THE EFFECT OF VICARIOUS REINFORCEMENT ON ATTENTIVE BEHAVIOR IN THE CLASSROOM¹

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The effect of social reinforcement delivered to target subjects on the attentive behavior of adjacent peers was examined in a classroom setting. In a combined reversal and multiple baseline design, two pairs of mentally retarded children were sequentially exposed to three reinforcement phases. After baseline rates of attentive behavior were obtained, praise was delivered to the target subject in each subject pair for attentive behavior. After a reversal phase, praise was delivered contingently to target subjects for inattentive behavior. In a final phase, contingent praise for attentive behavior was reinstated for the target subjects. Throughout the study, nontarget subjects received no direct reinforcers. The results indicated a vicarious reinforcement effect. Reinforcing attentive behavior of target subjects increased this behavior in adjacent peers. However, reinforcing *inattentive* behavior of target subjects also increased the *attentive* behavior of adjacent peers. The effects obtained through vicarious reinforcement were considered to reflect the discriminative stimulus properties of reinforcement, which may serve as a cue for the performance of nonreinforced peers.

Several authors have noted that learning can take place directly from the experience of others (Bandura and Walters, 1963; Campbell, 1961; Miller and Dollard, 1941). A particular form of this kind of learning occurs when the responses of one individual are altered by observing the delivery of reinforcers to another person, *i.e.*, vicarious reinforcement (Bandura, 1971; Hill, 1960; Kanfer, 1965). An essential condition for establishing a vicarious reinforcement effect, of course, is that the observer's performance is not directly reinforced. It is assumed that behavior of the observer is altered in the same direction as that of a reinforced model. While this assumption has been amply supported, particularly in laboratory settings (see Bandura, 1971 for review), it does not always hold. For example, Sechrest (1963) showed that the explicit or direct reinforcement of one

child under certain circumstances serves as implicit punishment for a partner. Apparently, vicarious reinforcement can be somewhat more complex than the simple delivery of reinforcement mediated "through" a model, and may depend upon situational cues and inferences the observer makes about his own performance.

Vicarious reinforcement has important implications for reinforcement programs in applied settings. The inadvertent effects of direct reinforcement may significantly improve behaviors in nonreinforced individuals. In fact, this is often assumed to be the case. For example, to handle behavior problems, particularly in the classroom, behavior modifiers frequently recommend the use of vicarious reinforcement. A specific recommendation given is that a teacher can develop behavior in one child by reinforcing the desired behavior of someone else nearby (Ackerman, 1972; Becker, Engelmann, and Thomas, 1971; Buckley and Walker, 1970; Diebert and Harmon, 1970; Meacham and Wiesen, 1969). Through vicarious effects it is hoped that the behavior of the observer will change in the same manner as that of the model. Anecdotal reports

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suggest that this is the case (Bolstad and Johnson, 1972; Hall, Lund, and Jackson, 1968; Surratt, Ulrich, and Hawkins, 1969).

In spite of the potential importance of vicarious effects of the contingencies in applied settings, they have not been extensively investigated. In one classroom study, the effect of vicarious punishment was demonstrated (Kounin and Gump, 1958). Disciplining target students affected adjacent individuals who were not directly disciplined. The authors referred to the spread of effects as the "ripple effect". Their analysis suggests a variety of behavioral effects that vicarious punishment had on the observer depending, to some extent, on the type of punishment used. (See Kounin, 1970 for review.)

Broden, *et al.*, (1970) showed that reinforcing a target subject's attending behavior in the classroom increased similar behavior in a nontarget (adjacent) peer. However, as the authors note, there was a slight increase in contingent teacher attention delivered to the nontarget subject during the phase in which vicarious reinforcement was examined. Hence, the improved behavior of the nontarget subject may simply reflect the direct operation of reinforcement. Moreover, teacher proximity (which may itself be reinforcing or serve as a cue for response consequence) covaried with direct and vicarious reinforcement. Thus, it was not clear that the improved performance of the target subject reflected vicarious reinforcement or the presence of other stimulus events.

The major purpose of the present investigation was to demonstrate the effect of reinforcement delivered to target subjects on the attentive behavior of nonreinforced adjacent peers in a classroom setting. Both the amount of reinforcement and proximity of the reinforcing agent to the adjacent subjects were carefully controlled.

