THE EFFECT OF MODEL REINFORCEMENT ON IMITATION

by

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A Thesis Submitted to the Faculty of the
DEPARTMENT OF PSYCHOLOGY
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF ARTS
In the Graduate College
THE UNIVERSITY OF ARIZONA

1966
STATEMENT BY AUTHOR

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ACKNOWLEDGMENTS

The author wishes to express special appreciation to Professor Ralph Wetzel for his inspiration and guidance. Special gratitude is also expressed to Professors James King and Jack Capehart for their suggestions and criticisms in the writing of this study.

Gratitude is also expressed to the staff of the University of Arizona Campus Nursery school, especially Miss Jane Ruley, for their cooperation and the use of their facility.

Special thanks go to Bernhardt Fritz for his assistance in conducting this study and to W. Patrick Lynch for construction of the experimental apparatus.
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ABSTRACT

The utility of imitation is recognized in common child rearing practices and everyday learning situations. Isolation of the variables affecting imitative learning may make it possible to increase the efficacy of this important learning phenomenon. The purpose of this study was to test the effect of model reinforcement on imitation with a simple bar press. An additional variable investigated was schedules of model reinforcement. Fifteen boys and fifteen girls with a mean age of forty-eight months were randomly assigned to one of three treatment conditions. The subjects' exposure phase consisted of viewing an adult model bar press ten times. In one condition the model was reinforced with candy rewards on a continuous schedule; in the second on a fixed ratio schedule, and in the third, a control, the model received no reinforcements. Following the exposure period, the children's bar presses were recorded for seven minutes (the test period); however, at no time were the subjects rewarded for their imitative bar presses. The results indicated model reinforcement significantly increased the amount of imitation as well as the probability of a child responding imitatively. The intermittent condition also produced significantly more imitative bar presses than the continuous schedule. The
possibility of predicting a child's imitative responding as a result of the model's schedule of reinforcement was discussed. Practical applications of the results were also suggested.
INTRODUCTION

The importance of imitation in normal child development has long been recognized. Imitation is presumed to play an important role in the acquisition of both deviant and normal behavior. Children may learn new responses or other characteristics of existing response repertories by observing the behavior of others (Bandura and Walters, 1963). In discriminative learning, imitation by children results in fewer errors and greater improvement than additional trials (Wilson, 1958; Rosenblith, 1959). Imitation has also been found extremely useful in the training of deviant populations, such as autistic children (Lovaas, 1964). Although the utility of imitation is recognized in common child rearing practices and everyday learning situations, isolation of the variables affecting imitative learning, may make it possible to increase the efficacy of this important learning phenomenon.

The interest of contemporary psychology in the concept of imitation dates back to Lloyd Morgan (1896), Tarde (1903), and McDougall (1908). The writers regarded imitation to be a constitutional or instinctive process. However, as the circularity of the instinct concept as an explanation of behavior became more widely appreciated,
imitation was reformulated in terms of Pavlovian conditioning principles (Humphrey, 1921; Allport, 1924). Humphrey regarded imitation as activity based upon conditioned reflexes, in which the imitative response is similar to the stimulus which produced it. This stimulus may originate either in the same or in another organism. In 1931, Holt formulated a concept of imitation very similar to Humphrey based on a "conditioned reflex circle." He stated that when an adult copies a movement made by the child, the latter tends to repeat this movement, and that this sequence may be continued time after time, with the child's response becoming increasingly spontaneous. Holt added that if during this interaction sequence, the adult makes a response that is novel for the child, the latter will also copy it. Miller and Dollard (1941) criticize Holt's theory for failure to account for the cessation of imitation. Classical conditioning theories have also failed to satisfactorily explain the emergence of novel responses (Bandura and Walters, 1963).

