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DEVELOPING STIMULUS CONTROL OF PRESCHOOLER MANDS: AN ANALYSIS OF SCHEDULE-CORRELATED AND CONTINGENCY-SPECIFYING STIMULI

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The present study replicates and extends previous research on stimulus control by arranging teacher attention for preschooler's mands into a multiple schedule and conducting a component analysis of the effects of schedule-correlated stimuli and contingency-specifying stimuli (rules) on the development of discriminated manding.

DESCRIPTORS: manding, multiple schedules, preschoolers, rules, stimulus control, teacher attention

Stokes, Fowler, and Baer (1978) taught children to recruit attention with appropriate behaviors, but these requests often occurred with undesirable frequency and timing. One solution recently described by Hanley, Iwata, and Thompson (2001) with developmentally disabled adults involved alternating between signaled periods of extinction and reinforcement of mands for attention. It was shown that manding was maintained during periods of reinforcement even when long periods of extinction were introduced. The present study replicated the multiple-schedule arrangement with typically developing preschoolers who reportedly engaged in high-rate or poorly timed mands for teacher attention. In addition, a component analysis of the independent contributions of correlating salient cues with periods of reinforcement and extinction and providing rules describing these correlations was conducted.

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METHOD

Participants and Setting

Three typically developing children, enrolled in a full-day university-based inclusive preschool, participated. Sessions were conducted in a room (5 m by 5 m) arranged similarly to classrooms in which the teacher provided direct instruction on skills with 2 children simultaneously. Jan was assessed individually, and Sue and Jill experienced the assessment together to simulate classroom conditions more closely.

Response Measurement

The number of mands for teacher attention, defined as any vocal or nonvocal behavior directed towards the teacher, was recorded during 10-s intervals. An occurrence was scored following a 2-s pause between mands. Data were recorded using handheld computers, and are reported as the rate of manding during reinforcement and extinction components.

Interobserver Agreement

Interobserver agreement was assessed by having a second observer simultaneously but independently score mands during 29.6%, 25.0%, and 28.5% of sessions. Agreement

averaged 93.6% (range, 78.9 to 98.6%), 93.0% (range, 87.9 to 97.3%), and 98.8% (range, 97.3 to 100%) for Jan, Sue, and Jill, respectively.

Procedure

Children sat with academic materials (e.g., blocks, string beads, etc.) at individual tables across from and facing the experimenter. The experimenter did not orient towards a child except when delivering contingent attention. All sessions were 12 min in duration and consisted of three components: fixed-ratio (FR) 1, Extinction 1, and Extinction 2. Each component occurred three times per session, twice for 1 min and once for 2 min. The order of components was randomly determined prior to sessions to minimize the likelihood that a temporal discrimination would develop. Approximately 5 s of attention appropriate to the mand was provided during FR 1 components. While the FR 1 schedule was operating for 1 child, the other child's mands did not result in attention from the experimenter (Extinction 1). This arrangement approximated classroom conditions in which a teacher attended to 1 child at a time. Attention was not available to either child during Extinction 2. This component approximated classroom conditions in which teachers were not available to provide attention to any child (e.g., when talking with a parent).

Mixed schedule. FR 1 and extinction periods rotated on a time-based schedule, and contingency changes were unsignaled (i.e., no schedule-correlated stimuli were present). This condition was analogous to typical situations when attention is unpredictably available.

Multiple schedule. This condition was arranged similar to the mixed-schedule condition, except that red, white, and blue floral leis were paired with each component (i.e., when attention was available for 1 child, the experimenter wore the red lei; when attention was available for the other child, the experimenter wore the blue lei, etc.). The purpose of this condition was to determine if correlating stimuli with the availability (FR 1) and unavailability (extinction) of attention was sufficient to acquire control over manding.

Multiple schedule plus rules. This condition was similar to the multiple-schedule condition, except that prior to each session the therapist presented each lei and specified the associated contingency (e.g., "When I am wearing the red lei, it is your time. I can answer your questions and look at your work. When I am wearing the blue lei, it is [other child's name] time. I can't answer your questions or look at your work. When I am wearing the white lei, it is my time. I can't answer either of your questions or look at either of your work."). Prior to each session, each participant was prompted to mand in the presence of each lei twice and experience the consequences associated with each. The purpose of this condition was to determine if providing rules prior the session would enhance stimulus control of manding.

Multiple schedule plus rules with varied discriminative stimuli. This condition was similar to the multiple-schedule plus rules condition except that the schedule-correlated stimuli were reassigned each session. For instance, the red lei was correlated with the FR 1 schedule for Jill during the initial session and with Extinction 1 during the second session. Accurate rules were still provided prior to each session. The purpose of this condition was to determine if experience with schedule-correlated stimuli was necessary for discriminated manding (i.e., contingency-shaped behavior) or whether stimulus control of manding would be observed immediately (i.e., rule-governed behavior).

