A PROCEDURE FOR THINNING THE SCHEDULE OF TIME-OUT

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Few studies have evaluated ways to thin punishment schedules. The purpose of this study was to examine the effects of using variable ratio (VR) schedules to thin the time-out schedule gradually. Warnings were used in some conditions to assist potentially with schedule thinning, but this analysis was limited. Participants were 3 young students who engaged in problem behavior during enriched time-in periods. Dense schedules of intermittent time-out were effective at reducing problem behavior.

Key words: time-out, schedule thinning, intermittent punishment

Time-out is a punishment procedure that involves restricting access to reinforcers contingent on a response (Baer, 1962). Time-out is used commonly with young children and has proven to be effective across various topographies of behavior and in many different settings (see Brantner & Doherty, 1983, for a review). Many teachers of young children (i.e., preschool and early elementary teachers) use time-out in their classrooms (Zabel, 1986), and parents of young children implement time-out procedures at home. In a recent study, time-out proved to be an effective procedure for reducing the problem behavior of young children in school and home settings (Donaldson & Vollmer, 2011). Because it is used commonly and is effective in reducing problem behavior in young children, further research on time-out is important to identify the most appropriate and effective parameters of this procedure.

Several studies have implemented time-out using intermittent schedules (e.g., Clark, Rowbery, Baer, & Baer, 1973), but only two

have evaluated punishment schedule thinning. The first was conducted by Barton, Brulle, and Repp (1987) in which a differential punishment of high rates (DPH) of behavior schedule was arranged based on the previous day's rate of problem behavior. In addition, warnings were delivered following problem behavior that did not produce punishment. Schedule thinning with DPH schedules effectively reduced problem behavior, but the extent to which the warning contributed to the effectiveness of punishment could not be determined because a condition in which punishment was implemented in the absence of warnings was not included. Lerman, Iwata, Shore, and DeLeon (1997) used fixed-interval (FI) schedules to thin the schedule of punishment with four participants. Schedule thinning was successful with two participants, although only after the first response of the session was punished for one participant. The authors reported one potential reason for the limited success of schedule thinning was that problem behavior occurred at the beginning of sessions with relatively short interresponse times. The purpose of the current study was to evaluate the effectiveness of gradually thinning the time-out schedule using variable-ratio (VR) schedules, because VR schedules are more sensitive to short interresponse times than FI schedules are.

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METHOD

Participants and Setting

Participants were three children who had been referred to the study by their teachers for the treatment of problem behavior during school. Damien was a 5-year-old boy in preschool, Jackson was a 6-year-old boy in kindergarten (he had participated in a previous time-out study by Donaldson & Vollmer, 2011), and Keenan was a 3-year-old boy in preschool. No participants had any formal diagnoses. All experimental sessions occurred at the participants' school during a time in which potential reinforcers were freely available. Damien's sessions were on the school playground during recess, when he had free access to playground equipment and peer interaction. Jackson's sessions were in his classroom during group instruction time, during which his teacher read books, the class sang songs, and calendar activities occurred. In addition, attention was available from teachers and experimenters for Damien and Jackson if they asked or raised a hand. Keenan's sessions took place in a small area of a room that contained two chairs, puzzles, books, and a shape sorter. An experimenter served as the teacher to simulate preschool circle time and provided continuous attention to Keenan, including reading books, asking questions, and providing high fives and tickles. An experimenter implemented the time-out procedure for all participants.

Response Measurement and Interobserver Agreement

The dependent variable was the rate (responses per minute) of the target problem behavior, defined individually for each participant across conditions. Data were collected using handheld devices with a behavioral recording program that allows frequency data to be collected for multiple responses in real time (Instant Data).

Damien's target problem behavior was *aggression*, defined as pushing, hitting, kicking, pinching, spitting on, or throwing objects or sand at others. Keenan's target problem behavior included both aggression and disruption.

Aggression was defined as for Damien, but also included hair pulling. *Disruption* was defined as throwing objects, biting books, tearing or attempting to tear books, banging toys, and rocking his chair. Jackson's target problem behavior was disruption in the form of getting out of his seat without teacher permission or rocking his chair. Rocking was scored each time the chair went from having all legs of the chair touching the floor to having one leg of the chair more than 2.5 cm off the floor.

Interobserver agreement was collected by having a second observer simultaneously but independently collect data during 56% of baseline sessions and 59% of time-out sessions for Damien, 47% of baseline sessions and 65% of time-out sessions for Jackson, and 39% of baseline sessions and 25% of time-out sessions for Keenan. Proportional agreement was calculated by dividing each session into consecutive 10-s intervals, dividing the smaller number of responses by the larger number of responses in each interval to get a proportion, adding all proportions, and dividing by the total number of intervals. When both observers scored zero occurrences, the interval was considered a 100% agreement. Mean interobserver agreement was 95% during baseline sessions and 99% during time-out sessions for Damien, 95% during baseline sessions and 99% during time-out sessions for Jackson, and 92% during baseline sessions and 95% during time-out sessions for Keenan.

Procedure

The effects of time-out were evaluated in a reversal design, in which baseline phases were alternated with warning and time-out phases. Some time-out phases contained a multiple-element comparison of time-out with and without warnings. Warnings were statements that if the problem behavior occurred again, the participant would be sent to time-out (e.g., "If you push someone again, you will have to go to time-out."). Throughout all sessions, an experimenter remained within arm's reach of the participant; during time-in, the experimenter

was playing with Damien on the playground, sitting behind Jackson during circle time, and sitting next to Keenan during the simulated circle time.