In *Social Learning and Imitation*, Miller and Dollard (1941) presented the phenomenon of imitative behavior as a major problem confronting learning theorists. They defined imitation as a process by which "matched" or similar acts are evoked in two people and connected to appropriate cues. They distinguish two types of imitative behavior: (1) copying and (2) matched dependent. In the
former the copier slowly brings his response to approximate that of a model and must know when he has done so. During matched dependent behavior, a leader is able to read some relevant environmental cue, but the follower is not. Reward is dependent on the follower matching his response to the leader. The essential difference between matched dependent behavior and copying is that in the former the imitator responds only to the cue from the leader whereas in copying the imitator responds also to cues of sameness and difference produced by the stimulation from his own and the model's responses. In both circumstances the imitative act is viewed as an instrumental response already in the subject's repertoire. Miller and Dollard's theory presents the learning of copying and matched dependent behaviors as contingent on the observer's performing a close approximation to the matching response before he can acquire it imitatively; however, it does not account for the occurrence of imitative behavior in which the observer does not perform the model's responses during the acquisition process and for which reinforcers are not delivered either to the models or observers, such as in movies (Bandura and Walters, 1963).

In 1960 Mowrer proposed a theory of imitation to deal more adequately with some of the criticisms of the Miller and Dollard theory. Mowrer described two forms of imitative learning. In one case, organism A makes a
response and at the same time rewards organism B. A's responses thereby take on secondary reward value for B. Consequently B will receive self generated secondary reinforcement as a consequence of making responses which are approximations of A's behavior. The second case Mowrer called "empathetic" learning. In this case, A both provides the model and receives the reinforcement. B, in turn, experiences some of the same sensory consequences of A's behavior as A experiences it and also "intuits" A's satisfactions or dissatisfactions. Mowrer focused on positively reinforcing proprioceptive feedback as the crucial process mediating imitative learning. Imitation occurs only when the observer is directly or vicariously rewarded by the consequences to himself of the model's instrumental responses. Bandura and Walters (1963) criticized Mowrer's stress on the proprioceptive feedback stating that these cues constitute only a small portion of the total stimulus complex. Therefore it is necessary to take account also of non-proprioceptive stimulus elements which probably play the role of important discriminative cues.

In the past few years Sheffield (1961) and Bandura (1962) have proposed theories similar to Mowrer's based on the principle of contiguity and mediated, at least in part, by essentially similar cue-producing cognitive responses. However, Sheffield made no assumptions concerning the role
of mediating conditioned emotional reactions or proprioceptive feedback such as Mowrer did. Bandura's work has been concerned primarily with responses mediated by observation of movies. During the acquisition period the children neither performed any overt responses nor received any direct reinforcement. Bandura (1962) concluded that any learning that occurred was a function of "vicarious reinforcement." The post-exposure test of imitative behavior revealed that the "vicarious reinforcement" produced differential amounts of imitative behavior. Bandura then extended the test and introduced positive incentives which eliminated these previously observed performance differences. He concluded from these results that the acquisition of imitative responses results primarily from "contiguity of sensory events," which appears to be a combination of Mowrer's proprioceptive feedback and external stimulus cues. He further stated that response consequences to the model or observer have a major influence only on the performance of the imitatively learned responses, but not on their acquisition. Bandura, Ross, and Ross (1963b) investigated the effect of immediate model reward and punishment on the imitation of aggressive behaviors. Their subjects were exposed to movies in which an aggressive model was either rewarded, punished, or received no consequences as a result of his behavior. The observers of the film in which the model was rewarded
emitted significantly more imitative aggression than did the observers of the model who was punished; however, no differences were obtained between the latter and the no consequences group. Apparently the model punishment and no consequence conditions were equivalent in this case. In addition, the model punished condition produced significantly less responding in boys than in girls. The authors explained these sex differences as resulting from differential social sanctions imposed on males and females for the expression of aggressive behaviors.

