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USING FIXED-TIME SCHEDULES TO MAINTAIN BEHAVIOR: A PRELIMINARY INVESTIGATION

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The purpose of this study was to evaluate the potential of fixed-time (FT) schedules to maintain behavior. Two children who had been diagnosed with autism were taught a functional task. Subsequently, three different FT schedules (i.e., yoked, thin, dense) were compared to determine their capacity to maintain task responding. Results suggested that FT schedules may be used to maintain previously acquired behavior.

DESCRIPTORS: fixed-time schedules, schedule density, maintenance, noncontingent reinforcement

Time-based schedules of reinforcement involve the delivery of a reinforcer independent of responding according to either fixed-time (FT) or variable-time (VT) schedules. Although research findings indicate that these schedules, often described as noncontingent reinforcement (NCR), can be an effective treatment for problem behavior, several studies have shown increases in or maintenance of behavior under NCR (e.g., Carr, Bailey, Ecott, Lucker, & Weil, 1998). Ringdahl, Vollmer, Borrero, and Connell (2001) suggested that incidental contingencies between the response and the reinforcing stimulus might account for response maintenance under FT schedules. Although such adventitious reinforcement is problematic when NCR is used to reduce problem behavior, this phenomenon may be advantageous in the context of skill maintenance.

The goal of the current study was to determine whether FT schedules could be used to maintain previously reinforced behavior. After response-dependent reinforcement was used to teach appropriate tasks to 2 participants, the effects of three FT schedules on responding were evaluated using multielement and reversal designs.

METHOD

Participants and Setting

Billy was a 4-year-old boy who had been diagnosed with autism. He exhibited good receptive and expressive language skills and could sight read approximately 200 words. Marissa was a 6-year-old girl who had been diagnosed with autism and failure to thrive. She had some receptive language skills and used several iconic symbols and vocalizations to request certain objects or activities. All sessions were conducted at a table in an empty therapy room at a university clinic. Two or three 10-min sessions were conducted each day, 5 days per week. An experimenter was present in the room, along with a table, chairs, food (in some conditions), and task materials. Each session was videotaped for subsequent data collection.

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Response Measurement and Interobserver Agreement

The first author and each participant's clinical team (i.e., guardians, case managers, clinic personnel) selected and defined an appropriate task for each participant. Billy's task, sock sorting, involved placing socks of four different colors into corresponding colored bins. A response was defined as picking up a sock from the pile and placing it in the correct bin. Marissa's task, utensil sorting, was defined as picking up a spoon or fork and placing it in the corresponding slot in a utensil separator. Response rate was calculated by dividing the total number of responses by the number of minutes in the session. Interobserver agreement was calculated for at least 25% of the sessions using the total agreement method (i.e., lower frequency divided by higher frequency and multiplied by 100%). Mean agreement scores were 96% (range, 80% to 100%) and 97% (range, 87.5% to 100%) for Billy and Marissa, respectively. In addition, independent-variable integrity and interobserver agreement were evaluated (procedures and results are available from the first author upon request).

Procedure

Prior to the study, five highly preferred food items were identified for each participant via paired-stimulus preference assessments. Brief multiple-stimulus assessments were then conducted prior to each session to select the food item to be delivered for responding (Carr, Nicolson, & Higbee, 2000). All sessions began with an instruction ("do this") and a model of the appropriate response. Sessions were terminated contingent on self-injury, aggression, crying, or any requests to leave the therapy room.

Baseline and extinction. No consequences were provided for task performance. In addition, food was not present during these conditions.

Variable-ratio (VR) reinforcement. The experimenter delivered the preferred food item for responding on a continuous reinforcement schedule (fixed-ratio [FR] 1), which was gradually thinned to a VR 3 schedule. For the terminal schedule, a food item was delivered following an average of three responses (range, two to four responses).

FT (yoked). The FT interval was based on the mean interreinforcement interval during the previous VR 3 phase. This interval was calculated by dividing the number of seconds during each VR 3 session by the number of responses in the session and multiplying by 3. The experimenter delivered the preferred food item each time the FT interval elapsed until the end of the session.

FT (dense). This condition was identical to the FT (yoked) condition, except that the schedule was twice as dense (i.e., the FT intervals were 50% shorter). The FT interval was calculated based on data from the previous VR 3 phase. A denser FT schedule also was implemented near the end of the study. This schedule was twice as dense as the previous dense FT schedule (i.e., the FT intervals were 50% shorter).

FT (thin). This condition was identical to the FT (yoked) condition, except that the schedule was twice as thin (i.e., the FT intervals were 100% longer). The FT interval was calculated based on data from the previous VR 3 phase.

Experimental Design

Multielement and reversal designs were used to evaluate the effects of three different FT schedules on response rate. Different conditions were associated with different-colored tablecloths and T-shirts worn by the experimenters.

