaviors to imitate via closed circuit television, and their responses were mechanically defined, recorded, and reinforced in an effort to control social influences from the presence of the experimenter. In Experiment 1, imitation of three behaviors was reinforced and imitation of a fourth behavior was never reinforced for four subjects. Two other subjects received noncontingent reinforcement. The following independent variables were tested: (1) the presence and absence of an experimenter, (2) instructions to "Do that," and (3) contingent and noncontingent reinforcement.

Results of Experiment 1 demonstrated the apparatus could be used to produce and maintain generalized imitation, even in the absence of the experimenter, so long as

differential reinforcement was available. "Do that" instructions were not necessary, and the presence of the experimenter served to maintain imitation when contingent reinforcement was not available.

In Experiment 2, four subjects produced generalized imitation in the absence of both an experimenter and any instructions with two reinforced and two nonreinforced imitations.

Using the same four subjects in Experiment 3, congruent, incongruent, and "Do what you want" instructions given before sessions demonstrated that instructions could override the effect of reinforcers or produce differential responding in most subjects. When given a choice to imitate or not imitate, subjects continued generalized imitation.

The data tend to support the theory that imitation is itself a response class, and the effect of instructions is to divide that response class into a class of imitated responses and a class of instruction-following responses. The influence of instructions, even in the absence of an adult experimenter, was obvious.

INTRODUCTION

Generally, the more frequently any particular stimulus component of the environment is present when a specific behavior is emitted, and not present when a specific behavior is not being emitted, the stronger the functional relationship between the behavior and the environmental stimulus. Among the more complex of the functional relationships are those which involve the social behavior of humans as stimuli. This study is concerned with those stimuli which influence imitation in children.

The conditions under which a child will imitate observed behavior have long been the focus of research in child psychology (Humphrey, 1921). Miller and Dollard (1941), who were largely responsible for placing imitation within a behavioral framework, influenced much of the later research in imitation and observational learning. Acquiring a behavior through observation is characterized by the observer's ability to reproduce a behavior that is behaviorally similar to the behavior produced by a model (Bandura, 1969). When the observed behavior is produced by the observer without prior training in making the response, imitation is said to exist (Gewirtz & Stingle, 1968).

Research has found that reinforcement, contingent upon imitative behavior, can develop and maintain imitative

responses. Baer and Sherman (1964) using differential reinforcement found nonreinforced imitative behaviors will increase and decrease as a function of whether or not other imitative responses are reinforced, a phenomenon they called "generalized imitation," to indicate imitation "generalized" to an unreinforced response. However, according to reinforcement theory, responses that have never been reinforced should extinguish.

Typically, generalized imitation studies provide an experimenter/model who instructs "Do this" or "Say," then performs a behavior and records whether or not the child reproduces a behaviorally similar response. One class of exceptions are studies which used symbolic models (Baer & Sherman, 1964; Parton, 1970) in the form of a puppet cowboy. Following the correct imitation of the modeled behavior, the child may nor may not receive social and/or tangible reinforcement. In most studies a majority of the imitative behaviors are reinforced while a small number are never reinforced. The number of different behaviors modeled and the number which are reinforced vary from study to study and condition to condition within studies. With the exception of Baer and Sherman (1964), these studies of generalized imitation have used discrete trials by providing an interval following the modeled response during which the subject can imitate and receive reinforcement. The

intervals, usually between 3 and 25 seconds, vary in length from study to study, but remain constant within the same study.

The environmental stimuli which control imitation can, therefore, be found at many points in the chain of stimulus-response events from the time the subject first observed the model until reinforcement is complete. Major investigators suggest several points as the focus of control over imitation.

One explanation posited to account for generalized imitation is that imitation is reinforced often enough for the similarity between the subject's behavior and the model's behavior to acquire conditioned reinforcing properties and, therefore, "nonreinforced" responses are actually receiving conditioned reinforcement (Baer, Peterson, & Sherman, 1967; Baer & Sherman, 1964; Brigham & Sherman, 1968; Lovaas, Berberich, Perloff, & Schaeffer, 1966). In this explanation "similarity" reinforces any behaviors which produce it and the extrinsic reinforcers are only functional in maintaining similarity as a conditioned reinforcer.

Another explanation is that generalized imitation occurs because the subject fails to discriminate reinforced from nonreinforced responses (Bandura, 1968, 1969; Bandura & Barab, 1971; Steinman, 1970a, 1970b; Steinman & Boyce, 1971). If subjects were able to make that discrimination, then they should not imitate nonreinforced behaviors. According to

this explanation, the behaviors to be imitated are too complex and/or too similar in topography to be discriminated. Thus, an observer emits unreinforced imitations because he does not discriminate them from reinforced imitations.

A third explanation assumes that imitative behavior is an operant, i.e., a response class amenable to reinforcement (Gewirtz, 1969, 1971; Gewirtz & Stingle, 1968). This explanation places imitation within a conditional discrimination framework in which the subject responds to a comparison stimulus (the modeled behavior) or sample by matching that sample from the array of responses available to him. When the subject's matching (imitation) is accurate, he may receive reinforcement. Since the child is receiving intermittent reinforcement for imitating, there is no need for the child to discriminate which actual individual behaviors are being reinforced. Thus, imitation functions as any other behavior on an intermittent schedule of reinforcement.

Steinman (1970a, 1970b) and Steinman and Boyce (1971) presented to subjects both a previously reinforced and a previously nonreinforced behavior within each trial. Subjects were then allowed to choose which behavior they wanted to imitate. While the subjects selected the previously reinforced response over the nonreinforced response during choice trials, they continued to perform both the reinforced

and nonreinforced responses when these behaviors were presented singly on consecutive trials. These studies demonstrated that subjects may be able to discriminate reinforced from nonreinforced imitative responses, even when their behavior does not suggest such a discrimination is being made. These studies seriously challenge Bandura's "failure to discriminate" explanation. Gewirtz (1971) on the other hand, suggests that the subjects begin to discriminate on choice trials because they are forced to select between incompatible responses. In addition, the other conditions for not producing generalized imitation would be those in which punishment was made contingent upon the performance of nonreinforced imitations. Steinman's subjects may have selected the previously reinforced response because selecting the nonreinforced response in a choice situation would have meant losing a reinforcer.

Other investigators have suggested that social factors may be responsible for generalized imitation. Some of these studies have investigated the effect of instructions to the subject to imitate. According to this explanation, subjects may imitate because they are instructed to imitate by an adult, and they have a long past history of following an adult's instruction. Reinforcement of some imitative behaviors may serve to reinforce instruction-following (Martin, 1971) rather than imitation of specific behaviors.

This instruction following likely happens because the model in most experiments verbally instructs the observer and then intermittently reinforces the latter for having carried out the instructions. Steinman and Boyce (1971) suggested the association of the experimenter with the delivery of reinforcers may contribute to the experimenter's control over imitation.

Peterson and his associates indicated the presence of the experimenter is a setting event for the subject who imitates all behaviors modeled simply because the experimenter is in the same room. Effects of differential reinforcement are overridden by the presence of the experimenter (Peterson, Merwin, Moyer, & Whitehurst, 1971). Peterson and Whitehurst (1971) and Peterson et al. (1971) found that when the experimenter left the room after modeling the behavior, the subjects failed to imitate. If Gewirtz's (1971) suggestion that choice trials force the subject to discriminate between incompatible responses is correct, then the subject's imitation should not be affected by whether or not the experimenter remains in the room. The problem at present is the difficulty of isolating the social variables considered to be relevant in the control of generalized imitation. For example, having an experimenter model a behavior for a subject, yet not be present to potentially influence the subject's responding, is difficult.

The purpose of the present study was to isolate and manipulate some of the social variables deemed relevant in the control of imitative behavior. This isolation was accomplished by using videotaped presentations of the behaviors to be imitated. Methodologically, the presence or absence of the experimenter could be controlled, since no experimenter was necessary in the room. In addition, the effect of instructions on imitation during the absence of the experimenter and the association of the experimenter with the delivery of reinforcement could be studied.

REVIEW OF THE LITERATURE

This review of the literature will consider six different explanations for generalized imitation. The first three explanations involve learning or discrimination approaches. In these explanations generalized imitation is treated much like any other behavioral phenomenon. The last three explanations emphasize social influence, such as the presence of an adult and the instructions the adult gives the subject in the experimental situation. For each of the six explanations, this review presents the basic components of the explanation, a review of the relevant literature which supports the explanation, literature which conflicts with it, and a brief critique of each.

At the end of the review is a segment dealing with three techniques that have been employed to control generalized imitation. These include the use of Time Out, differential reinforcement of other behaviors (DRO), and extinction. This section also contains a critique of these three techniques. The review ends with a brief summary of the literature presented. Some general conclusions are drawn regarding the generalized imitation paradigm and subsequent research.

The first study in which "generalized imitation" was produced was conducted by Baer and Sherman (1964). They

used a puppet cowboy which nodded, mouthed, and vocalized to a child who was given verbal reinforcement contingent upon imitation of the puppet. A fourth modeled behavior, depressing a bar, was never reinforced. In a free-operant paradigm the investigators found the nonreinforced response increased in frequency along with the reinforced imitations. The nonreinforced response was maintained at a rate comparable to that modeled by the puppet, and when the other three behaviors were placed on extinction bar pressing decreased. After reinforcement was reintroduced for the other three behaviors, the rate of bar pressing, still unreinforced, also recovered. This phenomenon was called Generalized Imitation and, as used in this study, refers to the continued imitation of a modeled behavior that has never been reinforced.

A number of explanations have been posited to account for generalized imitation, many of which overlap considerably. When imitative behavior occurs, it is in the form of a chain of behaviors which reproduces the modeled behavior. In the generalized imitation paradigm this imitative behavior has been preceded by instructions to "Do this" followed by a demonstration of the behavior to be performed. When the subject produces the same or a very similar behavior, he is reinforced, usually by social and/or tangible reinforcers. Explanations of generalized imitation have

emphasized various parts of this generalization paradigm.

Accounts of Generalized Imitation

Conditioned Reinforcement

The first explanation to account for generalized imitation suggested that subjects are reinforced for producing behavior that is similar to the behavior produced by the model. This explanation was presented by Baer and Sherman (1964) who concluded that the children in their study became responsive to the stimulus of similarity independent of the physical stimuli involved in producing the similarity. Since the similarity between the subject's behavior and the model's behavior cannot be determined until the modeled behavior is completed by the subject, the behavioral chain must be complete in order to produce similarity. Similarity, therefore, is at the end of the chain, becomes associated with the reinforcer, and may acquire reinforcing properties. This association makes similarity a conditioned reinforcer which will reinforce any behaviors that produce it.

The conditioned reinforcement explanation, also called the similarity explanation in the literature, would hold that new imitative behaviors could be acquired without extrinsic reinforcement, since the conditioned reinforcer, similarity, would be present. This account of new behaviors

has been supported by a number of studies. To control for the influence of past history, Baer, Peterson, and Sherman (1967) selected three retarded subjects who failed to imitate behaviors modeled for them. These subjects were trained to imitate ten behaviors. When the ten behaviors were learned, ten more were added. The process was continued until 13 groups of ten behaviors were imitated successfully. During the training sessions, some of the imitative behaviors were never reinforced. The investigators found that as training progressed, the subjects learned to imitate all behaviors more rapidly, and both reinforced and nonreinforced behaviors were maintained as long as some of the imitative behavior was reinforced. Baer et al. concluded that the similarity between the behavior produced by the model and that produced by the subject became a conditioned reinforcer, and remained so as long as it was occasionally strengthened by other reinforcers. This conclusion may have been premature, however, since similarity was not manipulated, e.g., using some nonimitative behaviors as a test of the similarity.

Brigham and Sherman (1968) supported the conditioned reinforcement explanation. They reinforced imitation of English words in three preschool children. Imitation of modeled Russian words was never reinforced, but Brigham

and Sherman found both English and Russian words were imitated. In addition, the authors felt the imitations improved, for both English and Russian words, over trials.

Additional support for the conditioned reinforcement explanation was provided by Metz (1965) and Lovaas, Berberich, Perloff, and Schaeffer (1966) in which imitative speech was developed in autistic and schizophrenic children respectively. Although all these studies have demonstrated the phenomenon called generalized imitation, none attempted to test the similarity explanation given to account for it.

The explanation that generalized imitation is a function of "similarity" (Baer & Sherman, 1964) was challenged by studies in which nonreinforced nonimitating behavior such as following instructions to "touch your toe" was maintained when interspersed with reinforced imitative behavior such as imitating a model touching his toe (Peterson, 1968; Wilcox, Meddock, & Steinman, 1973). Similarity would not act as a conditioned reinforcer for nonimitative behavior because similarity was not present on the nonreinforced trials. Baer and Sherman's explanation might predict that dissimilarity on the nonimitation trials also acquired conditioned reinforcement properties. However, since reinforcement was not given contingent upon nonimitative responses, dissimilarity could not acquire reinforcing properties.

Intermittent Reinforcement

According to Gewirtz (1969, 1971) and Gewirtz and Stingle (1968) the topographical differences between responses play a minimal role in generalized imitation as long as the responses are members of a response class functionally defined by the reinforcer. Here, topography refers to the overt characteristics of a response which allows the observer to discriminate and/or reproduce that response. For Gewirtz this response class is imitation. Gewirtz (1971) assumes that imitative behavior is itself an operant which receives reinforcement. He places imitation within a conditional discrimination framework. In this explanation the behavior demonstrated by the model is a comparison stimulus or sample. The subject attempts to match that sample from the array of responses in his repertoire. When the subject is successful in matching the sample behavior provided by the model, reinforcement may result. If all imitative behaviors are not reinforced, the subject operates as if he is on an intermittent schedule of reinforcement. The subject will not discriminate the actual physical behaviors being reinforced until the nonreinforced behaviors are specifically punished or are incompatible with stronger responses in the subject's repertoire (Gewirtz, 1971). The terminal reinforcer at the end of the behavioral chain

maintains the chain on an intermittent schedule of reinforcement. New responses may be acquired without reinforcement because the specific operants of the imitation response class can vary and/or reinforcement is intermittent. In addition, other environmental stimuli, such as the use of different models, can influence them.

As a causal factor for intermittent reinforcement leading to the development of generalized imitation, Gewirtz stresses the subject's past history. Subjects are reinforced for imitating from the time they are very young to the time they participate in studies on generalized imitation. Not all imitative behaviors are reinforced. Therefore, the child operates on intermittent reinforcement for imitating, first receiving social reinforcement from parents and later more diversified reinforcers from many sources.

Gewirtz's explanation differs from the "similarity" explanation in that no intrinsic component, such as a conditioned reinforcer, is necessary and the explanation can still account for generalized imitation (Gewirtz & Stingle, 1968). The importance of Gewirtz's explanation may be the emphasis on the importance of the subject's past history to account for his imitating. Support for the effects of past history is suggested by Wilcox, Meddock, and Steinman (1973). They found that after a subject had a history of

nondifferential responding, observing a model respond differentially did not change their performance. However, when subjects without such a history observed the model respond differentially, these subjects began to respond differentially. Since the study by Wilcox et al. employed a visual discrimination task rather than a model-imitation task and obtained results comparable to the generalized imitation studies, it would appear that the functional response class suggested by Gewirtz (1969, 1971) may be broader rather than limited to imitation alone.

Stimulus Complexity

A third explanation of generalized imitation was offered by Bandura (1968, 1969). Bandura suggests that children produce generalized imitation simply because the behaviors modeled are too complex for them to discriminate those that will be reinforced from those that will not be reinforced. As evidence to support this position, Bandura and Barab (1971) presented behavior varying in complexity to subjects. They found that subjects failed to respond differentially to very similar behaviors that were differentially reinforced. However, when the nonreinforced behaviors were dissimilar in topography from the reinforced behaviors, differential responding occurred. In addition, similar reinforced and nonreinforced behaviors were discriminated

when nonreinforced behaviors were modeled by a second experimenter.

Bandura and Barab (1971) question the conditioned reinforcement explanation. When subjects discriminate dissimilar reinforced from nonreinforced behaviors, they respond differentially. If the similarity between the subject's and the model's behavior is a conditioned reinforcer, then the ability to discriminate should be irrelevant and both behaviors should be maintained. Since Baer and Sherman's (1964) nonreinforced behavior was dissimilar, i.e., bar pressing differs from nodding, mouthing, and vocalizing, the question is reduced to whether the subjects discriminate this difference. Four of Baer and Sherman's subjects did not produce generalized imitation, and it is possible that these four discriminated the difference. Gewirtz, on the other hand, would simply submit that the nonimitated behaviors belonged to a different response class.