In a similar study Bandura (1965) was unable to replicate these results. Again the subjects observed films of models either rewarded, punished, or with no consequences for aggressive behavior. Observers of the model rewarded film emitted significantly more aggressive responses than observers of the model punished film; however, in this study, no differences were obtained between the former and the no consequences group, a reverse of the 1963 findings. The interpretation of more imitative aggression by observers of the model rewarded film was complicated by the fact that only girls responded significantly more. Imitative responding by the boys did not differ from the control subjects. Neither study is able to clearly demonstrate that reinforcement of a model will result in amounts of imitation which are different from those of a control group. In addition, the choice of aggression as a measure
of imitation involves radically different reinforcement histories which make this class behavior difficult to control in the experimental situation.

Walters, Leat, and Mezei (1963) tested the "resistance to temptation" in thirty-eight male subjects who saw film versions of a model either rewarded or punished for deviation from instructions not to play with highly desirous toys. A control group did not witness any movie. The model rewarded condition increased deviation while the model punished condition inhibited deviation. The control group showed an intermediate degree of deviation from instructions.

The purpose of the present experiment is to investigate the effect of immediate model reinforcement with a simple bar press. This experiment differs from the others not only in the choice of response but also in the use of a live model. The bar press response was chosen for several reasons: (1) it is a response which is easily and precisely measured and (2) it is a relatively neutral response and avoids the differential reinforcement histories due to sex. In addition to studying immediate model reinforcement, the experiment also investigates the effect of continuous and intermittent schedules of model reinforcement.
METHOD

Subjects
The Ss were fifteen boys and fifteen girls enrolled in the University of Arizona Campus Nursery School. They ranged in age from thirty-nine to fifty-six months with a mean of forty-eight months. The children were randomly assigned to one of three treatment conditions of five boys and five girls each.

An adult male served as the model for all thirty children while another adult male served as E.

Apparatus
The apparatus was a bar press constructed from an ordinary squeeze mop and connected to a Veeder-Root counter powered by two six-volt batteries. The bar press (bar p) was mounted on a red 2' x 2' face panel. To one side of it a white paper tube (t) extended down toward a paper cup (c). The E sat behind the panel and manually dispensed M & M candy rewards through this tube (t). See Figure 1.

Procedure
Each subject was brought to the experimental room by his teacher and asked to participate in a "game." After a few minutes to enable the subject to relax, the model asked the child to observe him. Having obtained the
Figure 1. Bar Press Apparatus. Bar $p =$ bar press; $t =$ tube; $c =$ cup.
child's attention, the model then proceeded to bar press ten times at approximately twelve second intervals. If the model was on a reinforcement schedule he ate the candy reward immediately following each bar press; if not he merely sat there for approximately the same amount of time it took to consume the candy. There were three treatment conditions: in the first, the model was reinforced with M & Ms on a continuous reinforcement schedule (crf) for ten bar presses; in the second, the model was reinforced on a fixed ratio schedule (FR 2:1) for ten bar presses. In the third condition, a control situation, the model received no reinforcement for any of his ten bar presses.

Following the model's ten responses (the exposure period) each child was placed in front of the test apparatus. The model then asked each child "Can you do this?" and left the room. The verbal cue was identical to the one used by Baer and Sherman (1964) to increase the possibility of imitative responding. All bar presses performed by the children during the following seven minutes (the test period) were recorded by the E over one minute intervals. The seven minute period was chosen as the result of a pilot study in which 95% of the subjects had ceased responding within this interval. However, at no time during the test period were the subjects reinforced for their imitative responding. Following the test period all subjects were
verbally encouraged to perform the model's response, reinforced and returned to the nursery.
RESULTS

In general the results supported the hypothesis that immediate model reinforcement increases the frequency of imitative responding. The median number of imitative bar presses per treatment condition are shown in Table 1.