RESULTS AND DISCUSSION

Results for both participants (Figure 1) showed that responding was low during the

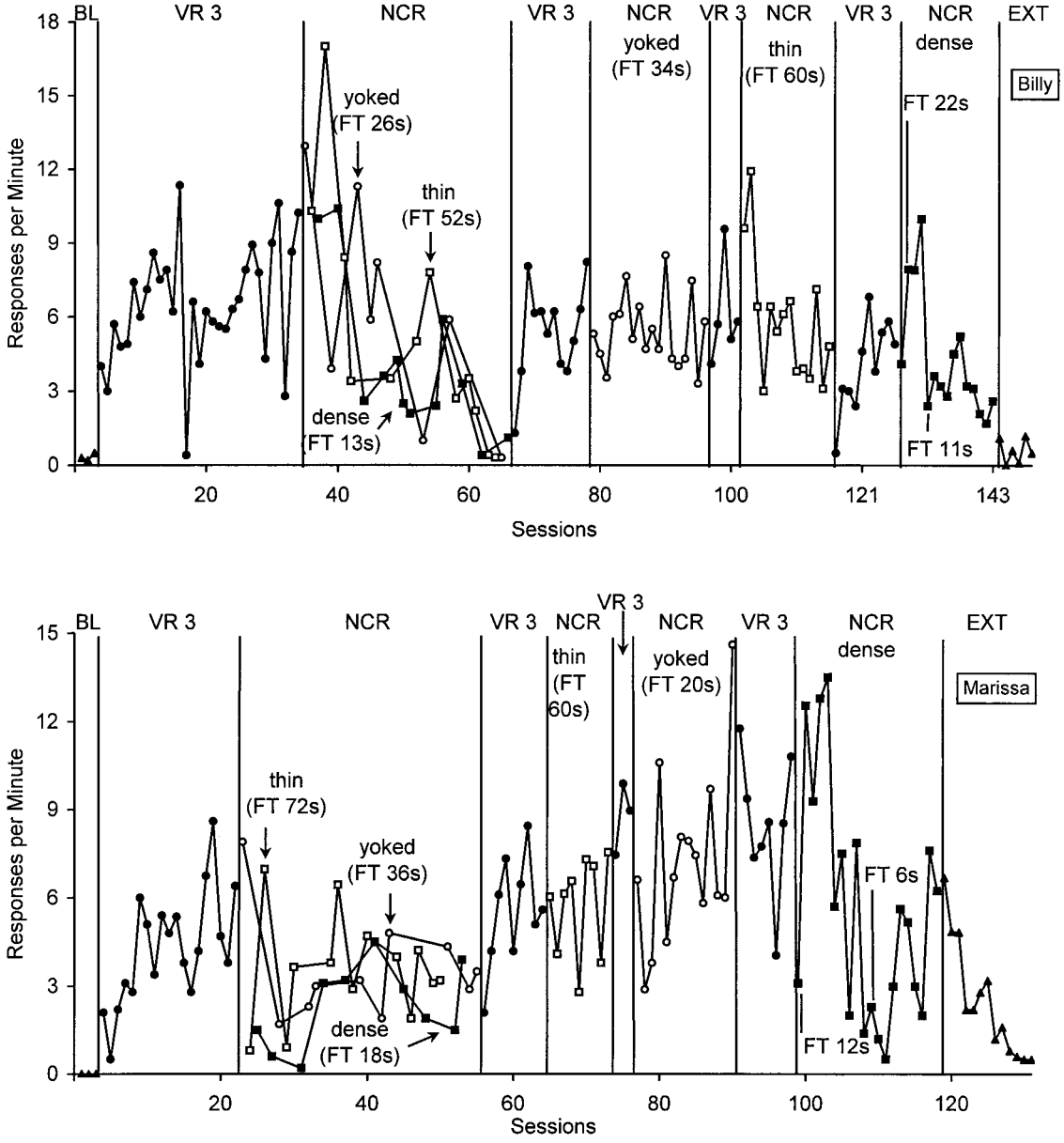

Figure 1. Number of responses per minute during baseline, FR 1, VR 3, FT (yoked, thin, dense), and extinction conditions for Billy (top panel) and Marissa (bottom panel).

initial baseline and increased during the initial VR 3 phase. For Billy, responding decreased under each of the three FT schedules—FT 26 s (yoked); FT 52 s (thin); FT 13 s (dense)—during the multielement analysis. When the FT schedules were alternated with the VR schedule in a reversal design, responding was maintained at similar levels under each FT schedule with the exception of the densest value. Responding further decreased to near-zero levels in the final extinction phase. For Marissa, similar levels of task responding were maintained under the three FT schedules in the multielement comparison. When the FT schedules were alternated with the VR schedule in a reversal design,

responding was again maintained at similar levels under the thin and yoked FT conditions. Similar but more variable levels of responding occurred under the dense FT schedules. During the extinction condition, the rate of responding decreased to low levels.

Results suggested that previously acquired responses were maintained under thin, dense, and yoked FT schedules for both participants. In addition, responding decreased to near-zero levels during the final extinction condition, indicating that reinforcer delivery was at least partially responsible for behavioral maintenance. Caregivers may find it easier to use FT schedules than response-dependent schedules to maintain adaptive behavior in clinical settings. However, these conclusions must remain tentative because (a) behavior decreased under FT schedules for 1 participant (Billy) during the multielement comparison, (b) participants were periodically reexposed to contingent reinforcement during the reversal phase, and (c) response patterns under extinction following periodic or extended exposure to VR reinforcement were not evaluated. Furthermore, a contiguity analysis (similar to that conducted by Vollmer, Ringdahl, Roane, & Marcus, 1997) indicated that the response–reinforcer relation was disrupted under FT schedules (i.e., adventitious reinforcement did not seem to occur), so it is unclear why responding was not extinguished.

It is possible that the presence of the food item functioned as a discriminative stimulus for engaging in the target response. In addition, responding may have been maintained because of the participants' history of receiving reinforcement for following instructions. Two additional limitations of the study should be addressed in future research. First, response rates were similar across FT schedules, perhaps because the schedules were not sufficiently different. Second, the FT values implemented in this study (6 s to 60 s) may not have clinical utility (i.e., these schedules may not be easier to implement than response-dependent reinforcement).

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