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DEVELOPING STIMULUS CONTROL OF THE HIGH-RATE SOCIAL-APPROACH RESPONSES OF AN ADULT WITH MENTAL RETARDATION: A MULTIPLE-SCHEDULE EVALUATION

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We evaluated a multiple schedule in which the extinction (S−) components were signaled overtly by a black lanyard and the reinforcement (S+) components were not correlated with any programmed stimuli in developing stimulus control over the high-rate social-approach responses of an adult with mental retardation. Responding was consistently low in the presence of the S− and consistently high when the lanyard was absent (i.e., the S+ condition). Component durations were thinned successfully to a level that was manageable for caregivers.

Key words: multiple schedules, social-approach responses, stimulus control

Recent studies have evaluated multiple-schedule variations for reducing high-rate social-approach responses. In such studies, periods (or components) of reinforcement and extinction are alternated based upon a time schedule, and each period is associated with some programmed, salient discriminative stimulus. For example, Hanley, Iwata, and Thompson (2001) used a multiple schedule to reduce high-rate manding during functional communication training for the problem behavior of 3 individuals with intellectual disabilities. The authors presented one colored card on a table during reinforcement periods (S+) in which each response was reinforced on a fixed-ratio (FR) 1 schedule and a different colored card during extinction (S−) periods. This procedure acquired stimulus control over mands, in that manding occurred in the presence of the S+ but not the S−.

Tiger, Hanley, and Heal (2006) compared the efficacy of three different multiple-schedule signaling arrangements in gaining stimulus control over the social approaches of preschool children. These arrangements involved providing overt signals during (a) both S+ and S− components, (b) the S+ component only (i.e., the S− component was signaled by the absence of a programmed discriminative stimulus), and (c) neither during the S+ or S− component (termed a mixed schedule). Both of the multiple schedules with signaled reinforcement components were efficacious; however, the authors did not evaluate a variation with overtly signaled S− components and no programmed discriminative stimuli during S+ components.

Tiger et al. (2006) excluded this S− only option based on the rationale of Terrace (1971) that the S− may gain aversive properties after a history of pairing between the S− and extinction. However, we believe the dismissal of an S− only arrangement to be premature. First, in some circumstances an S− only arrangement may be more practical than the S+ only arrangement described by Tiger et al. For example, a caregiver may find it easier to present an S− during a 20-min phone call than

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to present an S+ for the other 23 hr and 40 min of the day. Second, following certain learning histories, extinction-correlated stimuli can acquire reinforcing properties (i.e., those associated with increased response efficiency; Case, Fantino, & Wixted, 1985). Furthermore, many stimuli in the environment signal the unavailability of reinforcement; avoidance of those stimuli is adaptive (e.g., walking away from a locked door, driving by a closed store). Signaling the unavailability of reinforcement may reduce the number of responses exposed to extinction and maximize available reinforcers, negating the aversive aspects of this learning history.

Based on the potential utility of the S− only multiple schedule, we believe evaluation of this variation is warranted. Therefore, the purpose of this study was to evaluate the effects of a multiple schedule with FR 1 and extinction components in which only the extinction component (S−) was signaled overtly to develop stimulus control over the high-rate social-approach responses of an adult with mental retardation. A secondary purpose of the study was to thin the values of the component durations to a level that could be reasonably supported by behavior-change agents in the natural environment.

METHOD

Participants and Setting

Tim was a 43-year-old man who had been diagnosed with moderate mental retardation. He resided in a group home and attended a sheltered workshop during the day. He spoke in full sentences and completed most daily living skills independently. Experimental sessions were conducted at his home during leisure periods (e.g., after dinner). Tim was included in the study based on a history of high-rate social-approach responses. He engaged in low levels of problem behavior that were not specifically targeted during the intervention. Previous functional assessments (i.e., observation, rating scales) indicated that his problem behavior was sensitive to social positive reinforcement in the form of attention.

Response Measurement and Interobserver Agreement

The therapist collected primary data on paper-and-pencil data sheets that were precoded with three columns (i.e., one for each target response) under separate sections for reinforcement and extinction periods. Data were collected by making tally marks on the appropriate column when a target response occurred. A *social approach* was defined as any vocal (e.g., asking about the experimenter's day, saying "hi") or nonvocal (e.g., attempting to shake the experimenter's hand, waving) behavior directed toward the experimenter or staff member. *Problem behavior* was defined as hitting or kicking surfaces and throwing objects. *Attention delivery* was defined as the experimenter vocally or nonvocally acknowledging a social approach within 5 s.

A second observer simultaneously but independently scored all behavior during 29% of sessions. Total agreement on social-approach responses, problem behavior, and attention deliveries was calculated by dividing the smaller number of responses by the larger number of responses per session and converting the ratio to a percentage. Mean total agreement was 96% for social approaches (range, 93% to 100%), 100% for problem behavior, and 98% for attention deliveries (range, 95% to 100%). Attention was delivered accurately on 99% (range, 95% to 100%) of the opportunities.

