Reprinted from JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY, Vol. 1, No. 6, June 1965
Printed in U. S. A.

INFLUENCE OF MODELS' REINFORCEMENT CONTINGENCIES ON THE ACQUISITION OF IMITATIVE RESPONSES [1]

ALBERT BANDURA [2]

Stanford University

In order to test the hypothesis that reinforcements administered to a model influence the performance but not the acquisition of matching responses, groups of children observed an aggressive film-mediated model either rewarded, punished, or left without consequences. A postexposure test revealed that response consequences to the model had produced differential amounts of imitative behavior. Children in the model-punished condition performed significantly fewer matching responses than children in both the model-rewarded and the no-consequences groups. Children in all 3 treatment conditions were then offered attractive reinforcers contingent on their reproducing the model's aggressive responses. The introduction of positive incentives completely wiped out the previously observed performance differences, revealing an equivalent amount of learning among children in the model-rewarded, model-punished, and the no-consequences conditions.

It is widely assumed that the occurrence of imitative or observational learning is contingent on the administration of reinforcing stimuli either to the model or to the observer. According to the theory propounded by Miller and Dollard (1941), for example, the necessary conditions for learning through imitation include a motivated subject who is positively reinforced for matching the rewarded behavior of a model during a series of initially random, trial-and-error responses. Since this conceptualization of observational learning requires the subject to perform the imitative response before he can learn it, this theory evidently accounts more adequately for the emission of previously learned matching responses, than for their acquisition.

Mowrer's (1960) proprioceptive feedback theory similarly highlights the role of reinforcement but, unlike Miller and Dollard who reduce imitation to a special case of instrumental learning, Mowrer focuses on the classical conditioning of positive and negative emotions to matching response-correlated stimuli. Mowrer distinguishes two forms of imitative learning in terms of whether the observer is reinforced directly or vicariously. In the former case, the model performs a response and simultaneously rewards the observer. If the modeled responses are thus paired repeatedly with positive reinforcement they gradually acquire secondary reward value. The observer can then administer positively conditioned reinforcers to himself simply by reproducing as closely as possible the model's positively valenced behavior. In the second, or empathetic form of imitative learning, the model not only exhibits the responses but also experiences the reinforcing consequences. It is assumed that the observer, in turn, experiences empathetically both the response-correlated stimuli and the response consequences of the model's behavior. As a result of this higher-order vicarious conditioning, the observer will be inclined to reproduce the matching responses.

There is some recent evidence that imitative behavior can be enhanced by noncontingent social reinforcement from a model (Bandura & Huston, 1961), by response-contingent reinforcers administered to the model (Bandura, Ross, & Ross, 1963b; Walters, Leat, & Mezei, 1963), and by increasing the reinforcing value of matching responses per se through direct reinforcement of the participant observer (Baer & Sherman, 1964). Nevertheless, reinforcement theories of imitation fail to explain the learning of matching responses when the observer does not perform the model's responses during the process of acquisition, and for which reinforcers are not delivered either

[1] This investigation was supported by Research Grant M-5162 from the National Institutes of Health, United States Public Health Service.

[2] The author is indebted to Carole Revelle who assisted in collecting the data.

to the model or to the observers (Bandura et al., 1961, 1963a).

The acquisition of imitative responses under the latter conditions appears to be accounted for more adequately by a contiguity theory of observational learning. According to the latter conceptualization (Bandura, in press; Sheffield, 1961), when an observer witnesses a model exhibit a sequence of responses the observer acquires, through contiguous association of sensory events, perceptual and symbolic responses possessing cue properties that are capable of eliciting, at some time after a demonstration, overt responses corresponding to those that had been modeled.

Some suggestive evidence that the *acquisition* of matching responses may take place through contiguity, whereas reinforcements administered to a model exert their major influence on the *performance* of imitatively learned responses, is provided in a study in which models were rewarded or punished for exhibiting aggressive behavior (Bandura et al., 1963b). Although children who had observed aggressive responses rewarded subsequently reproduced the model's behavior while children in the model-punished condition failed to do so, a number of the subjects in the latter group described in postexperimental interviews the model's repertoire of aggressive responses with considerable accuracy. Evidently, they had learned the cognitive equivalents of the model's responses but they were not translated into their motoric forms. These findings highlighted both the importance of distinguishing between learning and performance and the need for a systematic study of whether reinforcement is primarily a learning-related or a performance-related variable.