Bandura's argument for complexity being responsible for generalized imitation was in turn challenged by Steinman (1970a, 1970b) and Steinman and Boyce (1971). Steinman produced generalized imitation in a group of children, then presented them with trials in which they could choose to imitate either a previously reinforced or a previously nonreinforced behavior. Bandura's explanation of generalized

imitation would predict the behaviors were too similar or too complex for the subjects and therefore selection in choice trials should be equal. Steinman and his associates found that the subjects selected the previously reinforced response nearly 100 percent of the time, and therefore the subjects had been able to discriminate which responses would be reinforced all along. However, when the subjects were again given the previously reinforced and nonreinforced behaviors randomly alternated on single trial presentations (i.e., no choice was possible), the subjects began to imitate both reinforced and nonreinforced behaviors again. Steinman (1970a) suggested social variables such as instructions might account for generalized imitation.

Bufford (1971) reinforced imitation of 50 English nouns and did not reinforce imitation of 20 German nouns. His subjects were presented with all 70 words initially, but Bufford then began to systematically reduce the number of words until only one English word was modeled ten times, randomly alternated with ten different German nouns modeled one time each. The subjects continued to imitate all the words used even when imitation of the English word alone produced reinforcement. Bufford suggested discrimination is clearly reduced in importance in generalized imitation since the discrimination between the one English word and

the ten German words would have been possible. However, since the number of reinforced words was progressively reduced for all subjects, perhaps the subjects were simply being placed on a progressively leaner schedule of reinforcement and only the initial lack of discriminating which imitations would be reinforced was important. Later, when discrimination would have been easier, the subjects were not under the control of differential reinforcement.

Martin (1971) compared imitation and nonimitation by presenting behaviors that could be imitated and instructions that could be followed (nonimitation) to four subjects. Two subjects were reinforced for following instructions and not reinforced for imitation, while the other two subjects were reinforced for imitating and not reinforced for following instructions. Martin found that all four subjects both imitated and followed instructions on almost all trials. An explanation of generalized imitation based on stimulus complexity would have difficulty explaining these results, since the stimuli were so apparently divergent.

Peterson (1968) also found that nonimitative behavior could be maintained as long as imitative behaviors were reinforced. In addition, both Peterson (1968) and Martin (1971) found that reinforcing nonimitative behavior maintained imitation of interspersed nonreinforced behaviors.

These findings challenge the similarity explanations of conditioned reinforcement. Peterson and Whitehurst (1971) showed that imitative behaviors could be maintained when no extrinsic reinforcement was given. It seems then that all three explanations are unable to account adequately for some aspects of generalized imitation without further elaboration.

Social Controls

The investigation of social factors that influence generalized imitation has been primarily directed at the kinds of instructions given to subjects and the actual presence of the experimenter/model. Instructions have received the majority of attention and may be roughly divided into two categories. The first to be considered in this review concerns the instructions given to the subject at the start of each session or group of sessions within which no variables are manipulated. These "session instructions" typically involve telling the subjects something about what responses are required of them. When used in studies not directly testing the effects of instructions, these instructions may be presented as: "All you have to do to win beads is listen to what I say and look at what I do (Peterson & Whitehurst, 1971, p. 2)." These instructions

are then followed by "Trial instructions." Trial instructions are almost always used, even when session instructions are not, and take the form "Do this" or "Say" given prior to the modeling of the behavior to be imitated. The manipulation of trial instructions will be considered in the second part of this discussion. Finally, the last part of this discussion will review studies which have manipulated the presence and absence of the experimenter.

Session instructions. Steinman (1970a) first reported the manipulation of instructions given before different conditions. Subjects were instructed at the beginning of the first session, "Today, don't do the ones you aren't going to get a bead for doing (p. 93)." These were subjects that had just completed one experiment in which generalized imitation was investigated. Before each trial the subjects still were asked to "Do this." The results showed a reduction in the number of imitations as compared to conditions in which the subjects were instructed, "Today, it doesn't make any difference whether you do the one you don't get beads for or not. I don't care (p. 92)." In addition, the reduction was more pronounced for behaviors that were dissimilar to the reinforced behaviors than for behaviors that were similar. Reinforced imitations were still performed on nearly 100 percent of the trials.

In a replication of the study of instructions, Steinman (1970b) told subjects, "Today, don't do the ones you aren't going to get a bead for doing (p. 162)," and responding decreased almost to zero for nonreinforced responses. As in the earlier study (Steinman, 1970a), when subjects were told it didn't matter and they could do what they wanted, nonreinforced responding increased. Steinman's studies then suggest that subjects will continue to perform nonreinforced behaviors unless specifically told not to.

In a replication of Steinman's studies (1970a, 1970b), Bufford (1971) manipulated instructions when the imitative response was verbal. Subjects were told to "Say only the words you get marbles for saying (p. 43)." Bufford found a decrease in nonreinforced responding by some subjects. When instructions before each trial were more emphatic (e.g., "Don't say this word unless you get a marble when you say it (p. 43)"), subjects decreased nonreinforced imitation. Later, when other subjects were told they could do "anything," all resumed nonreinforced responding. Bufford's data were comparable to Steinman's, even though Bufford's "Say" instructions were given only during the first three trials of the first session. Bufford suggests Steinman's instructions were redundant, since Bufford's instructions apparently developed their controlling properties rather quickly. If so, these "Say" instructions

would have retained their power through as many as 70 trials.

Trial instructions. The other group of studies investigating the influence of instructions had manipulated the instructions prior to each trial, e.g., "Do this." One of the first (Parton, 1970), a replication of Baer and Sherman (1964), manipulated requests to imitate (e.g., "Can you tap your foot?" or "Can you press your lever?"). A third behavior, arm raising, was never requested or reinforced. One group of subjects received requests before each foot tap and lever press trial. Another group of subjects received a request before half the foot tap and lever press trials. Parton suggested that if the requests (or instructions) increased the probability of making an imitative response, then the group which received requests on half the foot and lever trials should increase in their probability of imitating on trials in which no request was given.

Parton found no subject showed an increase in imitation on the "no request" trials as the session progressed for either the foot or lever responses. Imitation on the no request trials remained at about 30 percent, compared to 90 percent on the request trials for the lever press response. Parton concluded from these requests that Baer and Sherman's (1964) results were not due to the puppet's

motor responses acquiring a request or cue function as a result of pairing requests with motor responses, since Baer and Sherman's study involved fewer pairings. On the other hand, perhaps Parton's difference, i.e., verbal requests on half the trials, was not sufficient to produce a change. This is especially important when one considers there were only seven lever-request trials and subjects participated in only one session with a total of 42 trials.

Martin (1971) attempted a study to see if nonreinforced imitation could be maintained while interspersed among reinforced nonimitative behaviors, a replication of Peterson (1968). Using four severely retarded boys, Martin compared conditions in which the subjects were given instructions to "Touch your feet" as a nonimitative behavior with conditions in which a motor response was modeled. In each session the modeled behaviors were first presented without the instruction "Do this." If the subject failed to imitate, the verbal prompt "Do this" was then presented before each imitation trial for the rest of the session. Two subjects received no reinforcers for imitative behavior, but were reinforced for following the instructions in the nonimitative conditions. The other two subjects were reinforced for imitation, but were not reinforced for following the instructions, i.e., nonimitative behavior.

Martin found that reinforcing nonimitative behaviors, defined as instruction following, would maintain interspersed imitative behaviors, and vice versa.

Martin (1972) modeled behaviors whose imitation was reinforced (Set A) under some conditions and behaviors whose imitation was never reinforced (Set B). He then compared instructions to "Do this" before both sets of behaviors with instructions to "Don't do this" presented before both sets. The results showed no differential responding within any of the conditions. Subjects always imitated when told to "Do this" regardless of whether reinforcement was applied to any behaviors or not. However, when told "Don't do this" imitation occurred as a function of whether or not Set A behaviors were reinforced. Martin concluded incongruent instructions were overridden by reinforcement consequences. However, Martin did not test the effect of presenting "Don't do this" to Set B behaviors while presenting "Do this" instructions to Set A behaviors within the same session. An important question is whether or not this manipulation would produce differential responding and further test the strength of instructions. Perhaps instructions could serve to divide the response class.

Parton (1970), in addition to his other manipulations, did not give instructions to "Do this" prior to presenting

nonreinforced behaviors. Parton reported that few nonreinforced responses occurred and those decreased over trials. Waxler and Yarrow (1970) did not give "Do this" instructions for nonreinforced responses, yet generalized imitation occurred. In their study only one of nine responses was not reinforced, and it was introduced along with five new reinforced responses in a storytelling context. Perhaps the subjects in their study failed to discriminate, since they were also given a past history of all responses being reinforced.

Peterson and Whitehurst (1971) found withdrawing trial instructions to "Do this" for both reinforced and nonreinforced responses had no effect on their one subject who received this condition. At the same time they found subjects stopped imitating when the experimenter left the room after modeling the behavior, even though "Do this" instructions were still presented at the start of each trial.

Bandura and Barab (1971) used neither session instructions nor trial instructions. When subjects failed to imitate initially, they observed a peer modeling session in which the peer performed imitative behaviors. Generalized imitation resulted. When the similarity of the modeled behaviors was manipulated, some differential responding occurred, even though instructions were still not used.

The effects of instructions on responding, at least as far as the studies reported are concerned, are not clear at present. Instructions have been effective in reducing nonreinforced responding when subjects were specifically instructed to not perform the nonreinforced response (Steinman, 1970a, 1970b; Martin, 1972). However, when instructions were more ambiguous or at least less directive, such as telling the subjects "It doesn't matter what you do," the subjects began to perform nonreinforced responses once more. It appears that instructions may have a suppressive effect, but just how and to what degree instructions exert control over generalized imitation is not clear. Past studies have not investigated the influence of instructions in the absence of the experimenter, nor have the effects of differential instructions within the same session been tested. Perhaps another variable interacting with instructions accounts for some of the conflicting results. For example, Bandura and Barab (1971) may not have obtained differential responding had instructions been used. On the other hand, Peterson and Whitehurst's results may have been influenced by the subjects' past history or by the difference in reinforcement conditions. A parametric analysis is needed to determine the role of instructions. Perhaps when instructions are present the subject is

reinforced for following instructions. When instructions are not present, some other variable controls responding.

Experimenter presence. Another social variable investigated as a source of influence in generalized imitation has been the presence or absence of the experimenter/model. In past studies a model has always been present to give instructions to "Do this" and model the behavior to be imitated. When imitation occurs, the model is often the one to deliver the reinforcer. The subject, therefore, always imitates in the presence of the experimenter who may also become associated with the delivery of reinforcement. It is possible that the mere presence of the experimenter may act as a setting event for imitative behavior (Peterson & Whitehurst, 1971). The presence of the experimenter, therefore, may have or develop certain "demand characteristics" which serve to promote compliance to the experimenter's instructions, real or implied. The presence of the experimenter may be strong enough to override reinforcement contingencies, thus preventing differential responding.

The importance of the experimenter's presence was first tested by Peterson and Whitehurst (1971). While investigating a number of variables considered potential sources of control in generalized imitation, Peterson and Whitehurst manipulated the presence and absence of the

experimenter. In an experimenter-absent phase the subject was instructed as follows: "I don't want you to do anything until I leave the room (p. 3)." The experimenter then said, "Do this," modeled the behavior as before, and left the room. If the subject started to perform the behavior before the experimenter was out of the room, he was reminded "Remember, don't do anything until I leave the room (p. 3)." This instruction was repeated several times for some subjects. No instructions were given beyond the initial session except, "Do this." The experimenter was out of the room for ten seconds, then entered and modeled the next behavior and again left the room. These trials lasted at least 20 seconds. One other important point must be noted. During the experimenter-absent conditions, the subjects were not being reinforced as they had been in earlier conditions.

The introduction of the experimenter-absent condition resulted in a reduction in imitative behaviors for the three subjects. Two subjects showed a gradual reduction over 14 to 19 sessions. The third subject showed a rather rapid reduction during the second session of the experimenter-absent phase. This third subject was the only one that had shown a reduction in the earlier conditions. This reduction occurred during the differential reinforcement condition.

When imitative performance was nearly zero for each subject, the experimenter-present condition was reinstated. In this condition the experimenter again remained in the room after modeling the behaviors as in the typical procedure. Although reinforcers still were not dispensed during this period, imitation returned to its original level and remained between 80 and 100 percent for all subjects.

Peterson and Whitehurst then replicated the results with new subjects in a second experiment of the same study. Again, reinforcers were never presented. The first phase of the study consisted of the experimenter-present and "Do this" instructions. Imitation in all four subjects was nearly 100 percent for all seven behaviors modeled. Next, the experimenter-absent phase was introduced as in the first experiment. The percent of imitation dropped slowly in all four subjects and never reached zero for any. In fact, for three subjects the percent of imitation never fell below 70 percent. When the experimenter-present phase was reintroduced, imitation increased to nearly 100 percent for all four subjects. Peterson and Whitehurst (1971) concluded that in order to control the performance of generalized imitative behaviors, the presence of the experimenter must be considered.

Peterson, Merwin, Moyer, and Whitehurst (1971) investigated the effects of the experimenter's absence, discrimination training, and the complexity of the stimulus situation on nonreinforced imitation. In this study four subjects were exposed to a number of conditions which included experimenter-present and extinction, experimenter-absent and extinction, experimenter-absent and differential reinforcement, and experimenter-absent and differential reinforcement with response addition (for two subjects in which 12 or 24 new responses were added). For one subject the response-addition phase resulted in a decrease of imitation to about 20 percent. Then the new responses were withdrawn and responding remained about the same. In the last part of the study, this subject received differential reinforcement with the experimenter present. The result was an unstable rate of imitation which varied between 60 and 100 percent.

The second subject continued with the response addition and differential reinforcement phase to the end of the experiment. During the last seven sessions the experimenter was present and the subject imitated all behaviors nearly 100 percent of the time. The first subject responded differentially during the experimenter-absent and differential reinforcement condition for about seven sessions.

The response addition phase resulted in a decrease in all imitation with a low level of differential responding when the response addition was withdrawn. When the experimenter was again present, generalized imitation returned. For the second subject a mild prompt was necessary to get the subject responding again, but differential responding occurred after seven sessions and continued during the first part of the response addition phase. When the experimenter was again present, generalized imitation again occurred. The other two subjects never came under control sufficiently to go beyond the experimenter-absent with differential reinforcement phase.

Bandura and Barab (1971) and Wilcox et al. (1973) suggest that past history, i.e., the conditions presented, could have a strong influence on how subjects respond. Or, it could be that having the experimenter model a behavior then leave the room produces a source of punishment for the subjects and could account for the findings, particularly in Peterson and Whitehurst (1971). Their subjects acted as if they were in extinction when the experimenter was absent. To say the least, the act of getting up and leaving the room, then reentering, must have some disruptive influence on the subjects. Also, the very act of sitting alone in the room after the experimenter leaves could

influence the subject's responding. Peterson and Whitehurst report that 60 percent of the nonimitation in their study was incorrect responding, and 40 percent was failure to respond. There is, therefore, another variable that could account for at least part of the results obtained by Peterson and his associates. When the experimenter is leaving the room during experimenter-absent phases, the subject must wait before he can perform the behavior presented. This delay in responding has potential for producing errors in human subjects. The matching-to-sample literature indicates accuracy is affected by the amount of delay between the presentation of the sample stimulus and the presentation of the choice stimuli (Cumming & Berryman, 1965; Davidson & Osborne, 1974; Sidman, 1969; Weinstein, 1941). Delaying the opportunity to respond during an experimenter-absent condition could at least partially account for the results of Peterson and Whitehurst (1971).

Smeets and Striefel (1973) tested this delay influence using an 8-second delay before their subjects could respond. As in the Peterson and Whitehurst study, there were no reinforcement conditions in this study. This 8-second delay was compared to conditions with 0-second delay with the experimenter present and 8-second delay with the experimenter leaving the room after modeling the behavior to be

imitated. Smeets and Striefel found the delay decreased the percentage of correct responses, as did the absence of the experimenter. The absence of the experimenter, however, resulted in a slightly lower percentage of correct responses. The authors concluded " . . . the decrease of nonreinforced imitation was controlled less by the absence of the experimenter alone than might be inferred from the findings of Peterson and Whitehurst (p. 126)." Some of their subjects showed no decrease during the experimenter-absent phase. There was no reported differentiation of failure to respond and incorrect imitations. In addition, Smeets and Striefel could not test experimenter-absent with 0-second delay because the experimenter took 6.5 to 7.5 seconds to leave the room.