Procedure

All sessions (15-min duration) were conducted in Tim's living room, which contained a variety of leisure items (e.g., television, board games). We did not arrange any programmed consequences for problem behavior during the study.

FR 1 baseline. Each social approach resulted in an experimenter-delivered attention state-

ment on an FR 1 schedule. No discriminative stimuli were presented during this condition.

Multiple schedule plus rules. Similar to Tiger and Hanley (2004), the experimenter initiated sessions by presenting a black lanyard and stating, "When I am wearing this necklace, I am doing work and cannot talk to you. When I am not wearing the necklace, I can talk to you and answer your questions." Each session consisted of an alternation between extinction (always the first component presented) and FR 1 components. The experimenter delivered approximately 5 to 10 s of attention following each social-approach response during FR 1 components. If Tim engaged in a social-approach response immediately prior to the completion of the FR 1 component, the reinforcer interval was terminated at the end of the component, and the extinction component was initiated as planned. No attention (i.e., attention extinction) was provided following social approaches during extinction components. The final component was terminated early if the 15-min session duration elapsed.

The duration of each component started at 1 min and was increased systematically across sessions to reach a terminal goal that was acceptable to home and work staff. The duration of the extinction component was increased systematically by 1 min and the FR 1 component was increased by 30 s to terminal durations of 10 min for the extinction component and 5 min for the FR 1 component. The durations were increased when sessions produced two or more social-approach responses per minute during the reinforcement components and less than 0.5 responses per minute during the extinction components for a session. Component response rates were determined by dividing the total number of responses during a component by the total duration of that component.

To assess generality and maintenance of the multiple-schedule arrangement, staff from Tim's home conducted the last three sessions of the treatment evaluation as well as a follow-up session 6 months later. In addition, staff members at his workplace conducted five sessions following successful schedule thinning at his residence.

RESULTS AND DISCUSSION

Figure 1 depicts Tim's social-approach responses and problem behavior during the analysis. The FR 1 (baseline) condition was associated with high rates of approach responses (M = 4.8 responses per minute) during the entire 15-min session. However, when the multiple schedule plus rules was implemented, Tim engaged in very low rates of social approaches during the signaled extinction components (M = 0.4) and maintained high-rate responding during the FR 1 components (M = 3.4). From these data, it is evident that the combination of the signaled S− multiple schedule and the delivery of presession rules demonstrated effective control of behavior, in that social approaches were seemingly turned on and off both within and across sessions of this evaluation. This differential response pattern persisted throughout schedule thinning, during sessions in which Tim's home and work staff conducted sessions, and at a 6-month follow-up assessment. Marginally higher levels of social-approach responses during both components were observed when staff members from Tim's workplace conducted the sessions. Across all condition types, intervention agents, and settings, problem behavior remained low (M = 0.02 responses per minute; range, 0 to 0.3) and occurred most often during the extinction components with staff members from home or work.

In certain situations, signaling the unavailability of attention only (as in the current study) may be more practical than signaling the S+ and S− or the S+ only, as described by Tiger et al. (2006) and may be just as efficacious as these previously described procedures. The concern raised by Tiger et al. regarding the S− only

