*GENERALIZATION OF THE EFFECTS OF TEACHER-
AND SELF-ADMINISTERED TOKEN
REINFORCERS TO NONTREATED STUDENTS*

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Ten, black, second-grade boys served in a series of single-subject studies. They were from poor families, did not do well in arithmetic, were deficient in sustained attention, and presented behavior problems at school. One boy was a therapeutic confederate. Of the remaining nine nontreated students, three observed the confederate reinforced by a teacher, three observed the confederate self-reinforce without having an opportunity to use "self-reinforcement" themselves, and three observed self-reinforcement while having an opportunity to use "self-reinforcement." The target behavior was attending. Other measures of outcome were glancing, academic achievement, and accuracy of reinforcement. The basic experimental design consisted of an ABAB withdrawal applied to the confederate while the nontreated students remained on baseline. Generalization was expressed as a ratio (i.e., percent change in the generalization measure divided by percent change in the target behavior). Teacher-administered reinforcers to the confederate did not produce generalization of any kind. Both arrangements of self-administered reinforcers to the confederate produced across-subjects generalization and subject-response generalization. Additionally, the confederate manifested response generalization.

DESCRIPTORS: generalization, self-regulation, token economy, classroom behaviors

In recent years behavior analysts have emphasized the importance of developing a technology of programming the generalization of treatment effects (e.g., Forehand & Atkeson, 1977; McLaughlin, 1979; Stokes & Baer, 1977; Wildman & Wildman, 1975). Building on the conceptual advances of such writers, Drabman, Hammer, and Rosenbaum (1979) identified 15

categories of generalization which consist of combinations of the following dimensions: (a) subjects, (b) responses, (c) settings, and (d) time. Of these four dimensions the generalization of treatment effects across subjects was the most neglected in the literature. Only 8% of the 188 studies that they reviewed on treatment generalization in children covered subject generalization.

Subject generalization is behavior change in nontreated children. Synonymous terms that appear in the applied literature include "vicarious reinforcement" (Bandura, 1971), "ripple effect" (Kouin, 1970), "spillover effect" (Strain, Shores, & Kerr, 1976), and "across-subject generalization" (Fantuzzo, Harrell, & McLeod, 1979). Investigators of these phenomena have focused primarily on home and classroom settings.

Some investigators have reported that parental treatment of one child at home resulted in positive changes in untreated siblings (Ar-

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nold, Levine, & Patterson, 1975; Lavigneur, Peterson, Sheese, & Peterson, 1973; Resick, Forehand, & McWhorter, 1976; Humphreys, Forehand, McMahon, & Roberts, Note 1). Others have described increases in desirable classroom behavior of nontreated students when a teacher administered reinforcers to a target child (Brodén, Bruce, Mitchell, Carter, & Hall, 1970; Drabman & Lahey, 1974; Kazdin, 1973, 1977; Okovita & Bucher, 1976; Strain et al., 1976; Strain, Shores, & Timm, 1977; Strain & Timm, 1974).

The generality of the preceding findings was attenuated by those studies that have obtained inconsistent or no subject generalization (e.g., Brown & Pearce, 1970; Christy, 1975; Ward & Baker, 1968) and in one case (Sechrest, 1963), exposure to externally mediated reinforcement resulted in a decrement of performance. Other limitations include sampling from special populations (e.g., retarded or preschool children) and investigation of parent- and teacher-administered reinforcers only.

Because self-administered reinforcers can have a significant impact on targeted behaviors (Clement, Anderson, Arnold, Butman, Fantuzzo, & Mays, 1978; O'Leary & Dubey, 1979; Rosenbaum & Drabman, 1979), an important question is whether the effects of self-reinforcement generalize to nontreated children. Only one previous study has made a direct attempt to provide an answer. Fantuzzo et al. (1979) examined the effects of self-administered token reinforcers on attending behavior in two third-grade boys (a target student and a nontarget student). Using an ABAB withdrawal design, they discovered that increases and decreases in attending by the nontreated student paralleled those of the self-reinforcement student within the same classroom. They qualified their conclusions by noting that: (a) they had only studied one pair of students, (b) they were unable to control a number of extraneous variables in the natural classroom, and (c) the high degree of variability in the behavior of the target student impeded the discrimination of subject generalization effects.

