MAINTENANCE OF THERAPEUTIC CHANGE BY MOMENTARY DRO

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Differential reinforcement of other behavior (DRO) involves delivery of reinforcement at the end of an interval during which the target behavior has not occurred. Momentary DRO, however, is a procedure in which reinforcement is delivered if a response did not occur at the end of an interval. We examined the extent to which momentary DRO maintained suppression, following initial treatment with whole-interval DRO, of nine retarded students' maladaptive behavior. Results indicate that momentary DRO maintained response suppression comparable to that obtained by whole-interval DRO.

DESCRIPTORS: reinforcement schedules, severely handicapped, multiple baseline, maintenance

Differential reinforcement of other behavior (DRO) is a laboratory-based schedule in which reinforcement is delivered if a particular response has not been emitted for a specified interval of time (e.g., Kelleher, 1961). In a recent study, Repp, Barton, and Brulle (1983) found differences between two common methods of scheduling the DRO interval. In one, reinforcement is delivered if the target behavior has not occurred throughout an entire interval (e.g., 1 min), a procedure we have referred to as whole-interval DRO (WIDRO). In the other, reinforcement is delivered if the target behavior did not occur at the moment of observation, a procedure referred to as momentary DRO (MDRO). Results of those two experiments indicated that whole-interval DRO schedules were significantly superior to momentary DRO schedules. The authors hypothesized, however, that, although momentary DRO scheduling may not be the most effective procedure to decelerate target behaviors initially, it may be effective in maintaining behavior previously suppressed. If momentary DRO could be used to maintain behavior reduction after response suppression by other means (e.g., whole-interval DRO), the utility of DRO procedures in applied settings would be greatly enhanced. The purpose of our research was, therefore, to determine if momentary DRO scheduling

could be effective in maintaining response rates after their initial suppression by whole-interval DRO. This purpose was met in three ways: (a) by following whole-interval DRO with momentary DRO for three students and seeing whether the MDRO retained response suppression; (b) by comparing the MDRO data of these three students with the data of three other students who remained on the WIDRO and did not experience the MDRO condition; and (c) by examining the data of three other students who were presented with the WIDRO condition followed by a return to baseline condition to determine if response suppression was maintained after WIDRO withdrawal.

METHOD

Subjects and Setting

Nine (five male, four female) severely multi-handicapped elementary school aged students (IQ scores of 40 and below) served as the subjects of this study. The students were nonverbal, ambulatory, and had secondary handicaps of vision or hearing impairment varying from mild after correction (e.g., hearing aids or glasses) to severe. Three of the students were classified as having profound mental retardation with the remainder classified as having severe mental retardation. These students exhibited a variety of maladaptive behaviors (e.g., stereotypic behaviors, noncompliance) at widely varying rates. The students were enrolled in a program for individuals who displayed maladaptive

This research was supported by a grant from the Alberta Advisory Committee for Educational Studies (#55-52080).

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behaviors, that was located in an elementary school that housed classrooms for severely multihandicapped students.

Recording Procedure and Reliability

One behavior was recorded for each of the nine students. The definitions of each behavior and the students for whom each behavior was recorded were:

1. *Noncompliance* (Students 1 and 4): Any time the student does not respond, refuses to respond, or resists responding when asked a question or given an instruction, when such question or instruction had successfully and consistently elicited a response under similar situations with this staff member.

2. *Head-weaving* (Students 2 and 8): Any time the student moves his or her head in a horizontal back-and-forth manner when not requested to do so or when not situationally appropriate. Recording Rule: The behavior is ended after 5 s of no responding.

3. *Light-gazing* (Students 3 and 7): Any time the student looks up toward the ceiling when not requested or instructed to do so. Recording Rule: The behavior is ended after 5 s of no responding.

4. *Hand-flapping* (Students 5 and 9): Any time the student moves hands and/or arms up and down or back and forth repetitively, unless appropriate (e.g., waving) or instructed to do so. Recording Rule: The behavior is ended after 5 s of no responding.

5. *Finger-moving* (Student 6): Any time the student moves fingers back and forth in the air or up and down on arm(s) or on any object. Recording Rule: The behavior is ended after 5 s of no responding.

