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ASSESSMENT OF A RESPONSE BIAS FOR AGGRESSION OVER FUNCTIONALLY EQUIVALENT APPROPRIATE BEHAVIOR

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We evaluated the effects of a dense (fixed-ratio 1) schedule of reinforcement for an 11-year-old boy's mands for toys while aggression produced the same toys on various schedules chosen on the basis of a progressive-ratio probe. Based on the probe session data, we accurately predicted that aggression would be more probable than mands when the schedules were equal or slightly discrepant, but that mands would be more probable when the schedule discrepancy was large.

DESCRIPTORS: response bias, functional communication training, behavioral economics, choice, concurrent schedules, aggression

Functional communication training (FCT) consists of training an individual to obtain the reinforcer that maintains destructive behavior via appropriate communication (or mands). Horner and Day (1991) demonstrated that a key element in the success of FCT is making the mand more efficient (e.g., higher reinforcement rate) than the target behavior. This can often be accomplished by placing the target behavior on extinction, but extinction may not always be possible. In such cases, it may be useful to examine reinforcement parameters surrounding the effectiveness of FCT given continued reinforcement of destructive behavior.

Our functional analysis showed that an individual displayed aggression maintained by access to preferred toys. We then evaluated the effects of FCT while mands and aggression were concurrently reinforced on fixed-ratio (FR) 1 schedules and found that aggression was more probable. Next, we conducted a progressive-ratio probe session to determine the schedule parameters sufficient to make mands more probable than aggression. A final analysis was conducted to verify that mands would become more probable than aggression given the parameters identified in the probe session.

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METHOD

Participant and Setting

Jake was an 11-year-old boy who had been diagnosed with autism, bipolar disorder, and moderate mental retardation and who had been admitted to an inpatient unit for the treatment of aggression (hitting, kicking, biting, grabbing, pinching, head butting). Jake could understand simple requests, but his communication was limited to two- to three-word utterances. All sessions were conducted in a room containing his toys.

Procedure, Data Collection, and Interobserver Agreement

Initially, a verbal prompting procedure was used to train Jake to request his toys. Before each session, Jake was instructed that his toys would be returned if he said "toys, please." At the start of each session, Jake's toys were removed and he was given 15 s to independently mand for the toys. If Jake manded, his toys were returned for the remainder of the 1-min trial. If he failed to mand, the therapist prompted him to say "toys, please" and returned the toys when he complied. All aggression was ignored. Ten trials were conducted per session, and training continued (six sessions) until Jake independently (i.e., before the within-trial prompt) requested his toys on 80% of trials for three consecutive sessions. These prompting procedures were not repeated after training, but Jake was informed of the contingencies in operation prior to each session.

All subsequent sessions lasted 10 min (except for the probe session, which ended when the criteria described below were met). Frequency data were collected on aggression and mands. A second observer independently recorded aggression and mands during 55% of sessions. Exact agreement within 10-s intervals for mands and aggression averaged 96.9% combined.

Prior to each session, Jake had access to his toys for 2 min. When the session began, the therapist removed the toys and returned them for 30 s contingent on either mands or aggression depending on the contingencies in operation. During the first analysis, we examined rates of mands and aggression when only one response produced toys on an FR 1 schedule (single-operant reinforcement) or when either response produced toys on concurrent FR 1 schedules (concurrent reinforcement [equal]). Conditions within each phase were labeled with a two-component name in which the first and second components denoted the schedule for mands and aggression, respectively. For example, during FR 1/extinction, mands produced 30 s of toy access on an FR 1 schedule and aggression produced no programmed consequence.

After the first analysis, a progressive-ratio probe session was conducted in which the reinforcement schedule for mands remained at FR 1 while the schedule for aggression was increased (FR 2, FR 5, FR 10, and FR 20) after every third toy delivery. In the last analysis, rates of mands and aggression were examined when these responses produced the same rate of toy access during the concurrent reinforcement (equal) phases or different rates of toy access during the concurrent reinforcement (unequal) phases. The schedule parameters used in these phases were based on the probe session results and are described below.