It is not clear why these studies failed to use differential reinforcement in the experimenter-absent phases without confounding variables such as in Peterson et al. Such a condition might have provided more information about whether the results were due to the delay or the absence of the experimenter. For example, if accuracy decreases as a function of the delay, then past studies would suggest a reduction in accuracy during the absence of the experimenter. But if the subject is being punished in some way there should be a failure to respond. Since Peterson and

Whitehurst report both decrease in accuracy and failure to respond, it is possible that an interaction between the delay and punishment exists.

Other contradictory evidence is suggested by the previously noted study by Wilcox et al. (1973). Their study used a visual discrimination task within a generalized imitation paradigm. In the absence of an experimenter who sat behind a screen in the same room, subjects responded by pushing one of two windows containing either a circle or triangle, one of which was reinforced. The subjects responded indiscriminately, the analogue of generalized imitation. Instruction to the subjects that they were not required to make all the responses and should decide which they wanted to make, did not produce differential responding. Modeling differential responding was effective in producing discrimination in only one of four subjects. Moving the experimenter closer to the subject also failed to produce nondifferential responding in the subject, a conflict with the results obtained by Peterson and Whitehurst (1971).

In a second experiment of the same study, the modeling of differential responding was effective in producing differential responding in three of four subjects. This second experiment differed from the first in that the modeling occurred in the first session compared to the ninth or tenth

session in the first experiment. Wilcox et al. concluded that the different conditions to which a subject is exposed will influence imitative responding.

Techniques for Removing Nonreinforced Imitation

Generalized imitation is characterized by the occurrence of nonreinforced responding as long as some imitative behaviors are reinforced. When reinforcement is discontinued for all imitative behaviors, both reinforced and nonreinforced imitation decreases.

Extinction

The effect of extinction on nonreinforced imitation was first demonstrated with two subjects in Baer and Sherman's (1964) study, and has been replicated in a number of other studies (e.g., Baer et al., 1967; Lovaas et al., 1967; Metz, 1965). In addition, Peterson (1968) found subjects stopped performing nonimitative responses as soon as reinforcement was discontinued for imitative behavior. After about 40 trials the imitative behavior also extinguished. Martin (1972) found extinction was effective in reducing imitative responding unless contradictory instructions were given.

Other studies using extinction have produced conflicting results. Peterson et al. (1971) and Peterson and Whitehurst (1971) found extinction was not effective while the experimenter remained in the room. When the experimenter left the room after modeling the behaviors to be imitated, imitation recovered, although imitative behavior had never been reinforced during any of these conditions.

Time Out (TO)

Baer and Sherman (1964) used a form of TO for two of their subjects. This TO, however, was not response contingent. The puppet stopped modeling, nodding, mouthing, and verbalizing, and began reinforcing the subjects' conversation. The results showed the TO produced a weakening of the nonreinforced imitative behavior of bar-pressing. When reinforcement was again presented contingent upon imitation, the nonreinforced responses increased in frequency. It is not clear how much effect extinction had on the subjects' behavior, rather than TO, because all reinforcement contingent upon the subjects' imitation was withdrawn. Perhaps the subjects were not experiencing TO in the usual sense but, rather, extinction. Time out implies punishment, whereas extinction does not.

Wilcox et al. used a TO of ten seconds contingent upon the subjects' performing nonreinforced responses. The TO had no effect on three subjects and only a slight effect on the fourth subject, who recovered nonreinforced responding in the third TO session and reached 100 percent in the fourth session.

Some studies have used TO in conjunction with other procedures. Bufford (1971) used TO contingent upon imitation of nonreinforced German words and DRO following the modeling of English words. The TO-20 seconds plus DRO produced a reduction in all imitation. Epstein, Peterson, Webster, Guarnieri, and Libby (1973) used a fading procedure to introduce the nonreinforced response, while the reinforced imitative response was developed and maintained on CRF. Fading was combined with DRO, TO, or both DRO and TO. In other groups, fading was not used. Neither TO, nor DRO, nor both combined had any effect on imitation or nonreinforced responses, although fading procedures did.

Differential Reinforcement of Other Behavior (DRO)

Technically, DRO refers to the delivery of a reinforcer contingent upon the occurrence of any behavior other than the one being investigated. In practice, a reinforcer is delivered after a specific period of time during which

the response under investigation does not occur, i.e., the subject is reinforced for not emitting the response. In the generalized imitation paradigm, DRO is applied only to previously reinforced trials and not to nonreinforced trials which continue to meet with neutral consequences. Thus, subjects never experience reinforcement following the modeling, or performance, of nonreinforced behaviors.

In addition to the study by Epstein et al., cited above, who found DRO to have no influence on the acquisition of nonreinforced responses in generalized imitation, other studies have found DRO ineffective in removing existing nonreinforced responses. Steinman (1970a) and Steinman and Boyce (1971) used DRO-0 sec, DRO-15 sec, DRO-30 sec, and a condition in which subjects were given the reinforcers at the beginning of the session. The DRO was applied to reinforced trials and was not effective in reducing nonreinforced responding.

Brigham and Sherman (1968) used DRO during reinforced trials when reinforcement was delivered at least 5 seconds after the last imitation of each English word. No reinforcement was given after the Russian words. The DRO interval was then varied from five to 20 seconds. Brigham and Sherman reported a 20 percent decrease in all imitation. Peterson and Whitehurst (1971) found DRO-20 sec had no effect on imitation.

Other studies have shown a marked decrease in imitation when DRO procedures are instituted. Baer et al. used DRO-30 sec with one subject and DRO-0, -20, -30, or -60 seconds with the others. In this study imitation decreased significantly. However, one subject required the use of DRO-0 sec before imitation decreased. Thereafter, DRO-30 and -60 seconds was effective.

Martin (1971) used DRO-0 sec to reduce imitation and maintained the reduction with DRO-20 and -30 seconds. Burgess, Burgess, and Esveldt (1970) found DRO-0 sec -5 to -20 sec and -60 to -90 sec to be effective in reducing the previously reinforced response. In one subject DRO-0 sec was required to produce the initial reduction.

The results of the studies using DRO procedures to reduce nonreinforced and reinforced responding clearly suggest other variables may be operating, since the results are inconsistent. DRO appears to be most effective with imitative responses when reinforcement appears immediately after the presentation of the stimulus, i.e., DRO-0 sec. Whether this condition really constitutes DRO is questionable, however, since the subject is not given the opportunity to perform any "other" behavior to be reinforced.

Summary of the Reviewed Literature

From the studies reviewed it appears that the phenomenon of generalized imitation is very strong and durable. The "failure to discriminate" explanations posited to account for generalized imitation are descriptive of the phenomenon but do not explain it. With the exception of Baer and Sherman (1964), studies have failed to remove generalized imitation as a function of manipulating the variables given to account for it; then, contingent upon reinstating or removing the variable, reproduce generalized imitation. It is suggested here that such reversals are necessary in order to demonstrate control over the phenomenon. On the other hand, the baselines of generalized imitation may be nonreversible. In such cases, the initial conditions of the studies should first demonstrate differential responding. The evidence presented in this review might suggest that at present there is not sufficient information available to permit such manipulation.

The studies suggesting social factors control generalized imitation have shown that imitative responding can be increased and decreased, but have failed to produce differential responding. Steinman and his associates have shown that instructions to "Don't do it unless you get a bead for doing it" have reduced nonreinforced responding to various

levels. Martin has shown that instructions presented before each trial, such as "Don't do this," can influence imitations as a function of whether or not reinforcement is applied to some of the imitative behaviors, but his instructions were given prior to all behaviors modeled within the session. Waxler and Yarrow gave instructions to "Do this" differentially, but their results are inconsistent with Martin (1972), and may have been a function of the number and kinds of conditions presented.

Peterson and his associates have shown that imitative responding decreases when the experimenter leaves the room after modeling the behavior to be imitated. Smeets and Striefel have shown that the results obtained may be at least partially due to one other variable, the delay between the modeled behavior and the opportunity to respond. Contradictory evidence has been offered by Wilcox et al. who suggest the experimenter's presence may not have any influence on responding.

None of the studies have tested the potentially disruptive and/or punitive aspects of the experimenter leaving the room after modeling a behavior. None of the studies have directly tested instructions presented differentially before each imitative behavior. None of the studies have tested the possibility that the subject responds on

nonreinforced trials as a function of the length of the intervals provided for the subject to respond. The DRO procedures used to eliminate nonreinforced responding have generally been unsuccessful unless DRO-0 sec was included, or for two studies, when DRO was used in conjunction with time out (Bufford, 1971) or fading (Epstein et al., 1973). Further, studies have not directly tested the association of the experimenter with reinforcement (Steinman & Boyce, 1971).

The conclusion of this literature review is that the phenomenon of generalized imitation is not as yet clearly understood. More research in a number of areas is necessary. Future studies, as suggested by virtually all past investigators, must contain methods of isolating the social variables involved.

STATEMENT OF THE PROBLEM

Studies attempting to determine which social stimuli influence generalized imitation usually emphasize the presence or absence of the experimenter/model (Peterson et al., 1971; Peterson & Whitehurst, 1971; Smeets & Striefel, 1973), or instructions to imitate, e.g., "Do this" or "Say" (Parton, 1970; Martin, 1972; Steinman, 1970a, 1970b; Steinman & Boyce, 1971; Waxler & Yarrow, 1970). These studies found that imitation is less likely when the experimenter leaves the room after modeling a behavior. The studies suggest imitation may be a function of real or implied instructions.

Factors apart from the absence of the experimenter may have influenced the results; Peterson and Whitehurst (1971) had to remind the subjects "Remember, don't do anything until I leave the room (p. 13)" when attempts were made to imitate before the experimenter could leave. These instructions could have had a suppressive effect on the subjects' responding beyond the planned delay. Smeets and Striefel (1973) used an 8-second delay before imitation could occur and found the delay functioned similarly to the experimenter-absent phase in the earlier studies in that imitation of all behaviors decreased. Unfortunately, they were unable to present experimenter-absent-no-delay conditions, and they used no reinforcement contingent upon

imitation. Therefore, what effect the delay in the absence of instructions would have on imitation is not clear, especially when reinforcement is available for some imitations.

In these studies experimenters interacting with the subjects outside the experimental situation could have increased the demand characteristics noted earlier (Bandura, 1969; Bandura & Barab, 1971) by increasing the probability that the experimenter became a setting event. Subjects in Peterson and Whitehurst's study were reinforced for imitating prior to the experimenter-absent phase. The experimenter may have become a discriminative stimulus for reinforcement and thus maintained imitative responding until withdrawn. In their second experiment subjects were obtained through their contact with subjects in the first experiment, increasing the probability of communication outside the experimental environment.

If the experimenter/model becomes a discriminative stimulus for reinforcement, then his leaving the room could function as a time out from positive reinforcement and his return contingent upon not imitating could reinforce not imitating. Considering these events together, it may be that the subjects were (a) cued not to respond (indirectly by the instructions to wait), (b) punished by the removal of a positive reinforcer, (c) placed in time out by being

left alone in the room, and/or (d) reinforced for behaviors other than responding by the return of the experimenter. The position of the present study is that a test of the effect of the absence of the experimenter on generalized imitation must: (a) eliminate the experimenter entering and leaving the room during each trial, and (b) provide reinforcement for correct responses when the experimenter is absent. The present study accomplished this by presenting behaviors to be imitated via videotape so no experimenter was required in the room, and by having reinforcers delivered automatically by a token dispenser contingent upon the correct imitation of a reinforcible response.

According to the conditioned reinforcer (Baer & Sherman, 1964), intermittent reinforcement (Gewirtz & Stingle, 1968), and failure to discriminate (Bandura, 1969) explanations, if differential reinforcement is continued during the experimenter-absent phase, generalized imitation should continue as in the experimenter-present phase. According to explanations for generalized imitation occurring as a function of instructions used (Steinman, 1970a, 1970b), subjects should continue to respond during the nonreinforced trials unless instructed to do otherwise. However, if generalized imitation is a function of the presence of the experimenter (Peterson & Whitehurst, 1971), then differential

responding, or no responding at all, could occur during the experimenter-absent phase. The present study directly tested this last inference.

Martin (1972) instructed subjects "Don't do this" before each modeled behavior for some sessions and "Do this" before each modeled behavior on other sessions. In some conditions no imitative behaviors were reinforced. What effect the differential instructions would have in the absence of the experimenter and with consistent differential reinforcement within sessions is not clear.

The present study extended the past research in a number of ways. The first experiment tested the effects of the presence or absence of the experimenter apart from the potentially disruptive effects of entering and leaving the room. Since the presence of the experimenter may serve as a discriminative stimulus for the instructions given to subjects, whether instructions are real or implied, the second experiment evaluated the effect of the experimenter's presence on instructions by presenting the modeled behaviors to subjects without instructions and without the experimenter present. Both experiments tested the effects of differential reinforcement in the absence of the experimenter. Experiment 3 extended Martin's (1972) by giving differential instructions within the same sessions, i.e.,

"It's OK to do this, but don't do this." Further, the effects of congruent and incongruent instructions, combined factorially with differential reinforcement was tested. Finally, all three experiments minimized social influences both within and outside the experimental environment by using different experimenters who did not interact with the subjects in the experimental room, and by using subjects who did not know or interact with each other in the different experiments and conditions.

GENERAL METHOD

Since Peterson and his associates found that imitation decreases when an adult model does not remain in the room, it is possible that generalized imitation will not occur in the absence of the experimenter, even when the same reinforcement contingencies remain in effect. The task of the first experiment in this study, therefore, was to demonstrate that generalized imitation could be produced with the use of video equipment. Second, the experiment determined whether generalized imitation would continue in the absence of the experimenter.

Subjects

Ten children with no known behavioral or intellectual deficits were selected to participate in this study. The subjects were selected from the families of friends or relatives of students within the Department of Psychology at Utah State University. One exception was the daugther of a new secretary. None of the children had participated in research, nor had they been exposed to the Human Behavior Laboratory at Utah State University prior to this study. Table 1 shows the age, sex, and experimental participation of each subject. Upon arrival at the laboratory each subject was taken to the child care room where they were able

to see the toys and candy they would later be able to purchase with tokens.

Table 1

Subject Characteristics and Assignments

Subject	Age	Sex	Experiment	Nonreinforced Lever
S11	8-7	M	1	D
S12	5-10	M	1	C
S13	6-0	F	1	B
S31	7-11	F	1	all
S32	7-9	F	1	all
S33	7-4	M	1	A
S21	7-3	F	2-3	B & D
S22	7-2	F	2-3	B & C
S23	6-6	F	2-3	A & D
S24	7-9	F	2-3	A & C

Experimenters

Three experimenters were used to conduct the experiment. Experimenter 1 was in the experimental room with the subject to deliver instructions and to provide the experimenter presence. This experimenter was a female in Experiment 1 and a male in Experiment 3.

Experimenter 2 operated the equipment in the control room. This responsibility included loading appropriate programs into the computer, setting the VTR tapes, and obtaining printouts and other data for each subject.

Experimenter 3 had the responsibility of picking up subjects and watching them while they waited prior to or after participating in the experimental sessions.

Apparatus-Control

The control room housed a PDP/8L computer and expander console interfaced with electro-mechanical equipment. A large enclosed metal cabinet housed a control video monitor Sony CVM-950, which allowed the experimenter to observe the same modeled response the subject was seeing.

A Sony AV-3400 Videocorder (VTR) was housed inside the cabinet. Power to the VTR was supplied through a Sony AC-3400 power adapter. A remote control box located in the cabinet contained a relay and 120-volt plugs allowing the computer to operate the relay, thereby turning the VTR on and off remotely.

The electro-mechanical rack contained four Grason-Stadler, Model E3700A, counters. These recorded the number of responses on each of the four levers independent of the computer recording of the responses.

Apparatus-Experimental

Figure 1 shows the apparatus used by the subjects in this study. It was located in an experimental room in the Human Behavior Laboratory of the Psychology Department at Utah State University. The room had one door and a one-way observation window. Furniture consisted of a desk and two chairs. The desk held a black plywood console (Figure 1).

The console was 35-1/2 inches wide, 15-1/2 inches deep, and 26 inches high. Four chrome-plated steel levers, 5-3/8 inches long, fit through slots in the front of the console, and were spaced 5-3/8 inches apart. Each lever allowed for only one of the following topographies--either a push, pull, lift, or depress movement.

Mounted above the levers was the subject's monitor which presented the modeled response to the subjects. The upper portion of the front of the monitor compartment was recessed and contained an opening covered by clear plexiglas which allowed the subject to view the entire monitor screen inside. On the left was a remote control switch that allowed the experimenter to start and stop the VTR from the experimental room. To the right of the monitor was a green 28-volt pilot lamp and a nonfunctional switch.