In the present experiment children observed a film-mediated model who exhibited novel physical and verbal aggressive responses. In one treatment condition the model was severely punished; in a second, the model was generously rewarded; while the third condition presented no response consequences to the model. Following a postexposure test of imitative behavior, children in all three groups were offered attractive incentives contingent on their reproducing the models' responses so as to provide a more accurate index of learning. It was predicted that reinforcing consequences to the model would result in significant differences in the performance of imitative behavior with the model-rewarded group displaying the highest number of different classes of matching responses, followed by the no-consequences and the model-punished groups, respectively. In accordance with previous findings (Bandura et al., 1961, 1963a) it was also expected that boys would perform significantly more imitative aggression than girls. It was predicted, however, that the introduction of positive incentives would wipe out both reinforcement-produced and sex-linked performance differences, revealing an equivalent amount of learning among children in the three treatment conditions.

METHOD

Subjects

The subjects were 33 boys and 33 girls enrolled in the Stanford University Nursery School. They ranged in age from 42 to 71 months, with a mean age of 51 months. The children were assigned randomly to one of three treatment conditions of 11 boys and 11 girls each.

Two adult males served in the role of models, and one female experimenter conducted the study for all 66 children.

Exposure Procedure

The children were brought individually to a semi-darkened room. The experimenter informed the child that she had some business to attend to before they could proceed to the "surprise playroom," but that during the waiting period the child might watch a televised program. After the child was seated, the experimenter walked over to the television console, ostensibly tuned in a program and then departed. A film of approximately 5 minutes duration depicting the modeled responses was shown on a glass lenscreen in the television console by means of a rear projection arrangement, screened from the child's view by large panels. The televised form of presentation was utilized primarily because attending responses to televised stimuli are strongly conditioned in children and this procedure would therefore serve to enhance observation which is a necessary condition for the occurrence of imitative learning.

The film began with a scene in which the model walked up to an adult-size plastic Bobo doll and ordered him to clear the way. After glaring for a moment at the noncompliant antagonist the model exhibited four novel aggressive responses each accompanied by a distinctive verbalization.

First, the model laid the Bobo doll on its side, sat on it, and punched it in the nose while remarking, "Pow, right in the nose, boom, boom." The model then raised the doll and pommeled it on the head with a mallet. Each response was accompanied by

the verbalization, "Sockeroo . . . stay down." Following the mallet aggression, the model kicked the doll about the room, and these responses were interspersed with the comment, "Fly away." Finally, the model threw rubber balls at the Bobo doll, each strike punctuated with "Bang." This sequence of physically and verbally aggressive behavior was repeated twice.

The component responses that enter into the development of more complex novel patterns of behavior are usually present in children's behavioral repertoires as products either of maturation or of prior social learning. Thus, while most of the elements in the modeled acts had undoubtedly been previously learned, the particular pattern of components in each response, and their evocation by specific stimulus objects, were relatively unique. For example, children can manipulate objects, sit on them, punch them, and they can make vocal responses, but the likelihood that a given child would spontaneously place a Bobo doll on its side, sit on it, punch it in the nose and remark, "Pow . . . boom, boom," is exceedingly remote. Indeed, a previous study utilizing the same stimulus objects has shown that the imitative responses selected for the present experiment have virtually a zero probability of occurring spontaneously among preschool children (Bandura et al., 1961) and, therefore, meet the criterion of novel responses.

The rewarding and punishing contingencies associated with the model's aggressive responses were introduced in the closing scene of the film.

For children in the model-rewarded condition, a second adult appeared with an abundant supply of candies and soft drinks. He informed the model that he was a "strong champion" and that his superb aggressive performance clearly deserved a generous treat. He then poured him a large glass of 7-Up, and readily supplied additional energy-building nourishment including chocolate bars, Cracker Jack popcorn, and an assortment of candies. While the model was rapidly consuming the delectable treats, his admirer symbolically reinstated the modeled aggressive responses and engaged in considerable positive social reinforcement.