The present investigation was designed to extend and improve upon the procedures and findings of Fantuzzo et al. (1979) on self-reinforcement and the previous research on subject generalization during teacher-administered reinforcers. The study explored three categories of generalization as identified by Drabman et al. (1979): subject generalization, response generalization, and subject-response generalization.

METHOD

Participants and Setting

Participants consisted of ten, black, second-grade boys from the Pasadena Unified School District. They ranged in age from 7 to 9 yr and attended regular classrooms. The investigators obtained referrals of students who met the following criteria: (a) each child's family fell in the lower socioeconomic level; (b) teachers reported that the students tended not to complete arithmetic assignments; (c) they received unsatisfactory grades on their report cards in arithmetic during the past year; (d) they were deficient in sustained attention and scored at least one standard deviation below the mean on the *Children's Checking Test* (Margolis, 1972); and (e) they were disruptive and/or inattentive/withdrawn in the classroom as measured by scores of at least one standard deviation above the mean on the relevant scales of the *Devereux Elementary School Behavior Rating Scale* (Spivack & Swift, 1967).

The first author approached prospective students and offered them a "job" using procedures that have been described by Clement et al. (1978). The first 10 students who were referred by the school principal and who were approached accepted the invitation to join the project.

The students attended "tutoring" sessions in a room measuring 5 m $\times$ 5.5 m at the Child Development Clinic in Pasadena. Only two children (the confederate and the nontreated student) sat in the room at a given time. The room contained two students' desks and chairs

and one desk and chair for the teacher. The "teacher" (a white teenage female honors student from a local private school) sat facing the two students. Directly behind the teacher was a one-way mirror through which observers recorded the students' behavior.

The investigators selected one of the 10 students, Al, to serve as a confederate throughout the series of single-subject experiments. After selecting Al as the confederate, the investigators randomly assigned the remaining nine boys to one of three experimental sequences (three students to a sequence). Throughout the remainder of this paper these boys are referred to as the "nontreated students."

Sequencing the nontreated students. The present investigation consisted of three sets of single-subject studies. Each set lasted 22 days and contained three replications of the same study. The three sets were run in tandem. The first set evaluated the effects of teacher-administered reinforcers, the second set evaluated the effects of self-administered reinforcers, and the third set evaluated the effects of opportunity to "self-reinforce." The three nontreated students participating in a given set followed the same order within days (i.e., the same boy always went to his session first at the same time of day, the second boy always went next, and the third boy always started last). The teacher randomly assigned the boys to this order prior to their first class session.

Each day three successive classroom sessions were held involving the confederate and one of the nontreated students. Each session consisted of two parts. The first part included 10 min of videotaped math instruction involving creative math exercises and their solutions. During the second part, the teacher passed out math worksheets and instructed the boys to work independently on their worksheets for the next 10 min. Data were only gathered during this second part. When time was up the teacher collected the papers, immediately corrected them, recorded the number of correctly answered problems, and offered the two boys a small edible treat. Ses-

sions occurred Monday through Friday, between 9:00 and noon, during summer vacation.

Treatment Conditions

Habituation. The investigators did not gather formal data during the first two sessions that each nontreated student spent in the experimental classroom. These sessions provided a brief period of habituation to the classroom setting and the general procedures. Except for the fact that no data were gathered during the habituation sessions, they were identical to baseline conditions.

Baseline. During the 10-min independent study period of each of the five baseline sessions, a research assistant prompted the confederate via a "bug-in-the-ear" apparatus to be on task 20% of the time and to be off task 80% of the time. The prompts occurred once every 10 sec. The research assistant followed a randomly selected sequence which changed each day. On-task behavior prompts consisted of telling the confederate to pick up his pencil and to attend to his math sheet. Off-task behavior prompts consisted of telling the confederate to put down his pencil, look aimlessly around the room, or to put his head on his desk, or to stand up. At no time did the confederate initiate talking to the nontreated student or respond to the nontreated student's verbalizations. During these sessions, no contingent reinforcement was delivered to either student.

