CONTEXTUAL CONTROL OF PROBLEM BEHAVIOR IN STUDENTS WITH SEVERE DISABILITIES

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We investigated the impact of contextual variation on the effectiveness of two interventions. The problem behavior of 2 students with severe disabilities was analyzed across two contexts (task and leisure). Effects of differential reinforcement of other behavior (DRO) and time-out procedures were examined in the two contexts. Results indicated that in the task context the DRO procedure effectively reduced the problem behavior and increased task performance, whereas the time-out procedure was ineffective. In addition, rate of correct task performance increased during DRO relative to baseline and time-out. In contrast, in the leisure context, the time-out procedure effectively reduced the same problem behavior and the DRO procedure was ineffective. The results are discussed in terms of contextual control of problem behavior and alternative strategies for the design of DRO procedures.

DESCRIPTORS: self-stimulatory behavior, functional analysis, negative reinforcement, differential reinforcement of other behavior, contextual control

Problem behaviors become targets for reduction when they interfere with the acquisition, generalization, or maintenance of more adaptive repertoires (Gaylord-Ross, 1980; Koegel & Covert, 1972). Recent efforts to design interventions to suppress problem behaviors have focused on assessment of the variables that functionally control behavior (Repp, Felce, & Barton, 1988). These analyses attempt to identify a broad class of antecedent or consequent events that control problem behaviors. For example, Carr and Durand (1985) analyzed the problem behavior of students to determine the type of controlling relationship affecting the students' behavior. Interventions were then designed

based on the controlling variables identified as maintaining the problem behavior. Their results indicated that interventions designed to gain outcomes functionally equivalent to the problem behaviors (through appropriate, communicative means) effectively replaced the problem behaviors, whereas interventions that trained appropriate responses irrelevant to attaining the outcomes were ineffective in replacing problem behavior.

There have been conflicting results when attempts have been made to analyze the functional control of stereotypic behavior. Several authors have suggested that stereotypic behavior is maintained by its sensory consequences. For example, Rincover (1978) showed that eliminating the sound produced by spinning a plate resulted in decreased plate spinning, suggesting that the auditory feedback of the spinning response maintained the behavior. Similarly Wolery, Kirk, and Gast (1985) demonstrated that stereotypic behavior can be used as a positive reinforcer. Taken together, these two studies indicate that stereotypic behavior may be controlled by sensory-based reinforcers. In contrast, Durand and Carr (1987) demonstrated that social factors (in this case task difficulty) controlled stereotypic responding. These discrepant findings regarding stereotypic behavior may exist because the behaviors were observed under conditions specific to

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different contexts. As contextually bound conditions vary, the function of behavior within those contexts may vary.

Contextualism is emerging as an important concept in behavior analysis (Baer, Wolf, & Risley, 1987). Contextual control can be conceptualized as a form of complex stimulus control in which the context serves as a conditional (or higher order) event that alters the probability of a class of responses (Michael, 1982; Wahler & Fox, 1981). Thus, an intervention designed to affect behavior in one context may not be effective in another context because contextual variables interact with some aspect of the intervention. This is supported by the findings of Iwata, Dorsey, Slifer, Bauman, and Richman (1982), who demonstrated that the function of self-injurious behavior was affected by the context in which it occurred.

The purpose of the present study was to demonstrate the influence of contextual variation on the effectiveness of interventions. In the present investigation, we conducted a functional analysis of the problem behavior of 2 students across two contexts. To conduct the analysis we introduced two interventions: time-out and differential reinforcement of other behavior (DRO). If the time-out contingency (defined as the loss of access to the activity) results in a reduction of the behavior, it can be assumed that the activity itself functions as a reinforcer and that the problem behavior does not serve an escape function. Thus, the time-out procedure allowed escape contingent on *emitting* problem behavior. In contrast, the DRO procedure produced escape contingent on *omitting* problem behavior and emitting correct responses (in addition to allowing access to a positive reinforcer).

METHOD

Participants and Settings

The participants (Sandra and Raff) were adolescents with severe disabilities who attended a special education classroom located in a public high school. The students were selected for inclusion in

the study on the basis of teacher nominations of students who frequently engaged in problem behaviors that interfered with classroom and community activities. After the initial teacher nominations, the teachers completed the Motivation Assessment Scale (Durand, 1988) separately for instruction and leisure contexts for each student. From an initial sample of 4 students identified by the teachers, Sandra and Raff were selected as participants because they scored comparatively high on the subscales of self-stimulation and escape and comparatively low on the subscales of attention and tangible reward.