For children in the model-punished condition, the reinforcing agent appeared on the scene shaking his finger menacingly and commenting reprovingly, "Hey there, you big bully. You quit picking on that clown. I won't tolerate it." As the model drew back he tripped and fell, the other adult sat on the model and spanked him with a rolled-up magazine while reminding him of his aggressive behavior. As the model ran off cowering, the agent forewarned him, "If I catch you doing that again, you big bully, I'll give you a hard spanking. You quit acting that way."

Children in the no-consequences condition viewed the same film as shown to the other two groups except that no reinforcement ending was included.

Performance Measure

Immediately following the exposure session the children were escorted to an experimental room that contained a Bobo doll, three balls, a mallet and pegboard, dart guns, cars, plastic farm animals, and a doll house equipped with furniture and a doll family. By providing a variety of stimulus objects the children were at liberty to exhibit imitative responses or to engage in nonimitative forms of behavior.

After the experimenter instructed the child that he was free to play with the toys in the room, she excused herself supposedly to fetch additional play materials. Since many preschool children are reluctant to remain alone and tend to leave after a short period of time, the experimenter reentered the room midway through the session and reassured the child that she would return shortly with the goods.

Each child spent 10 minutes in the test room during which time his behavior was recorded every 5 seconds in terms of predetermined imitative response categories by judges who observed the session through a one-way mirror in an adjoining observation room.

Two observers shared the task of recording the occurrence of matching responses for all 66 children. Neither of the raters had knowledge of the treatment conditions to which the children were assigned. In order to provide an estimate of interscorer reliability, the responses of 10 children were scored independently by both observers. Since the imitative responses were highly distinctive and required no subjective interpretation, the raters were virtually in perfect agreement (99%) in scoring the matching responses.

The number of different physical and verbal imitative responses emitted spontaneously by the children constituted the performance measure.

Acquisition Index

At the end of the performance session the experimenter entered the room with an assortment of fruit juices in a colorful juice-dispensing fountain, and booklets of sticker-pictures that were employed as the positive incentives to activate into performance what the children had learned through observation.

After a brief juice treat the children were informed, that for each physical or verbal imitative response that they reproduced, they would receive a pretty sticker-picture and additional juice treats. An achievement incentive was also introduced in order to produce further disinhibition and to increase the children's motivation to exhibit matching responses. The experimenter attached a pastoral scene to the wall and expressed an interest in seeing how many sticker-pictures the child would be able to obtain to adorn his picture.

The experimenter then asked the child, "Show me what Rocky did in the TV program," "Tell me what he said," and rewarded him immediately following each matching response. If a child simply described an imitative response he was asked to give a performance demonstration.

Although learning must be inferred from performance, it was assumed that the number of different physical and verbal imitative responses reproduced by the children under the positive-incentive condi-

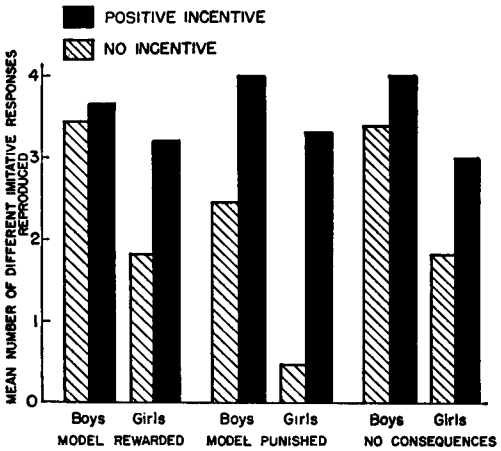

FIG. 1. Mean number of different matching responses reproduced by children as a function of positive incentives and the model's reinforcement contingencies.

tions would serve as a relatively accurate index of learning.

RESULTS

Figure 1 shows the mean number of different matching responses reproduced by children in each of the three treatment conditions during the no-incentive and the positive-incentive phases of the experiment. A square-root transformation ($y = \sqrt{f + \frac{1}{2}}$) was applied to these data to make them amenable to parametric statistical analyses.