RESULTS AND DISCUSSION

The top two panels of Figure 1 show rates of aggression and mands during the FR 1/extinction, extinction/FR 1, and FR 1/FR 1 conditions. In the single-operant reinforcement conditions, the reinforced response occurred more frequently than the nonreinforced response. However, when both responses produced equal reinforcement (concurrent reinforcement [equal]), aggression was more probable than mands.

The middle panel of Figure 1 shows the frequency of aggression during each concurrent schedule of the progressive-ratio probe session and the number of reinforcers earned with each response. Based on the results of the probe session, we selected two reinforcement schedules for aggression for the last analysis. We selected the FR 2 schedule because it was the leanest schedule (relative to FR 1 for mands) at which aggression was

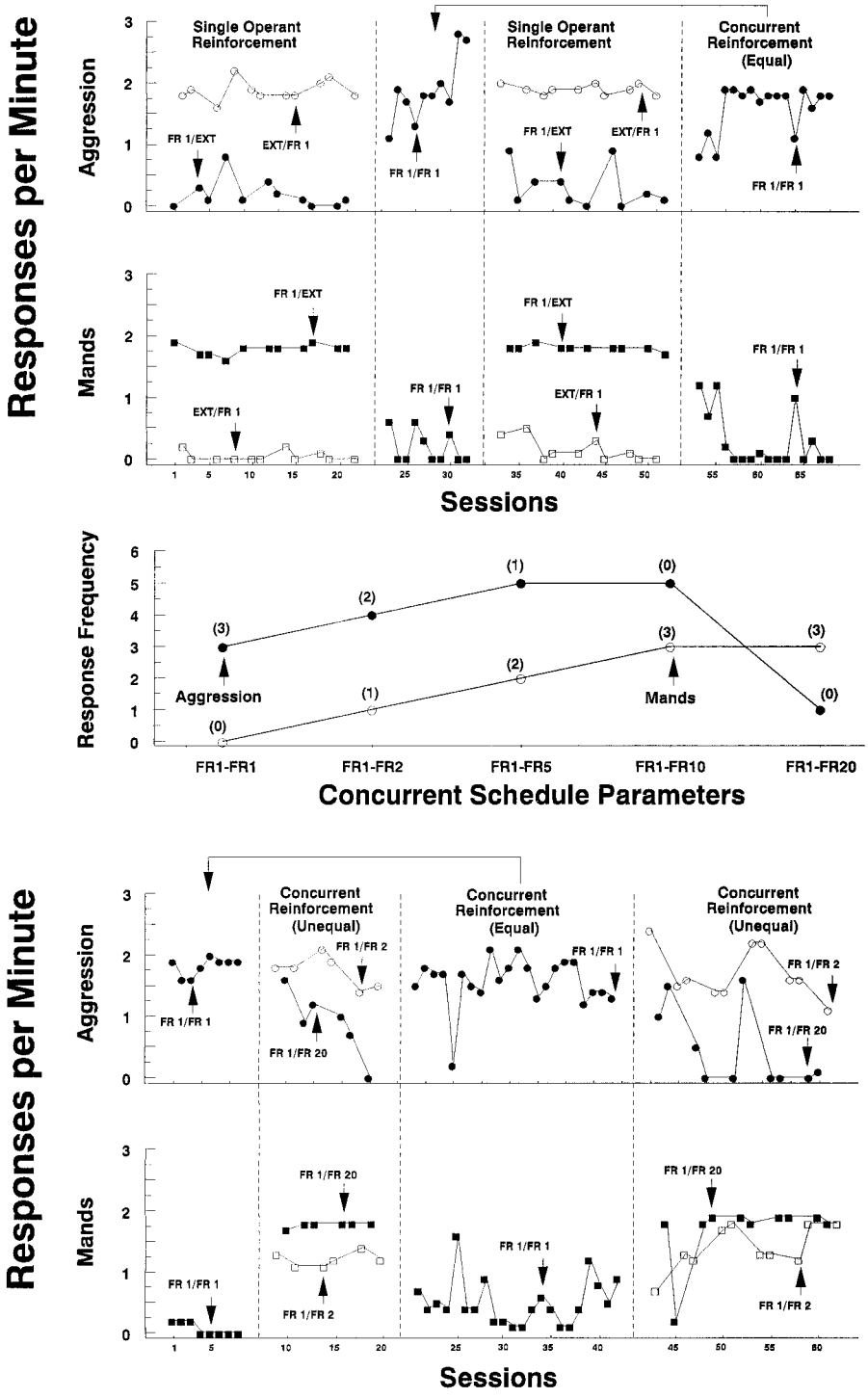

Figure 1. Number of responses per minute of aggression (first panel) and mands (second panel) during the single-operant reinforcement and concurrent reinforcement (equal) phases of the first analysis; frequency of aggression and mands and the number of reinforcers earned for each response (in parentheses) during the progressive-ratio probe session (third panel); and responses of aggression (fourth panel) and mands (fifth panel) during the concurrent reinforcement (equal) and concurrent reinforcement (unequal) phases of the second analysis.

more probable than mands and the number of toy deliveries earned with aggression was more than that earned with mands. We selected the FR 20 schedule because it was the densest schedule at which both responding and number of toy deliveries earned almost completely shifted towards mands.

The bottom two panels display rates of aggression and mands during the FR 1/FR 1, FR 1/FR 2, and FR 1/FR 20 conditions. During the first concurrent reinforcement (equal) phase, aggression was high and mands were at near-zero levels. During the first concurrent reinforcement (unequal) phase, aggression decreased only slightly in FR 1/FR 2 but decreased sharply in FR 1/FR 20. Mands increased in both conditions, but increased more in FR 1/FR 20 than in FR 1/FR 2. In the second concurrent reinforcement (equal) phase, mands decreased and rates of aggression were similar to those observed in the first phase. In the final phase, aggression remained high in FR 1/FR 2 but decreased to near-zero levels for six of the last seven sessions in FR 1/FR 20. Mands again increased in both