RESULTS AND DISCUSSION

Similar to the results of Hanley et al. (2001), we observed undifferentiated pat-

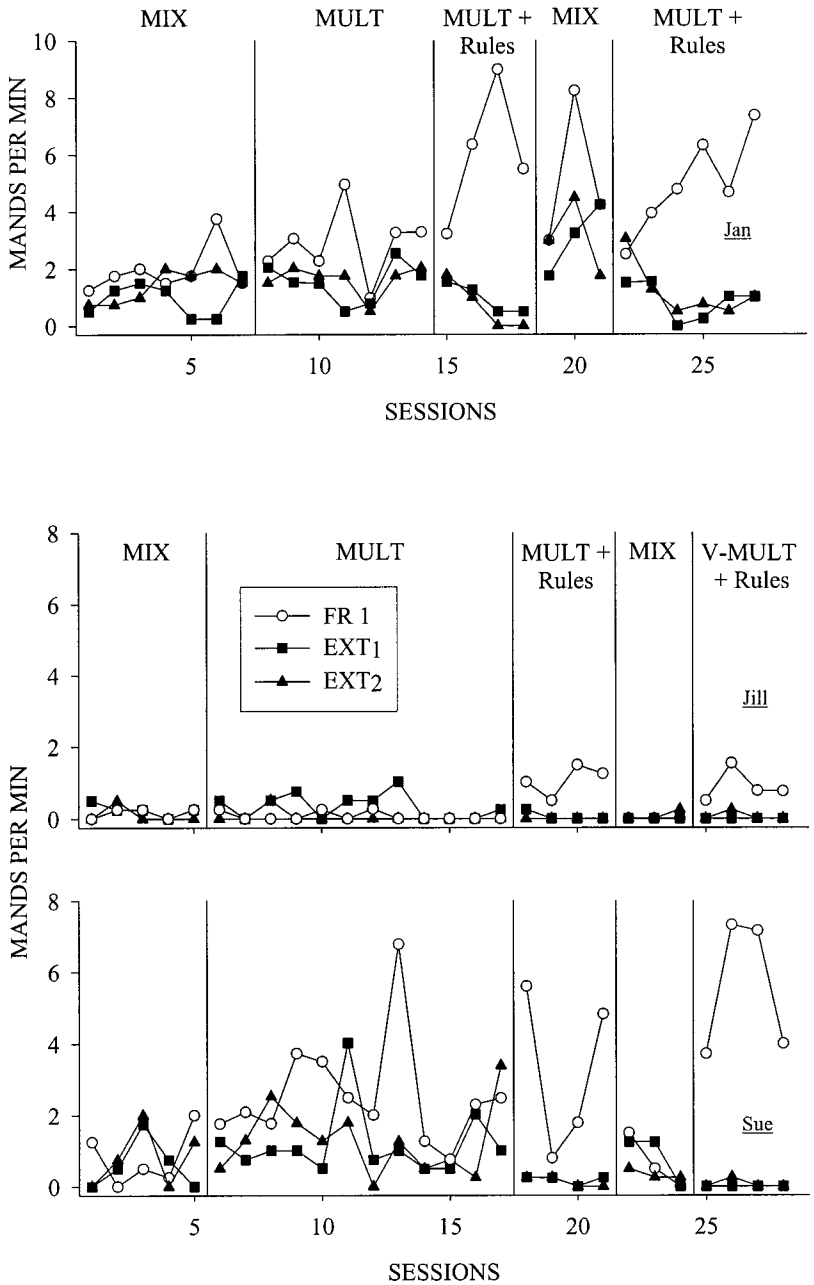

Figure 1. Rate of manding during FR 1, Extinction 1, and Extinction 2 components across conditions for Jan (top panel), Jill (middle panel), and Sue (bottom panel).

terns of manding in the mixed-schedule conditions for all participants (Figure 1). When the multiple schedule was arranged, manding increased during FR 1 components but persisted during extinction components for 2 participants (Jan and Sue). In addition, manding did not reliably occur during FR 1 components for Jill. These findings differ from those of Hanley et al., in which discriminated manding did emerge under multiple-schedule conditions. Procedural differences probably account for the discrepancy.

