An Attempt to Develop a Model as a Secondary Reinforcer and Elicitor by Observational Learning

John William Pangburn
AN ATTEMPT TO DEVELOP A MODEL
AS A SECONDARY REINFORCER AND ELICITOR
BY OBSERVATIONAL LEARNING

by

John W. Pangburn

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John William Pangburn
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THE PROBLEM AND ITS BACKGROUND

The Purpose

The purpose of this paper is to examine the possibility that the phenomenon called imitation learning can, in part, be accounted for in terms of secondary reinforcement principles with the exception that an observable operant need not be emitted by the reinforced observer. Specifically, it is predicted that a human subject, through having been placed in temporal relation to a primary reinforcer in the procedural fashion to establish it as an $s^D$ and an elicitor, can acquire secondary reinforcing properties for an observer who has observed this relationship rather than having performed an operant to gain the primary reinforcement directly.

Three Theories of Imitation Learning

The phenomenon of learning new responses or facilitating or inhibiting previously learned responses as a function of observing the behavior exhibited by models has cast serious doubt upon the theory that all learning is a function of direct reinforcement. Although many divergent learning conditions have been proposed as necessary antecedent variables for imitation (Bandura, 1963; Freud, 1949; Maccoby, 1959; Miller and Dollard, 1941; Mowrer, 1950; Whiting, 1960), only recently has it been rigorously studied to any significant degree. Although rarely conceptualized in terms of the strict principles derived from animal experiments, there has been a general
evolution towards the use of more controlled experimentation. This impetus essentially derives from the established validity of much of the data of behavioristic psychology arrived at through imposing rigorous controls on experimental designs.

Various learning theorists have accounted for imitation learning within the framework of direct reinforcement theory. Miller and Dollard (1941) explain the phenomenon as a special case of discrimination place learning in which the behavior of a model is imitated only after the subject is directly reinforced for random behavior which happens to match that of the model. This theory does not account for the occurrence of imitative behavior when the observer does not perform his model's response during acquisition (Bandura and McDonald, 1963) and for which reinforcers are not delivered to either the model or the observer.

A more recent attempt to specify the necessary preconditions for imitative learning is that of Mowrer (1950). He proposes that as a model mediates a subject's biological and social rewards, the responses of the model acquire secondary reward value. On the basis of stimulus generalization, responses which match those of the model are reinforcing to the extent that they are similar to those of the model.

Mowrer also describes another form of imitation which implies vicarious learning. In this case, the model reinforces while the subject "... both experiences some of the same sensory consequences of A's
behavior as A experiences it and also 'intuits' A's satisfactions or dissatisfactions." According to Mowrer, imitation occurs only when the observer is either directly or vicariously rewarded by the model's operant responses. Here, learning is essentially the same as in habit formation and differs only in respect to the origin of the response-correlated stimuli that sustain the learned responses. In both cases the stimuli take the form of rewarding proprioceptive feedback associated through classical conditioning with the learner's execution of the behavior he exhibits.

There is little doubt, as both Mowrer and Miller point out, that direct reinforcement produces increments in imitative behavior. Other researchers, however, (Bandura and Kupers, 1964; Bandura and Walters, 1963) have persuasively argued that direct reinforcement is not an exclusive pre-condition for the learning or performance of imitative behavior. Bandura (1962b) suggests that learning of imitative responses results primarily from the contiguity of sensory events, whereas response consequences to the model or to the observer (real or assumed) have a major influence only on the performance of imitative responses.

This latter finding has lead to Bandura's use of the term "vicarious reinforcement" to account for the observer's varying rates of imitation which, he feels, are a function of the type of reinforcement administered to the model.

This latter principle appears to be similar to Mowrer's concept of the observer's intuition of the model's satisfactions. Bandura, however, uses the principle to partially explain performance
differences rather than as an explanatory principle of learning. For Bandura, the response consequences to the model are the major discriminative stimuli controlling the observer's response probabilities.

**Observer Inference**

There is some evidence that imitation can be facilitated or inhibited as a function of the observer's "inferred" consequences to the model on the basis of his possessing tangible evidence of social success for past performance. Hovland, Janis, and Kelley (1953) found that imitation is exhibited more often if the model is typically known to be the recipient of social reinforcers such as praise and admiration. Further, if a model can demonstrate proficiency in skills which are known to be rewarded materially as well as socially, he can elicit a higher rate of imitation than those who do not possess these capabilities (Gelfand, 1962; Kanareff and Lanzetta, 1960; Lanzetta and Kanareff, 1959).