Teacher-administered reinforcers. The research assistant prompted the confederate to be on task 80% of the time and off task 20% when the three "reinforcement" conditions were in effect. During teacher-administered reinforcement sessions the teacher delivered points and praise to the confederate only. At the beginning of the independent study period, she turned on a tape recorder which delivered a soft, 1-sec tone on a variable interval schedule of 60 sec with a range of 30 to 90 sec. If the confederate was on task when the tone sounded, the teacher said, "Good (boy's name)!" and pressed a button on a small control box which sat on her desk.

When she pressed the button, a light flashed and a counter clicked and recorded one point on a small box which was in the upper left-hand corner of the confederate's desk. At the end of the 10-min session, each student was offered the same small edible treat as obtained during baseline. In addition, the confederate exchanged his accumulated points for more edible treats, each point purchasing one small treat.

Self-administered reinforcers. During this treatment condition the teacher did not have a control box on her desk. At the beginning of the independent study period, the teacher turned on the tape recorder. The recorder played the same variable interval 60-sec tape as was used in the teacher-administered-reinforcers condition. If the confederate was on task when the tone sounded, he said to himself, "Good!" and pressed the button on top of his feedback box, thereby producing a light flash and an additional point on the counter. At the end of the study period, the teacher gave both students the same noncontingent treat as offered during baseline and then invited the confederate to exchange his self-administered points for a choice of edible treats, each point purchasing one small treat.

Opportunity to "self-reinforce." This final experimental arrangement contained all elements of the self-administered-reinforcers condition plus the opportunity for the nontreated student to use a feedback box just like the one on the confederate's desk. The teacher placed a feedback box on both students' desks and said, "Children, these boxes are not toys. You may use them to help yourself, if you wish." She never gave any instruction in the use of the feedback boxes and never intervened if they were being misused.

The reinforcement delivery procedure for the confederate in this condition was identical to the one applied in the self-administered reinforcers condition. Both students received noncontingent rewards, but only the confederate received reinforcers contingent upon his feedback box score. This procedure was not spe-

cifically explained to the nontreated student. If he asked "Why not me?" he was told that the teacher was trying to help the target student.

Measures of Outcome

Independent observers used an interval-recording system to register the performance of the confederate and each nontreated student. One observer recorded data for the confederate and one recorded for the generalization student. Each observer alternated between observing for 5 sec and then recording for 5 sec, each 5-sec interval being marked by a tone delivered by an earphone from a single tape recorder. The observers used *interval recording*, i.e., each of the "behaviors" described below was recorded as occurring or not occurring within a given interval. The 10-min study period produced 50 observation cycles; therefore, a student's score on a given behavior for a single session could range from 0 to 50. These raw scores were multiplied by two in order to express the percentage of all intervals in which the behavior occurred.

Attending. The observer recorded attending in each cycle that the student stayed on task for the entire 5-sec observation interval. Attending was the target behavior for the confederate during the "reinforcement" phases.

Glancing. The observer recorded glancing any time that the observed student turned his eyes from the worksheet toward the adjacent student.

Teacher-administration of reinforcers. The confederate's observer recorded each time the teacher pressed the control button, thereby flashing the light and triggering the counter on the student's feedback box. The observer recorded every discrete occurrence, and the record showed exactly in which 5-sec interval the reinforcers were delivered.

Self-administration of reinforcers. The observer used the same procedure as described in the preceding paragraph, the only difference being that the student produced the light flash and point.

Auditory cuing. The observer noted on the record sheet exactly when the classroom tape recorder delivered the 1-sec tone.

Accuracy of reinforcement. Based on the record provided by the observer the investigators determined the percentage of intervals in which reinforcers were delivered when they should have been. To score accurate reinforcement the flash and point had to be delivered in the same interval that showed check marks for both attending and auditory cuing in the immediately succeeding interval.

Academic achievement. This was the one measure that was not based on observational data. Academic achievement was defined as the percent correct of all arithmetic problems completed in a given study period.

