EFFECTS OF PROMPTING AND REINFORCEMENT OF ONE RESPONSE PATTERN UPON IMITATION OF A DIFFERENT MODELED PATTERN

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Twelve preschool children participated in a study of the effects of explicit training on the imitation of modeled behavior. The responses trained involved a marble-dropping pattern that differed from the modeled pattern. Training consisted of physical prompts and verbal praise during a single session. No prompts or praise were used during test periods. After operant levels of the experimental responses were measured, training either preceded or was interposed within a series of exposures to modeled behavior that differed from the trained behavior. Children who were initially exposed to a modeling session immediately imitated, whereas those children who were initially trained immediately performed the appropriate response. Children initially trained on one pattern generally continued to exhibit that pattern even after many modeling sessions. Children who first viewed the modeled response and then were exposed to explicit training of a different response reversed their response pattern from the trained response to the modeled response within a few sessions. The results suggest that under certain conditions explicit training will exert greater control over responding than immediate modeling stimuli.

Key words: imitation, conditioning history, marble dropping, children

The probability of imitation is a function of both historical and immediate environmental factors. Research on immediate environmental factors has demonstrated the influence of model characteristics (Bandura, 1969), probability of current reinforcement or punishment (Bandura, 1965; Miller & Dollard, 1941), and instructions and other demand characteristics (Peterson, 1968; Steinmen, 1970). Historical factors have received less attention. History of reinforcement for imitation in general (Baer & Sherman, 1964) and history of general instruction-following (Martin, 1971) have been shown to influence subsequent imitation. History of involvement with materials used in modeling has thus far largely involved passive exposure (e.g., familiarity, cf. Roberts, Santogrossi, & Thelen, 1976; Vasta, Andrews, Griffin, & Kwiatkoski, 1978).

A study by Bondy and Erickson (1977) suggested that children would modify their imi-

tative performance in accordance with their previous history of using the material, but history was not directly manipulated. The present study tested whether training one response pattern (via prompting and praising) would influence the probability of topographically identical imitation of a different modeled response pattern. Single-subject methodology made it possible for each subject's operant level of particular response patterns to serve as a control for interpreting the effects of the experimental manipulations.

A simple motor response (dropping marbles in cans) was selected because it was not likely to be in the subject's repertoire before the experiment, yet could be quickly acquired. Training was introduced either prior to or within a series of exposures to the modeled behavior. The study assessed the occurrence of response pattern reversals, either from the trained response pattern to the modeled pattern, or vice versa.

METHOD

Subjects

Twelve children (six males, six females) between the ages of four years six months and five years six months (mean age = five years

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one month) participated. The children were of varied ethnic backgrounds, of predominantly low socio-economic status, and attended a local Day Care Center. Parental consent was obtained in writing and the children were free to refuse to participate during any portion of the experiment.

Materials

Three videotapes served as modeling stimuli. The activity control videotape showed an adult and an infant playing simple floor games. This film was used during operant level sessions. The single-can videotape showed a male undergraduate student sitting behind a desk. Upon the desk were two tin cans, one white and the other black, and between them a box containing marbles. The model picked up a single marble at a time and placed it (approximately 1 marble every five seconds) into a single can. The alternating-can videotape showed the same adult in the same setting, but now the adult dropped marbles alternately into the white can, the black, the white, the black, etc. at the same rate as in the single-can videotape. All tapes were two minutes long.

The testing room, located in the Day Care Center, consisted of an area approximately 1.5 m by 2.5 m. Within this area was a chair, a table, one black tin can, one white tin can, a box of approximately 150 marbles placed between the cans, a toy car, and several simple wooden toys. One wall of the testing room had two one-way mirrors (30 cm by 30 cm) behind which observers sat.

Observers sat with pocket-calculator keyboards in their laps. Each key was linked to one track on a Rustrak Model 392-16 event recorder. Two observers could record their observations simultaneously. The responses recorded were:

- 1) Dropping a marble into the white can
- 2) Dropping a marble into the black can

The event records were analyzed for the number of marble drops and for the order in which marbles were placed in the cans (i.e., alternate versus repeat sequences).

Procedure

Operant level sessions. During the initial session, the children were asked by the experimenter to watch a TV show of a friend playing. Then, one at a time, the children were

shown the activity-control videotape outside the testing room. Then the children were brought into the test room and told that they could play with anything in the room and that the experimenter would return shortly. During the next five minutes, the children's behavior was observed and recorded. Following this observation period, the experimenter returned, briefly talked with each child and returned the child to the day care room.

Modeling sessions. Modeling sessions were conducted similarly to the operant-level session except that the children watched either the single-can or alternating-can videotape before entering the test room for a five-minute observation period.