Sandra was 15 years of age and was classified as having autism according to standards for diagnosis of autism and developmental delay with autistic characteristics (Ritvo & Freeman, 1978). She was estimated to be functioning at the 1.9-year-old level with the Vineland Adaptive Behavior Scales (VABS). She was nonverbal but used a small repertoire of manual signs to communicate needs (e.g., requesting use of the bathroom) and desired items and events (e.g., access to recreation and leisure activities). Throughout the school day, Sandra engaged frequently in problem behaviors across all settings. Raff was 19 years old and was classified as having Down Syndrome. Using the VABS, he was estimated to be functioning at the 2.6-year-old level. Raff used one- and two-word utterances to express needs and comment on events; however, most of his vocalizations consisted of delayed echolalic utterances. He, too, exhibited interfering behaviors throughout the school day across all contexts.

Experimental sessions were conducted in instructional and leisure contexts. These contexts were selected based on teacher reports and subsequent prebaseline observations, which indicated that the same class of problem behaviors occurred in both contexts at comparable levels. Instructional sessions took place in a room that was adjacent to the classroom. Students were seated at a table next to the experimenter (the second author) with instructional materials placed in front of them. The leisure activity for Raff took place in a break-time area

within the classroom, and Sandra's leisure sessions took place in the same room used for instruction.

Response Definitions

For each student, three different problem behaviors were identified because they occurred across both contexts. For Sandra, the behaviors were body rocking, loud vocalizations, and spitting; for Raff, the behaviors were body rocking, hand flapping, and head bobbing. Body rocking was defined as a continuous back-and-forth or sideways movement of the upper body that was repeated two or more times within 5 s. Loud vocalizations were defined as vocalized high-pitched noises above a normal conversational level. Spitting was defined as any instance in which saliva left the student's mouth. Hand flapping was defined as extending the forearms above the head while waving the fingers. Head bobbing was defined as any repetitive upward and downward movement of the student's head that occurred two or more times within 5 s.

Experimental Design

Each of the three problem behaviors was recorded in the instructional and leisure contexts. Either the DRO or time-out condition was introduced after a stable baseline (A) was established in each context. The DRO (B) and time-out (C) conditions were then alternated in each setting to assess the effects of each intervention on the problem behaviors. For Sandra, the order of conditions was ABCBCB in the task context and ACBCBC in the leisure context. For Raff, the order of conditions was ACBCBCB in the task context and ABCBC in the leisure context. Thus, the order of conditions was counterbalanced across contexts (within student) as well as across students. Sessions were conducted once per day in each context with order being randomly determined each day.

Instructional Context

During each session each student was presented with one of four tasks that were randomly sequenced. The tasks were identified by the classroom teachers as having had been recently acquired by

the students (i.e., maintenance tasks). These tasks were matching to sample the appropriate amount of money to ride public transportation (Sandra and Raff), putting public transportation I.D. in a wallet (Sandra and Raff), choosing items from a lunch menu (Sandra and Raff), receptive signing (Sandra), and matching to sample small dollar amounts (Raff). Maintenance tasks were selected to prevent task acquisition or task difficulty from covarying with specific independent variable manipulations. The length of each instructional trial was approximately 15 s (this was the mean time required to complete a response in the discrete-trial format). If the students performed a trial correctly, they earned edible rewards that were accumulated until the session ended (i.e., the rewards were consumed after the session). A correction procedure was used if the students failed to make a correct response within 5 s of an instructional command or did not initiate a response. Correct responses were first verbally or gesturally prompted. If this failed, a correct response was modeled.

Instruction baseline. Correct responses were followed by edible rewards (e.g., potato chips) that accumulated on a plate in front of the student until the end of the session, at which time the student consumed what he or she had earned. Occurrences of problem behaviors were ignored and did not affect the amount of reward earned. Instructional sessions lasted 10 min.

DRO in instruction. A conjunctive reinforcement (conj) schedule that required students to perform a task correctly and omit problem behavior for the duration of the trial was used. The DRO intervention was a higher order contingency consisting of a conjunctive schedule (Ferster & Skinner, 1957), which itself was under a fixed-ratio (FR) 10 schedule requirement; that is, FR 10 (conj continuous reinforcement (CRF) fixed-interval (FI) 15 s). In the conjunctive schedule, the students had to meet two contingencies simultaneously to earn a token: (a) They had to produce a correct response (CRF) and (b) omit stereotypy during the trial (FI 15 s). After 10 tokens were earned (FR 10), the procedure allowed the student to escape further

contact with a context and allowed access to an edible reward.

On each occasion that the conjunctive schedule requirement was met, the students earned a token. Tokens were placed on a token card that consisted of 10 circles in two columns of five circles. Once the student earned 10 tokens, the session was ended and the student received the edible reward and was allowed to escape the instructional context by entering free time. The length of sessions during this condition ranged from 2.5 min (the minimum time it took to complete 10 trials) to 10 min (the maximum length of a session).