METHOD

Overview

Vicarious reinforcement was evaluated in a combined multiple baseline and reversal experi-

mental design (Baer, Wolf, and Risley, 1968). The multiple baseline design was included because the phenomenon being evaluated (vicarious reinforcement) suggests a spread of the effect of reinforcement for one individual on the behavior of others in the classroom. This effect was controlled for by gathering data across two nonadjacent pairs of subjects in the classroom and subjecting each pair to the experimental conditions at different points in time. Five experimental phases were presented in the same order for each pair. The effect of reinforcement was evaluated by identifying in each subject pair a target subject who would receive direct reinforcement and a nontarget subject who would not over the duration of the study.

An *a priori* time restriction determined the maximum duration of the individual experimental phases. To complete the study in the academic term, the phases could average approximately eight days each. The study lasted for 38 days spread over approximately 11 weeks. The experiment was conducted in the mornings for four days each week. One morning weekly (Monday) was devoted to music. The study was not conducted at this time. The remaining days were lost due to holidays and absences on the part of a subject or the teacher.

Subjects and Setting

Four moderately retarded elementary school students, enrolled at the laboratory demonstration school at The Pennsylvania State University, served. The class consisted of 14 children. Two boys and two girls constituted the two pairs of subjects used for this study. Ken, age 10, achieved a verbal score of 66 on Wechsler Intelligence Scale for Children (WISC). Ralph, age 12, had attained a WISC verbal score of 67. Jane, age 8, had a WISC verbal score of 71. Laura, age 10, achieved a verbal score of 57 on the WISC.

The two boys sat side by side at a large table at the back of the classroom. The two girls sat beside each other at the side of the room out of direct view of the two boys. All four subjects

faced the center of the room. For each pair of subjects there were no other children within approximately 7 ft. This arrangement was not especially constructed for the present study.

Within each pair of subjects, one was randomly assigned to receive direct reinforcement during the study. Of the two boys, Ken was selected as the target subject. Of the two girls, Jane was the target subject. Reinforcement was delivered directly to these subjects during the experimental phases. Conversely, Ralph and Laura received no direct reinforcement during the study. Thus, vicarious reinforcement effects were observed on their performance.

Assessment

Observations were conducted daily on each pair of subjects from approximately 9:15 to 9:45 a.m. after a lesson had been assigned by the teacher. Each pair of subjects was observed daily for 50 intervals (8.33 min). Each interval was divided into 5 sec for observing followed by 5 sec for recording. During an interval, the behavior of *both* members of a pair was simultaneously but separately scored for that interval. Thus, an observer would look at both members of a pair for 5 sec, stop observing, and score the behavior of both subjects separately for the interval. After observations were completed for the first pair (boys), the second pair (girls) was observed. When an observer made recordings for a given subject pair, he sat 3 ft behind the students and directly between them. The children had the opportunity to become accustomed to this arrangement, as an observer practised for two weeks before the study began.

The behaviors observed were categorized as either attentive or inattentive for each student (Kazdin, 1973). In order to be scored for attentive behavior, the child had to be sitting in his seat, working on the assignment, and not talking to a neighbor without permission. The child had to be attentive for the entire 5 sec of the observational interval. Behavior was considered inattentive if the child did not meet the above requirements, or played with materials in-

appropriate to the task, or reclined on his desk. In each observation interval either, a "+" (attentive) or "0" (inattentive) was checked by the observer for each member of the pair being observed.

Each day, individual seat work (handwriting) constituted the assigned task. This lesson continued throughout the study. During this lesson the teacher usually tutored children in the room (not subjects in the study), prepared materials for subsequent tasks, and answered questions.

Reliability of observations. Checks on the reliability of observation were made approximately every five days throughout the study for a total of eight reliability sessions. In computing reliability, agreement during an observation interval was counted only when two observers agreed upon the behavior scored for *each* of the students simultaneously observed. If the observers disagreed upon the score of either one or both subjects in a pair, the entire interval counted as a disagreement. Reliability was determined by computing the number of intervals in which there was agreement over total intervals observed. Forming a percentage from this, reliability ranged from 91% to 100% during the study (mean = 95.6%).

Reinforcement

Reinforcement throughout the study consisted of verbal praise expressed in the statements: "Good, I like what you're doing!" or "That's really good!" or "Good, you're doing nicely!" One of these statements was used for an instance of reinforcement. The verbal praise did not specify the behavior being performed (*e.g.*, sitting appropriately, writing, or attentiveness, in general). Explicit information was excluded from the praise to determine if information was available (to the nontarget subject) from either the target subject's (*i.e.*, model's) behavior or the cue properties of reinforcement. To ensure that reinforcement was directed to the target subject, the subject's name was included in each instance of praise (*e.g.*, "Good, Ken. You're

doing nicely!" or "Jane, that's really good!").

