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DECREASING CLASSROOM MISBEHAVIOR THROUGH THE USE OF DRL SCHEDULES OF REINFORCEMENT[1]

SAMUEL M. DIETZ AND ALAN C. REPP

GEORGIA STATE UNIVERSITY AND GEORGIA RETARDATION CENTER

In three studies, reinforcing low rates of responding reduced inappropriate behaviors. In the first study, the talking-out behavior of one TMR student was reduced when the teacher allowed 5 min of free time for a talk-out rate less than 0.06 per minute. In a second study, the talking-out behavior of an entire TMR class was reduced when reinforcement was delivered for a response rate less than 0.10 per minute. In a third study, successively decreasing DRL limits were used to reduce off-task verbalizations of an entire high school business class. In each case, the DRL procedure proved manageable for the teacher and successful in reducing misbehavior.

Punishment has long been a popular method for eliminating behavior in classrooms. Recently, for a number of reasons, school personnel have found punishment to be an unacceptable technique. There are potentially adverse effects on students (Skinner, 1968; Clarizio and Yelon, 1967), frequent legal prohibitions, and problems raised by its almost necessary severity (Azrin and Holz, 1966).

With the development of behavioral technology, several alternatives that do not incorporate aversive stimuli have replaced punishment as a method for eliminating behavior. These include extinction (Madsen, Becker, and Thomas, 1968), timeout (McReynolds, 1969; Pendergrass, 1972; Wasik, Senn, Welch, and Cooper, 1969), and the reinforcement of behaviors incompatible with the undesired behavior (Becker, Madsen, Arnold, and Thomas, 1967; Thomas, Becker, and Armstrong, 1968). Other studies have had success by combining the above techniques. Timeout (Bostow and Bailey, 1969) and extinction (Hall, Fox, Willard, Goldsmith, Emerson, Owen, Davis, and Porcia, 1971) have been combined with the reinforcement of incompatible behavior, and extinction has been successfully combined with timeout (Zeilberger, Sampen, and Sloane, 1968).

Another technique, using positive reinforcement to reduce behavior, has not often been used. That technique involves the differential reinforcement of low rates of responding (DRL). DRL schedules have been investigated in the laboratory, where the method of lowering response rates through the process of reinforcing specified intervals of no responding has most often been used (Kramer and Rilling, 1970). A variation of this procedure, delivering reinforcement if the number of responses in a specified period of time is less than, or equal to, a prescribed limit, may provide a manageable method for teachers to lower student rates of responding.

Using this alternative DRL procedure, a teacher may contract with a class or with individuals and reinforce a low number of responses during the class period. If baseline levels of behavior are high, successively lower DRL limits may be used to bring the rate of behavior into the acceptable range. If the acceptable limit is zero, that level, too, may be reinforced.

The purpose of the present studies was to demonstrate the efficacy, as well as the manageability, of DRL schedules in reducing classroom misbehavior.

[1]Reprints may be obtained from Samuel M. Dietz, Department of Educational Foundations, Georgia State University, 33 Gilmer Street, Atlanta, Georgia 30303 or from Alan C. Repp, Georgia Retardation Center, 4770 North Peachtree Road, Atlanta, Georgia 30341.

EXPERIMENT I

This study involved the use of a DRL schedule to reduce the talking-out behavior of one subject.

Subject

An 11-yr-old boy, classified as trainable mentally retarded (TMR), was enrolled in a special classroom of a regular DeKalb County, Georgia, elementary school. He was chosen by his teacher as the most disruptive student in the class.

Method

The experiment was conducted in the classroom for 50 min a day. Observations were made by a practice teacher, located in the back of the room, who recorded talk-outs in a notebook. Talk-outs were defined for the observers, and for several sessions before Phase 1 and the last two sessions of Phase 3, reliability checks were made by having a second trained observer record responses. Phase 1 began after three consecutive days with greater than 80% agreement between the two observers. The per cent agreement on observations was calculated by dividing the larger number of observations of talk-outs per day into the smaller.

In Phase 1, several types of verbal statements by the subject were defined as talk-outs and were recorded. These behaviors were: talking to the teacher or classmates without the teacher's permission; talking, singing, or humming to oneself; and making statements not related to the ongoing class discussion. Phase 1 ended after 10 sessions.

In the first session of Phase 2, talk-outs were defined for the subject, and he was instructed that, if at the end of 50 min, he made three or fewer "talk-outs" (rate $\leq$ 0.06 min), he would be allowed five free minutes of play time at or near the end of the day. At the end of each session, the subject was told by the teacher whether he had met the requirement, but, during the session, he was never informed of his moment-to-moment accumulation of "talk-outs". These experimental conditions were in effect for 15 sessions.

The conditions of Phase 1 were reinstated after the second phase was concluded. At the beginning of Phase 3 (Session 26), the subject was told that he would no longer receive free time for low rates of talk-outs.