conditions, but the increase was more immediate and consistent in FR 1/FR 20 than in FR 1/FR 2. Overall, aggression was more probable than mands when both responses produced equal reinforcement. The greater probability of aggression was less dramatic but still clear during the first FR 1/FR 2 evaluation, when aggression produced half as much reinforcement per response as mands. However, mands gradually increased in all conditions over the course of the second analysis, and towards the end, aggression and mands were equally probable in FR 1/FR 2. Finally, Jake clearly displayed more mands than aggression when aggression produced one 20th as much reinforcement per response as mands (FR 1/FR 20).

Several studies have shown that destructive behavior can be maintained at higher rates than mands when both responses produce equal reinforcement (e.g., Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998; Shirley, Iwata, Kahng, Mazaleski, & Lerman, 1997). The current results illustrate a method for assessing the relative probability of one response over another using rate of reinforcement as the comparison parameter. Based on the probe session, we accurately predicted that the FR 1/FR 2 schedule would not substantially reduce aggression whereas the FR 1/FR 20 schedule would. These preliminary findings suggest that the progressive-ratio probe may be helpful for predicting the efficacy of FCT when extinction of problem behavior is difficult or unlikely. For individuals who are more likely to display destructive behavior than appropriate mands, it may be particularly important to insure that the rate of reinforcement for mands is substantially higher than for destructive behavior.

Explanations for observed response biases, given equal reinforcement for two topographies, have sometimes focused on reinforcement history, in which responses with a more favorable history tend to be more probable than those with a less favorable history (Shirley et al., 1997). Reinforcement history, particularly a local history during the functional analysis in which destructive responses in the tangible condition occurred at an average rate of 2.1 responses per minute, may have similarly influenced the current results. The increase in communication over the course of the second analysis is also consistent with a reinforcement history account. Future research should evaluate the effects of different reinforcement histories on responses within an operant class.

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