Reinforcement was delivered by the observer on the basis of the interval data collected. Counting the behavior scored in an interval as a response (attentive response), reinforcement was delivered on a fixed-ratio (FR 5) schedule. For every fifth interval of attentive behavior (or in one experimental phase every fifth interval of inattentive behavior), verbal praise was delivered immediately after the interval was marked. (An exception to the FR 5 schedule is discussed below.) To praise the target subject, the observer leaned forward between both subjects in a subject pair. The observer then leaned back into his seat and continued observing. In this way, the observer did not differ in proximity from the two subjects in a pair when observing or when reinforcing the target subject.

Experimental Conditions

Each pair of subjects was exposed to the same order of experimental phases. However, the phases began at different periods for each pair.

Baseline. Attentive behavior was recorded for each child without invoking contingencies for performance. Baseline conditions were in effect for the first six days of the study for Ken and Ralph and for the first 14 days for Jane and Laura.

Reinforcement for attentive behavior. Direct reinforcement for the target subject in each pair was delivered to ascertain if this would vicariously influence the behavior of nontarget subjects. On the seventh day of observations, Ken received reinforcement for attentive behavior. For every fifth interval Ken was scored as attentive, he received reinforcement. No reinforcement was delivered to Ralph. For Ken and Ralph, this phase continued until Day 14.

For the second pair of subjects, this phase began on the fifteenth day and continued through the twentieth day of the study. Jane received reinforcement for attentive behavior, but Laura did not. Because Jane's operant rate of attentive behavior was markedly low during baseline, it

was decided to begin reinforcement on an FR 2 schedule and eventually thin the schedule to FR 5, as used with the boys. However, after only three instances of praise (FR 2) in the first session, Jane's attentive behavior dramatically increased so the schedule was moved to FR 5. The schedule of reinforcement throughout the remainder of the study was kept at FR 5 for the two subjects receiving reinforcement.

Reversal. This phase was employed to determine if direct reinforcement delivered to the target subject controlled attentive behavior in the target and nontarget subject in each pair. During the reversal phase, no reinforcement was delivered. For the two boys, this phase began at Day 15 and continued until Day 20. For the girls, this phase began at Day 21 and continued until Day 27.

Reinforcement for inattentive behavior. The purpose of this phase was to determine if the behavior of the target subjects, which was reinforced, was imitated by the nontarget subjects. During this phase, the target subject in each pair received reinforcement for inattentive behaviors. For both target subjects, an FR 5 schedule was used. Praise (e.g., "Good, Jane. I like what you're doing!") was delivered for every fifth interval of inattentive behavior, as defined earlier. For the boys, this phase began at Day 21 and continued until Day 27. For the girls, the phase began at Day 28 and continued until Day 34.

Reinforcement for attentive behavior. This final experimental phase was included primarily to ensure that the target subjects would not maintain inappropriate (inattentive) classroom behavior when the study was terminated. Also, this phase provided additional evidence for the vicarious reinforcement effect. Reinforcement was delivered to the target subject in each pair for attentive behavior (FR 5). Whenever the target subject was scored for five intervals of attentive behavior, he or she was praised. This phase began at Day 28 for the boys and at Day 35 for the girls and continued to the end of the study (Day 38).

RESULTS

The effect of the experimental conditions was evaluated on the percentage of intervals each day in which subjects were scored as attentive. The percentages of attentive behaviors for the two pairs of subjects are presented in Figures 1 and 2, respectively. The mean daily frequency of praise each subject received in each phase of the study is presented in Table 1.

Table 1

Mean daily frequency of praise delivered in each phase.

Subject	Base	Rft Att	Rev	Rft Inatt	Rft Att
Ken	0	7.1	0	6.6	7.7
Ralph	0	0	0	0	0
Jane	0	8.7	0	8.7	7.5
Laura	0	0	0	0	0

During baseline, when no experimental intervention was made, Ken and Ralph were attentive for 47.8% and 40.8% intervals per session, respectively. In this phase, Jane and Laura had means of 20.2% and 51.8% attentive behaviors, respectively. When Ken received reinforcement for attentive behavior, his mean increased to

Fig. 1. Attentive behavior of Ken and Ralph across experimental conditions. Baseline—no experimental intervention. Reinforcement for Ken only for Attentive Behavior. Reversal—return to Baseline conditions. Reinforcement for Ken only for Inattentive Behavior. Reinforcement for Ken only for Attentive Behavior. (Means for each phase are represented by dotted lines.)