RESULTS

The reliability criterion was fulfilled in five session. The mean agreement for these sessions was 87.5% with a range of 75% to 100%. The mean agreement for the last two sessions of Phase 3 was 100% (only four responses occurred).

Figure 1 shows the rate of talk-outs during the three phases of this experiment. During baseline conditions (Sessions 1 to 10), the subject averaged 5.7 talk-outs per 50-min session. The average rate was 0.11 responses per minute and total talk-outs ranged from four to 10 per session.

Sessions 11 to 25 show the results of Phase 2. The subject averaged 0.93 talk-outs per session with a range of zero to two. The mean rate for this phase was 0.02 responses per minute. At no time while the DRL contingency was in effect

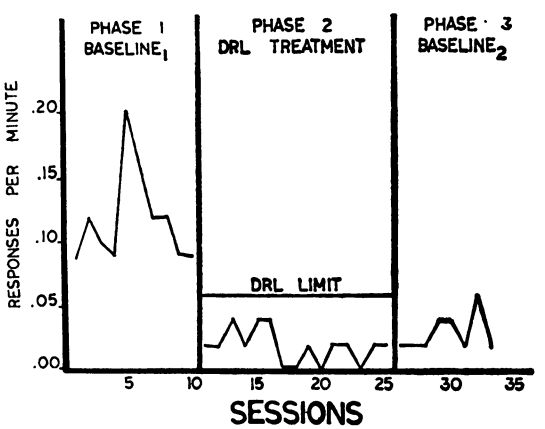

Fig. 1. The rate of talk-outs during baseline 1, treatment, and baseline 2 phases for one TMR male. The subject could earn five free minutes of play time during Phase 2 if he made three or fewer responses during the 50-min session (DRL limit).

did the subject exceed the specified requirement, and the five free minutes were earned each day.

When the DRL contingency was removed during Sessions 26 to 33, responding increased slightly. During this return-to-baseline condition, the mean number of talk-outs increased to 1.5 per session with a range of one to three. The average rate for the phase was 0.03 responses per minute, a rate still below the requirements set during the DRL phase.

Discussion

The DRL contingency effectively reduced the number of talk-outs by the subject. The reduction of behavior occurred immediately and was maintained during the remainder of the study. The variability, as well as the frequency of talk-outs, was also reduced.

Although the behavior did not return to baseline levels during the reversal phase, the abrupt decrease in responding when Phase 2 began suggests that the DRL contingency was effective. In addition, the increase in responding when Phase 3 began indicates that the DRL procedure was effective, although, since the behavior did not return to the Phase 1 level, the data indicate that during Phase 3 other factors probably began to interact with the DRL procedure to decrease responding.

EXPERIMENT II

This study involved the reduction of talk-outs in a group of students through the use of a DRL schedule.

Subjects

Ten TMR students in a special classroom of a regular DeKalb County, Georgia, elementary school, six males and four females, were described by the teacher as "extremely disruptive".

Method

Observations were made for 50 min a day by a graduate student, located in the back of the classroom, who recorded talk-outs in a notebook. For several sessions before Phase 1 and the last two sessions of Phase 3, reliability checks were made by comparing the data of the graduate student with that of a second trained observer. The per cent agreement on observations was calculated by dividing the larger number of observations of talk-outs per day into the smaller. Phase 1 began when agreement was greater than 80% for three consecutive days.

As in Experiment I, talk-outs were defined before Phase 1 as: talking to the teacher or classmates without the teacher's permission; talking, singing, or humming to oneself; and making statements not related to the ongoing class discussion.

Phase 1 consisted of baseline data collected for 10 days. At the beginning of Phase 2, students were told that if the group made five or fewer "talk-outs" in the 50 min (rate $\leq$ 0.10 min), each would receive two pieces of candy of their selection at or near the end of the day. At the end of 50 min, the teacher announced to the class whether the requirements had been met, but, during the 50 min, the subjects were never informed of the moment-to-moment accumulation of talk-outs. Phase 2 ended after 15 sessions.

Phase 1 conditions were reinstituted at the beginning of Phase 3 (Session 26). At the beginning of this second baseline phase, the class was told that the contingency was no longer in effect.

Results

The criterion for observer reliability was met in six sessions. The mean agreement for these six sessions was 86.3% before Phase 1 and the range was 78% to 95%. The mean agreement during the last two sessions of Phase 3 was 87% with a range of 85% to 89%.

The rate of talk-outs emitted by the class during the three phases of this experiment is shown in Figure 2. During Phase 1 (Sessions 1 to 10), the subjects averaged 32.7 talk-outs per 50-min session with a range of 10 to 45. The average rate for Phase 1 was 0.65 responses per minute.