The subject monitor was a Sony Video Monitor CVM-950. This monitor presented the modeled behaviors to the subject from the videorecorder in the next room.

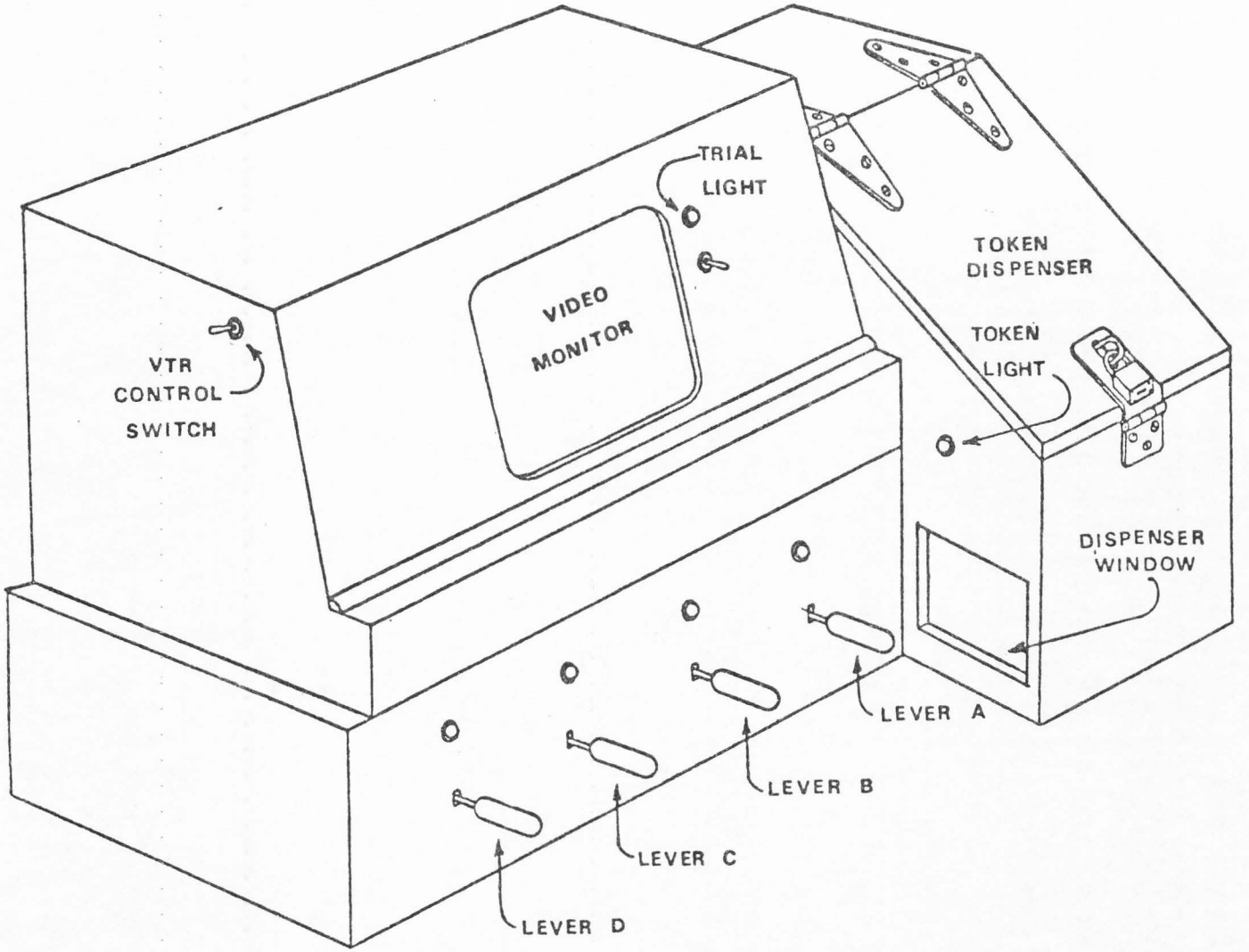

Figure 1. Apparatus.

On the right side of the monitor and levers was the token dispenser. The front slanted portion was hinged at the top to form a lid secured by a hasp and padlock. The dispenser extended forward 6-1/2 inches beyond the front of the other two consoles.

The interior housed a Gerbrands model G5405 dispenser. When operated, the dispenser delivered a token into a compartment in the left front of the console. The left outside wall of the console was open and covered with plexiglas to allow the subject to see the tokens he had acquired. The interior of the token area was lighted by a white 110-volt pilot lamp. Above the plexiglas opening was a white 28-volt pilot lamp that flashed when the dispenser operated to deliver a token.

The cover on the dispenser console made possible the dispensing of tokens on appropriate trials, yet did not permit the subject to play with them as young subjects often do during an experiment.

Stimulus Material

Each trial was ten seconds in length. The behavior to be imitated was modeled during the first 3-1/2 seconds of the interval. There were four behaviors modeled: (a) pushing a lever, (b) depressing a lever, (c) pulling a lever, or (d) lifting a lever. Each stimulus (modeled

response) consisted of a view of a single lever from the left and above the model. No other levers were visible. The model's right hand, on the videotape, grasped the lever and made the response. Only a Caucasian right hand was seen. The model's hand presented no other cues to age, sex, or social variables.

Following the modeled response the subject had the rest of the ten-second interval to respond. By the time the behavior's topography had been revealed to the subject, i.e., the hand on the tape made a downward, outward, inward, or upward movement, the computer was set to read the subject's input from the lever.

Presentation Order

All possible combinations of the four behaviors were determined. This yielded 24 blocks of four modeled responses. Each block was then randomly assigned a number from 1 to 24, using a table of random numbers. The 24 blocks were then placed in random sequence using the table of random numbers. This procedure yielded a sequence of 96 modeled behaviors with each behavior being performed at least once every seven trials, and no more than twice in succession.

The table of random numbers was again used to determine the starting point in the series of modeled responses.

From that point the 96 numbers were recorded in sequence, with the first eight responses repeated at the end of the sequence, yielding 64 random starting points in the tape where a session could begin.

The sequence of responses was recorded on Sony black and white videotape using a Sony AV-3400 Videocorder and a Sony AVC-3400 camera. After the stimulus sequence was recorded, the call tone from a Lloyd's 100 mw walkie talkie (model 8A22J, operating on CB Channel 9) was used to record tones on the videotape. The number of tones corresponded with the behavior being modeled: A-1, B-2, C-3, or D-4. The tones operated a voice-operated relay (Grason-Stadler model E7300A-1) which allowed the computer to determine which stimulus, defined by the number of tones, was presented to the subject.

EXPERIMENT 1

Method

Subjects

Subjects 11, 12, 13, 31, 32, and 33 from Table 1 participated in Experiment 1.

Experimenters

The experimenters described in the General Method section conducted this experiment.

Design

Subjects were presented the four modeled responses individually. Imitation of three of the behaviors was reinforced with tokens. Imitation of the fourth response was never reinforced. The nonreinforced response was randomly determined for each subject with the stipulation that the nonreinforced response differ for each of the four subjects.

Experimenter 1 was present during the initial imitation sessions. After stable responding occurred, three subjects received reinforcement contingent upon imitation of three modeled behaviors and no reinforcement for imitation of a fourth. Three other subjects received noncontingent reinforcement. These reinforcement conditions

were manipulated concurrently with conditions in which the experimenter was present or absent.

Procedure

Experimenter present. Each subject was brought into the experimental room and seated facing the apparatus. The experimenter, seated to the left of the subject, began the session by reading the following instructions:

> [Subject], there are four levers in front of you. This one moves up; this one pulls out; this one moves down; and this one pushes in.

The experimenter demonstrated each action as it was described.

> Now, watch the TV screen, and you will see how you can get some of the tokens you can use to buy some of the candy and toys you saw in the other room. Now, watch the TV screen, and I will show you what to do.

The VTR started, and the first behavior was modeled; then the VTR stopped. The experimenter said:

> See the green light?

The experimenter pointed to the monitor lamp and said:

> When this light is on, I can move a lever.

The lever was manipulated, the dispenser operated, a token was delivered, and the experimenter asked:

> See the tokens in the window?

The experimenter pointed to the token compartment in the dispenser console and said:

> The tokens will fall in there, and after we are through I will take them out and give them to you. Now, it's your turn. Watch the screen.

The VTR started. The next behavior was modeled, the VTR stopped, and the subject was asked:

> Now, see, the light is on. Can you get a token?

If the subject performed the behavior, the session went on. If the subject did not perform the behavior, the experimenter guided the subject to the lever. Upon a correct imitation, the dispenser operated and a token was delivered. The experimenter then said:

> Very good, [Subject]. You earned a token. Now let's see if you can get some more.

After the first four trials control of the VTR was switched back to Experimenter 2 in the control room. Experimenter 2's control of the VTR prevented the subjects from starting and stopping the stimulus presentations. It was accomplished by closing a switch in the control cabinet. The VTR started remotely and continuously operated through the rest of the session. Further conversation with the subject was discouraged except for instructions at the start of each trial to "Do that" while the experimenter pointed to the TV screen.

The first three behaviors, one imitated by the experimenter and two imitated by the subject, were always reinforced responses in the first session. A nonreinforced

response was not shown until the fourth trial or later. Each time the subject correctly imitated a response to be reinforced, a token dropped into the dispenser compartment and the dispenser light flashed. When the subject imitated a nonreinforced behavior, there was neither a token nor the dispenser light. At the start of each trial the experimenter watched the monitor, and at the time the model started to make a response the experimenter told the subject, "Do that," or "Now, do that" while pointing to the monitor. The session continued until the subject received 40 trials. Then the VTR was turned off by the computer; the session ended, and the subject and Experimenter 1 removed the earned tokens from the dispenser console. The subject was then escorted into the playroom and permitted to buy either toys, trinkets, soft drinks, candy, or save all or part of the tokens to buy larger toys. Exchanging tokens for the reinforcers was never carried out by the experimenter who was present during the sessions.

At the second session the subject was asked, "Do you remember what we did yesterday?" If the subject answered negatively, the experimenter said, "We earned some tokens by moving these levers. Let's see if we can earn some more."

The VTR started, and the session was the same as the day before, except the experimenter did not make the first

response. On the first trial a behavior was modeled whose imitation was reinforced. Thereafter, and on subsequent sessions, no attempt was made to control which trial material was presented first. That is, the first response may have been a nonreinforced response. The sessions could start any place in the sequence of the modeled stimuli on the videotape. The only requirement was that the subject be shown 40 trials.

Subsequent sessions ran for 40 trials regardless of the number of tokens earned. Each subject could earn a maximum of 31 tokens, and a minimum of zero. If each behavior presented on the monitor was correctly imitated, the subject earned from 29 to 31 tokens, depending on the place the subject started in the stimulus sequence.

These sessions continued until the subject had completed four consecutive sessions exhibiting generalized imitation or three consecutive sessions of differential responding. The criterion for generalized imitation was defined as correctly imitating nonreinforced responses at a rate of 10 percent or less deviation from the average percent of imitation on the other three response levers. The criterion for differential responding was imitating 20 percent less on the nonreinforced levers than the average percent on the other reinforced levers. The rate between 10 percent and 20 percent was defined as a lack of stimulus

control, and those rates were recorded for each subject. No subject responded within that range for an entire session.

Experimenter absent. After the subject reached the criterion specified in the Experimenter-Present phase, the experimenter was no longer present during the session. Before the Experimenter-Absent sessions, the subject was told by Experimenter 3:

> Today [Experimenter 1] will not be with you, but we would like you to work by yourself. I will be back in 6-1/2 minutes when you are through, and give you your tokens.

The VTR was started, and the experimenter left the room. Control of the VTR was immediately returned to the control room.

When the session ended, Experimenter 3 returned to the room, removed the tokens for the subject, and returned him to the playroom. Sessions continued until one of the criterion specified earlier was met.

Experimenter present--noncontingent reinforcement. When the subjects reached criterion during the Experimenter-Absent phase, the Experimenter-Present phase was reinstated for one subject. This time, however, reinforcement was not contingent on the subject's performance, and no instructions were given. In this condition Experimenter 3 gave the subject 30 tokens prior to the commencement of the experimental

sessions. The token dispenser did not operate during these sessions. This noncontingent reinforcement remained in effect for three sessions.

Two additional subjects were started with this condition as their first experimental condition.

Experimenter absent--noncontingent reinforcement. Subjects 13, 33, 31, and 32 were then exposed to noncontingent reinforcement conditions with no experimenter in the room. All six subjects had started the experiment with an experimenter present. One other, Subject 14, started the experiment, but due to many absences and an inability to perform one response (she couldn't push lever "A" in all the way), she was terminated, and her data are not reported here. She was 4 years old.

Results

A correction procedure was used in this study which allowed subjects to respond on a trial and be reinforced for an imitation after prior nonimitative responding. This correction procedure was employed for two reasons. First, the subjects could learn which responses on which lever would be reinforced, and increase their chances of learning which lever was not associated with reinforcement. Second, the correction procedure allowed the subject greater opportunity to respond differentially to the modeled response

because the subject could make an error on the first response and still receive a reinforcer for a subsequent correct imitation. The position taken in this study is that the correction procedure more closely resembled imitation in the natural environment where an imitation does not have to occur immediately after the modeled behavior in order to be reinforced. However, this condition raises the question of the data of Experiment 1 being artifactual if subjects were employing strategies not under the control of the modeled response. For example, the subject could respond on all levers until the correct one was found (see "Acquisition of the Imitative Response" section, p. 68). However, only the first response following the modeled response was used to measure imitation. Since a trial could end either without an imitation or with no response at all, there was no chance of artifactuality. In addition, observation of the subjects' performances indicated that subjects did not attempt search strategies beyond the first or second session. Therefore, the data were not artifacts of the equipment design.

Summary of the Results of Experiment 1

The major task of Experiment 1 was to demonstrate that generalized imitation could be produced using the video equipment, and thereby, provide greater control over social influences on generalized imitation.

For all subjects in Experiment 1, generalized imitation was produced quickly and maintained thereafter (Figure 2). The ordinate depicts the percent of imitations on the first response following the modeled behavior. A reduction in the percent of imitation could be a function of either an error (nonimitation) as the first response, or a failure to respond.

Which response lever was nonreinforced was not important in this study because nonreinforced imitation was maintained on each lever across subjects. Of particular interest, however, was the fact that subjects performed the nonreinforced imitation ($\overline{X}$ = 97.83%; R = 80-100) with better accuracy than they performed the reinforced imitation ($\overline{X}$ = 91.63%; R = 60-100). These data are from the first experimental condition and more closely approximated each other during the Experimenter-Absent condition ($S^{D}\overline{X}$ = 93.14%; R = 83-100; $S^{\Delta}\overline{X}$ = 93.33%; R - 70-100).