Data were recorded by trained observers who marked the occurrence of each response. Data collection began after the students had entered the classroom, and continued throughout the day with three exceptions: during lunch, while students were going from one room to another, and during toileting. A second observer recorded data during at least one half-day each phase, and interobserver reliability was calculated by dividing the smaller

number of recorded behaviors by the larger number of behaviors. The reliabilities were all greater than .80 for each student.

Design

One group of three students was presented with an ABC design consisting of baseline (A), WIDRO (B), and MDRO (C). We attempted to determine whether responding in the C phase maintained at the level found in the B phase. Each of the three students was also paired with a different student who was presented with an AB design. The rationale here was that if students in the ABC design maintained B-level responding in the C phase, one might question whether behavior would have been different in the sessions of the third phase if the B condition had been retained. By having three other students who were only presented with conditions A and B, we could make a between-students comparison of the amount of responding found in those last sessions concurrent with the C phase.

A third group of three students was presented with an ABA(B) design. In this way a comparison can be made demonstrating that a return to baseline does or does not maintain behavior suppression initiated by WIDRO.

Procedure

Before the study began, information was gathered on each student's reinforcement preference from teachers, aides, and parents or other caregivers. These suggested preferences were then used on innocuous tasks to determine whether they functioned as reinforcers for particular behaviors. These efforts resulted in the identification of primary reinforcers such as apples, raisins, grapes, or juice, which were paired with praise and used with each of the students in the DRO study.

Reinforcement was delivered by the teacher or aide who was working with the child. Delivery was cued by prerecorded cassette tapes, which sounded a tone at the end of each interval. In the WIDRO condition, the reinforcement was delivered only if the student had not exhibited the target behavior throughout the entire interval. In the MDRO con-

Figure 1. Rate of responding during baseline, whole-interval DRO (WIDRO, in which reinforcement was delivered when responding did not occur throughout an entire interval), and momentary DRO (MDRO, in which reinforcement was delivered when responding did not occur at the end of an interval, regardless of whether it had occurred within the interval).

dition, all behavior of the student was ignored prior to the sounding of the cue. If the student was not exhibiting the target behavior at the sound of the cue, reinforcement was delivered.

The study began with the baseline phase for all students. At this time, students were randomly assigned to the experimental conditions. In the first pair, student 1 experienced baseline for days 1–10 followed by WIDRO for days 11–35, while student 4 experienced baseline for days 1–12, WIDRO, for days 13–27, and MDRO for days 28–35. In the second pair, student 2 experienced baseline for days 1–10 followed by WIDRO for days 11–33, while student 5 experienced baseline for days 8–12, WIDRO for days 13–27, and MDRO for days 28–36. In the third pair, student 3 experienced baseline for days 3–10 followed by WIDRO for days 11–32, while student 6 experienced baseline for days 9–12, WIDRO for days 13–27, and MDRO for days 28–35. Due to absences, students 5 and 6 missed the first 7 and 8 days of baseline, respectively.

Students 7, 8, and 9, who experienced only the WIDRO condition, had 8, 9, and 12 days of baseline, respectively, prior to the initiation of the WIDRO condition. WIDRO lasted during days

9–27 (student 7), 10–32 (student 8), and 13–41 (student 9). Students 7 and 8 experienced a return to baseline during days 28–34 (student 7) and 33–40 (student 8). Student 9 experienced a similar return to baseline on days 42–53 and then a return to the WIDRO during days 54–66.

Because previous research (Barton, Barrow, Brulle, & Repp, 1983; Repp & Slack, 1977) has indicated that the length of the DRO interval should bear some relationship to the rate of responding during baseline, time equal to the inverse of the mean rate of responding during baseline was used as the DRO interval for each student on the first day after baseline. Applying this formula and rounding off for programming ease resulted in the following DRO intervals for each student: student 1, 3 min; student 2, 12 min; student 3, 4 min; student 4, 7 min 30 s; student 5, 1 min 30 s; and student 6, 1 min. Students who experienced only the WIDRO condition had their intervals similarly calculated. Their intervals were: student 7, 2 min; student 8, 2 min 30 s; and student 9, 1 min. Although one would normally increase the size of the DRO interval as behavior came under schedule control, changes were not made in this study because we wanted a consistent and well experienced

DRO value for both the WIDRO and MDRO conditions.