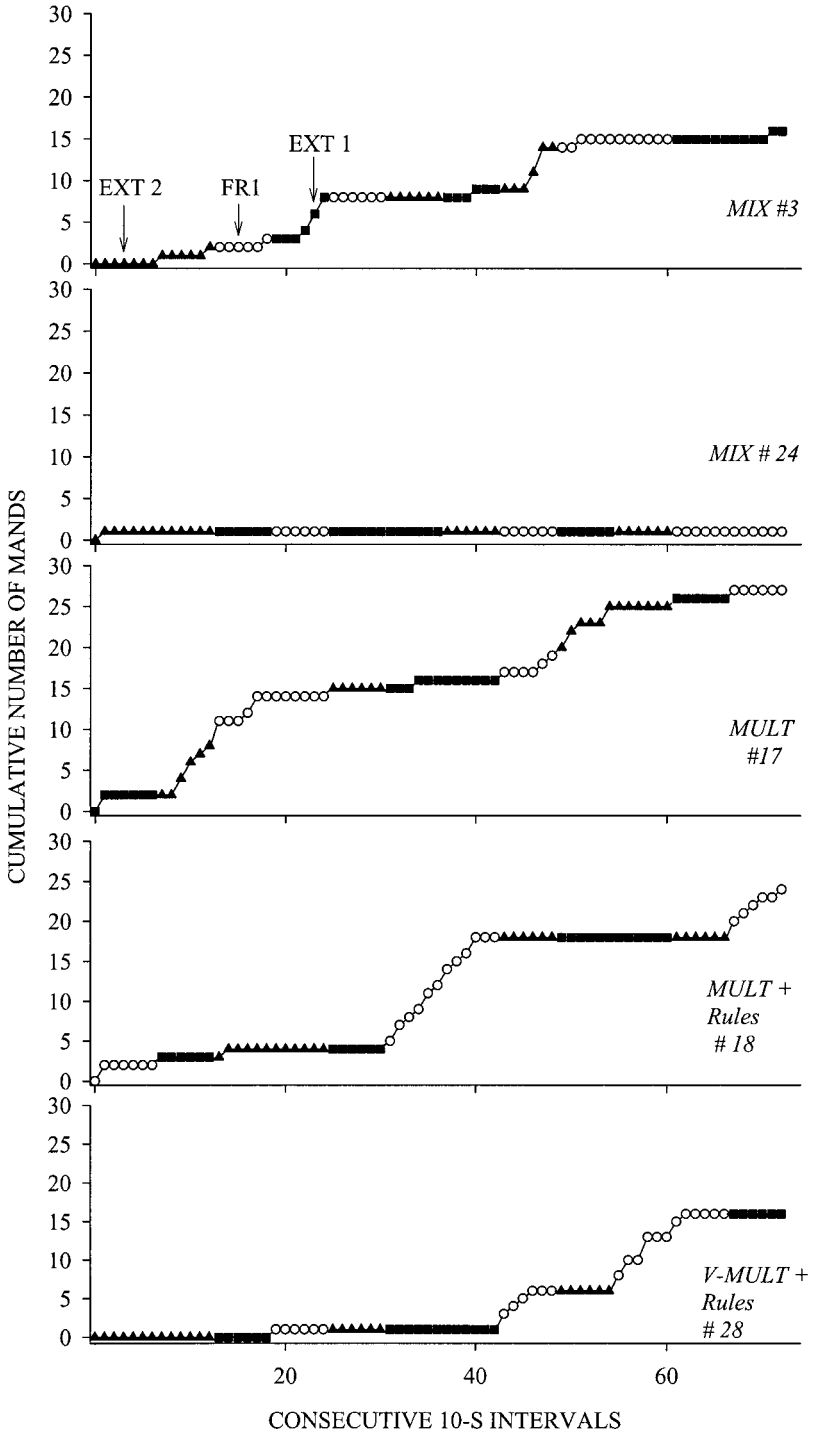

Figure 2. Relevant within-session patterns of responding that highlight the development of stimulus control of manding for Sue. Under mixed-schedule conditions, we observed either persistent manding during extinction components (top panel) or the cessation of manding (second panel). The schedule-correlated stimuli failed to control manding after 11 12-min exposures (third panel). Discriminated manding was observed immediately following the introduction of presession rules (fourth panel). Manding occurred exclusively during FR 1 components during the condition with varied discriminative stimuli (bottom panel).

Hanley et al. used a procedure in which the multiple schedule began with 45-s periods of reinforcement alternating with 15-s periods of extinction that were gradually faded to 60-s periods of reinforcement and 240-s periods of extinction. The current investigation did not use fading procedures, but rather trained participants at a terminal schedule requirement.

When contingency-specifying stimuli (i.e., rules) were provided prior to sessions, all participants engaged in highly discriminated manding, showing immediate and strong stimulus control of manding. The effects of the multiple schedule plus rules were then replicated for all 3 participants in reversal designs. The effects of the previous multiple-schedule history were addressed in the condition with varied discriminative stimuli; manding occurred exclusively in the presence of each new stimulus correlated with reinforcement. Both children's performance conformed to the rules, suggesting that discriminated manding was primarily rule governed rather than controlled by contingencies. Within-session data for Sue (Figure 2) highlight the development of stimulus control by showing relevant patterns of responding across conditions, and show that the multiple schedule plus rules did not suppress the absolute rate of manding; rather, manding was reallocated to appropriate times (see Sessions 18 and 28).

Although there are natural cues in the classroom to signal the availability of teacher attention, these cues are often subtle and may not be perfectly correlated with the availability of attention. Therefore, explicitly signaling times when attention is available should minimize children's contact with extinction or social punishers. Although floral leis are artificial, the type of signal used is probably of less concern than consistently signaling the availability of reinforcement *and* describing the signal functions. Nevertheless, future research should assess teacher acceptability of this type of stimulus control procedure and possibly evaluate children's preference for signaled versus unsignaled periods of reinforcement and extinction in the classroom.

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