This far we have proposed that there are three conditions under which a model can facilitate or inhibit imitative behavior. Bandura and his associates indicate that the rate of imitation is effected by the observed consequences to the model for his having performed an operant. This behavior has been labeled vicarious (primary) reinforcement. Others (Bandura and Huston, 1961; Mowrer, 1958, 1950) argue that through the model directly reinforcing the observer, he is established as a secondary reinforcer and gains partial control over the observer's imitative behavior. The third condition is similar to the first except that the reinforcement of the model's operants are
"inferred" rather than observed.

The proposition that "inference" on the part of the observer can effect imitation (concerning the efficacy of the model whose history is "inferred") leaves little room for real validation. It is useful to know that certain high status models who are not reinforced in the presence of the observer can elicit a higher rate of imitation than can low status models. It is, however, insufficient unless we know what specific conditions contributed to the high or low status model's relative imitation eliciting capacities.

Recently, a number of social psychologists (French, Morrison and Levinger, 1960; French and Raven, 1959; Maccoby, 1959; Zipf, 1960) have attempted to identify the conditions which contribute to a phenomenon defined as social power and have defined the term as the ability of a person to influence the behavior of others by controlling their positive and negative reinforcements. This group has implied a rather general secondary reinforcement theory (not unlike Mowrer's) to account for the phenomenon. In a test of this theory, it was concluded (Bandura and Huston, 1961; Bandura, Ross and Ross, 1963) that establishing the model as a secondary reinforcer, through direct reinforcement of the observer, resulted in his increased imitative eliciting capacity.

Questions to be Answered

If an observer can be reinforced vicariously by observing the response consequences to a model, it seems worthy of consideration that so also should a model, by being paired with direct reinforcement
which he directs toward a second model, become a secondary reinforcer to the observer in a like vicarious manner.

It seems inconsistent that a concept of vicarious reinforcement should be invoked to explain observer learning when a model receives primary reinforcement, but that direct reinforcement is necessary for a model's responses to acquire secondary reward value. There is little doubt that Mowrer's principle of direct secondary reinforcement can account for some forms of imitative response facilitation. However, if an observer can be vicariously reinforced through a model, then that model who was the reinforcing agent should take on, vicariously also, secondary reward characteristics.

The testing of this possibility requires that an observer imitate a model who had bestowed upon a recipient model a number of primary reinforcements, rather than a model who interacted with, but did not personally reward, the recipient model.

The following experiment carries out this design in an attempt to address itself to the following questions.

1. Can the phenomenon of secondary reinforcement be learned vicariously?

An affirmative answer to this question should generate, at least in part, an answer to question two below.

2. What accounts for the differential eliciting power of two models possessing "inferred" qualities of high and low status, but who are not reinforced in the presence of the observer?
THE EXPERIMENT

Subjects

The subjects were 25 males and 23 females ranging in age from 63 months to 72 months.

Two adult males served as models. A male experimenter conducted the study. Two females served as raters.

Design and Procedure

The subjects were assigned randomly to two groups. Each child was told that he was going to watch some games being played and that if he was very attentive, he could join in later. Upon entering the experimental room, each subject was introduced to both models and was told by the experimenter that he could sit and watch.

There were two stages to the experiment: stage one, subject observation of model interaction and stage two, imitation task during which the subjects joined the two models in a new game. (See Figure 1.)

Stage One, Observation of Model Interaction

For the "controller-reward" group, stage one consisted of a situation in which the subjects observed a model (the controller) verbally structure the contingencies for reward for a second model (the recipient). This involved the controller's explaining to the recipient that he would see how well he could play certain games; and that if he were good enough, he would receive prizes. The following
Stage One

Controller-reward group

Subject asked to enter game

Subject observes models exhibit different behaviors in game

Subject imitates some component of one or both models

Stage Two

Controller-reward group

Recipient

Subject

Experimenter-reward group

Recipient

Subject

Same as for group #1 above

- - - - = observation

= progression of time
tasks were given to the recipient model:

1. **Task:** Make a model car go around a race track three times in less than 15 seconds.
   
   **Prize:** the race car set

2. **Task:** Draw a line from inside to a goal outside a maze on the blackboard without once going into a dead end.
   
   **Prize:** five Milky Way bars

3. **Task:** Complete a simple picture from five pre-drawn, disconnected lines.
   
   **Prize:** a half dollar

4. **Task:** Score 500 points on a miniature pin-ball machine using only four balls.
   
   **Prize:** the pin-ball machine

5. **Task:** Make a top spin for 30 seconds.
   