Performance Differences

A summary of the analysis of variance based on the performance scores is presented in Table 1. The findings reveal that reinforcing consequences to the model had a significant effect on the number of matching responses that the children spontaneously reproduced. The main effect of sex is also highly significant, confirming the prediction that boys would perform more imitative responses than girls.

Further comparisons of pairs of means by t tests (Table 2) show that while the model-rewarded and the no-consequences groups did not differ from each other, subjects in both of these conditions performed significantly more matching responses than children who had observed the model experience punishing consequences following the display of aggression. It is evident, however, from the differences reported separately for boys and girls in Table 2, that the significant effect of the model's reinforcement contingencies is based predominantly on differences among the girls' subgroups.[3]

TABLE 1

ANALYSIS OF VARIANCE OF IMITATIVE PERFORMANCE SCORES

Source	*df*	*MS*	*F*
Treatments (T)	2	1.21	3.27*
Sex (S)	1	4.87	13.16**
T × S	2	.12	<1
Within groups	60	.37	

* $p < .05$.
** $p < .001$.

TABLE 2

COMPARISON OF PAIRS OF MEANS BETWEEN TREATMENT CONDITIONS

Performance measure	Treatment conditions		
	Reward versus punishment t	Reward versus no consequences t	Punishment versus no consequences t
Total sample	2.20**	0.55	2.25**
Boys	1.05	0.19	1.24
Girls	2.13**	0.12	2.02*

* $p < .05$.
** $p < .025$.

Differences in Acquisition

An analysis of variance of the imitative learning scores is summarized in Table 3. The introduction of positive incentives completely wiped out the previously observed performance differences, revealing an equivalent amount of imitative learning among the children in the model-rewarded, model-punished, and the no-consequences treatment groups. Although the initially large sex difference was substantially reduced in the positive-incentive condition, the girls nevertheless still displayed fewer matching responses than the boys.

[3] Because of the skewness of the distribution of scores for the subgroup of girls in the model-punished condition, differences involving this group were also evaluated by means of the Mann-Whitney U test. The nonparametric analyses yield probability values that are identical to those reported in Table 2.

Acquisition-Performance Differences

In order to elucidate further the influence of direct and vicariously experienced reinforcement on imitation, the differences in matching responses displayed under nonreward and positive-incentive conditions for each of the three experimental treatments were evaluated by the *t*-test procedure for correlated means. Table 4 shows that boys who witnessed the model either rewarded or left without consequences performed all of the imitative responses that they had learned through observation and no new matching responses emerged when positive reinforcers were made available. On the other hand, boys who had observed the model punished and girls in all three treatment conditions showed significant increments in imitative behavior when response-contingent reinforcement was later introduced.

TABLE 4

SIGNIFICANCE OF THE ACQUISITION-PERFORMANCE DIFFERENCES IN IMITATIVE RESPONSES

Group	Treatment conditions		
	Reward *t*	Punishment *t*	No consequences *t*
Total sample	2.38*	5.00***	2.67**
Boys	0.74	2.26*	1.54
Girls	3.33**	5.65***	2.18*

* $p < .025$.
** $p < .01$.
*** $p < .001$.

DISCUSSION

The results of the present experiment lend support to a contiguity theory of imitative learning; reinforcements administered to the model influenced the observers' performance but not the acquisition of matching responses.

It is evident from the findings, however, that mere exposure to modeling stimuli does not provide the sufficient conditions for imitative or observational learning. The fact that most of the children in the experiment failed to reproduce the entire repertoire of behavior exhibited by the model, even under positive-incentive conditions designed to disinhibit and to elicit matching responses, indicates that factors other than mere contiguity of sensory stimulation undoubtedly influence imitative response acquisition.

Exposing a person to a complex sequence of stimulation is no guarantee that he will attend to the entire range of cues, that he will necessarily select from a total stimulus complex only the most relevant stimuli, or that he will even perceive accurately the cues to which his attention is directed. Motivational variables, prior training in discriminative observation, and the anticipation of positive or negative reinforcements contingent on the emission of matching responses may be highly influential in channeling, augmenting, or reducing observing responses, which is a necessary precondition for imitative learning (Bandura, 1962; Bandura & Walters, 1963). Procedures that increase the distinctiveness of the relevant modeling stimuli also greatly facilitate observational learning (Sheffield & Maccoby, 1961).