A second task of Experiment 1 was to determine whether or not the presence of the experimenter had significant control over generalized imitation. Subjects continued to perform nonreinforced imitation in the absence of the experimenter as long as some of the imitations were reinforced. However, when reinforcement was not contingent upon imitation and the experimenter was not present, all imitation decreased, including imitation that had previously been

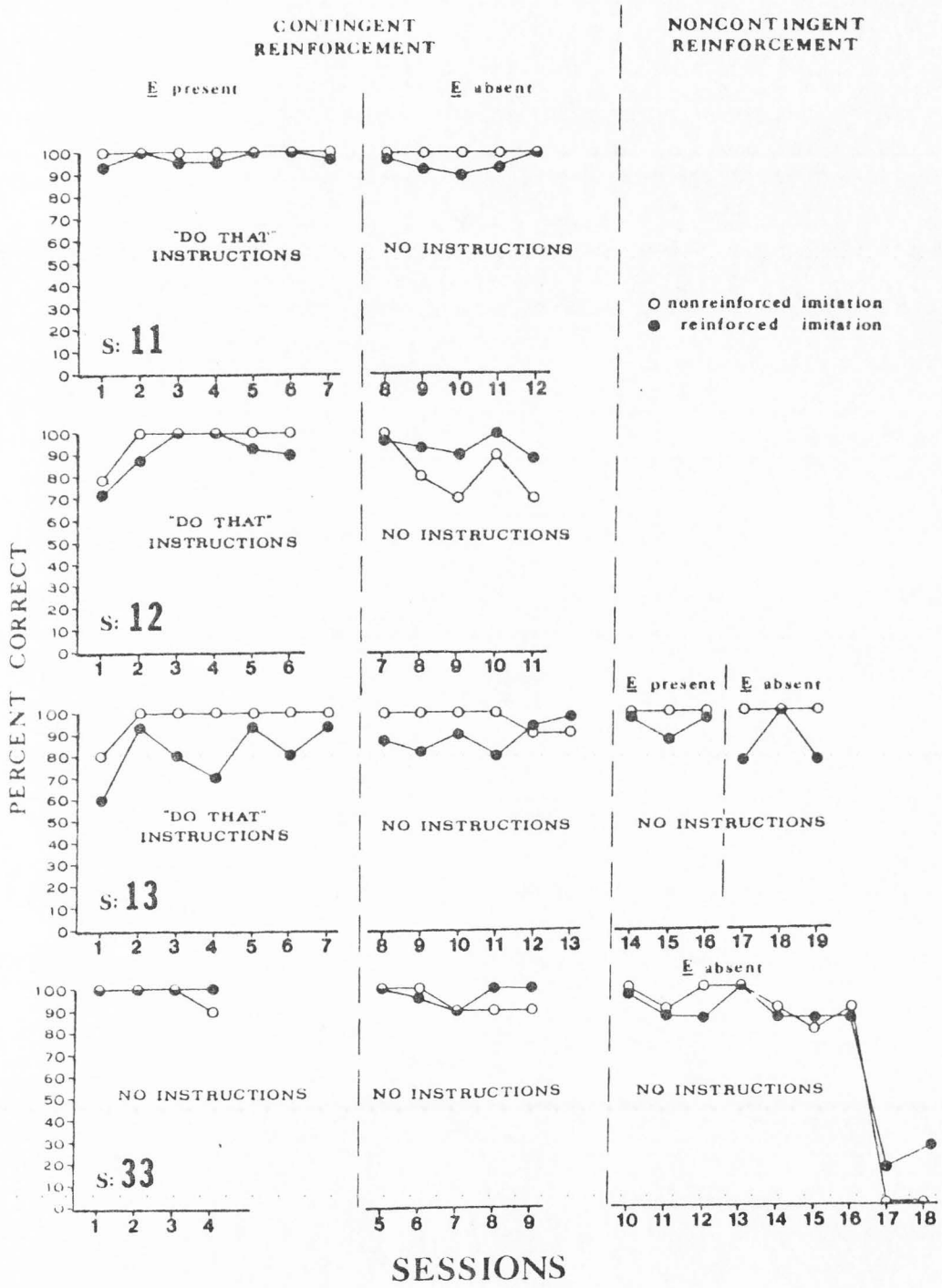

Figure 2. Performance of subjects under conditions of contingent and noncontingent reinforcement with Experimenter Present--Instructions and Experimenter Absent--No instructions.

reinforced, as shown by Subject 33 in Figure 2. The subjects in Figure 3 and Subject 33 in Figure 2 show the presence of the experimenter was sufficient to cause imitation to occur even when reinforcers were not provided contingent upon imitation.

A third task of Experiment 1 was to determine if instructions to "Do that" were necessary in order for generalized imitation to occur. The data of Subject 33 suggest instructions were not necessary. It is clear from all subjects that once instructions were used, it was no longer necessary to continue them in order to maintain generalized imitation, and three subjects produced nonreinforced imitations entirely without the use of "Do that" instructions.

Subjects 31, 32, and 33 who were not given contingent reinforcement and who did not have an experimenter present, decreased imitative responding. Therefore, the experimenter probably served as a discriminative stimulus for reinforcement.

Results of Individual Subjects

Acquisition of the Imitative Response

Observation of the subjects during the first sessions of the experiment showed a search strategy used by all subjects while learning the lever movements. This strategy consisted of attempts by the subjects to move each lever in the direction modeled. The observed response topography

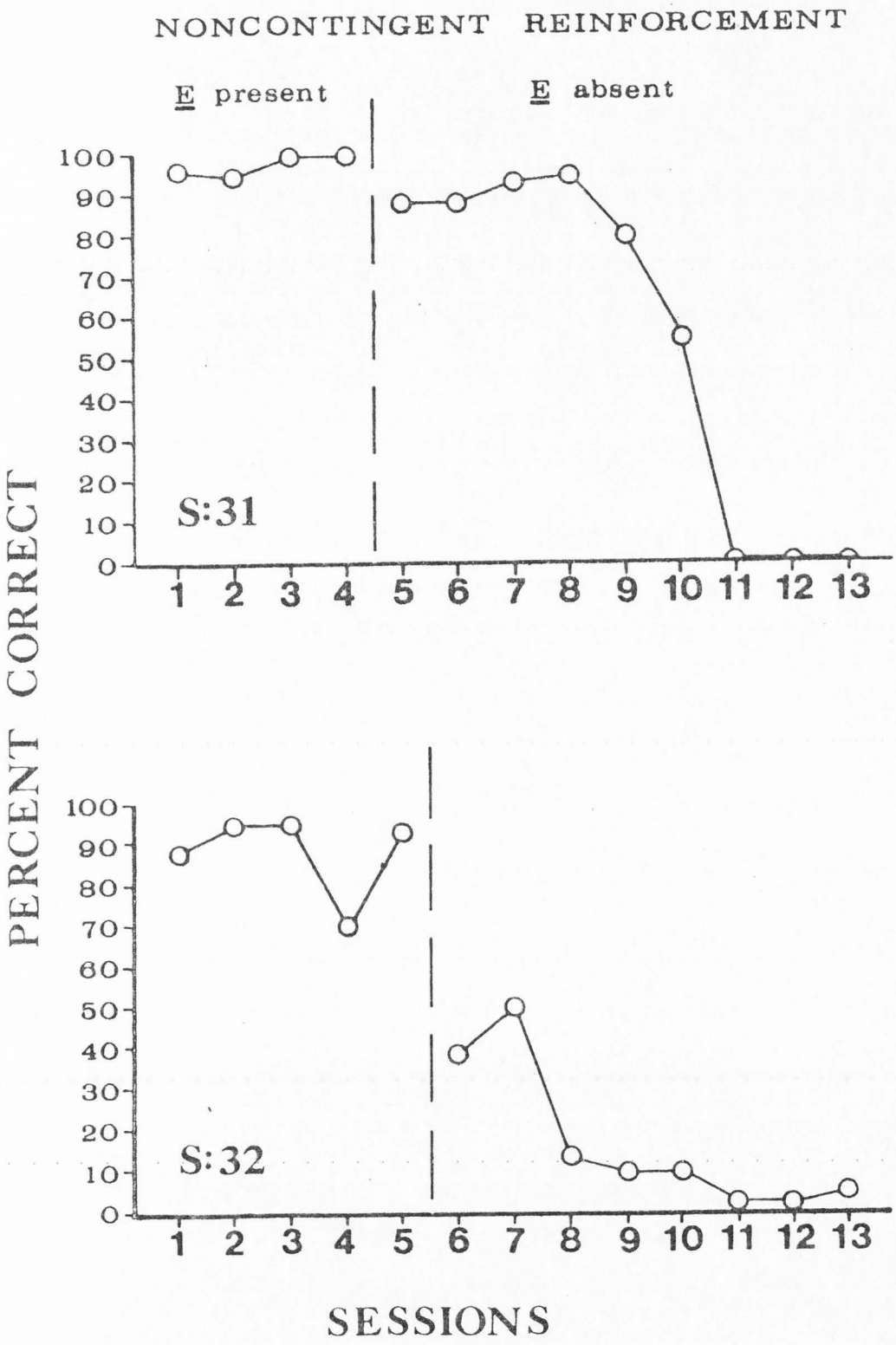

Figure 3. Performance of subjects under conditions of Experimenter Present and Absent with noncontingent reinforcement.

was attempted on each lever in turn until the one producing imitation was found. For example, when a depress movement was modeled, the subjects attempted to depress each lever until they found the one that depressed. At that point the subject stopped until a new behavior was modeled.

In Experiment 1 three subjects employed a left-to-right search pattern, one used a right-to-left pattern, and two others used a random approach. All but Subject 13 ceased observable search strategies during the first session and Subject 13 ceased the strategy early in the second session. However, Subject 13 developed a form of superstitious behavior that occurred on one to three trials per session. On these occasions when the lever "A" response was modeled, the subject would make the lever B (depress) response followed by the lever A (push) response.

Experimenter-Present--Instructions

As shown in Figure 2, each of the three subjects developed and maintained generalized imitation in the presence of the experimenters. There was little difference in performance between Subjects 11 and 12, with Subject 11 showing better than 90 percent accuracy on all levers. Subject 12 took longer to develop accuracy, but after two sessions produced accuracy above 90 percent on all sessions. Subject 13 had the most difficulty developing stable responding.

Analysis of the errors show this was primarily due to errors on levers A and B, discussed above. During the first seven sessions, the BA search strategy was used on 11 of the 70 trials presenting the lever A response to be imitated.

All three subjects in the Experimenter-Present--Instructions condition were 100 percent accurate in nonreinforced imitation after the first session, whereas the same subjects were less than 100 percent accurate in reinforced imitation.

To test the need for instructions in developing generalized imitation, Subject 33 began with the Experimenter-Present--No Instructions condition. This subject also produced and maintained generalized imitation, thereby questioning the need for instructions to "Do that" before each modeled response.

Experimenter-Absent--No Instructions

Subjects 11, 13, and 33 continued generalized imitation with accuracy comparable to that in the presence of the experimenter. Subject 12, however, showed a greater tendency to explore, and, during his free time, attempted to disassemble the equipment. Even with his nonattending, no session showed a difference in accuracy between reinforced and nonreinforced imitations greater than 20 percent. Subject 12 was the only subject who produced more errors on

the nonreinforced imitations than on the reinforced imitations during this condition.

Subject 11 and 12's experimental participation was terminated by their parents before reversals could be attempted. Subjects 13 and 33 continued, and Subjects 31 and 32 were added.

Experimenter-Present--
Noncontingent Reinforcement

Subject 13 was exposed to the Experimenter-Present condition for the second time. However, this time the subject was given the 30 tokens before the session commenced. With the experimenter present the subject's accuracy on the previously nonreinforced imitation returned to 100 percent, while accuracy on the previously reinforced imitation continued to fluctuate. The response protocol showed errors to be due to her aforementioned response strategy.

Subjects 31 and 32 were started under this condition. Both began imitating with accuracy at about 90 percent to 95 percent. On Session 4, Subject 32 attempted to converse with the experimenter, but was ignored. During this session there were nine failures to respond and three errors. The imitation levels of these two subjects were comparable to the Experimenter-Present conditions in the first four subjects.

Experimenter-Absent--
Noncontingent Reinforcement

Subject 13 was then exposed to the Experimenter-Absent condition with noncontingent reinforcement. The subject continued her former pattern, and in addition, made a few errors on lever C. No pattern was evident on trials in which lever C was correct. Without the BA response strategy, Subject 13 would have been accurate about 90 percent for all imitations.

Since there was no difference in accuracy of imitation when the experimenter was present and the experimenter absent, Subject 33 was switched directly from the Experimenter-Absent condition to the Experimenter-Absent--Noncontingent Reinforcement condition. Imitations on the four levers were equally accurate during the remaining sessions, even when overall responding decreased. During the final sessions of the noncontingent reinforcement condition, Subject 33 explored the experimental room.

Under this condition, Subject 31, shown in Figure 3, continued a high level of imitation for four sessions before decreasing responding. Subject 32 reduced imitation immediately to less than 40 percent imitation. The reduced imitation for both subjects was the result of failures to respond rather than errors in imitation. The pattern of responding near the end of the condition for both subjects was responding on clusters of three or four trials with no

responding during the rest of the sessions.

Both Subject 31 and 32's participation was terminated by their respective parents before reversals could be implemented.

Table 2 illustrates the percentage of non-imitations due to "failure" to respond, and to "error," i.e., an incorrect response as the first response. The percentage of total non-imitations changed little when the presence and absence of the experimenter was manipulated during differential reinforcement. However, absence of the experimenter under noncontingent reinforcement conditions produced a comparatively large increase in failures to respond.

The change from Experimenter-Present to Experimenter-Absent under contingent reinforcement produced an increase in errors in all subjects. Subject 13, on the other hand, decreased errors when the experimenter was again present under noncontingent reinforcement conditions, and increased errors when the experimenter was again absent. The other three subjects showed no significant increase in errors when the experimenter's presence and absence was manipulated under conditions of noncontingent reinforcement. Table 3 shows the data further divided into non-imitation on reinforced and nonreinforced levers.

Table 2

Error Analysis for

Experiment 1[a]

		Contingent Reinforcement		Noncontingent Reinforcement	
		E Present	E Absent	E Present	E Absent
S_{11}	Fail[b]	0%	1%		
	Error[c]	1.25%	3%		
S_{12}	Fail	2%	2%		
	Error	2%	8%		
S_{13}	Fail	1.25%	1.25%	0%	1.7%
	Error	5.8%	7.5%	5%	10.0%
S_{33}	Fail	9%			20.6%
	Error	0%	3.5%		3.3%

[a]Session 1 was considered an acquisition session, and is not included in the data of Table 2.

[b]Fail = Failure to respond.

[c]Error = Nonimitative first response.

Table 3

Error Analysis of Reinforced and Nonreinforced Nonimitations for Experiment 1[a]

		Contingent Reinforcement								Noncontingent Reinforcement							
		E Present				E Absent				E Present				E Absent			
		R[b]		N		R		N		PR		PN		PR		PN	
S_{11}	Fail	0	0%	0	0%	2	1.3%	0	0%								
	Error	3	1.7%	0	0%	6	4%	0	0%								
S_{12}	Fail	4	2.7%	0	0%	1	.7%	1	2%								
	Error	4	2.7%	0	0%	10	6.7%	6	12%								
S_{13}	Fail	3	1.7%	0	0%	1	.6%	2	3.3%	0	0%	0	0%	2	2.5%	0	0%
	Error	14	7.8%	0	0%	18	10%	0	0%	6	7.5%	0	0%	12	15%	0	0%
S_{33}	Fail	0	0%	0	0%	0	0%	0	0%					56	20.7%	18	20%
	Error	0	0%	1	3.3%	4	2.7%	3	6%					9	3.3%	3	3.3%

[a]Session 1 was considered an acquisition session and is not included in the data of Table 3.

[b]R = Reinforced; N = Nonreinforced; PR = Previously reinforced; PN = Previously nonreinforced.

Discussion

Restricting Social Influences

The primary purpose of Experiment 1 was to determine whether video equipment would produce generalized imitation comparable to that produced in studies using live models. There are a number of points at which comparison to the literature achieves this assessment.

The use of video equipment to present the behaviors to be imitated is very important in the investigation of non-reinforced imitations for it permits a larger degree of control over the social variables which have so frequently been cited as an extraneous influence on generalized imitation.

Throughout this experiment attempts were made to minimize extraneous social influences and allow for the isolation of the social variables to be manipulated. To evaluate social controls the subject should have the opportunity to respond solely under the influence of the immediate environment. One method of achieving this isolation was to have Experimenter 1 who was present in the experimental room remain as neutral to the subjects as possible by not interacting with subjects unless required by the experimental procedures, or to insure the safety of the subject. This neutrality was achieved by having an experimenter who had no other contact with the child outside the experimental room. In addition, reinforcers were machine delivered,

leaving a minimal association between the experimenter and reinforcement. The adult who picked up the children daily and brought them to the laboratory and the adult who was responsible for the subjects in the laboratory playroom were kept as independent of the experimental setting as possible, and were the only ones to interact with the children outside the experimental room. At no time were these adults told which experimental condition was in effect with which subject, although that was often easy to determine. The adults were coached in possible responses to questions asked by the subjects regarding the experiment which would have the least detrimental effect on the experimental design.

The video presentation was designed to minimize social cues as much as possible. The response to be imitated was modeled by a Caucasian right hand. Attempts by graduate students to identify other characteristics about the model such as age, sex, physical characteristics, etc. were unsuccessful, and the hand, therefore, assumed to be as neutral for the subjects as possible. The video tape allowed for uniform delivery of the modeled responses across subjects and sessions, and the interpersonal relations between Experimenter 1 and the subject were held as constant as possible.

Even with these attempts to control social influences there were many which continued to influence the subjects.

For example, the child had to be transported to the laboratory playroom. The children knew they were being brought there for a reason. Their parents approached them and asked if they would be willing to go to the laboratory. The children also learned, except for Subjects 31 and 32, that the experimental room was a place where they could earn tokens to purchase the candy and toys in the laboratory store. In addition, the experimental room was special because their activities in the playroom would be disrupted while they were taken to the experimental room.