   **Prize:** the top

Upon completion of each task, the controller rewarded the recipient both physically and verbally (in the form of praise, approval and positive attention). The recipient, in turn, verbalized considerable positive affect characteristics of a person experiencing positive reinforcement.

For the "experimenter-reward" group of stage one, a similar procedure was carried out with one major alteration. In this instance, the experimenter proffered the physical and verbal rewards and the controller, giving no rewards, sat unemotionally silent.

Therefore, both groups observed the controller verbally structure the situation and establish the reward contingencies for the recipient. The "controller-reward" group, however, observed the controller administer the physical and verbal rewards to the recipient while the
"experimenter-reward" group observed the controller sit passively while the experimenter rewarded the recipient model.

The two models changed roles for every other child in each group to control for personality and physical variables. At the completion of the controller-recipient interaction, the experimenter announced that he had a surprise game in the next room and that the observer could join in this one if he wished.

Stage Two, Imitation Task

A choice discrimination problem was used in the second stage. The apparatus consisted of two boxes with hinged lids. These were placed on stools approximately four feet apart and eight feet from the starting point. On the lid of each box was a plastic doll. The experimenter asked the two models (controller and recipient) to stand at the starting point while he described the game they were about to play. The experimenter explained that he would hide a cardboard cartoon card in one of the two boxes and that the object of the game was to guess which box contained the card. The adults would have a series of turns first, following which the child would play the guessing game.

The discrimination problem was used as a cover task to occupy the children's attention while at the same time permit observation of the models as they performed divergent patterns of behavior during the discrimination trials so as to disallow any set to attend to or learn the responses exhibited by the models. Before starting the trials, the experimenter invited the participants to join him in selecting a "thinking cap." These were Robin Hood type hats of different colors,
each with a different feather position. The controller selected the
green cap, remarked, "green feather, green hat, feather in the back,"
and wore the hat with the feather facing back. The recipient selected
the red hat, remarked, "red hat, red feather, feather in the front,"
and placed the hat on his head with the feather facing front. The
children then made their choice from two different colored hats re­
mainning, and it was noted whether the feather placement, color
preference and verbal responses of the children matched one or the
other of the models.

The models then went to the starting point. The child returned
to his seat, and the experimenter loaded both boxes with cartoon card­
boards for the model's trials.

For each trial, each model exhibited a different set of verbal
and motor responses that were totally irrelevant to the discrimination
problem to which the child's attention was directed. Each model was
warned not to look. The controller turned sideways, hands over his eyes
and asked, "Ready?". The recipient put his arms on his hips, turned
completely around and asked "Now?".

Upon the signal for the first trial, the controller remarked
"Forward march" and began marching toward the box repeating, "march,
march, etc.". When he reached the box, he said "Sock him," hit the
doll aggressively off the box, opened the lid, and yelled "Bingo" as
he raised the card high above his head. Closing the box, he placed
the doll on top, faced backwards and said, "Face the wall".

The recipient model took his turn and performed a different set
of responses, but equated with the controller's in terms of number,
types of classes and interest value. At the starting point, he re­
marked, "Get set, go," and walked stiffly toward the box, repeating
"left, left, left, etc."

Upon reaching the boxes, he gently laid the doll down, opened the
box and said "down and up". He reached down for the cartoon, ex­
claiming "hot dog," picked out the cardboard and extended his arm out
while looking at the picture in it and said "Here it is." The model
then picked up the doll, laid it down on its face and remarked "Lay
down".

The two sets of responses were counter-balanced by having the
models display each pattern with half the subjects. The models per­
formed alternately for four trials. They then left the room and the
child took his turn so as to remove any imagined situational res­
traints against or coercion for the child to produce the model's
responses. The models always selected different boxes in a fixed or­
der. The models also received cartoons on each trial, but the child
was rewarded on two thirds of the trials in order to maintain his in­
terest in the cover task.

In addition to the introductory block of four trials by the mod­
els, the child's total of three test trials were interspersed with
two trial blocks by the models. In addition, the models alternated
between subjects in the order in which they executed the trials so as
to test for the possibility of a recency of exposure effect.

Imitation Scores

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The subject's imitation scores were obtained by summing the number of postural, verbal and motor responses, as well as the hat color and placement. Performances were scored simultaneously and independently by two raters who observed from the side of the room. Each had a separate check list of the nine responses exhibited by each of the two models. The scoring required checking the imitative responses performed by the children on each trial. No coefficient of inter-rater reliability was obtained since the raters differed on only two of the total 221 responses.