Table 1

Median Number of Imitative Bar Presses per Treatment Condition

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<tr>
<th>Model Reinforcement Condition</th>
<th>Sex</th>
<th>Condition Total</th>
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<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Continuous</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Intermittent</td>
<td>85</td>
<td>74</td>
</tr>
<tr>
<td>Control</td>
<td>0</td>
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However, because seven of the ten control subjects made no imitative responses, the data for this group were extremely skewed. As a result of this skewed data, the assumptions of parametric statistics could not be met. A one tailed Mann Whitney U test was used to compare the continuous model reinforced condition and the control. The resulting U of 20 ($n_1 = 10$; $n_2 = 10$) was significant beyond the .025 level, indicating the frequency of imitative bar presses.
is increased by the continuous model reinforced condition. Identical results \((U = 20; n_1 = 10; n_2 = 10; p < .025)\) were obtained in favor of the intermittent model reinforcement condition in comparison with the control group. A significant difference \((U = 23; n_1 = 10; n_2 = 10; p < .025)\) was obtained between the continuous and intermittent reinforcement conditions which indicated intermittent model reinforcement produced a higher frequency of imitative responding.

To further test the effect of model reinforcement, the number of responders—those Ss who emitted at least one imitative bar press during the test period—were compared with the non-responders. A one tailed Fisher's exact probability test showed that there were significantly more responders in both the continuous \((A = 9, C = 3; p < .01)\) and intermittent \((A = 9, C = 3; p < .01)\) groups than in the control group. However, there was no significant difference between the continuous and the intermittent groups. These results lend further support to the hypothesis that model reinforcement increases the probability of imitative responding.
DISCUSSION

This study demonstrated that immediate positive reinforcement increases both the probability that a subject will respond imitatively and the frequency of imitative responding. Because of the nature of the imitative response utilized in this study it is difficult to generalize to more complex imitative responses, particularly responses which are highly dependent on a specific reinforcement history, e.g., aggressive behavior (Bandura, 1963b; 1965). No sex differences were found in this study.

Even a response as simple as the bar press is not completely independent of the individual's past reinforcement history. As already noted only three out of ten subjects in the control group responded imitatively. Two of the subjects responded at a fairly steady rate whereas the third subject responded only once. In an interview following the experiment, the teacher described the two responding subjects as being "highly dependent on adults" and "anxious to please" them. For these subjects it appeared that the verbal cue "Can you do this?" combined with an adult model served more as a command than question, although this combination was ineffectual in evoking imitation from the other seven control subjects. One might assume that the "dependent personality" of these observers
is primarily responsible for their imitative responding. This result was similar to those of Jakubczak and Walters (1959) who discovered a high rate of imitative responding between adult models and children scoring high on a dependency scale.

The findings also indicated that the schedule of this reinforcement affected the frequencies of the observers' imitative responding. Intermittent schedules usually yield more responding in an extinction condition than a continuous schedule (Ferster and Skinner, 1957) and the results of this study are congruent with this statement. Although the test period was not truly an extinction process, sixty per cent of the Ss had ceased responding by the final minute. If further studies confirm this finding, accurate prediction of an observer's extinction curve might be predicted by knowledge of the model's schedule of reinforcement. This study only hints at the great number of possible schedule combinations. The effect of tandem schedules could also be easily investigated by an approach similar to the one utilized in this study. For example: Models could be placed on fixed ratio (FR) schedules while the observers were tested on a fixed interval (FI) schedule. One would predict, according to Ferster and Skinner (1957) that if the tandem fixed interval is only a few seconds long, the variation in the number of responses between the
model's fixed-ratio segment and the observer's fixed-interval segment will be slight.

The results of this study appear to suggest some practical application. For example, in order to increase the chances of a child imitating certain desired behaviors, he should be exposed to a model being rewarded for these behaviors. Although mere exposure to a model may evoke imitative behavior, the chances are significantly better if a model is observed being rewarded at least part of the time for his performance. To ensure "increased" imitation of certain behaviors, this study would suggest a child viewing the model on an intermittent schedule of reinforcement, which is also more congruent with everyday living. This type of schedule should insure a higher frequency of imitative responding as well as greater persistence.

The use of a simple imitative response appears to aid in clarifying some of the variables involved in the effect of model reinforcement and to provide a method for studying the effect of variables of reinforcement schedules on imitative behavior.
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