Other social influences that could be controlled were those directly manipulated in association with the experimental process, such as an adult being in the room saying, "Do this," modeling a behavior, and giving the subject a token, bead, candy, trinket, or social reinforcement such as "very good." In other studies, the same experimenter solicited, transported, and cared for the subjects, in addition to acting as the model. Control of these social variables is especially important in studies using extinction where subjects frequently terminate themselves.

Experimenter Presence

Past studies producing generalized imitation have typically used an adult to model a behavior to be imitated while saying "Do this," and for some of the imitations the child was reinforced, while for other imitations the child was not

reinforced. In these studies, when generalized imitation occurred, determining why the child continued to imitate was difficult for a number of reasons. For example, the child may have continued to imitate (a) because the adult said, "Do this," (b) because the imitation was reinforced "sometimes" while the other times the adult "forgot," (c) because the child did not discriminate reinforced from nonreinforced imitation, or (d) because of some combination of the above.

It is clear from Figure 1 that generalized imitation was quickly produced using an experimenter present and instructions to "Do that." These results are consistent with the literature using similar experimental conditions. With generalized imitation established it was then possible to begin manipulation of the experimental variables.

Experimenter Absent--No Instructions

The second stage of the experiment was to remove the experimenter in an attempt to replicate the research of Peterson and Whitehurst (1971) who found a decrease in imitation when the experimenter modeled a behavior, then left the room before the child could imitate. The subjects in this study continued to respond in the absence of the experimenter, and the absence of "Do that" instructions. This finding is not consistent with the findings of Peterson and Whitehurst. There are two important differences between their study and the study reported herein. In the present

study differential reinforcement continued even though the experimenter was absent, while in Peterson and Whitehurst's study there were no reinforcers available for any imitation. Secondly, the experimenter in the current study did not model any of the behaviors to be imitated, while the experimenter in Peterson and Whitehurst's study modeled all the behaviors. Third, the experimenter in Peterson and Whitehurst's study entered and left the room after each trial while there were no such disruptions in this study.

The results of the Experimenter-Absent conditions suggest that the presence of the experimenter is not necessary in order for nonreinforced imitation to continue when differential reinforcement is available for imitation.

Instructions

Another variable manipulated concurrently with the presence and absence of the experimenter was the use of the trial instructions to "Do that." When the Experimenter-Absent condition was introduced, no "Do that" instructions were used. The performance levels of Subjects 11, 12, and 13 suggest "Do that" instructions are not essential to maintain generalized imitation.

Subjects 31, 32, and 33 more directly tested the need for "Do that" instructions, as such instructions were omitted from those subjects' initial Experimenter-Present conditions. The performance of all three subjects was not different

from that of the other subjects under Experimenter-Present with Instructions, and, thereby, demonstrated that it was not necessary to utilize instructions to develop generalized imitation, or maintain it.

Noncontingent Reinforcement

In order to test the influence of differential reinforcement on maintaining nonreinforced imitation, and to extend the study of Peterson and Whitehurst, Subjects 13 and 33 received noncontingent reinforcement after they failed to produce differential responding in the absence of the experimenter. Subject 14 had the Experimenter-Present condition, while Subject 33 continued with Experimenter-Absent condition. Subject 13 showed a slight increase in performing the nonreinforced imitations with the Experimenter-Present. When the Experimenter was again absent, the performance of previously reinforced imitations decreased an average of 10 percent, while performance of previously nonreinforced imitations showed no decrease at all. Subject 33, on the other hand, showed a gradual reduction in all imitation until responding was functionally extinguished following Session 16.

The specific influence of the presence or absence of the experimenter is not clear from the data of these two subjects. Clearly, the experimenter did not have to be present in order for generalized imitation to be maintained

when reinforcement was contingent upon imitation of some of the modeled behaviors. However, one interesting aspect of this study was that performance of nonreinforced imitation under differential reinforcement conditions was generally higher than performance of reinforced imitation (Table 3), both in the presence and absence of the experimenter. Possibly the experimenter's presence serves to maintain all imitation in the absence of reinforcement, i.e., the experimenter is a setting event for imitation. This explanation is supported by Subject 33, whose performance decreased in the experimenter's absence with noncontingent reinforcement. When positing this explanation one must also consider that control by reinforcers is stronger than control by social influence, at least under some conditions.

Subjects 31 and 32 were used to test control by social influence. Both received noncontingent reinforcement while the presence and absence of the experimenter was manipulated. If social control by the experimenter's presence is second to that of differential reinforcement, then both subjects should decrease their level of imitation in the Experimenter-Absent condition as compared to the other four subjects in this experiment who received differential reinforcement in the experimenter's absence. Figure 1 shows that imitation decreased for both subjects.

Error Analysis

The data presented in Table 2 suggest that decreased imitation in the absence of the experimenter during differential reinforcement was due to an increase in errors in imitation. This difference was quantitatively minor in the present experiment. However, under noncontingent reinforcement conditions, experimenter absence led to increased failure to respond. Subjects under this condition performed as if in a period of extinction. Further support for this hypothesis is given by the difference in performance between Subject 33 and Subjects 31 and 32. Subject 33, who had a longer reinforcement history, took longer to extinguish. The data of these three subjects suggest the past history of the subject must be considered in studies of generalized imitation and nonreinforced responding (Draper, 1976).

The question arises as to why subjects exposed to differential reinforcement responded more accurately on nonreinforced trials than on reinforced trials. That the phenomenon is coincidental is questionable. All subjects exhibited the behavior on different levers, and across all conditions. That the phenomenon was due to the social influences of the experimenter's presence is also questionable, since it occurred in most subjects in the absence of the experimenter.

Speculatively the phenomenon occurred because the nonreinforced response became "different" from the others. It was the only nonreinforced response. The subject might then have attended more carefully when that response was modeled. Subject 33's performance supports this, since the phenomenon disappeared under noncontingent reinforcement comditions.

EXPERIMENT 2

Method

While the data from Experiment 1 demonstrated that generalized imitation can be maintained without the presence of the experimenter, and can be developed and maintained without the use of "Do that" instructions, the design did not make clear whether the presence of the experimenter was necessary for generalized imitation to develop in the first place.

In addition, while trial instructions to "Do that" were not essential, general instructions prior to the initial sessions were still employed. Perhaps these instructions inferred the behavior desired by the experimenter. Experiment 2 was designed to answer these two questions.

In Experiment 1 three of the four imitations were reinforced. Perhaps additional trials and only two of the four responses reinforced would be more likely to facilitate discrimination and produce differential responding. This condition, plus additional cues, would more directly test Bandura's "Failure to Discriminate" hypothesis. For example, a cue differentiated by the plane of movement is available, e.g., levers A and C moved on a horizontal plane, in and out, push and pull. Levers B and D moved on a vertical plan, down and up, depress and lift. Second, a spatial

cue is available. A subject could be reinforced according to the location of the lever. For example, the two on the left reinforced, while the two on the right were not, and vice versa; or, the outside levers might be reinforced while the two in the middle were not.

Subjects

Subjects 21, 22, 23, and 24 from those described in Table 1 participated in Experiment 2. Participation time was increased to 10 minutes per session, while the ratio of reinforced trials to nonreinforced trials was reduced.

Experimenters

The same experimenters in Experiment 1 also conducted this experiment.

Procedure

In this experiment the subjects were presented the same modeled behaviors as in Experiment 1. However, in this experiment only two of the four behaviors were reinforced, and two were not reinforced. The subjects received 60 trials producing 10-minute sessions.

Experiment 2 also differed from the first experiment in that subjects were placed in the experimental room after exposure to the reinforcers in the playroom, and instructed:

> Your tokens will fall in here. I'll be back in 10 minutes and give them to you.

The experimenter pointed to the token dispenser window while giving the instructions. No other instructions or gestures were given. The experimenter left the room and the VTR was started from the control room. After 10 minutes the experimenter returned, opened the dispenser, and removed any tokens the subject had earned. Interaction with the subject was as neutral as possible. The subject was then returned to the playroom.

Sessions were continued daily until the subject had responded differentially for five sessions under the criteria in Experiment 1, or until the subject had produced generalized imitation for ten sessions under the criteria in Experiment 1.

Apparatus

The same equipment used in Experiment 1 was used in Experiment 2.

Stimulus Material

The same stimulus material used in Experiment 1 was used in Experiment 2.

Lever Assignment

Subjects were assigned two of the four levers as levers that produced reinforcement, while the other two produced no reinforcement. The assigned levers were paired according to two major cues. The first cue was differentiated by the

plane of movement, in and out versus up and down, and second, a spatial cue was given by the location of the levers.

Subjects were assigned levers according to these additional cues as follows: Subject 21 was reinforced on levers A and C (in and out), and not on B and D (up and down). Subject 22 was reinforced on levers A and D (outside levers), and not on B and C (inside levers). Subject 23 was reinforced on levers B and C (inside levers), and not on A and D (outside levers). Subject 24 was reinforced on levers B and D (down and up), and not on A and C (in and out levers).

Results

A correction procedure was employed in this study as in Experiment 1 which allowed subjects to respond on a trial and be reinforced for an imitation after a prior non-imitative response. The data reported in this study are the first response following the presentation of the modeled response.

Summary of the Results of Experiment 2

The major task of Experiment 2 was to demonstrate that generalized imitation could be produced without an experimenter present, and without instructions to "Do that" or instructions explaining how to obtain reinforcers. Generalized imitation was produced in all four subjects, though

not as quickly as in Experiment 1. The generalized imitation was stable over sessions (Figure 4). Throughout Experiment 2, reinforced and nonreinforced imitations occurred a similar percentage of the time.

Acquisition of the Imitative Response

Subjects in this experiment typically demonstrated more exploratory behavior by looking over the equipment, watching the video presentation, sitting down, and then using the search strategy of responding on each lever. Subject 21 was the exception. She sat down and began the search strategy immediately. Subject 23 failed to respond during the first session, but began on Session 2. All subjects functionally ceased the search strategy by the end of the third session.

Subjects in this experiment tended more toward multiple responses than had subjects in Experiment 1. There were also more failures to respond on the first sessions than with previous subjects. In Experiment 2 all subjects employed a random search pattern to identify the appropriate lever on a particular trial.

Results of Individual Subjects

Experimenter Absent--No Instructions

As evident in Figure 4, generalized imitation was

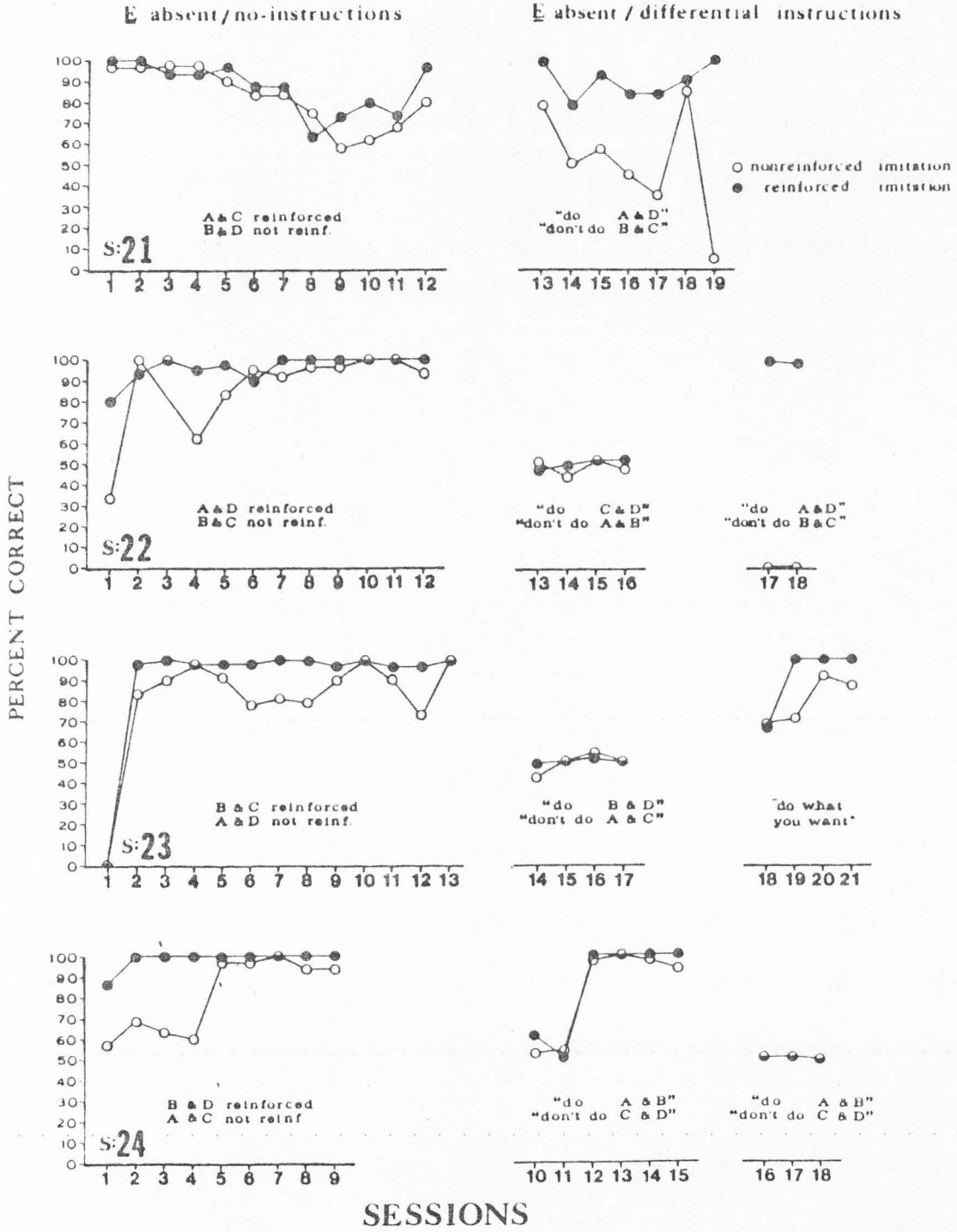

Figure 4. Performance of subjects under minimal social influence followed by differential instructions.

developed in all four subjects in this experiment. Responding during the first sessions was more erratic than responding had been during the Experimenter-Present--No Instructions condition in Experiment 1. There were more trials of nonimitative first responses than failures to respond.

Subject 23 sat through the first session without responding on any lever, nor did she explore the experimental room. Rather, she sat in the chair and occasionally wept throughout the session. Upon being removed from the experimental room at the end of the session, Subject 23 wanted to know if she could "Do it again." After 30 minutes the subject was returned to the experimental room. No instructions were given. The subject failed to respond on the first two trials, made errors on the next two, and produced 100% imitation on the next 56 trials.

Subject 24 began sessions with differential responding and continued through four sessions, just short of the five session criterion. During this period, nonimitation was primarily due to failure to respond (N = 31) as opposed to nonimitative first responses (N = 17). Interestingly, most of these failures to imitate occurred in the first half of the session (N = 37) rather than the second half (N = 11). However, this phenomenon was not observed with Experiment 1 subjects under the Experimenter-Present condition. During

this first condition in Experiment 2, Subjects 21, 22, 23, and 24 performed at 87 percent, 96 percent, 98 percent, and 98 percent imitation, respectively, during nonreinforced trials.

Error Analysis

Table 4 shows the nonimitative trials divided into Failure to Respond and Nonimitative First Responses (errors). The Total Response column shows Subject 21 produced more nonimitative first responses than failure to respond, but there was little difference between the two for the other three subjects, even though the same trend was present. Further division into reinforced and nonreinforced trials shows more nonimitation on nonreinforced trials.

Table 4

Error Analysis for

Experiment 2[a]

		Experimenter-Absent--No Instructions					
		Total Responses		Reinforced		Nonreinforced	
S_{21}	Failure	15	2.3%	9	2.7%	6	1.8%
	Error	89	13.5%	39	11.8%	50	15.2%
S_{22}	Failure	9	1.4%	3	.9%	6	1.8%
	Error	12	1.8%	5	1.5%	7	2.1%
S_{23}	Failure	21	3.2%	1	.3%	20	6.1%
	Error	23	3.5%	5	1.5%	18	5.5%
S_{24}	Failure	18	3.8	0	0%	18	7.5%
	Error	19	4.0%	0	0%	19	7.9%

[a]Session 1 was considered an acquisition session and is not included in the data of Table 4. For S_{23} the first two sessions are omitted as no response was made in Session 1.

Discussion

Subjects in Experiment 2 demonstrated that generalized imitation could be produced by the symbolic modeling procedures and apparatus used in this study with no instructions and without an experimenter in the room. While all subjects produced generalized imitation, responding in the absence of the experimenter and instructions was more erratic than that of subjects in Experiment 1. While one subject began differential responding under the conditions of Experiment 2, this performance was transitory, and disappeared after four sessions.