Training and monitoring the observers. Five graduate students served as observers on a rotating basis with only two recording behavior in a given session. The investigators trained the observers until they consistently achieved interobserver agreement scores of 80 or higher on each recorded behavior. The first author served as the standard against whom the five observers were compared, using the agreement formula of Clement (1976).

In order to maintain high levels of interobserver agreement throughout the research, the investigators kept a television camera trained on the two students in the classroom throughout every session. The closed-circuit television system facilitated making spot checks for interobserver agreement without informing the observers exactly when the checks were occurring. The observers did know that the investigators could watch the students via the television monitor and obtain a record of each boy's behavior in order to determine if the regular observers were maintaining high reliability. Actual spot checks occurred once in each 5-day phase for each generalization student, the confederate, and each observer. The particular day for performing the reliability check within a phase was determined randomly.

Training the confederate and teacher. The first author trained the confederate and the teacher on each treatment condition including baseline prior to introducing any nontreated students into the experimental classroom.

Experimental Design and Data Analysis

The investigators used an ABAB withdrawal design. Comparisons across phases, behaviors, or students were based on the phase means for the measure(s) in question. For each measure the amount of change from one phase mean to the next was computed so that positive percentages indicate improvement and negative percentages indicate worsening. Also, the maximum amount of change was always 100% because the computational formula was "obtained change divided by maximum possible change (i.e., distance from the comparison phase mean to the ceiling or floor of the scoring system)."

The degree of generalization was quantified by dividing the percent change for the nontreated student/measure by the percent change for the confederate/target behavior, thereby obtaining the *percentage of generalization*. *Subject generalization* was determined by dividing the amount of change in attending for each nontreated student by the change in attending for the confederate during Phases II, III, and IV. When the nontreated student and the confederate changed in the same direction, the percentage of generalization was positive. When they changed in opposite directions (i.e., one got worse and the other got better), the percentage of generalization was negative.

In a similar fashion *response generalization* was determined by dividing change in glancing and in academic achievement by change in attending for the confederate during the last three phases of each study. *Subject-response generalization* was determined by dividing change in glancing and in academic achievement for each nontreated student by change in attending for the confederate during the last three phases of each study.

RESULTS

Interobserver Agreement

Collapsing the data across the five observers, the mean (and range) of agreement scores were as follows: for attending—Phase I, baseline = 93 (87-99); Phase II, treatment = 92 (81-100); Phase III, return to baseline = 94 (94-94); Phase IV, return to treatment = 96 (96-96); for glancing—Phase I = 88 (81-90), Phase II = 89 (85-94), Phase III = 94 (94-94), and Phase IV = 96 (96-96); for teacher administration of reinforcers, Phase II = 100 and Phase IV = 100; for self-administration of reinforcers, Phase II = 100 and Phase IV = 100; and for auditory cuing, Phase II = 88 (88-88) and Phase IV = 100. Interscores agreement for academic achievement (i.e., percent correct on arithmetic problems) was 100% across phases for each student.

Teacher-administered Reinforcers

Graphic representations of Zeke, Gus, and Sam's attending appear in Figure 1 with the

Table 1
Phase Means for Attending

Condition	Student	Base- line	Treat- ment	Base- line	Treat- ment
Teacher-Administered Reinforcers	Al	19.2	72.0	14.8	76.9
	Zeke	36.4 ^a	12.4	14.0	6.4
	Al	15.6	63.8	15.6	66.6
	Gus	26.8	17.0	21.2	23.8
	Al	18.4	70.2	16.8	69.4
	Sam	17.0	19.4	4.4	3.4
Self-Administered Reinforcers	Al	16.7	77.8	13.6	75.4
	Earl	26.0	70.8	26.4	57.2
	Al	17.7	70.8	14.0	73.2
	Rob	27.7	54.4	11.6	48.4
	Al	17.6	79.2	13.2	81.4
	Bert	57.6	68.8	26.4	63.2
Opportunity To "Self-Reinforce"	Al	13.8	81.6	12.4	68.0
	Ed	12	67.6	.8	46.8
	Al	14.0	62.4	12.0	78.8
	Ron	42.8	85.2	22.8	61.6
	Al	16.4	83.8	16.6	78.8
	Fred	48.8	87.4	52.8	77.2