In addition to attention-directing variables, the rate, amount, and complexity of stimuli presented to the observer may partly determine the degree of imitative learning. The acquisition of matching responses through observation of a lengthy uninterrupted sequence of behavior is also likely to be governed by principles of associate learning such as frequency and recency, serial order effects, and other multiple sources of associative interference (McGuire, 1961).

Social responses are generally composed of a large number of different behavioral units combined in a particular manner. Responses of higher-order complexity are produced by combinations of previously learned components which may, in themselves, represent relatively complicated behavioral patterns. Consequently, the rate of acquisition of intricate matching responses through observation will be largely determined by the extent to which the necessary components are con-

TABLE 3

ANALYSIS OF VARIANCE OF IMITATIVE LEARNING SCORES

Source	*df*	*MS*	*F*
Treatments (T)	2	0.02	<1
Sex (S)	1	0.56	6.22*
T × S	2	0.02	<1
Within groups	60	0.09	

* $p < .05$.

tained in the observer's repertoire. A person who possesses a very narrow repertoire of behavior, for example, will, in all probability, display only fragmentary imitation of a model's behavior; on the other hand, a person who has acquired most of the relevant components is likely to perform precisely matching responses following several demonstrations. In the case of young preschool children their motor repertoires are more highly developed than their repertoires of verbal responses. It is, perhaps, for this reason that even in the positive-incentive condition, children reproduced a substantially higher percentage (67%) of imitative motor responses than matching verbalizations (20%). A similar pattern of differential imitation was obtained in a previous experiment (Bandura & Huston, 1961) in which preschool children served as subjects.

It is apparent from the foregoing discussion that considerably more research is needed in identifying variables that combine with contiguous stimulation in governing the process of imitative response acquisition.

It is possible, of course, to interpret the present acquisition data as reflecting the operation of generalization from a prior history of reinforcement of imitative behavior. Within any social group, models typically exhibit the accumulated cultural repertoires that have proved most successful for given stimulus situations; consequently, matching the behavior of other persons, particularly the superiors in an age-grade or prestige hierarchy, will maximize positive reinforcement and minimize the frequency of aversive response consequences. Since both the occurrence and the positive reinforcement of matching responses, whether by accident or by intent, are inevitable during the course of social development, no definitive resolution of the reinforcement issue is possible, except through an experiment utilizing organisms that have experienced complete social isolation from birth. It is evident, however, that contemporaneous reinforcements are unnecessary for the acquisition of new matching responses.

The finding that boys perform more imitative aggression than girls as a result of exposure to an aggressive male model, is in accord with results from related experiments (Bandura et al., 1961, 1963a). The additional finding, however, that the introduction of positive incentives practically wiped out the prior performance disparity strongly suggests that the frequently observed sex differences in aggression (Goodenough, 1931; Johnson, 1951; Sears, 1951) may reflect primarily differences in willingness to exhibit aggressive responses, rather than deficits in learning or "masculine-role identification."

The subgroups of children who displayed significant increments in imitative behavior as a function of positive reinforcement were boys who had observed the aggressive model punished, and girls for whom physically aggressive behavior is typically labeled sex inappropriate and nonrewarded or even negatively reinforced. The inhibitory effects of differing reinforcement histories for aggression were clearly reflected in the observation that boys were more easily disinhibited than girls in the reward phase of the experiment. This factor may account for the small sex difference that was obtained even in the positive-incentive condition.

The present study provides further evidence that response inhibition and response disinhibition can be vicariously transmitted through observation of reinforcing consequences to a model's behavior. It is interesting to note, however, that the performance by a model of socially disapproved or prohibited responses (for example, kicking, striking with objects) without the occurrence of any aversive consequences may produce disinhibitory effects analogous to a positive reinforcement operation. These findings are similar to results from studies of direct reinforcement (Crandall, Good, & Crandall, 1964) in which nonreward functioned as a positive reinforcer to increase the probability of the occurrence of formerly punished responses.