The assignment of reinforced and nonreinforced levers was designed to allow subjects the opportunity to discriminate reinforced from nonreinforced levers by (a) spatial cues, or (b) movements within planes. Of the two subjects assigned planes, In and Out vs. Down and Up, Subject 24 nearly produced differential responding during the initial sessions. Of the two subjects assigned spatial cues, Outside vs. Inside levers, neither produced differential responding.

In the present study it is possible that it was easier for subjects to imitate the nonreinforced responses than to attend closely enough to the modeled responses to differentially respond. In addition, not performing the nonreinforced imitation left the subject with nothing to

do during the interval between trials. Since the interval was only a few seconds long, the subjects did not have much time to explore the room and the apparatus. Observation of the subjects in Experiment 1 revealed that exploration was a high probability behavior when the experimenter was not present.

In Experiment 2 there were more trials of nonimitative first responses (N = 26) than failures to respond (N = 21), whereas in Experiment 1 there were fewer nonimitative first responses (N = 10) than failures to respond (N = 15). Subjects in Experiment 2 performed better on reinforced trials than on nonreinforced trials, the opposite of the findings during the first condition of Experiment 1.

Demand Characteristics

The demand characteristics of the present experiment may still have exerted control over the subject's responding. Orienting subjects to the location of dispensed tokens also oriented them toward the apparatus. However, this was done in order to reduce the fright possibly resulting from the noise produced by the token dispenser, and to let subjects know they could earn reinforcers in the room. The instructions also stated the experimenter would return in ten minutes to remove the subject. This instruction may have increased the probability of the subject responding by

simply knowing a time limit was operating.

This study did, however, offer the first opportunity to look at generalized imitation that developed without an experimenter present, and without instructions regarding the apparatus or procedure.

EXPERIMENT 3

Experiments 1 and 2 demonstrated that generalized imitation could be produced and maintained without the presence of an adult, without instructions to imitate, and without instructions in the procedures, equipment, or response required.

The next question was whether instructions have any effect on the subject's performance using the procedures and equipment in these experiments. Experiment 3 was designed to test this question by extending the studies of Steinman (1970a, 1970b) and Martin (1972) who found differential instructions produced differential responding under conditions where an experimenter was present. Their subjects' performance varied as a function of reinforcement conditions. Perhaps instructions would have no effect on a subject's performance if there was no experimenter present.

Method

Subjects

The four subjects who served in Experiment 2 also participated in Experiment 3 (see Table 1).

Experimenters

The same experimenters from Experiments 1 and 2 also conducted this experiment.

Procedure

In this experiment, the subjects were presented the same modeled behaviors as in Experiment 2, and the same reinforced imitations continued to be reinforced.

Incongruent instructions. Experiment 3 differed from Experiment 2 in that subjects from Experiment 2 were given instructions incongruent with the differential reinforcement consequences of their imitation. The following instructions were given to subjects after their participation in Experiment 2:

> Today we are going to change things. Today it's all right to do this and this [Experimenter demonstrates one reinforced and one nonreinforced response], but don't do this one and this one [Experimenter demonstrates one reinforced and one nonreinforced response]. Remember, you can do this and this, but don't do this and this [Experimenter demonstrates again]. Now, tell me which ones you can make [Subject demonstrates, if correct, continues; if wrong, Experimenter repeats]. Which ones are you not supposed to do? [Subject demonstrates.] I'll be back when you are through.

The experimenter then left the room and the session started.

These instructions were repeated at the start of the first three sessions.

Congruent instructions. Following the Incongruent Instruction condition above, Subject 22 was changed to instructions to "Do" the reinforced imitations and "Don't Do" nonreinforced imitations:

> Today we are going to change things again. Today it's all right to do this and this [Experimenter demonstrates both reinforced responses], but don't do this

> one and this one [Experimenter demonstrates both nonreinforced responses]. Remember, you can do this and this, but don't do this and this [Experimenter demonstrates again]. Now, tell me which ones you can make [Subject demonstrates]. Which ones are you not supposed to do [Subject demonstrates]. I'll be back when you are through.

This instruction was given only on the first session of the condition.

"Do anything" instructions. Following the Incongruent Instruction condition, Subject 23 was given the following instructions:

> Today it doesn't matter what you do. If you want to make this response, it's OK. If you don't want to make the response, that's OK, also. You can do whatever you want. Do you understand? [If subject indicates the instructions were not understood, the experimenter repeats them.]

The experimenter left the room and the session started.

Subject 24 failed to follow Incongruent Instructions presented in the first condition, and continued producing generalized imitation. The same Incongruent Instructions were repeated on Session 16.

Design

Subjects in this experiment were given instructions designed to produce imitation on half the trials, if followed. Subjects were instructed to imitate on one reinforced and one nonreinforced lever, and not to imitate on one reinforced and one nonreinforced lever. These incongruent instructions could then produce an interaction with

differential reinforcement. That interaction is displayed in Table 5. Table 5 shows 2 X 2 factorials containing hypothetical data consistent with complete instruction following and complete control by reinforcers. The rows show the subject performed all the imitations the subject was instructed to follow, whether reinforced or not. The subject did not imitate any of the responses (s)he was instructed to not imitate.

If the instructions exerted stronger control than reinforcers, the right side of the table would show 100 percent "Do" and 0 percent "Don't," while imitation of reinforced and nonreinforced responses would show 50 percent each. If, on the other hand, reinforcers exerted stronger control than instructions, the bottom of the table would show reinforced imitations 100 percent and nonreinforced imitations 0 percent. The right side of the table would show 50 percent "Do" and 50 percent "Don't" imitations. This procedure allows quantification of the interaction, and the opportunity to determine whether instructions or reinforcers are stronger for any particular subject. In reading the table the reader should keep in mind that the data shown are the imitative responses. If the subject failed to imitate then the total of the row and column will not reach 100 percent. For example, the hypothetical subject in Table 5 failed to imitate on 20 percent of the non-

reinforced trials when instructed to do so; the data would resemble the lower third of Table 5. These data show the subject was influenced mostly by instructions, but the subject was also influenced by whether or not reinforcement was contingent upon the imitation. When nonreinforced behaviors were modeled the subject did not imitate the behavior even when instructed to do so.

Table 5

Hypothetical Data to Demonstrate Explanation of Function of 2 X 2 Factorial in the Analysis of Responses During Experiment 3

	Reinforced	Nonreinforced	
Complete Instruction Control[a]			
Do	50%	50%	= 100%
Don't	0%	0%	= 0%
	50%	50%	
Complete Control by Reinforcers (Incongruent Responding)[b]			
Do	50%	0%	= 50%
Don't	50%	0%	= 50%
	100%	0%	
Incomplete Instruction Control[c]			
Do	50%	40%	= 90%
Don't	0%	0%	= 90%
	50%	40%	

[a] Instructions have maximum control over imitation.

[b] Reinforcers have maximum control over imitation.

[c] Instructions have strongest influence but reinforcement also has some control.

Results

The correction procedure employed in Experiments 1 and 2 was still in effect throughout Experiment 3. The data reported in this experiment are the first responses following the presentations of the modeled response.

Summary of the Results of Experiment 3

Experiment 3 was designed to test the effect of differential instructions on responding in the absence of an experimenter. The data presented in Figure 4 show that changing to incongruent "Do" and "Don't" instructions produced varying results with Subjects 22 and 23 following instructions, and Subjects 21 and 24 not following instructions. At this point Subject 21 produced differential responding.

One subject was then switched to "Do what you want" instructions, while another was instructed to "Do the ones you get a token for doing." The first resumed generalized imitation, while the second produced differential responding. A third subject was given incongruent instructions a second time, and this time followed them.

Incongruent Instructions

Figure 4 indicates that incongruent instructions to imitate one reinforced and one nonreinforced response, and

"Don't" imitate one reinforced and one nonreinforced response of the four responses available, met with varying results. After the incongruent instructions, Subject 21 produced differential responding based on reinforcement rather than instructions. The subject was able to indicate which levers were all right to use, and which were not after instructions at the start of each of the first three sessions.

As explained in the Design section of Experiment 3, subjects who followed instructions precisely should have imitated on 50 percent of the reinforced trials and 50 percent of the nonreinforced trials. Table 6 presents the analysis of each subject's responding during the Incongruent Instructions section. The data for Subject 21 suggest reinforcement exerted more stimulus control on her responding than instructions. In fact, the subject imitated more on trials where instructed not to imitate, but where reinforcers were available, than on trials where instructions and reinforcers were compatible.

Subjects 22 and 23 followed the incongruent instructions precisely, and performed at 50 percent accuracy on previously reinforced and nonreinforced pairs of levers. Subject 22 performed at 50 percent on reinforced and 48 percent on nonreinforced levers, 97 percent on levers where instructed to imitate, and less than 1 percent on levers

Table 6

Reinforcement X Instructions

for Experiment 3

		Incongruent Instructions			Add'l Instructions		
		Reinf.	Nonreinf.		Reinf.	Nonreinf.	
S_{21}	Do	40.7	33.2 =	73.9			
	Don't	47.7	17.6 =	65.3			
		88.4	50.8 =	139.2			
					[Congruent Instructions] +Yes	+No	
S_{22}	Do	50.0	46.7 =	96.7	50.0	0	= 50.0
	Don't	0	.9 =	.9	23.5	0	= 23.5
		50.0	47.6 =	97.7	73.5	0	= 73.5
					[Do What You Want Instructions]		
S_{23}	Do	50.0	47.5 =	97.5	48.9	40.0	= 88.9
	Don't	0	1.7 =	1.7	50.0	44.6	= 94.6
		50.0	49.2 =	99.2	98.9	84.6	= 91.8
					[Incongruent Instructions]		
S_{24}	Do	49.5	48.9 =	98.4	50.0	48.9	= 98.9
	Don't	35.2	34.3 =	69.5	0	0	= 0
		84.7	83.2 =	167.7	50.0	48.9	= 98.9

where instructed not to imitate. Subject 23 imitated on 50 percent of the reinforced trials and 49 percent on the nonreinforced trials. Imitation was also performed on 98 percent of the trials where instructions said imitation was all right, and less than 2 percent imitation when instructed not to imitate. Table 6 shows both Subjects 22 and 23 conformed to the instructions.

Subject 24 began by following instructions for two sessions, but then imitated on all trials. As explained in the hypothetical data in Table 5, this subject had a slight tendency to follow instructions. The difference in imitation was a function of Sessions 10 and 11, because there was no difference in imitation for the rest of the condition. On Session 16, Subject 24 again received the same incongruent instructions. The subject again came under control of the instructions, and remained there for the last three sessions.

Congruent Instructions

Following the Incongruent Instruction session, Subject 22 was given instructions to imitate reinforced trials and "Don't" imitate nonreinforced trials. The result was differential responding according to instructions with imitation on reinforced trials at 99 percent, and imitation on nonreinforced trials at 0 percent. Subject 22 became ill,

and was terminated before the "Do whatever you wnat" instructions could be applied.

"Do Whatever You Want" Instructions

Subject 23 was given instructions to "Do whatever you want" at the start of Session 18. While the subject seemed to understand the instructions at the start of the session, she told the experimenter after the session that she was confused. The instructions were repeated at the start of the next session. The subject reported after the session that she now understood, and verbalized the instructions. The hypothetical data from Table 5 indicate Subject 24 was more under the control of reinforcers than instructions and, in fact, responded more on levers where she had previously been instructed not to imitate. During this condition the subject imitated on 99 percent of the reinforced trials and 85 percent of the nonreinforced trials.

The previous error analysis is not reported here for three subjects as almost all nonimitation during this experiment was due to failure to respond, as the subjects had been instructed. The notable exception was Subject 21 who imitated on 51 percent of the nonreinforced trials and 88 percent of the reinforced trials. The error analysis indicates failure to respond was responsible for 73 percent of that subjects' nonimitations, the majority of which, 90 percent, occurred on nonreinforced trials.

Discussion

Restricting Social Influences

The same procedures used in Experiments 1 and 2 were also used in this experiment to reduce extraneous social influences. There were no experimenters in the room with the subjects during these sessions. Experimenter 1 was in the room to deliver instructions prior to the start of each of the first three sessions of the Incongruent Instruction condition and to present instructions at the start of the first session of each of the other conditions.

Incongruent Instructions

This condition was implemented in an attempt to determine the influence of instructions on a subject's imitative behavior when no adult was present to influence responding. The data, as presented in Figure 4 and in Table 6, suggest the interaction between instructions and reinforcement is complex and, at least partly, influenced by other factors.

If instructions exerted total control over imitation, then subjects should have performed at the 50 percent level on both reinforced and nonreinforced trials (Table 4, Figure 4). This control was evident in the performance of Subjects 22 and 23. However, Subject 24 continued generalized imitation and Subject 21 began producing differ-

ential responding. The control of instructions for these two subjects was, therefore, different from Subjects 22 and 23. Comparison of responding during Experiments 2 and 3 for Subjects 21 and 24 show both had periods during which imitation was comparatively low, but neither were remarkably different from Subjects 22 and 23. It is possible that Subject 24 had failed to understand the instructions and, therefore, did not produce differential responding.

Table 6 shows the analysis of imitation of reinforced, nonreinforced, permitted, and nonpermitted responses. The data for Subject 21 shows the greatest influence over imitation to be exerted by reinforcers. However, the subject performed more of those responses she was instructed not to perform than those responses that were permissible when reinforcement became available. Further, the subject performed more permissible responses than not permissible responses when no reinforcement was available. Clearly, Subject 21 did not follow instructions to the letter.

Subject 24 was controlled slightly more by instructions than reinforcers, but that influence was transitory and was lost after two sessions. Clearly, Subject 24 failed to follow instructions.

The question most obvious in the cases of Subjects 21 and 24 is whether or not they understood the instructions. Both subjects were able to verbalize and demonstrate both

the permissible and nonpermissible responses before each of the first three sessions after instructions had been presented.

Subjects 22 and 23 both conformed to the incongruent instructions. Both failed to imitate all nonpermissible reinforced responses. However, both imitated a few nonpermissible nonreinforced responses. For both subjects the instructions produced more control over imitation than did reinforcers.

Explanations for the difference in performance between the two pairs of subjects might be found in their past histories.

Congruent Instructions

Subject 22 was switched from Incongruent Instructions to Congruent Instructions to expose the subject to differential responding. The instructions were presented prior to the first session under this condition. The result was an immediate increase to 99 percent imitation on reinforced trials, and no imitation on nonreinforced trials. Unfortunately, the subject was terminated after two sessions under these conditions.

"Do What You Want" Instructions

Subject 23 demonstrated the durability of generalized imitation. Even after a form of differential responding

was imposed by instructions, during which the subject imitated only 1.7 percent of the time on one pair of levers, the subject returned to performing nonreinforced imitations when given a choice. The results of Experiment 3 show that instructions can exert some control over imitation, even in the absence of an adult.

GENERAL DISCUSSION

Reinforcement may be necessary for the development and maintenance of generalized imitation. However, other sources of control on nonreinforced imitation are also evident. Many studies have expressed the probability of two major sources of control (e.g., Steinman, 1970a, 1970b; Martin, 1972). These studies contend there is control by (a) a differential reinforcement system, and (b) control exerted by social variables, such as the presence of, and therefore, surveillance by an adult, the instructions functioning as setting events, and the subjects' own past history of following instructions of adults and the consequences of so doing. Any time an adult models a response, these social variables can influence the subject's imitation. The perceived attitude of the adult by the child, the child's past history of interacting with adults, and the child's stereotyping of people, all potentially influence responding. When the adult then gives instructions to the child, those social controls are confounded with the instructions which are themselves social. The perceived attitude of the experimenter, suggested by appearance, interacts with the perceived attitude of the experimenter suggested by voice characteristics. Each interaction and each bit of feedback may influence the child's behavior. Optimal conditions for

the investigation would, therefore, be those in which no experimenter is present, and the subject's only interaction is with an immediate environment void of as many extraneous social influences as possible. The environmental influence should then be as consistent as possible.

Clearly, in order to understand generalized imitation and nonreinforced responding, it is necessary that the isolation and control of these variables be accomplished. Until this isolation and control is possible, any theories to account for generalized imitation and nonreinforced responding can only be temporary and subject to revision until the controls are possible.