^aPhase mean expressed as the percentage of possible intervals in which the behavior could occur.

phase means of their attending, glancing, and academic achievement in Tables 1, 2, and 3, respectively. Following the original baseline phase, the amount of subject generalization for Zeke was -58% in Phase II (treatment), -1% in Phase III (return to baseline), and -12% in Phase IV (return to treatment). The amount of subject generalization for Gus was

Fig. 1. Percentages of attentive behavior across experimental phases for Al (confederate) and Zeke, Gus, and Sam (nontreated students). The phase sequence is as follows: A = baseline; B = teacher-administered reinforcers for Al's attending only; A = return to baseline conditions for Al; B = reinstatement of teacher-administered reinforcers for Al's attending.

Table 2
Phase Means for Glancing

Condition	Student	Base-line	Treat-ment	Base-line	Treat-ment
Teacher-Administered Reinforcers	Al	4.4	24.0	24.0	10.0
	Zeke	29.6 ^a	28.2	31.6	11.6
	Al	15.2	27.4	9.6	11.8
	Gus	39.6	23.0	31.2	24.0
	Al	4.8	14.4	12.0	6.8
	Sam	7.2	12.6	2.0	1.8
Self-Administered Reinforcers	Al	8.0	14.4	22.8	10.0
	Earl	18.3	11.2	12.8	11.8
	Al	8.7	14.4	21.6	8.0
	Rob	30.3	19.6	29.6	24.0
	Al	5.2	12.4	16.4	5.2
	Bert	13.2	13.4	18.4	11.8
Opportunity To "Self-Reinforce"	Al	8.2	6.8	24.0	25.6
	Ed	20.4	22.4	36.8	16.0
	Al	18.0	18.4	24.4	16.0
	Ron	27.2	9.6	13.6	6.2
	Al	10.0	9.2	14.8	13.2
	Fred	23.2	3.6	26.0	12.4

^aPhase mean expressed as the percentage of possible intervals in which the behavior could occur.

—23% in Phase II, —4% in Phase III, and 5% in Phase IV. Sam's attending data yielded subject generalization percentages of 5% in Phase II, 11% in Phase III, and —2% in Phase IV. These data fail to indicate consistent subject generalization for these boys in the teacher-administered reinforcement condition. These failures occurred in spite of the fact that the confederate produced clear differences in levels of attending across phases and the teacher has mean accuracy of reinforcement scores during "reinforcement" phases of 90%, 92%, and 97% for Al's pairings with Zeke, Gus, and Sam, respectively.

Glancing and academic achievement provided data that were relevant to subject-response generalization. The amount of subject-response generalization for Zeke's glancing was —3% in Phase II, —2% in III, and —40% in IV. Gus's subject-response generalization percentages for glancing were —47% in Phase II, —8% in Phase III, and —17% in Phase IV. The amount of subject-response generalization for Sam was 10% in Phase II, 7% in III, and

Table 3
Phase Means for Academic Achievement

Condition	Student	Base-line	Treat-ment	Base-line	Treat-ment
Teacher-Administered Reinforcers	Al	29.4	49.2	38.8	76.8
	Zeke	39.4 ^a	17.6	16.8	12.0
	Al	24.4	58.8	52.2	80.0
	Gus	23.2	10.6	17.0	17.8
	Al	28.0	58.8	52.6	67.2
	Sam	11.8	19.2	6.6	6.2
Self-Administered Reinforcers	Al	20.3	46.2	35.2	76.8
	Earl	59.0	100.0	81.0	99.8
	Al	17.3	48.8	28.2	84.0
	Rob	21.8	42	11.2	17.2
	Al	27.2	45.2	42.2	80.6
	Bert	55.0	7.4	1.8	3.0
Opportunity To "Self-Reinforce"	Al	39.4	84.4	47.6	83.4
	Ed	21.2	14.4	2.4	31.8
	Al	35.0	61.0	35.8	68.2
	Ron	36.4	75.0	30.4	52.4
	Al	43	58	55.8	90.6
	Fred	89.6	88.8	81.4	93.2

^aPhase mean expressed as the percentage of possible intervals in which the behavior could occur.