RESULTS

Figure 1 presents the data for the students paired as previously described. Student 4 exhibited non-compliance, which occurred during baseline on the average of 0.12 responses per minute (rpm) (range, 0.35–0.03 rpm). Following the introduction of WIDRO, the rate immediately dropped to an average of 0.02 rpm (0.05–0 rpm). After MDRO was begun, the average response rate remained at 0.02 rpm (0.08–0 rpm), a rate well below baseline levels. Student 1, who was paired with student 4, also exhibited noncompliance. During baseline, this behavior averaged 0.31 rpm (0.70–0.10 rpm). Following initiation of the WIDRO contingency, the rate immediately dropped to below 0.07 rpm and averaged 0.02 rpm during the last 5 days of treatment. These results clearly showed that WIDRO reduced the behavior of both students, MDRO maintained response suppression for student 4, and student 4's level of responding during the last phase was similar to that of student 1.

Student 5 exhibited hand-flapping which occurred an average of 0.76 rpm during baseline (1.2–0.45 rpm) and decreased to an average of 0.09 rpm (0.8–0 rpm) during WIDRO. MDRO resulted in a further average reduction to 0.01 rpm (0.08–0 rpm) and was in the range exhibited in the last 12 days of WIDRO. Student 2, who was paired with student 5, exhibited head-weaving that occurred at an average rate of 0.08 rpm during baseline (0.20–0.03 rpm). Following the initiation of the WIDRO program, the rate decreased to an average of 0.01 rpm during the last 5 days of treatment. As with the first pair's data, these data support the efficacy of MDRO as a procedure to maintain responding already reduced by WIDRO.

Student 3 exhibited light-gazing, which averaged 0.24 rpm during baseline (0.28–0.20 rpm). During WIDRO, light-gazing immediately dropped to below 0.12 rpm and averaged 0.04 rpm during the last 5 days of treatment. Student 6 exhibited finger movements, which occurred at

an average of 1.17 rpm during baseline (1.82–0.92 rpm) and decreased to an average of 0.18 rpm during WIDRO (0.70–0.03 rpm). The rate decreased further to an average of 0.04 rpm during the MDRO program (0.11–0 rpm).

Figure 2 presents data for the students who experienced only the WIDRO condition. Student 7 exhibited light-gazing behavior, which averaged 0.61 rpm during baseline. Following the initiation of WIDRO, the rate dropped to an average of 0.06 rpm. During a return to baseline, the response rate showed a steady upward trend (average of 0.14 rpm). Student 8's head-weaving behavior occurred at an average rate of 0.43 rpm during baseline and decreased to 0.13 rpm during the WIDRO; during the last 15 days of WIDRO, the rate was below 0.08 rpm. Following the return to baseline this rate followed a steady upward trend, which averaged 0.17 rpm. Student 9 exhibited hand-flapping behavior, which averaged 1.09 rpm during baseline. The behavior was reduced to an average of 0.12 rpm during the initial WIDRO condition and increased to an average of 0.93 rpm when baseline was reinstated. This rate was again reduced during a return to the WIDRO condition, when response rate averaged 0.19 rpm over the last 10 days.

DISCUSSION

Results of this study demonstrated that MDRO can be effective in maintaining behavior change once behaviors have been decelerated through WIDRO. In addition, the data from the students who received only the WIDRO condition suggest that the elimination of the experimental condition *per se* results in either recovery or trends indicative of recovery of baseline response patterns. For each of the six students in the WIDRO/MDRO condition, WIDRO proved an effective means for reducing the targeted behaviors, and, for three of the students, MDRO was effective in maintaining the response suppression generated by the whole-interval method. There are, however, several aspects of the study that raise interesting questions. First, neither programming method resulted in total response suppression. Although the WIDRO/

Figure 2. Rate of responding during baseline and whole-interval DRO (WIDRO).

MDRO treatment program was shown to be an effective method of response reduction, there continued to be a response rate above zero (i.e., an average of 0.04 rpm), suggesting that there may be inadvertent reinforcement of the inappropriate response or simply treatment decay over time. Second, although MDRO interval programming appears to be a sufficient means to maintain behavior previously reduced via the WIDRO method, it may not be a necessary condition. The use of MDRO maintains response suppression and reduces the amount of teacher time involved in carrying out the program, but other reinforcement procedures (e.g., noncontingent reinforcement) may also be sufficient to maintain the response suppression and require even less time from the teacher. This issue, too, can be addressed in future research.

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Received February 4, 1985

Final acceptance June 3, 1986