Results

The results were obtained by compiling the available data and enumerating the possible imitative responses and the occurrence of these in the "controller-reward" and "experimenter-reward" groups. (See Table 1.) The prediction appears to have been validated that a controller model who distributes verbal and material reinforcers to highly competent reward gaining recipient models will elicit more observer imitation than either the recipient model or another controller who structures the reward contingencies for, but does not reward, the recipient.

A t test for independent samples clearly shows that the subjects in the controller-reward groups imitated the controller of that group (M=3.5) at a significantly higher rate than the subjects in the experimenter-reward group (M=2.1) imitated the controller in that group (t=6.0824, \( p < .001 \)).

A further comparison of the rewarding controller model with the
Table 1.

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N=3.5

T Test for Independent Samples

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Sign Test

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recipient models of both groups shows that this controller elicited a significantly higher rate of imitation than did either of the recipient models. This is verified in Table 1 by the following comparisons: 1) the controller in the controller-reward group was compared with the recipient in the experimenter-reward group by means of a t test ($t=2.0610, p>.05$) and 2) the rewarding controller was compared with the recipient model within the controller-reward group by means of a sign test ($p=.001$).

The low rates of imitation are quite puzzling since a previous experiment done by the author resulted in much higher rates using essentially the same response criteria. Mean age of the present subject was, however, more than 14 months greater than that of subjects in a prior experiment. It is quite possible that the responses were considered too "babyish" by the present subjects who often exhibited embarrassment when imitating some of the postural and verbal model behavior. Limited retention may also have been a factor since a large variety of fairly complex and novel verbal, motor and postural responses were required. Regardless of these factors, the rewarding controller model elicited a significantly higher rate of imitation than did any of the other models in the experiment.

Discussion

The present findings clearly indicate that A) a model who is associated temporally with social and material reinforcers (which he distributes to a second model) is more often imitated by an observer than is a model who interacts with but is not associated with such
reinforcers and B) this rewarding model is imitated more often than a model who receives rewards from either the rewarding model or from some other person.

These findings appear to support the proposition that a stimulus can acquire secondary reinforcing properties with its attendant functions via an observational learning process wherein the direct reinforcement of a subject has not occurred.

This proposition appears justified since both the procedural conditions for establishing a stimulus as a secondary reinforcer were met and the typical attendant functions of a secondary reinforcer were exhibited. The latter were reflected in the observer's increased rate of imitation after observing the behavior of the controller model.

One question that must be answered is this. In what manner did the secondary reinforcer (controller) effect an increase in the subject's rate of response? The answer to this question can be found within the present experimental procedure. The rewarding-controller was placed in a temporal relationship to different primary and secondary reinforcers in the procedural fashion to establish it as an S^D and an elicitor. There is strong evidence that secondary reinforcers can function as elicitors of responses (Longstreth, 1962; McNamara and Paige, 1962a; Marx and Murphy, 1961), as well as S^D's for various responses (Dinsmoor, 1950, 1952; Keller and Schoenfeld, 1950; Saltzman, 1949). Although the proponents of these theoretical positions often perceive them as mutually exclusive, there is evidence (Reynolds, Anderson and Besch, 1963; Wike, 1966), that the function a secondary reinforcer performs is more a matter of the experimental procedure
(that is, the temporal relationship of the primary and formerly neu-
tral stimulus) than in its possessing any one inherent function.

High imitative eliciting powers of the rewarding controller seem
to be explicable in terms of both the so-called elicitation and dis-
criminative stimulus theories, since secondary reinforcers, which have
been established as $S^D$'s and precede a response (rather than being
contiguous with or succeeding the response), are capable of eliciting
or energizing a response (Longstreth, 1962; Keileher, 1958).

Although the basic procedural conditions for establishing a sec-
ondary reinforcer as an $S^D$ and eliciting stimulus were followed and
appear to have been successful, the question of what responses would
be elicited (since the conditioned responses of stage one were not
compatible with the stimulus requirements of stage two) was difficult
to predict. It was reasoned that if the subject is vicariously rein-
forced via a model performing an operant or operants, then by pairing
numerous different primary reinforcements with the rewarding-controller
(Verbal and physical), the rewarding-controller would acquire the sta-
rus of a generalized (rather than discrete) secondary reinforcer
(Kanfer and Matarazzo, 1959; Skinner, 1953; Wike and Barrientos, 1958).
It was hoped that by so doing he would be capable of eliciting not
merely the training response (which was not called for) but an entire
spectrum of new responses exhibited by himself in stage two. This
appears to have been the case in the present experiment as evidenced
in the significantly higher rate of imitative responses elicited by
the controller-reinforcer compared with those elicited by the other
three models. It might be argued, alternatively, that Mowrer's
imitation performance concept of self-induced reinforcement could be invoked to explain why the controller-reinforcer could elicit new responses (during stage two) which differed from those with which it was paired during the conditioning stage. This theory, however, is beset with elicitation problems since elicitation of imitative responses, for Mowrer, is a function of internal cue controls rather than external stimuli; and comes dangerously close to what Skinner (1953) refers to as "explanatory fictions."