Fig. 2. Attentive behavior of Jane and Laura across experimental conditions. Baseline—no experimental intervention. Reinforcement for Jane only for Attentive Behavior. Reversal—return to Baseline conditions. Reinforcement for Jane only for Inattentive Behavior. Reinforcement for Jane only for Attentive Behavior. (Means for each phase are represented by dotted lines.)

73.8% of attentive behavior per session. Although Ralph received no direct reinforcement, his mean attentive behavior increased to 64.3%. Jane, who received reinforcement for attentive behavior, increased to a mean of 85.0% per session. Laura also increased during this phase to a mean of 77.0% attentive behavior per session. Thus, contingent reinforcement of attentive behavior in target subjects increased this behavior in adjacent peers. During the reversal phase, no reinforcement was delivered for attentive behavior to either target subject. As evident in Figure 1, performance of attentive behavior for both Ken and Ralph declined to means of 44.3% and 45.3% per session, respectively. For Jane and Laura (Figure 2), attentive behavior declined to 18.0% and 50.6% per session, respectively. When reinforcement was no longer given to the target subjects, the behavior of all subjects returned to levels that closely approximated baseline. When reinforcement was delivered for inattentive behavior to the two target subjects, Ken's attentive behavior decreased slightly to a mean of 30.6%. Ralph, who received no reinforcement, increased in attentive behaviors to a mean of 75.7%. Praise delivered to Jane for inattentive behavior resulted in a mean attentive

behavior of 11.1%. Yet, Laura, who did not receive praise, increased in attentive behavior to a mean of 81.4%. For each pair of subjects, contingent praise of the target subject for inattentive behavior either reduced attentive behavior (Ken) or maintained behavior near the baseline level (Jane). However, the adjacent (nonreinforced) peer in each pair (Ralph and Laura) increased in attentive behavior. Reinstatement of contingent praise for attentive behavior in the two target subjects increased this behavior. Ken increased to a mean of 81.3% per session. Ralph, who did not receive reinforcement, averaged 80.9% intervals of attentive behavior. Jane's performance increased to 79.5% attentive behavior per session. Laura, who was not praised, remained at a mean of 81.0%. Reinforcing attentive behavior of target subjects increased this behavior for these subjects. However, the performance of nontarget subjects remained at levels attained in the previous phase when reinforcement was delivered to target subjects for inattentive behavior.

DISCUSSION

The major findings were that (1) contingent reinforcement delivered to a target subject altered the behavior of an adjacent peer who received no direct reinforcement, and (2) the behavior changes in the adjacent peer were not always in the same direction as that of the target subject receiving reinforcement. Reinforcement of attentive or inattentive behavior in the target subjects increased attentive behavior in the adjacent peers.

The effect of contingent reinforcement delivered to a target student on the behavior of an adjacent peer is in accord with the reports of other investigators who have suggested vicarious effects of reinforcement (Brodén *et al.*, 1970) or punishment (Kounin and Gump, 1958) in the classroom. In the Brodén *et al.*, (1970) demonstration of vicarious reinforcement, the "adjacent" subject actually received some direct contingent reinforcement for atten-

tive behavior. The present study showed that delivering reinforcement to some subjects for attentive behavior increases this behavior in adjacent subjects even when direct reinforcement delivered to the adjacent subjects is carefully controlled. Vicarious reinforcement reliably altered behaviors of the nontarget subjects. Thus, the recommendation frequently made to employ direct reinforcement for one child to alter the behaviors of other children vicariously is supported.

There are several interpretations available to explain a vicarious reinforcement effect. One interpretation is that the nonreinforced observer may simply imitate the behavior of the model which led to reinforcement. In this case, it is the actual behavior of the model that is important. The nonreinforced subject in a classroom setting performs attentive behavior through imitation of the model. Another interpretation to explain the effect of vicarious reinforcement relates to the distractibility of the target subject. The adjacent nonreinforced subject may improve in behavior when a target subject receives reinforcement because the target subject no longer serves as a source of distraction (see Brodén *et al.*, 1970). Further, as the target subject becomes more attentive, he may provide less social reinforcement (attention) for disruptive behavior in the adjacent peer. The nonreinforced subject may become more attentive because his disruptive behavior is extinguished by the reinforced peer. With this interpretation, the behavior of the target subject is important not so much because it is imitated directly, but rather because it does not contribute to the disruptiveness of the adjacent subject.