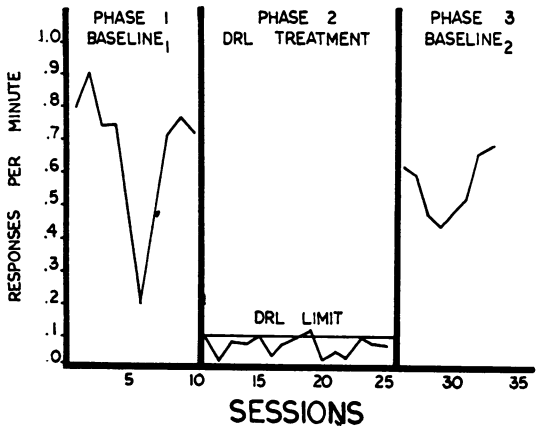

Fig. 2. The rate of talk-outs for a class of TMR children during baseline 1', treatment, and baseline 2 phases. All students received two pieces of candy during Phase 2 if the class as a whole emitted five or fewer responses during the 50-min session (DRL limit).

Sessions 11 to 25 show the results of Phase 2. The subjects averaged 3.13 talk-outs per session with a range of one to six. The average rate fell to 0.07 responses per minute. In Session 19, the class exceeded the DRL limit, thus losing the reinforcement for that day. Subsequently, in Session 20, they fell to a low of one talk-out, a number reached only one other time (Session 12). In all other sessions of Phase 2, the DRL requirement was met.

Sessions 26 to 33 show the results of the return-to-baseline condition. The students were informed that candy would no longer be given for a low rate of talk-outs, and the behavior increased to a rate almost equal to that which occurred in Phase 1. The subjects averaged 27.16 talkouts per session with a range of 22 to 34. The average rate for Phase 3 was 0.54 responses per minute.

Discussion

The DRL contingency reduced the variability of responding and reduced frequency of responding by a factor almost equal to 10. The increase in behavior during the second baseline demonstrated that the DRL schedule, rather than other factors, decreased the rate of responding.

EXPERIMENT III

Experiment III involved the use of a DRL schedule to reduce the verbal behavior of a group of high school students.

Subjects

Fifteen high school senior girls, enrolled in an Office Procedures class, were in a regular, rather than a special, class.

Method

The experiment was conducted during an Office Procedures class that lasted 50 min a day. Data were recorded on paper by the teacher throughout the experiment and by a second observer for several sessions before Phase 1. The second observer's function terminated when the agreement was greater than 80% for three consecutive days. Following this per cent agreement, Phase 1 was begun.

The experiment was conducted in six phases. During Phases 1 and 6, baseline conditions were in effect, while during Phases 2 to 5, the DRL schedules were in effect. In Phase 1, a subject-change was defined as a change in the topic of the ongoing academic discussion to another, usually social, topic. Phase 1 ended after seven sessions.

In Phases 2 to 5, the DRL limit was reduced to zero using four steps, each lasting four sessions. At the beginning of Phase 2, the first DRL contingency was specified and explained to the class. When fewer than six subject-changes occurred per day (rate $\leq$ 0.10 min) during each day of the first four days of the week, Friday was a "free" day to be used as the class pleased.

In Phase 3, students were allowed three or fewer subject-changes (rate $\leq$ 0.06 min) per day, while in Phase 4, fewer than two responses (rate $\leq$ 0.02 min) were required. In Phase 5, a zero rate of responding was required for reinforcement. Each phase specified that these rates be maintained at or below criterion levels for the first four days of the week in order to

earn the "free" Friday. Changes were always explained to the class, but at no time during the experiment were they informed of the moment-to-moment accumulation of responses.

At the beginning of Session 24, baseline conditions were reinstituted for nine sessions, and the withdrawal of the DRL contingency was explained to the class.

Results

The reliability criterion was met in five sessions. The mean agreement was 82%, with a range of 67% to 100%.

Figure 3 shows the rate of subject-changes in the six phases of this experiment. During Phase 1 (Sessions 1 to 7), the class averaged 6.6 subject-changes per 50-min session. Subject-changes ranged from five to eight responses per session with an average rate of 0.13 responses per minute.

Phase 2 began in Session 8. During this phase (Sessions 8 to 11), the subjects averaged 2.5 responses per session with a range of one to five. The mean rate was 0.05 responses per minute.