0% in IV. These data across Zeke, Gus, and Sam do not suggest any consistent pattern of subject-response generalization for glancing.

With respect to the academic achievement data, the amount of subject-response generalization for Zeke was —55% in Phase II, 0% in III, and —8% in IV. Gus's subject-response generalization percentages were —28% in II, —5% in III, and 0% in IV. The amount of subject-response generalization for Sam was 13% in II, 9% in III, and 0% in IV. These data fail to indicate subject-response generalization for the academic achievement of these students.

Self-administered Reinforcers

The attending behavior of Earl, Bob, and Bert is displayed in Figure 2. The phase means of their attending, glancing, and academic achievement are presented in Tables 1, 2, and 3, respectively. Following the original baseline phase, the amount of subject generalization for Earl was 84% in Phase II, 53% in Phase III, and 58% in Phase IV. The amount of subject

Fig. 2. Percentages of attentive behavior across experimental phases for Al (confederate) and Earl, Rob, and Bert (nontreated students). The phase sequence is as follows: A = baseline; B = self-administered reinforcers for Al's attending only; A = return to baseline conditions for Al; B = reinstatement of self-administered reinforcers for Al's attending.

generalization for Rob was 57% in Phase II, 48% in III, and 61% in IV. Bert's attending data yielded subject generalization percentages of 35% in Phase II, 43% in III, and 63% in IV. These data demonstrate consistent subject generalization for these students (i.e., the confederate's use of self-administered reinforcers to increase his attending was paralleled by the generalization student's increases in attending). The confederate's mean accuracy of reinforcement during "reinforcement" phases was 98%,

98%, and 100% for Earl, Rob, and Bert, respectively.

Glancing and academic achievement data served as indicators of subject-response generalization. The amount of subject-response generalization for Earl's glancing was -12% in Phase II, 0% in III, and -1% in IV. Rob's glancing data indicated subject-response generalization percentages of -23% in Phase II, -6% in III, and -12% in IV. Subject-response generalization for Bert was 0% in Phase II, -2% in III, and -10% in IV. These data do not suggest the presence of subject-response generalization for glancing for these students.

Earl's Academic Achievement data yielded subject-response generalization percentages of 137% in Phase II, 0% in III, and 138% in IV, suggesting subject-response generalization for attending in the confederate to academic achievement in Earl. Subject-response generalization for Rob's academic achievement was 40% in Phase II, 27% in III, and 10% in IV. These data suggest some subject-response generalization. Subject-response generalization for Bert was 33% in Phase II, 2% in III, and 1% in IV. Bert's data for academic achievement did not clearly suggest subject-response generalization.

Opportunity to "Self-reinforce"

Figure 3 presents the attending data for Ed, Ron, and Fred, and Tables 1, 2, and 3, respectively, summarize the boys' attending, glancing, and academic achievement. Following the original baseline phase, the amount of subject generalization for Ed was 90% in Phase II, 54% in Phase III, and 72% in Phase IV. Ron's attending data indicated subject generalization percentages of 132% in Phase II, 314% in III, and 66% in IV. The amount of subject generalization for Fred was 93% in Phase II, 66% in III, and 69% in IV. These data demonstrate consistent subject generalization for these students.

Accuracy of reinforcement data (i.e., student's accurate use of the self-reinforcement

Fig. 3. Percentages of attentive behavior across experimental phases for Al (confederate) and Ed, Ron, and Fred (nontreated students). The phase sequence is as follows: A = baseline; B = self-administered reinforcers for Al's attending only plus allowing nontreated students access to self-reinforcement equipment; A = return to baseline conditions for Al; B = reinstatement of self-administered reinforcement for Al's attending and allowing nontreated students access to equipment.

procedure) provided another opportunity to measure the degree to which the generalization students' behavior paralleled the confederate's, since the generalization students were allowed to use the same procedure. The confederate's mean accuracy of reinforcement during "reinforcement" phases was 95%, 88%, and 93%

for Ed, Ron, and Fred, respectively, while Ed's was 82%, Ron's was 67%, and Fred's was 54%.