A final interpretation to be discussed attributes the vicarious reinforcement effect to the cue properties of reinforcement. Reinforcement delivered to a target subject may function as a discriminative stimulus (S^D) for other subjects because it often precedes contingent reinforcement or punishment for these other subjects. For example, when a teacher praises one individual in a classroom it may be likely that she consequates

the performance of others nearby. Hence, reinforcement delivered to one subject, may serve as a cue to others that their performance may be consequted (reinforced or punished). This is likely to result in desirable or situation-appropriate behavior in the nonreinforced subjects. Interestingly, with this interpretation the behavior of the model who receives reinforcement is not important from the standpoint of a vicarious reinforcement effect. The vicariously reinforced subject is affected by the cue value of reinforcement to a target subject rather than responding to the contingent application of reinforcement to the target subject for a specific behavior.

This latter interpretation of vicarious reinforcement is plausible in the situation devised in the present study. However, it should not be readily generalized to other situations in the absence of further empirical support. Several features of the study may delimit the results. First, the praise used did not include information that specified the behavior that was reinforced. Subjects were praised ambiguously, such as "You're doing nicely." This was employed because one purpose was to determine if, in an applied setting, reinforcement could serve as a cue for situation-appropriate behavior in the absence of additional information. Further, teachers in fact sometimes give ambiguous praise to their students (where the behavior is implied) in the hope of controlling classroom deportment. However, the ambiguity of the praise may have accounted for the performance of nontarget subjects when the target subjects increased in inattentive behavior and the nontarget subjects increased in attentive behavior. Without specifying which behaviors were reinforced, the nontarget subjects may rely on their previous reinforcement history in the situation. The next study to evaluate vicarious reinforcement will begin with ambiguous reinforcement to replicate the present findings and then add information to the praise that specifies target behaviors. For example, praise such as "That's good, you have stopped working," could be given to the

target subject. If an adjacent subject hears this, he may also decrease in attentive behaviors (instead of increase, as shown in the present study). The goal, of course, is not to develop inattentive behavior in nonreinforced subjects but to determine the influence of situational cues, model behavior, instructions, and reinforcement.

An additional point to be evaluated is that the adjacent subject may not be aware of the behavior of the target subject. If unaware, adjacent subjects may be more likely to rely on the cue properties of praise. Another step in evaluating vicarious reinforcement will be to determine if requiring the adjacent subject to attend to the target subject's behavior results in imitation of the target subject, rather than responding to the cue value of the reinforcement. For example, before the target subject is praised, the reinforcing agent can say to the adjacent subject "Look at what he (the target subject) is doing." This can be followed by "That's good" to the target subject. With the nontarget subject attending to the behavior of the target subject, this may result in behavior change in the nontarget subject that is congruent with that of the target subject. A related point is that in the present study, retarded children served as subjects. It may be that nonretarded subjects attend more to the behaviors of those nearby. The present results need to be replicated with nonretardates.

In future research it will be important to determine if the nontarget subject in the classroom responds to the cue value of reinforcement or to the behavior of the reinforced model when that behavior is made salient. In advance of that information, a few points can be made regarding the reliance upon vicarious reinforcement as a behavior control technique. In situations where praise is given to a subject for unspecified behavior (as in the present study), the vicarious effect of that reinforcement can improve performance of adjacent peers. The cue properties of reinforcement may account for behavior change in nonreinforced subjects. However, in circumstances where reinforcement has cue properties because it has been an S^D for rein-

forcement of the behavior of other students, caution may be required in relying upon its use. One cannot recommend to teachers simply to praise one or a few individuals in the classroom with the idea that this will consistently increase performance of observers (peers). The effect of praise of one student on the performance of another may depend upon the fact that it is actually an S^D for consequence of the observer's behavior. If the approval of one person no longer signals reinforcement for the observer (at least intermittently), it is no longer an S^D ; then the effect of vicarious reinforcement demonstrated in the present study and by others (Broden *et al.*, 1970) might extinguish. The observer may learn that approval for others is not a signal that more approval will be dispensed.

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