Training sessions. During each child's training session the experimenter accompanied the child into the testing room and physically prompted and then praised the children for either a) dropping marbles only into the white can, or b) dropping marbles only into the black can, or c) alternately dropping marbles into the white and the black cans. No modeling or specific instructions (i.e., "Drop the marbles into the white can") were provided. The length of the training session (10 to 20 min) varied. The amount of praise was reduced in order to establish a stable rate of marble dropping (approximately one marble drop per 5 sec, equivalent to the model's rate of marble dropping) while the experimenter remained with the child. At this point, all marbles were returned to the holding box, and the experimenter left the test area for 5 min, again suggesting that the child could play with whatever he or she wished.

Design

All modeling and training sessions were immediately followed by the 5-min observation period. All children initially were shown the activity control videotape and were then observed on their own. This observation period established each child's initial operant level of dropping marbles in cans.

There were six sequences with two children exposed to each. Four sequences involved training before modeling (T1 through T4), one involved training after one modeling session (M1), and the other introduced training after two modeling sessions (M2). In T1, children were trained to drop a marble into a single can (the white can for one child, the black can

Table 1
Treatments

Designation	Child	1	2	3	4	5	6
T1	C1, C2	OP	TS	OP	OP	OP	OP
T2	C3, C4	OP	TS(black can)	MA	MA	MA	MA
T3	C5, C6	OP	TS(white can)	MA	MA	MA	MA
T4	C7, C8	OP	TA	MS	MS	MS	MS
M1	C9, C10	OP	MA	TS	MA	MA	MA
M2	C11, C12	OP	MA	MA	TS	MA	MA

Order of treatments for all children, where TS = train on single can, TA = train to alternate, MS = observe single-can videotape, MA = observe alternating-can videotape, OP = operant level following activity-control videotape.

for the other), and on subsequent sessions, again observed the activity-control videotape. Children in T2 and T3 observed the activity-control videotape and then were taught to drop marbles into a single can (T2:black can, T3:white can) and subsequently observed the alternating-can modeling videotape. Children in T4 were taught to alternate cans before observing the single-can modeling videotape. These particular training-before-modeling treatments were selected to counterbalance the influence of response biases (i.e., white can versus black can, single versus alternating).

Children in M1 observed the alternating-can modeling videotape. Children in M2 were exposed to the alternating-can modeling videotape for two consecutive sessions in order to assess whether imitation would be maintained over time. The children in M1 and M2 were then trained to drop marbles into a single can (one child from each treatment into the white can, the other child into the black can). Following the single training session, these children again observed the alternating-can videotape.

The total number of sessions varied due to a number of factors which included illness, two consecutive no-response sessions (C6), leaving the day care center, etc. The specific numbers of sessions for each subject will be evident in the data presentation below. Sessions were conducted no more than one week apart.

Reliability

The data records were divided into 1-min periods. Inter-rater reliability was assessed on approximately 20% of the test sessions. Inter-rater reliability for a session was the total number of agreements on which can a marble was dropped into (agreement within one second),

divided by the total agreements plus disagreements. By this measure, inter-rater reliability ranged from 85% to 100% with an overall mean of 93%.

RESULTS

The minute-by-minute alternating and non-alternating marble-dropping rates for each child for each minute of all conditions are presented in Figures 1 and 2. All children assigned to initial procedures involving a single can (black or white) exclusively used that particular can. Therefore, all such responses were pooled as single-can marble drops. In the baseline condition, after observing the activity-control videotape, one child dropped a single marble; the others dropped none. Response rates for children in the T (training-before-modeling) treatments indicated that training successfully induced the trained response to occur when the experimenter was no longer present. Performance of children in the M (modeling-before-training) treatment suggests modest effectiveness of the videotapes in promoting imitation.

The children in T1 (operant level - train - operant level) continued to drop marbles in the posttraining sessions at a rate (17.5 per min) similar to that reached in the training session (18.8 per min). Children in the other training-before-modeling treatments continued to drop marbles during sessions that followed observation of the modeling tape in a manner and rate (19.5 per min) similar to that reached in the training session (21.0 per min). In general, these children continued to perform the trained response even after several viewings of the videotape that modeled a different response pattern. Departures from this pattern are discussed below.

Fig. 1. The number of marbles dropped by each child in Groups T1, T2, and T3 during each minute of all sessions. The X's show the rate of marbles dropped into a single can (nonalternating) and the dots show the rate of alternation.