The amount of subject-response generalization for Ed's glancing was 4% in Phase II, -5% in III, and -43% in IV. Ron's subject-response generalization percentages were -43% in Phase II, -3% in III, and -12% in IV. Subject-response generalization for Fred was -32% in Phase II, -6% in III, and -24% in IV. These data for glancing do not indicate subject-response generalization for glancing across these students.

Ed's subject-response generalization percentages for academic achievement were -11% in Phase II, 4% in III, and 47% in IV. For Ron, these percentages were 109% in Phase II, 133% in III, and 51% in IV. The amount of subject-response generalization for Fred was -10% in Phase II, 16% in III, and 84% in IV. Ed and Fred's data for academic achievement demonstrated subject-response generalization in the second treatment phase (i.e., Phase IV) only, while Ron's data indicated clear subject-response generalization had occurred across experimental phases.

Response Generalization in the Confederate

The investigators instructed Al to vary his level of attending from phase to phase; however, they made no direct requests for him to alter his glancing and accuracy of arithmetic behavior (academic achievement). They did not cue or consequence these latter two "behaviors"; therefore, these two measures allowed for an evaluation of response generalization in Al.

For glancing versus attending, Al's mean response generalization scores across the nine pairings were 11.9% in Phase II (range = 0% to 32%), 0.1% in III (range = -5.0% to 19.0%), and -8.9% in IV (range = -25% to 3%). These data do not reflect consistent response generalization.

For academic achievement versus attending, Al's mean response generalization scores were 58.2% in Phase II (range = 32% to 94%),

19.1% in III (range = 1% to 62%), and 88.2% in IV (range = 49 to 113). These data demonstrate consistent response generalization from attending to academic achievement.

DISCUSSION

The present findings indicated the absence of consistent student generalization when nontreated students were exposed to a peer who was being reinforced by a teacher for his attending behavior. The overall mean amount of subject generalization across reinforcement phases was -14%. In contrast, the results for both self-administered reinforcement conditions indicated consistent subject generalization when nontreated students were either (a) exposed to a confederate who administered self-reinforcement, or (b) exposed to a confederate who administered self-reinforcement *and* were given the opportunity to use self-reinforcement equipment themselves. The overall mean amounts of subject generalization for the self-administered reinforcement and opportunity to "self-reinforce" conditions across reinforcement phases were 60% and 85%, respectively.

In the opportunity to "self-reinforce" condition, there was another measure of subject generalization. The accuracy of reinforcement data indicated that all three nontreated students used the feedback boxes on a contingent basis achieving a mean score for accuracy of 68%. They did this without direct training or reinforcement for equipment use. Since the confederate's mean score for accuracy was 92%, the amount of generalization for this behavior was 74%.

The subject-response generalization data suggested no consistent pattern of generalization for glancing across all nontreated subjects. The data for academic achievement, which was the other measure relevant to subject-response generalization, revealed no significant subject-response generalization for students exposed to the teacher-administered reinforcement condition. However, in the self-administered reinforcement condition, the nontreated student

manifested an overall mean subject-response generalization score of 60%, with two of the students demonstrating consistent increases. The opportunity to "self-reinforce" condition yielded even more stable and significant increases in the nontreated students' academic achievement with an overall mean generalization score of 85% across reinforcement phases.

The results relevant to the confederate's performance revealed that he was able to follow accurately the preprogrammed schedule for attending behavior and that increased attending was followed by parallel increases in nontargeted academic achievement across *all* nine pairings with the nontreated students, indicating positive response generalization from attending to academic achievement. The overall mean generalization score across reinforcement phases was 73.2% with 18 out of 18 comparisons (i.e., reinforcement phases) producing positive generalization scores.