Time-out (task withdrawal) in instruction. Whenever a student produced a problem behavior, the instructional task was removed until the behavior had been omitted for 15 s. As in baseline, edible rewards were given for each correct response and were accumulated until the end of the session. All sessions during the time-out condition lasted 10 min. Thus, under this condition, emitting the problem behavior resulted in escape from instruction.

Leisure Context

One activity was identified for each student. Sandra's leisure activity consisted of listening to a Sony Walkman® radio and Raff's consisted of looking at magazines. All sessions began when the student was seated and engaged in their respective activity.

Leisure baseline. During baseline, all problem behavior was ignored. Sessions lasted 10 min.

DRO in leisure. A token system similar to that used during DRO in instruction was used: Token delivery was contingent on the student omitting problem behavior for 15 s. Once the student earned 10 tokens for the omission of problem behavior, sessions were ended and the student was given an edible reward. If the student did not earn 10 tokens, the session was ended after 10 min. Thus, under this condition, omitting the problem behavior resulted in escape from leisure time.

Time-out (task withdrawal) in leisure. Whenever a student produced a problem behavior the leisure activity was removed until the student omitted the problem behavior for 15 s. For Sandra, this meant that the instructor turned her radio off. When

Raff engaged in problem behavior, his magazine was removed. As in baseline, sessions lasted 10 min.

Observation and Observer Agreement

All sessions were recorded on a Sony VHS portable camcorder. Observers scored the videotapes for the occurrence and nonoccurrence of each specified problem behavior using a continuous 15-s interval procedure. In addition, observers scored the videotapes for the accuracy of students' task performance. Interobserver agreement was assessed on approximately 33% of the sessions across both contexts and conditions. Agreement was calculated on an interval-by-interval basis by dividing the sum of agreements by the sum of agreements plus disagreements and multiplying by 100. Mean agreement on the occurrence of problem behaviors was 94% (range, 82% to 100%) and 86% for non-occurrences (range, 74% to 100%). For task performance in the instructional context, the observers' scores were compared on a trial-by-trial basis. The mean percentage agreement was 95% (range, 87.5% to 100%).

RESULTS

Comparability of Baselines Across Contexts

The average level of occurrence for each of the problem behaviors for Sandra and Raff was analyzed to ensure consistency across contexts. Sandra's data indicate that her level of problem behavior was similar (although slightly higher in leisure) across the two contexts. In the task context, the percentage of intervals was 40% for rocking (range, 9% to 65%), 12% for spitting (range, 0% to 30%), and 11% for vocalizations (range, 0% to 31%); in the leisure context the percentage of intervals was 51% for rocking (range, 33% to 75%), 21% for spitting (range, 8% to 46%), and 20% for vocalizations (range, 3% to 41%). Raff's data show that very similar levels of problem behavior occurred across contexts. In the task context the percentage of intervals was 50% for rocking (range, 47% to 51%), 38% for hand-flapping (range, 19% to 49%), and 36% for head bobbing (range, 30% to 43%); in the leisure context the percentage of intervals

Figure 1. Percentage of intervals with stereotypy across baseline, DRO, and time-out conditions in task and leisure contexts for Sandra.

was 51% for rocking (range, 35% to 71%), 32% for hand flapping (range, 6% to 54%), and 38% for head bobbing (range, 24% to 51%). In summary, these data show that the level of problem behaviors was similar across contexts for both students.

Effects of Intervention Across Contexts

The effects of the DRO and time-out interventions across the two contexts for Sandra are shown in Figure 1. The top panel in Figure 1 shows the effects of the two interventions in the task context. The mean percentage of intervals in which problem behavior occurred in the task context was 60% in baseline, 16% during DRO, and 52% during time-

out. After a stable baseline was established, the DRO intervention was introduced and the level of problem behavior dropped appreciably. Following the DRO condition, time-out was introduced and the level of problem behavior increased to baseline levels. On Session 20, the DRO intervention was reintroduced and the level of problem behavior immediately dropped. These effects were then replicated with an additional alternation between time-out and DRO. By the end of the study, the level of problem behavior in the task context was at near-zero levels. In summary, these data show that DRO was an effective intervention, and time-out was ineffective.

The bottom panel of Figure 1 (which shows the

Figure 2. Percentage of intervals with stereotypy across baseline, DRO, and time-out conditions in task and leisure contexts for Raff.

effects of the interventions in the leisure context) shows that each introduction of the time-out condition substantially reduced problem behaviors, whereas each application of the DRO condition resulted in levels of problem behavior that were equivalent to baseline levels. In the leisure context, the problem behavior occurred during 73% of the intervals during baseline, 65% during DRO, and 21% during time-out. These data show that time-out, which resulted in removal of the leisure activity, was an effective intervention in the leisure context, whereas in the task context, it was an ineffective intervention. Thus, depending on the context, the two interventions had differential effects on Sandra's behavior.

