MANIPULATING ANTECEDENT CONDITIONS TO ALTER THE STIMULUS CONTROL OF PROBLEM BEHAVIOR

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In a three-phase study, antecedent conditions involving instructor's task demands and social comments were evaluated for 3 students with severe disabilities who emitted problem behavior. The results of a descriptive analysis (Phase 1) demonstrated that task demands served as antecedents for problem behavior, and social comments were generally associated with increased levels of positive social affect. In a subsequent experimental analysis (Phase 2), an instructor emitted high rates of social comments and gradually faded in task demands across sessions. The results of Phase 2 showed initial reductions in problem behavior to near-zero levels from the onset of intervention, with the successful reintroduction of task demands for all students. Phase 3 replicated the procedures of Phase 1. The results demonstrated that for 2 students, task demands no longer served as antecedents to problem behavior. The outcomes from two social validity assessments indicated that substantial improvements were perceived in student behavior and that the independent variable was a socially acceptable means of reducing problem behavior.

DESCRIPTORS: problem behavior, stimulus control, social validity, severe disabilities

Although the operant functions of consequences that serve to maintain problem behavior are becoming well established (Carr, 1977; Carr, Newsom, & Binkoff, 1980; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982), less is known about antecedent conditions. However, two general strategies have been used in past research to reduce problem behavior through antecedent manipulations. The first intersperses antecedent stimuli exerting differential control over response classes. For example, Carr, Newsom, and Binkoff (1976) showed that a child's self-injury was occasioned by task demands (e.g., "Point to the window"), but not by social comments (e.g., "It's a sunny day"). Carr et al. (1976) further demonstrated that when

task demands were interspersed at low rates among high rates of social comments, near-zero levels of self-injury occurred when demands were made. However, they did not attempt to increase the frequency of demands relative to comments across time.

Similar effects have been demonstrated with interspersed requests (Horner, Day, Sprague, O'Brien, & Heathfield, 1991; Singer, Singer, & Horner, 1987) and high-probability/low-probability response sequences (Mace et al., 1988). The results of these studies are similar, in that higher frequencies of instructor behaviors that were associated with desirable behavior (e.g., compliance) were interspersed with instructor behaviors that were related to problem behavior, resulting in rapid reductions in problem behavior and increases in desirable behavior. Although interspersing antecedent conditions appears to alter the establishing conditions associated with demands (Michael, 1982), the durability of these outcomes may be restricted. Thus, successful outcomes appear to be dependent on procedures that present antecedent requests from a competing response class immediately before a terminal request.

A second strategy, fading, produces more durable effects by physically altering stimuli or re-

This paper is dedicated to the memory of Tom Haring, mentor and friend. It is based on a dissertation submitted to the University of California, Santa Barbara, in partial fulfillment of requirements for the PhD degree. The author thanks his committe members John Baldwin, James Halle, Thomas Haring, Robert Koegel, and Marta Valdez-Menchaca for their constructive comments. The assistance of Debbie Bertrando, Liz Gilliam, Kristin Lindquist, and J. J. Longley was greatly appreciated. I owe a particular debt of gratitude to Tiina Itkonen. David Wacker and several reviewers provided helpful suggestions for improving the report.

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moving and gradually reintroducing them over time (Heidorn & Jensen, 1984; Pace, Iwata, Cowdery, Andree, & McIntyre, 1993; Touchette, MacDonald, & Langer, 1985; Weeks & Gaylord-Ross, 1981). Fading along the dimension of task difficulty has been accomplished by altering the physical characteristics of stimuli to achieve criterion performances (Weeks & Gaylord-Ross, 1981). Another approach has been to fade in stimuli along the dimension of rate (Heidorn & Jensen, 1984; Pace et al., 1993; Touchette et al., 1985). However, a concern related to using fading alone is that no procedure is in effect to suppress problem behavior if it reoccurs during fading (Pace et al., 1993). For this reason, combining interspersal and fading techniques may permit immediate reductions in problem behavior and the reestablishment of high levels of task demands while minimizing the reoccurrence of problem behavior. The current investigation analyzed such an intervention package involving both the manipulation of interspersal and fading as antecedents to alter the stimulus control by task demands over problem behavior for 3 students with severe disabilities.

METHOD

Students and Setting

Two special education teachers from a public high school campus nominated 3 students with severe disabilities who engaged in stereotypy, self-injury, and/or aggression. Instruction took place in a classroom (10 m square) containing areas for cooking and cleaning dishes and cabinets for storing materials. A student and instructor were typically the only individuals present.

Edgar was 20 years old and was classified as having autism and moderate intellectual retardation. He was verbal (although a high proportion of his verbalizations were delayed echolalia) and could follow two-step requests. Edgar received a daily dosage of 20 mg of Thorazine® throughout the study. He had a 10-year history of perseverative verbalizations, biting himself, and grabbing others

during demand situations and alterations in scheduling.

Sally was 20 years old and was classified as having severe intellectual retardation, autistic-like behavior, and cerebral palsy. She did not use vocal communication but could follow simple requests and used three to five manual signs to indicate specific needs (e.g., requesting a drink). Sally had a 15-year history of screaming, hitting others, and falling on the ground during instruction and demand-related situations.