The extent to which these findings are germane to different populations and settings is qualified by the specific characteristics of the students and experimental setting used in this study. The results are restricted by the age, race, and socioeconomic status of the nontreated, the confederate, and the reinforcing agent; therefore, conclusions drawn from this investigation must be applied within the context of using black, "deprived" second graders as confederate and nontreated subjects with white, middle-class reinforcing agents. Also, the treatment phases were of short duration. We do not know how the obtained trends in subject generalization would have been different had a given treatment condition been maintained for a full semester or for an entire school year.

The applicability of these findings to a regular public school classroom is limited by the potentially reactive aspects of the experimental classroom which presented a high degree of novelty. The most notable departures from a standard classroom were class size and the use of novel instrumentation. Mindful of the limitations of analogue research (Azrin, 1977), this

study was conducted under these conditions because of the paucity of controlled studies of subject generalization and to provide a more detailed analysis of Fantuzzo's study documenting across-subject generalization of self-administered reinforcement in a regular classroom setting (Fantuzzo et al., 1979).

These results support and extend the growing body of literature documenting the efficacy of self-administered reinforcement techniques with children (Bolstad & Johnson, 1972; O'Leary & Dubey, 1979; Rosenbaum & Drabman, 1979) particularly with "deprived" children (Arnold & Clement, in press; Clement et al., 1978; Edgar & Clement, 1980) by demonstrating generality of treatment effects not only to non-targeted academic achievement for the target child (response generalization) but also to the attending (subject generalization) and Academic Achievement (subject-response generalization) of the nontreated students.

The results from the three single-subject studies in the teacher-administered reinforcement condition were in accord with the studies that either inconsistently reported or failed to document subject generalization (e.g., Brown & Pearce, 1970; Christy, 1975; Sechrest, 1963; Ward & Baker, 1968) but did not support the positive findings published by others (Brodin et al., 1970; Kazdin, 1973, 1977; Kazdin, Silverman, & Sittler, 1975; Okovita & Bucher, 1976; Strain et al., 1976; Strain et al., 1977; Strain & Timm, 1974).

Since all these studies documenting across-subject generalization with teacher-administered reinforcement were conducted with retarded or preschool children, the applicability of these findings to normal grade school children is limited. In contrast to normal grade school children, retarded and preschool children may be more positively responsive to being exposed to teacher-administered reinforcement because they may be described as being (a) more limited in their ability to discriminate and comprehend the relationship between the confederate's behavior and subsequent reinforcement and, there-

fore, be more predisposed to only the *discriminative cue value* of the reinforcement delivery to the target (Kazdin, 1973), (b) more dependent upon adults (e.g., the teacher) as the primary source of reinforcement, and (c) less likely to protest inequities (possibly due to their more limited exposure to reward discrepancies and their limited reinforcement history for competitive behavior).

Drabman and Lahey's study (1974) was the only study that recorded across-subject generalization with grade school children; however, that investigation differed from the present study in that they used a "nondeprived" sample of children instead of a "deprived" sample. The unique impact of these variables has been made evident by investigators such as Thelen (1971) and Turner and Forehand (1976) who have documented the differential effects of the class and race of subjects, the race of the reinforcing agent, and the race and class of the model on the degree of imitative behavior elicited.

The findings of this study have significant implications for the utilization of behavioral techniques with children in classroom-like settings. Generally, they bespeak the importance of not assuming that all behavioral interventions with children will automatically generalize and have positive effects on neighboring students. Some interventions, such as the teacher-administered reinforcement condition in the present study, may have negligible or inconsistent effects on certain nontreated students. These may require additional techniques and procedures to program needed generalization effects (Stokes & Baer, 1977). More specifically, these findings suggest that exposing "deprived" grade school children to successful self-regulation interventions results in improvements in nontreated peers.

The present findings further demonstrated that using a confederate and peers with similar problems benefited both the peers and the confederate. These findings are consistent with Clement's (1974) proposition that children are potentially more effective therapeutic agents for

themselves than are parents or teachers. Given the limitations of funding and personnel in public school settings, self-control strategies have promise as effective and economical methods of classroom management and merit further investigation, but further studies of self-administered interventions in children need to investigate systematically all 15 categories of generalization outlined by Drabman et al. (1979). The present study only focused on three: subject, response, and subject-response generalization.

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