All sessions were either 10 min or the duration of the scheduled activity in which problem behavior typically occurred, and time-out time was subtracted from the session time. Rates of problem behavior were calculated only for problem behavior that occurred during time-in. Sessions were conducted once or twice per day, 5 days per week.

Baseline. No programmed consequences were delivered contingent on the target problem behavior. Aggression was blocked physically by an experimenter to prevent harm to others, but nothing was said about the behavior. Disruption that could lead to physical harm or damage to property also was blocked by an experimenter, and nothing was said to the participant. Teachers and other school personnel were instructed to ignore problem behavior.

Warnings. The first response resulted in a warning, and all subsequent warnings were delivered on a fixed-ratio (FR) 2 schedule (i.e., warnings were delivered every other time the target problem behavior occurred). Time-out was never implemented. Problem behavior that did not result in a warning was ignored or blocked, if necessary.

Time-out. Time-out locations were small areas within the larger time-in areas (e.g., a carpeted corner of the classroom or a carpet square at the edge of the playground) for Damien and Jackson, designed as a contingent observation procedure (Porterfield, Herbert-Jackson, & Risley, 1976). Keenan was not moved to a new location during time-out, but all session materials were removed from the session room. Otherwise, time-out procedures were identical to the fixed-duration time-out condition in Donaldson and Vollmer (2011).

FR 1 time-out. Time-out was implemented on an FR 1 schedule. No warnings were delivered.

FR 2 time-out. Time-out was implemented on an FR 2 schedule. No warnings were delivered.

FR 2 time-out versus FR 2 warnings plus FR 2 time-out. FR 2 time-out sessions were alternated with sessions in which the first response produced a warning, and, thereafter, the consequences for a response alternated between time-out and a warning.

VR time-out versus FR 1 warnings plus VR time-out. This phase was identical to the FR 2 time-out versus FR 2 warnings plus FR 2 time-out phase except that the schedule of time-out was thinned until problem behavior reemerged, at which point the previous schedule that reduced problem behavior to an acceptable level was reinstated (Keenan and Jackson) or until the schedule was thinned successfully in one or both conditions (Damien). The criterion for schedule thinning was two consecutive sessions in both conditions with less than or equal to 0.1 responses per minute of the target problem behavior. In the FR 1 warnings plus VR time-out condition, all responses produced a warning except for the response that completed each ratio value, which resulted in time-out. Ratio values were determined for each session using the code provided in Bancroft and Bourret (2008), modified to generate a different series of values each time the program was run. The range of values for each VR schedule included the range of integers from 1 to X for which the average was the VR value.

RESULTS AND DISCUSSION

Figure 1 shows the rate of problem behavior in all phases for each participant. All participants engaged in high, variable rates of problem behavior during the initial baseline. The criterion for schedule thinning was particularly stringent because continuous time-out was expected to eliminate or nearly eliminate problem behavior, as observed in Donaldson and Vollmer (2011). During the initial warnings-only phase, decreases in level were ob-

Figure 1. Responses per minute of problem behavior across sessions for each participant. The horizontal line across the time-out versus time-out plus warning phase represents the criterion for schedule thinning.

served for Damien and Jackson, but problem behavior never fell below the criterion. The warnings condition was included to serve as a probe to determine the effects of warnings prior to exposure to punishment contingencies (Damien and Keenan). FR 2 time-out was implemented prior to the warnings phase for Jackson because he had a history of time-out with the experimenters (see Donaldson & Vollmer, 2011), so the warnings condition was used to probe the current effects of warnings, given a history with time-out procedures.

FR 1 and FR 2 schedules of time-out were effective at reducing the problem behavior of all participants. During the schedule-thinning phase, Damien's problem behavior reached the criterion at all VR values through VR 4 (83% of sessions met criterion during VR 4) and remained below the criterion during VR 5 until the school year ended and sessions could no longer be conducted. Jackson's and Keenan's problem behavior met the criterion in 100% and 80% of sessions during the first VR 2 phase and 80% and 80% of sessions during the second VR 2 phase but only 53% and 33% of sessions during the VR 3 phase, respectively. We presented the final baseline and schedule-thinning phases alone (Figure 1, bottom panel) to facilitate visual inspection of changes in Keenan's problem behavior during schedule thinning. Warnings appeared to have no effect on the efficacy of intermittent time-out, but carryover effects produced by the multielement design could obscure any effect warnings may have had.

These results, combined with those of Donaldson and Vollmer (2011), support the efficacy of time-out with young children and provide a method for thinning the schedule. Parents and teachers may be unable to implement time-out on a continuous schedule because they are unlikely to observe every instance of the problem behavior (parents may leave the room momentarily to answer the phone, teachers may attend to other students).

To obtain a VR 2 schedule of time-out, parents and teachers need to implement time-out with approximately 50% treatment integrity, which is a feasible goal for most parents and teachers.

Because the warnings-only condition was not replicated, the effects of warnings could not be evaluated empirically; however, the effect of warnings was only a secondary consideration for this study. Future studies should evaluate the effects of warnings and how to condition warnings as punishers because of the practical benefits of delivering warnings instead of implementing time-out (e.g., Dorsey, Iwata, Ong, & McSween, 1980; Vorndran & Lerman, 2006). Another limitation of the schedule-thinning procedure was the lack of a probe of the terminal schedule prior to schedule thinning. However, Lerman et al. (1997) found the terminal schedule to be effective prior to thinning with only one of five participants, suggesting the need for schedule thinning to obtain the desired clinical results.

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