Punishment administered to the model apparently further reinforced the girls' existing inhibitions over aggression and produced remarkably little imitative behavior; the boys displayed a similar, though not significant, decrease in imitation. This difference may be partly a function of the relative dominance of aggressive responses in the repertoires of boys and girls. It is also possible that vicarious reinforcement for boys, deriving from the mod-

el's successful execution of aggressive behavior (that is, overpowering the noncompliant adversary), may have reduced the effects of externally administered terminal punishment. These factors, as well as the model's self-rewarding and self-punishing reactions following the display of aggression, will be investigated in a subsequent experiment.

REFERENCES

BAER, D. M., & SHERMAN, J. A. Reinforcement control of generalized imitation in young children. *Journal of Experimental Child Psychology,* 1964, **1**, 37–49.

BANDURA, A. Social learning through imitation. In M. R. Jones (Ed.), *Nebraska symposium on motivation: 1962.* Lincoln: Univer. Nebraska Press, 1962. Pp. 211–269.

BANDURA, A. Vicarious processes: A case of no-trial learning. In L. Berkowitz (Ed.), *Advances in experimental social psychology.* Vol. 2. New York: Academic Press, 1965, in press.

BANDURA, A., & HUSTON, ALETHA C. Identification as a process of incidental learning. *Journal of Abnormal and Social Psychology,* 1961, **63**, 311–318.

BANDURA, A., ROSS, DOROTHEA, & ROSS, SHEILA A. Transmission of aggression through imitation of aggressive models. *Journal of Abnormal and Social Psychology,* 1961, **63**, 575–582.

BANDURA, A., ROSS, DOROTHEA, & ROSS, SHEILA A. Imitation of film-mediated aggressive models. *Journal of Abnormal and Social Psychology,* 1963, **66**, 3–11. (a)

BANDURA, A., ROSS, DOROTHEA, & ROSS, SHEILA A. Vicarious reinforcement and imitative learning. *Journal of Abnormal and Social Psychology,* 1963, **67**, 601–607. (b)

BANDURA, A., & WALTERS, R. H. *Social learning and personality development.* New York: Holt, Rinehart, & Winston, 1963.

CRANDALL, VIRGINIA C., GOOD, SUZANNE, & CRANDALL, V. J. The reinforcement effects of adult reactions and non-reactions on children's achievement expectations: A replication study. *Child Development,* 1964, **35**, 385–397.

GOODENOUGH, FLORENCE L. *Anger in young children.* Minneapolis: Univer. Minnesota Press, 1931.

JOHNSON, ELIZABETH Z. Attitudes of children toward authority as projected in their doll play at two age levels. Unpublished doctoral dissertation, Harvard University, 1951.

MCGUIRE, W. J. Interpolated motivational statements within a programmed series of instructions as a distribution of practice factor. In A. A. Lumsdaine (Ed.), *Student response in programmed instruction: A symposium.* Washington, D. C.: National Academy of Sciences, National Research Council, 1961. Pp. 411–415.

MILLER, N. E., & DOLLARD, J. *Social learning and imitation.* New Haven: Yale Univer. Press, 1941.

MOWRER, O. H. *Learning theory and the symbolic processes.* New York: Wiley, 1960.

SEARS, PAULINE S. Doll play aggression in normal young children: Influence of sex, age, sibling status, father's absence. *Psychological Monographs,* 1951, **65**(6, Whole No. 323).

SHEFFIELD, F. D. Theoretical considerations in the learning of complex sequential tasks from demonstration and practice. In A. A. Lumsdaine (Ed.), *Student response in programmed instructions: A symposium.* Washington, D. C.: National Academy of Sciences, National Research Council, 1961. Pp. 13–32.

SHEFFIELD, F. D., & MACCOBY, N. Summary and interpretation on research on organizational principles in constructing filmed demonstrations. In A. A. Lumsdaine (Ed.), *Student response in programmed instruction: A symposium.* Washington, D. C.: National Academy of Sciences, National Research Council, 1961. Pp. 117–131.

WALTERS, R. H., LEAT, MARION, & MEZEI, L. Inhibition and disinhibition of responses through empathetic learning. *Canadian Journal of Psychology,* 1963, **17**, 235–243.

(Received October 21, 1963)