The children who received the modeling-before-training treatments (M1 and M2) dropped marbles alternately in the two cans after their initial modeling session (14.8 per min), thus conforming to the modeled behavior. Following training to drop marbles in just one can, these children dropped marbles into a single can at a rate (30.6 per min) comparable to the

rate displayed by the children who received training before modeling. After subsequently reviewing the videotape that modeled the alternating-response pattern, each child performed the single-can response at a higher rate (32.2 per min) than the modeled alternating response (12.8 per min). However, during the next several sessions with exposure to the mod-

Fig. 2. The number of marbles dropped by each child in Groups T4, M1, and M2 during each minute of all sessions. The X's show the rate of marbles dropped into a single can (nonalternating) and the dots show the rate of alternation.

cled response, the rate of the modeled response came to exceed that of the trained response. For three of the four children in treatments M1 and M2, the rate of the modeled response (25.1 per min) was clearly greater than the rate of the trained response (12.3 per min) by their last experimental session. The remaining child in this group (C12) left the day

care center before any response dominance was apparent. There were no differences between males and females, nor any color biases (black can vs. white can).

The occurrence of response reversals and the time to such reversals served as useful dependent measures. A session during which the 5-min marble-dropping rate was greater for the

response not dominant in the preceding session was selected as indicating a response pattern reversal. For the children who were initially trained on a response pattern prior to viewing modeling of a different response, only one of the six children reversed from the trained to the modeled response. This child reversed during the eighth posttraining modeling session. Of the four children who observed modeling prior to being trained, three displayed reversals by the third posttraining modeling session. The fourth child's two response rates during the second posttraining modeling session were nearly equal.

DISCUSSION

The results support the important role that explicit training plays in determining a child's responses to subsequent modeling of a different response. Children who received training before modeling all engaged in the trained response during their first posttraining test session. This outcome replicates many operant studies with children (cf. Staats, 1975). The children who viewed the alternating-response videotape prior to any training immediately imitated the modeled response, an outcome which replicates many modeling studies (cf. Bandura, 1971). More important was the effect that training had on subsequent responses to modeled response patterns. Children who were trained on a response that differed from the modeled response continued to perform the trained response following the first subsequent modeling session. This pattern was true even for children who had observed and imitated the modeled response before being trained to perform a different response.

Most of the children who had training before modeling continued to drop marbles during the subsequent modeling sessions exclusively in the way they had been trained. In other words, for most of the children, and given the parameters of the current training and modeling procedures, a single (and initial) training session resulted in long-term response maintenance despite exposure to a series of modeling sessions involving a different response. However, one child displayed a different pattern and changed the dominant pattern during the course of successive modeling sessions from the trained response to the modeled response. This response reversal did not

occur until after many modeling sessions. It appears that after training followed by extended modeling exposure, the behavior of this child came to be controlled more by immediate modeling stimuli than more remote reinforcement history. Whether this kind of change would occur more frequently, as a function of absolute time since the end of training with reinforcement, the number of reinforced responses, or the type or number of modeling exposures remains to be explored.

The children who had one or two modeling sessions before training (Groups M1 and M2) showed strong evidence of response reversals during the extended modeling sessions that followed their training. In addition, the time to these response reversals was typically much less than for the one child that showed a reversal when no modeling sessions had preceded training. Three of the four children evidenced response reversals by the third posttraining modeling session, and the remaining child showed some evidence of response reversal during the second such session. If the modeled response was imitated before training then exact imitation may recur relatively rapidly following subsequent modeling experiences. Alternatively, initial training of a particular response resulted in strong resistance to the influence of modeling stimuli related to a different response pattern. Therefore, the type of initial experience a child has in a given situation appears to substantially affect the extent to which imitation will subsequently occur under modeling conditions.

The results of this study also suggest certain cautions for traditional assumptions regarding "naive" subjects in modeling studies (cf. Bandura, 1965). If a subject does not perform the modeled response prior to modeling, then the subject is assumed to be experimentally "naive." If we restricted our observation to the to-be-imitated response, then the children who had a training session before a modeling session would have been termed "naive" prior to their initial modeling session, since they did not yet display the modeled response. However, the performance of these children following their first modeling session was clearly different from the performance of those children with no known training history. Rather than restricting future attempts at establishing whether a child is experimentally naive to the observation of topographically

unique responses, it may be more useful to test for a variety of responses within the same response class as the modeled response. For example, in a study such as Bandura's (1965), which was designed to study the acquisition of novel aggressive responses, instead of determining only whether the specific to-be-modeled responses involving the Bobo doll were emitted, a measure of the strength of a variety of responses directed toward the Bobo doll might have been preferable. If a child had displayed a strong tendency to produce some nonhitting response toward the Bobo doll, the results of the current study suggest that subsequent imitation of hitting responses might not have occurred.

The role that time plays in the interaction between specific reinforcement procedures and modeling procedures needs to be more clearly delineated. For example, it may be that as the time between an initial modeling session and a subsequent training session increases, the reappearance of the modeled response following subsequent modeling exposures will take longer. The time between a training experience and subsequent modeling may also affect how soon the modeled response appears. In general, the present results suggest that the effect of modeling procedures is influenced by an individual's reinforcement history with respect to the stimulus materials and the modeled response.

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