The durability of generalized imitation was obvious in the experiments of this study. Experiment 1 demonstrated that generalized imitation could be developed using closed circuit television to symbolically model the response to be imitated. Symbolic modeling is not new to generalized imitation. Baer and Sherman (1964) first reported the phenomenon of nonreinforced imitation of responses modeled by a puppet, and began the studies investigating generalized imitation. Other studies have also used symbolic modeling (Bandura, Ross, & Ross, 1963; Parton, 1970; Bandura & Barab, 1973). The use of puppets and films has been successful in producing imitation in children, and puppets were used specifically to develop generalized imitation. This study

extends those procedures by including electro-mechanical equipment to define and record imitative responses.

The use of the apparatus and procedures in this study permitted a greater control over social variables said to exert control over imitation. This study was designed to demonstrate that such control is possible by producing generalized imitation, and then extend other studies by isolating and manipulating some of those variables.

Experimenter Present

Many studies have attempted to demonstrate the control over imitation exerted by the presence of the experimenter in the experimental room. Since most studies have required an adult to be present in order to model the behaviors to be imitated, separating the model's response and the model's social characteristics as influences on subjects' imitation has been difficult. Attempts to do this by having the experimenter model a behavior then leave the room before imitation could occur (Peterson, Merwin, Moyer, & Whitehurst, 1971; Peterson & Whitehurst, 1971; Smeets & Striefel, 1973) are inconclusive because the experimenter in these studies was still present to model a behavior, and may also have been disruptive by entering and leaving the room.

Experiment 1 of this study produced generalized imitation in a setting similar to the typical setting of other studies investigating generalized imitation. There was an experimenter present who gave instructions regarding how to receive tokens and "Do that" instructions before each trial. The apparatus, however, presented the modeled responses, recorded responding, and delivered reinforcers. The result of the study was the production of generalized imitation which was stable over trials. This study was a successful replication of the results of past studies.

Also, the present results are comparable to those of Peterson et al. (1971) and Peterson and Whitehurst (1971). They produced nonreinforced imitation in the presence of an experimenter while using noncontingent reinforcement. In their studies, responding decreased when the experimenter was absent.

Experimenter Absent

Symbolic modeling and reinforcement maintained generalized imitation in the absence of the experimenter and "Do that" instructions. Generalized imitation continued with only differential reinforcement in effect. This finding extends the studies of Peterson and his associates and the study of Smeets and Striefel (1973). The subjects

exposed to noncontingent reinforcement in the absence of the experimenter decreased all imitation, thereby replicating the findings of Peterson and his associates.

The results of these conditions challenge the explanation of social control by the presence of the experimenter as a necessary condition for generalized imitation. Clearly, the important factor here is the use of reinforcement for at least some of the imitative responses.

Experiment 2 further extended past findings by developing generalized imitation in experimentally naive subjects without an experimenter present and without instructions, the first time this has been done.

Instructions

The question of the need for and influence of instructions was investigated. Experiments 1 and 2 demonstrated that instructions were not necessary in order to develop and maintain generalized imitation. What control, then, might they have over imitation? This question was investigated in Experiment 3 by providing instructions which were incongruent with differential reinforcement. Subjects were instructed to imitate some behaviors which were reinforced and some which were not. This study was an extension of Martin (1972) who provided incongruent instructions before trials using three retarded children.

The long range effects of social influences were demonstrated by the subjects given incongruent instructions which resulted in their being able to acquire only half the available reinforcers, if they conformed to the instructions. Most of the subjects did conform, even though the instructions had to be presented again for one subject. These instructions produced significant control over the subject's responding even when the experimenter was not present during responding.

What, then, is the adult's role in studies of generalized imitation? The data from these experiments suggest the presence of the adult stabilizes responding, particularly the performance of nonreinforced imitations. The subjects in Experiment 1 produced more stable responding than did subjects in Experiment 2. In addition, the subjects in Experiment 1 showed less stable responding during the Experimenter-Absent condition. Further, subjects imitated in the presence of the experimenter even when noncontingent reinforcement conditions were in effect. Removal of the experimenter during Noncontingent Reinforcement resulted in a significant reduction in imitation.

In Experiment 1, when the experimenter was no longer present in the room, the subjects increased multiple responses on the same lever, began exploring the experimental room, and some attempted to take the apparatus apart.

Observations of the subjects further suggest that the Experiment 1 subjects were more aggressive and demonstrated more exploratory behavior after the experimenter was removed than did subjects in Experiment 2 who had not experienced the presence of the experimenter.

The possibility exists, therefore, that subjects in Experiment 2 exhibited more freedom to imitate when they chose than subjects in Experiment 1. There was noticeably more "other" behavior when the experimenter was removed in Experiment 1, although imitative responding remained basically the same.

A recent study found an interaction between instructions and adult presence. Winston and Redd (1976) presented subjects a two-choice color discrimination task where pushing one colored light always paid one token, while pushing another colored light paid either one, two, or four tokens. These three groups of subjects were further divided by either the presence or absence of an adult who gave instructions to choose a specific color which was always associated with the one token. Winston and Redd found instructions were effective when payoffs were equal. However, the adult's absence under unequal payoff conditions resulted in a loss of instructional control. If the one-to-four unequal payoff condition was in effect, there was a decrease in instructional control over trials, even with the adult

present. Winston and Redd did not include a condition in which one of the responses was never reinforced, and the study did not involve imitation. However, the study demonstrates that instructions do exert some influence on responding even in the absence of an adult.

Demand Characteristics and "Do This" Instructions

In order to systematically investigate generalized imitation, it is imperative that the influence of instructions be controlled. Unless this is done, determination of which responses are being reinforced is functionally impossible. For example, in typical studies of generalized imitation, a subject is brought into an experimental room and seated facing the experimenter who models the behavior to be imitated.

The demand characteristic of the experimental situation above may not be sufficient to produce imitation without some form of complex social interaction. The expressionless neutral experimenter could face the subject and pull his ear every 20 seconds for days until his ear became sore or the subject walked home, without imitation occurring. To overcome this problem, experimenters use trial instructions to "Do this" prior to each modeled response. Immediately a problem arises. Namely, if the "Do this" instruction is presented before each response to be imitated and imitation

is sometimes followed by reinforcement, then the subject may simply be receiving intermittent reinforcement for following "Do this" instructions (Martin, 1972). If, on the other hand, a subject is given "Do this" instructions only before modeling a response whose imitation will be reinforced, and not given "Do this" instructions before modeling a response whose imitation will never be reinforced, then whether any differential responding is imitation of differentially reinforced modeled responses can never be clear. If differential responding isn't forthcoming, then performance may be a function of intermittent reinforcement of instruction following.

The obscuring of the controlling stimuli within the situations described above negates clear investigation of generalized imitation. The present study avoided that problem by using equipment and procedures with minimized demand characteristics to produce generalized imitation without the use of instructions and the presence of an adult. The result was an opportunity to investigate nonreinforced imitation under condtions where the demand of the instruction was controlled and probability of reinforcing instruction following behavior rather than imitation was minimized.

The critical question of whether or not the inherent reinforcing properties of the equipment used in this study

were sufficient to maintain imitation without external reinforcement was tested. The demand characteristics need only be strong enough to get imitation started. After that, it must be demonstrated that simply operating the equipment alone is not sufficient to maintain imitation. Subjects 31, 32, and 33 in Experiment 1 tested this question. When noncontingent reinforcement was introduced and the experimenter was not present, the imitations of all three subjects extinguished. This suggests that the reinforcing properties of the equipment and procedures were not sufficient to maintain imitation. Had these results not occurred, the use of the present equipment for investigating generalized imitation would be seriously challenged.

The answer as to why nonreinforced imitation is so easily produced and so resistant to extinction during differential reinforcement is still evasive. Many theories have been posited to account for the behavior, and many potential sources of control have been listed, but much additional research is necessary.

The data from experiments reported here cannot refute the argument that imitation is itself a response class, and nonreinforced imitation intermingled with reinforced imitation presents reinforcement on an intermittent schedule (Gewirtz, 1968). The function of instructions, then, may

be to divide the response class. The divisions may be as complex as the instructions can make them, limited only by the subject's ability to understand the instructions and make the discriminations based on them. The function of the presence of the adult within this paradigm is to increase the probability that the instructions, real or implied, will be met.

It is possible that instruction following is a separate response class, and the interaction between instruction following and the response class of imitation serves to further confound the investigation of imitation. The instructions followed may be real or implied; they may come from the external environment; they may be generated by the subject as hypotheses to test, and, thereby, guide behavior. The instructions implied would then be a function of the subject's past history, and would be used in any case where external instructions were not available.

The above explanation of generalized imitation would then suggest that the performance of nonreinforced imitative behaviors would continue until an event is present which would divide the response class. Apparently, differential reinforcement as used in this study was not sufficient. Dividing the response class might be accomplished by making the nonreinforced response too costly in terms of time and energy, or by differentially reinforcing other

behaviors. If there is an alternative response to the non-reinforced response that requires less effort by subject, producing the alternate behavior is most likely (Draper, 1976; Steinman, 1970a, 1970b).

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Wilcox, B., Meddock, T. D., & Steinman, W. M. "Generalized imitation" on a nonimitative task: Effects of modeling and task history. Journal of Experimental Child Psychology, 1973, 15, 381-393.

Winston, A. S., & Redd, W. H. Instructional control as a function of adult presence and competing reinforcement contingencies. Child Development, 1976, 47, 264-268.

VITA

Name: EMMETT G. ANDERSON
Date of Birth: February 3, 1939
Citizenship: U.S.A.
Sex: Male
Marital Status: Married, one child

Educational History

1967 B. A. Psychology, California State University, Chico

1970 M. A. Psychology, California State University, Chico
Thesis Title: Effects of post-IF informational components and categories on retention and free recall.

1979 Ph.D. Psychology, Utah State University, Logan
Dissertation Title: The use of symbolic modeling on generalized imitation in children.
J. Grayson Osborne, Ph.D.--Committee Chairman

Teaching Experience

1965-1968	Student Assistant	CSU, Chico
1968-1969	Instructor Research & Statistics	CSU, Chico
1969-1970	Instructor Research & Statistics	CSU, Chico
	Instructor Introductory Psychology	Butte College
1971	Teaching Assistant Operant Lab.	USU, Logan
1972-1973	Teaching Assistant Exp. Child Development Behavior Modification	USU, Logan
	Applied Classes at Utah School for Deaf Behavior Modification Classroom Management	USD, Salt Lake City
1973-1974	Teaching Assistant Exp. Child Develop. Child Development	USU, Logan

1975-1976 Lecturer CSU, Chico
Introductory Psychology
Psychology of Marriage
Exceptional Child

Additional teaching under supervision in Advance Behavior Modification at USU, Logan

Applied Experience

1971-1973 Behavior Consultant to Behavior Management Company, Logan, Utah. Psycholgist under contract to Utah School for the Deaf, Ogden and Salt Lake City, Utah.

Job: To develop, carry out, and/or supervise behavior modification project with the students, faculty, administration, and staff. About 25 of these projects were conducted personally and an additional 25 to 30 were supervised. Special group discussions were conducted for parents with handicapped and special problem children and consultation was provided to administative staff with special problems involving relations with faculty, students, parents, and staff.

1974-1976 Developed and Directed Parental Stress Program.

The Parental Stress Program was developed as a treatment program for abusing/neglecting parents and abused/neglected children. The program provides individual, group, couples, and family counseling; behavior modification programs, home visitation, and a child care/treatment program.

1974-1976 Counselor, Family Service Association, Chico, Ca.

Provided services to children, parents, families, individuals, and groups, specializing in family violence. Other duties included instruction to other agencies, public speaking engagements, and television and radio interviews.

1974-1976 Director of Training, Coordinator of Services, Rape Crisis Intervention Group, Chico, Ca.

Conducted services for spouses of victims.

1975 Co-organizer and current member of the Butte County Child Abuse Steering Committee.

Committee developed jointly with Susan Ybanez, Division Chief, Child Protective Services, Butte Co., Ca. Objectives: (a) to assist in the organization of public and private agencies to deal with the problem of child abuse/neglect, (b) to assist with training for public agencies who deal with abused children, and (c) to increase community awareness of the problems of child abuse/neglect.

May 1976- June 1978 Executive Director, Family Service Association, Chico, Ca.

Responsible for the operation of a Family Service Agency providing psychological services to Butte and Glenn counties of California. Staff included 26 full- and part-time professionals plus administrative and clerical. Programs included the Parental Stress Program under contract to California Council on Criminal Justice, the Crisis Service under contract to Butte Co. Mental Health Services, and the Core Counseling Program which provides a variety of therapeutic services.

July 1978- Current Director, Parental Stress Program.

1978-1979 Child Abuse Training Task Force.

Provide training for law enforcement agencies, school administrators, school teachers, and various social service organizations in the detection, intervention, and prevention of child abuse/neglect.

1979 Committee to Celebrate the Year of the Child-1979.

Task: provide monthly programs on children and their problems for the general public throughout 1979.

Research Experience

1966-1969	Research Assistant (To P. Sturges)	CSU, Chico
1971-1973	Research Assistant (To J. G. Osborne and R. B. Powers)	USU, Logan

Papers and Publications

Retention in verbal learning: Effect of informational components during post-IF interval. Proceedings, 76 Annual Convention, American Psychological Association, 1968. (With P. Sturges and P. Donaldson)

Effect of informational components during post-IF interval on a transfer task. Paper presented to Western Psychological Association Convention, Vancouver, B. C., 1969. (With P. Sturges and P. Donaldson)

Effects of post-IF informational components and categories on retention and free recall. Paper presented to Western Psychological Association Convention, Los Angeles, 1970. (With P. Sturges)

Litter control in the natural environment. Paper presented to Rocky Mountain Psychological Association Convention, Albuquerque, 1972. (With R. Powers and J. G. Osborne)

Positive reinforcement of litter removal in the natural environment. Journal of Applied Behavior Analysis, 1973, 6, 579-586. (With R. Powers and J. G. Osborne)

A litter lottery. Psychology Today, August 1974. (With J. G. Osborne and R. Powers)

National Radio Program: Up to the Minute, Hostess: Bess Meyerson, Topic--Effectiveness of Positive Reinforcement for controlling littering in the U.S. Sept. 23, 1976, Program 106.

Supplementary Psychological Services for School Districts. Paper presented to the Chico Conference on Human Relations, Chico, Calif., May 1975.

Rape: Is it more than assault? (With Larry Stuelpnagel) Community Service Program--Special, KHSL-TV, Topic--Psychological effects of rape on the victims and families. Presented with a four-part news series. Aired February, 1976.

The Child Abuse Carousal (With Larry Stuelpnagel) Community Service Program--Special, KHSL-TV, Topic--Psychological effects and dynamics of child abuse in Butte County. Presented with a five-part news series. Aired May 9-May 14, 1976.

Beyond the tip of the iceberg. Presentation on concerns for the future in dealing with child abuse/neglect. 1977 Child Abuse Conference, Chico, Ca. Child Abuse: The Community Approach.

Who are we. Presentation on concerns for the future in dealing with child abuse/neglect. 1978 2nd Annual Child Abuse Conference, Chico, Ca. Child Abuse: The Professional Approach.

Affiliations and Activities

Psi Chi, Student honorary society in Psychology

Theta Psi, Student social organization in Psychology, CSU, Chico

Chairman, Psychology Graduate Student Union, CSU, Chico

Author and Coordinator of CSU Student Psychology Convention, 1968-1969

Developed and Edited Proceedings of CSU Student Psychology Convention, 1968-1969

Child Abuse Steering Committee, Butte County

Rape Crisis Intervention Group, Chico, 1978-1979, Chairman, Board of Directors

Western Psychological Association, current

Rocky Mountain Psychological Association, 1972-1974

Marines Memorial Club, San Francisco

Gerontology Advisory Committee, Butte County, 1976-1978

Gerontology Ombudsman Advisory Committee, 1977-1978

International Society for the Prevention of Child Abuse and Neglect, 1978-current

National Committee for the Prevention of Child Abuse, 1978-current

References

Research Skills:

1. Richard B. Powers, Assoc. Prof., Ph.D., Dept. of Psychology, USU, Logan

2. J. Grayson Osborne, Assoc. Prof., Ph.D., Dept. of Psychology, USU, Logan

Teaching Skills:

3. Sara Armstrong, Professor, Ph.D., Dept. of Psychology, CSU, Chico

4. James V. Pierce, Professor, Ph.D., Dept. of Psychology, CSU, Chico

5. Clarence Mahler, Professor, Ph.D., Dept. of Psychology, CSU, Chico

Applied Skills:

6. Margot Butler, Curriculum Coordinator, Utah School for the Deaf, Salt Lake City

7. Anne Giel, M. A., Parental Stress Program, Family Service Association, Chico

8. Dennis Bruce, M.S.W., Far Northern Regional Center, Chico