Why the secondary reinforcer-controller elicited more imitation than either of the recipient models becomes a matter of logical conjecture rather than being based on sound empirical data. If an observer is vicariously reinforced by observing a recipient model, then the recipient model may merely function as a passive vehicle through which the observer gains reinforcement. This explanation, however, is at best tentative, since it is merely an inductive extension of a theoretical interpretation (albeit derived from empirical findings).

This extreme difference in eliciting capacity of the rewarding-controller and the recipient models was not predicted since past research in this area has indicated that models receiving rewards are consistently imitated at a significantly higher rate than no-reward or punished models, although no previous design incorporated an observational secondary reinforcement paradigm for comparison. It is this extreme difference which strongly suggests that a recipient model may function as an elicitor for only those responses for which he was reinforced and does not represent a stimulus which can function as a reinforcer for new responses if the reinforcement of those responses
was not observed by the subject. Conversely, the controller-reinforcer established as a generalized secondary reinforcer should be capable, as appears to be the case in the present study, of eliciting and reinforcing responses which were not present during the conditioning procedure.

By explaining these model stimulus conditions which appear to exert control over imitation as we have done in terms of secondary reinforcement, the differential amount of imitation may have been accounted for; but we do not fully explain why the recipient models are imitated at all. In a large part, it can be attributed to the stimulus requirements of the experimental design. However, observer characteristics contribute greatly to imitation as a learned response. This appears to be a function of their past reinforcement histories. It has been indicated that persons who have received insufficient rewards, such as those lacking in self-esteem (deCharms and Rosenbaum, 1960; Gelfand, 1962; Lesser and Abelson, 1959) or who are "incompetent" (Kanareff and Lanzetta, 1960) and those who have been previously rewarded for displaying matching responses (Lanzetta and Kanareff, 1959; Miller and Dollard, 1941; Schein, 1954) are especially prone to imitate. So too are highly dependent individuals (Jakubczak and Walter, 1959; Kagan and Mussen, 1956; D. Ross, 1962) persons who have probably been frequently rewarded for conforming behavior. Further, there is some evidence that moderate emotional arousal can increase the probability of matching behavior (Walters, Marshall and Shooter, 1960). This factor undoubtedly was present in the experimental situation.
Although it is evident from the poorly defined clinical terminology that conditions which contribute to observers' imitative reinforcing histories must be more clearly defined in the future, these studies do indicate that external stimulus conditions are only partially controlling factors in imitative behavior.

A tentative explanation for the differential eliciting power of two models possessing "inferred" qualities of high and low status (but who were never reinforced in the presence of the observer), might be offered in terms of the eliciting function of generalized secondary reinforcers.

A model's stimulus qualities which are, for the observer, indicative of high or low rewarding capacities (that is, speech patterns, dress, sex) may function as generalized secondary reinforcers. The extent to which a model possessed those stimuli which were historically, for the observer, conditioned to rewarding, non-rewarding, or punishing stimuli, may account for that model's imitative eliciting capacity.

Summary

Two groups of subjects were used to test the imitative eliciting effect of various models. The experiment was divided into two stages. For stage one, group one observed a model (controller-reinforcer) structure the reward contingencies for, and verbally and physically reward, a recipient model for exhibiting a high degree of competence in a series of games. Group two differed only in the fact that the experimenter rather than the controller actually rewarded
the recipient model. The procedure for developing the secondary reinforcement as an elicitor and an $S_D$ was followed with the exception that the controller-reinforcer did not directly reinforce the observer.

During stage two, children observed models play a new game and then were allowed to join in playing. Observers scored subjects on amount of model specific imitation exhibited. It was found that model controller-reinforcer elicited a significantly higher rate of observer imitation during the second stage of the experiment than did either of the other three models. Findings were discussed in terms of a concept of vicarious secondary reinforcement. It was proposed that a model could acquire secondary reinforcing capacities for an observer although the observer had not been directly reinforced by the model. This vicarious secondary reinforcing concept was offered as a possible explanation of the concept of "observer inference" which is said to account for the differential imitative eliciting rate of high and low status models.
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