Figure 2 shows the effects of the two interventions for Raff across the task and leisure contexts.

In the task context, Raff's problem behavior had a mean occurrence of 81% during baseline, 15% during DRO, and 74% during time-out. In the leisure context, the mean occurrence of problem behavior was 78% during baseline, 80% during DRO, and 25% during time-out. These data are similar to those obtained for Sandra, in that the two interventions affected the problem behavior differentially across contexts. As before, the DRO intervention was effective only in the task context, and time-out was effective only in the leisure context.

Effects of Intervention on Task Performance

The effects of the two interventions on the task performance of Sandra and Raff are presented in Figure 3. Sandra's data indicate that the DRO

Figure 3. Rate of correct responding to instructional trials for Sandra and Raff across baseline, DRO, and time-out conditions.

procedure resulted in a substantial increase in the rate of correct responding, and the time-out intervention was associated with low rates of correct performance. Raff's data also show increased rates of correct responding under DRO, relative to the time-out intervention. In summary, these data parallel the data from the instructional context, in that DRO produced both lower levels of problem behaviors and substantially greater rates of correct responding.

DISCUSSION

The results indicate that time-out and DRO produced differential outcomes depending on the

environmental context within which the interventions were applied. In the task context, the DRO intervention consistently produced substantial behavior reduction, and the time-out intervention was ineffective. In the leisure context, the converse was true: Time-out reduced the level of problem behaviors substantially, and DRO was ineffective. The effectiveness of time-out in the leisure context suggests that the activity itself was reinforcing to the student. These results also indicate that the problem behavior was not serving a negative reinforcement function in the leisure context.

An interpretation of the variables controlling the effectiveness of the DRO procedure in the task context is less clear, because the operation of the

DRO contingencies included aspects of control by negative reinforcement (i.e., escape from task) and positive reinforcement (i.e., access to an edible reinforcer). That is, the results concerning the effectiveness of the DRO procedure in the task context indicate that the problem behavior could have been a function of negative reinforcement, positive reinforcement, or a combination of both.

The DRO procedure used in the present research differs from those traditionally employed in behavior-analytic research, where students receive positive reinforcement after some predetermined interval in which targeted behaviors did not occur. In the present research, although this traditional component of DRO remained (students received tokens on an FI 15-s schedule for omitting problem behaviors), this contingency was conjunctive with reinforcement for correct responding. In addition, after 10 correct intervals the student was allowed to escape the instructional context. This raises issues for further research. It is possible to design a DRO procedure based on negative reinforcement (cf. Haring, Breen, Pitts-Conway, & Gaylord-Ross, 1986). For example, students could earn tokens for omitting problem behavior and, when a set criterion is reached, be allowed to exit instruction. This procedure may be termed *escape DRO* and could be contrasted to a more traditional DRO (which may be termed *appetitive DRO*) or the combined procedure used in the present research.

In the present study, an a priori or structural analysis of the behavior based on response frequency during baseline is not sufficient to predict the differential effects of the interventions across contexts. That is, a strictly topographic analysis of the behavior during baseline does not indicate any substantial differences in the response class across contexts. A functional analysis conducted by alternating the DRO and time-out interventions indicated that, although the behaviors appeared to be structurally (i.e., topographically) similar, their functional control was not.

These results, if replicated with a larger data base, further suggest that a functional analysis within just one context may not be sufficient to design

a behavior management program that is to be implemented across an entire day. That is, for some students it may be necessary to fine-tune interventions based on the characteristics of the context and the characteristics of the function of behavior within that specific context. The omnibus admonishment to "be consistent" may not always apply; consistency in the absence of a functional analysis across contexts may prove to be counterproductive for responses that are under multioperant control. This suggests that assessment systems need to consider more comprehensively the deterministic role of contexts on behavior.

Given that only 2 students participated in this research, the generality of these effects across similar participants is unknown. However, in extending these findings to other students with high rates of stereotyped responding, it is important to note that students under multioperant control may compose a relatively small subsample of the entire population of students who engage in these behaviors. Because the understanding of the functional control of stereotypic behavior is important diagnostically, these results require broader application prior to any assumptions of generality.

Contextualism is emerging as a major theme in behavior analysis. The present study indicates that contextually bound conditions should be considered in assessing the functional control of problem behaviors. Contextually bound conditions are important determinants of the social responding of students with disabilities. Only recently has this perspective been extended to normalizing the responding of students with severe disabilities. The continued development of research in this area may provide an important source of methods to increase the efficiency and effectiveness of interventions.

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