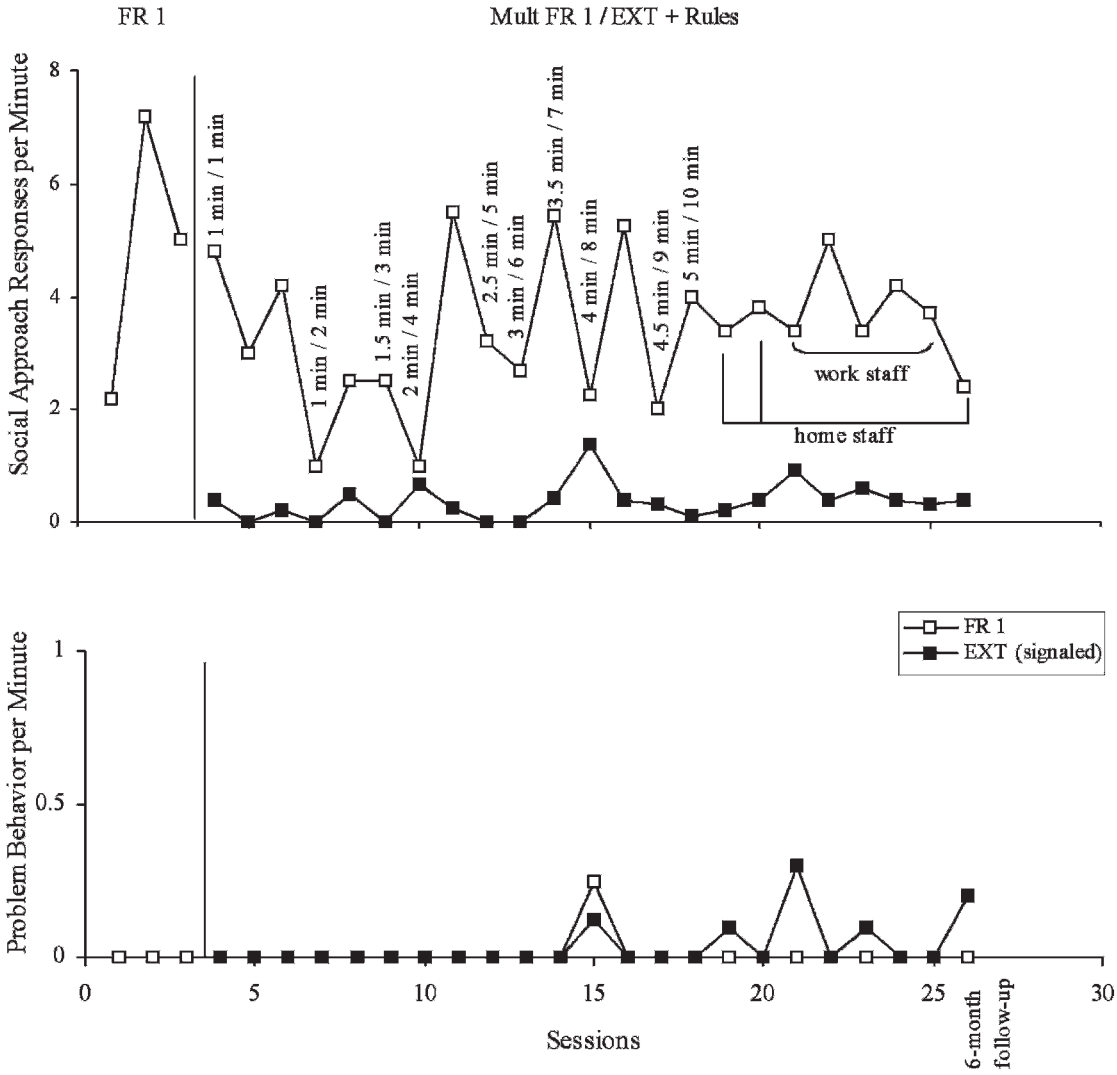

Figure 1. Social-approach responses (top) and problem behavior (bottom) per minute during unsignaled FR 1 (open squares) and signaled extinction (filled squares) conditions.

procedure having a negative impact (i.e., decreased preference for the environments associated with these stimuli, avoidance behavior) was not addressed directly in the current study; however, no increases in problem behavior were associated with the signaled S− condition. Future research should evaluate client preferences for S− only multiple schedules relative to other schedules of discontinuous reinforcement availability.

The current study is also one of the few to demonstrate procedures to thin reinforcement density via lengthening extinction-component durations and reducing reinforcement-component durations (see also Hagopian, Toole, Long, Bowman, & Lieving, 2004; Hanley et al., 2001; Neidert, Iwata, & Dozier, 2005) in an effort to make these procedures more practical for caregivers. Our study was also relatively novel in that our multiple-schedule

evaluation incorporated typical caregivers and was assessed in multiple settings typically experienced by our participant (see also Cammilleri, Tiger, & Hanley, 2008).

There are a few procedural limitations of the current study that should be resolved in future research. First, the total agreement method worked well with our paper-and-pencil data-collection system but is a relatively nonstringent calculation for interobserver agreement. Thus, these data should be interpreted with caution despite the high agreement coefficients. Second, the stimulus control exerted in the current study was not evaluated independently of control exerted by the schedules of reinforcement. That is, responding may have ceased during extinction components due to direct contact with extinction rather than the presentation of the S− (such a phenomenon was demonstrated by Tiger & Hanley, 2005). Future research should conduct a mixed-schedule reversal (i.e., same schedules of reinforcement during each component without programmed signals) as a control condition to evaluate the acquired stimulus properties of signals over time. Similarly, the delivery of contingency-specifying statements co-occurred with the implementation of the multiple schedule in the current study, so the additive effects of the contingency-specifying statements are unknown. Future research may examine the additive effect, if any, of contingency-specifying statements while schedule thinning during multiple schedules in which only the extinction component is signaled.

Finally, it is worth noting that some level of extinction-component responding persisted throughout the evaluation, which is indicative of incomplete stimulus control and may be particularly problematic should caregivers intermittently or inadvertently reinforce approaches during extinction periods. Future research should evaluate the use of additional procedures to eliminate extinction-component approaches and problem behavior. For instance, one could change the multiple-schedule arrangement to a chained-schedule arrangement in which access to the FR 1 component is withheld until a period passes without a social approach.

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