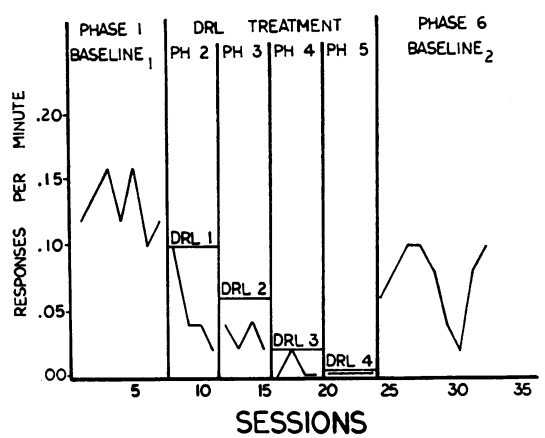

Fig. 3. The rate of subject-changes for a class of high school senior girls during baseline 1, treatment, and baseline 2 phases. "Free" Fridays could be earned by the group if they made fewer than the specified number of responses for each of the first four days of the week. The limit for the first treatment week was five or fewer responses during the 50-min sessions (DRL 1). DRL 2 required three or fewer responses. DRL 3 required one or fewer responses and DRL 4 required zero responses.

During Phase 3, an average of 1.5 responses was made per session with a range of one to two. The average rate was 0.03 responses per minute. In Phase 4, the average number of responses was 0.25, with a range of zero to one and a mean rate of 0.005 responses per minute. The average number, range, and average rate all fell to zero during Phase 5. In all four DRL phases, reinforcement was earned each Friday.

In Session 24, Phase 6 began. In Sessions 24 to 32, the DRL contingency was removed and the rate of subject-changes immediately increased. The average number of responses was 3.67 per session with a range of one to five and a mean rate of 0.07 responses per minute.

Discussion

The results of Experiment III demonstrate that the DRL contingency can be effective with high school students in regular classrooms. Decreasing the value of DRL limits had an orderly effect on response rates, with the final requirement, DRL 50-min, eliminating responding.

In Phase 6, when the baseline conditions were reinstituted, the behavior did not recover to Phase 1 levels, but did increase to a level substantially above that in Phase 5.

GENERAL DISCUSSION

The present results demonstrate the effectiveness of DRL schedules in reducing classroom disruption as well as the ease with which they may be implemented. The DRL procedure used here is unusual, in that reinforcement was produced when responding was less than a limit for a period of time, rather than when a response followed a specified period of no responding. Whether the latter procedure, used in laboratory experiments, would have been as easy for a single teacher to implement is doubtful. The first study demonstrated its effectiveness with an individual, and the remaining two studies demonstrated control of group behaviors. The success with both TMR children and with high

school students suggests the efficacy of DRL schedules across widely divergent groups.

Although the primary purpose of these studies was to demonstrate the usefulness of DRL schedules, one must still locate powerful reinforcers to support any schedule of reinforcement. Candy, with groups of young children, has repeatedly been found to be effective, and free time is being used more often.

There is little question that free time, or time-off from ongoing classroom activities, is an effective reinforcer. One problem with using free time in classes that are changed hourly is the loss of time that could be used for teaching. The effect upon weekly academic output can be assessed, but was not in this study. The teacher in the third study did comment, however, that she found it more useful to have four days in which the students are not disruptive and are working, than to have five relatively disruptive days.

Whatever the reinforcer, if it is more powerful than that maintaining the misbehavior, DRL schedules provide an efficient and manageable method for reducing classroom disruption. The teacher may specify upper limits of allowable misbehavior, thus eliminating problems of attempting to silence completely a class of active children. The limits chosen should be within the abilities of the children and acceptable to the teacher. In addition, the teacher should find this method satisfactory for situations in which one wants to reduce (to a specified limit), but not to eliminate, responding.

If the goal is to eliminate misbehavior entirely, as in the case of aggressive responses, the DRL limits can be reduced in successive steps, or set initially, at zero. The third study demonstrated that this is possible, the last phase ending with a requirement of zero responses. DRL schedules can be used either to reduce or to eliminate misbehavior.

In conducting a study using DRL, one might modify two of the procedures used in these experiments. First, specification of the contingency, its announcement, and explanation to the persons involved may not be necessary. This process was found to be effective, but its necessity can be assessed in future research investigations. Second, the subjects of these studies were never informed of their moment-to-moment accumulation of target behavior occurrences. This technique, too, was effective but also deserves further investigation. Methods of informing subjects of this accumulation are presently being used by the authors in other work. For the behavior of a whole class, cards marked from zero to an upper limit are located on the teacher's desk and flipped at each occurrence of the behavior. For individuals, counters are placed on the subject's desk and operated by the teacher.

The use of DRL schedules provides another positive method for reducing classroom misbehavior. More research is necessary to investigate the many parameters of DRL schedules, such as the efficacy of informing subjects of moment-to-moment accumulation, questions about initial announcement and explanation of the arrangement, as well as to what types of behaviors and to what groups of subjects the DRL schedule is applicable.

The present results demonstrate that DRL is an effective method for reducing classroom misbehavior. It employs the use of positive reinforcement, thus satisfying the requirement of those searching for nonpunitive methods of classroom control. And finally, it is a technique that is effective with both individuals and groups and can be easily managed by a single teacher in a self-contained classroom.

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