Ernest was 20 years old and was classified as having profound intellectual retardation, quadriplegia, hydrocephalus, and "significant health impairments" as a result of a closed head injury occurring at the age of 15 years. Ernest used a wheelchair but had limited self-mobility because of complete paralysis in all but his right arm. Throughout the course of the study, Ernest received a daily dosage of 100 mg of Dilantin® for grand mal seizures. Ernest had a 5-year history of hitting or throwing objects and hitting other people during instruction.

Student and Instructor Response Definitions

The following student behaviors were recorded: (a) correct task performance, (b) incorrect task performance, (c) noncompliance to a task request, (d) positive social affect, and (e) problem behavior. Correct and incorrect task performance referred to accurate and inaccurate responding to an instructional request, respectively. Noncompliance was defined as the failure to follow an instructional request within 15 s. Discrete occurrences of positive social affect included smiling, laughing, nodding "yes," and positive verbalizations (e.g., "I like you"). Problem behavior was identified based upon information supplied by teachers and school-based observations. For Edgar, the problem behaviors were perseverative verbalizations (repeating the verbalization of a teacher or asking the teacher to repeat a verbalization for 5 s or longer), biting himself (his mouth coming into contact with his wrist or hand), and grabbing others (physically placing his hand on a teacher's garments). Sally's problem be-

haviors were screaming (a high-pitched vocalization above a conversational level), hitting others (her hand or fist making contact with another person), and falling on the ground (sitting on the floor). For Ernest, the problem behaviors were throwing objects (holding an object and throwing the object at a person or on the ground), hitting objects (hand or fist making forceful contact with a physical object), and hitting others.

Instructor responses included (a) task demands, (b) social comments, and (c) social praise. Task demands referred to task-related statements made by the instructor (e.g., "Put the dish away"). Task demands were always related to the instructional activity the student was currently engaged in. Social comments were the instructor's remarks about previous events or some aspect of the current environment (e.g., "I think the Dodgers will win the World Series this year"). Social comments were individualized for each student based upon teachers' and nondisabled peers' perceptions about preferred conversational topics. Social praise consisted of positive social remarks made by the instructor regarding a student's behavior.

Design and Procedures

A multielement design was used in Phases 1 and 3 to analyze antecedent conditions associated with differing topographies of student behavior. A multiprobe baseline across students was used in Phase 2 to study the effects of manipulating antecedent conditions (Horner & Baer, 1978). The sequence of phases was constructed so that an assessment of variables associated with problem behavior could be done both before and after an analysis of the effects of the independent variable.

General procedures. A previously learned work-related task was selected for each student from his or her respective education plans. Edgar stacked chairs, and Sally and Ernest shelved dishes throughout the investigation. One trial on each of the tasks required approximately 15 s to complete; a maximum of four trials per minute could be completed. Each trial consisted of a single task demand. During all phases, if a student responded correctly to a task

demand he or she received verbal praise; both positive social affect and problem behavior were ignored. If a student responded incorrectly, a brief pause occurred and then another task demand was delivered.

Phase 1: Descriptive analysis of antecedent conditions. The frequency of the instructor's task demands and social comments was manipulated within four conditions: (a) high demand, high comment (HD, HC); (b) high demand, low comment (HD, LC); (c) low demand, high comment (LD, HC); and (d) low demand, low comment (LD, LC). High-demand conditions presented students with instructional requests approximately four times per minute. Low-demand conditions presented students with one instructional request every 2.5 min (or 0.4 per minute). High-comment conditions presented social remarks approximately six times per minute (irrespective of the occurrence of task-related or problem behavior), and low-comment conditions presented no social comments. Sessions occurred once per day, with each of the four conditions occurring once within a session. Conditions were sequenced randomly across sessions within the multielement design. Each condition lasted 5 min and consisted of the instructor interacting with a student during an activity in accordance with the condition in effect. A 5-min interval occurred between each condition, during which the student sat at a table and was asked to wait for the next activity.

Phase 2: Experimental analysis of antecedent conditions. All sessions in this phase lasted 10 min and took place once or twice per day. Initially, a baseline condition occurred before the sequential introduction of the independent variable across participants. Baseline was structured to simulate a typical one-on-one teaching interaction between instructor and student that consisted of multiple demands (four per minute) with no social comments (similar to the HD, LC condition in Phase 1).

During the antecedent manipulation intervention, instructional sessions were altered so that one demand was made every 2.5 min and six social comments occurred per minute (similar to the LD,

HC condition in Phase 1); no other changes were made relative to baseline. When a student demonstrated a low frequency of problem behavior, demands were gradually increased across sessions. As long as problem behavior remained at a low frequency, task demands continued to be increased across sessions. If an increase in problem behavior occurred, the frequency of task demands was decreased. The change in demands from one session to the next was determined by visual inspection of trends between frequency of task demands and problem behavior. For Ernest, we conducted an additional reversal analysis to assess further the relation between teacher demands and his problem behavior.

Phase 3: Descriptive analysis of antecedent conditions. Phase 3 was the same as Phase 1 and was conducted to reassess the variables identified as occasioning problem behavior during the first phase of the study.

Observation and Interobserver Agreement

A tripod-mounted Sony® VHS camcorder was used to videotape all sessions, which were subsequently analyzed using T1000SE® Toshiba portable computers employing observational software developed by Communitech International (Repp, Harman, Felce, van Acker, & Karsh, 1989). Continuous event recording was used to measure student and instructor behavior. Across all phases, 25% of sessions were assessed for interobserver agreement by having a second observer separately score the videotapes. Interobserver agreement was calculated by counting the number of agreements, dividing by agreements plus disagreements, and multiplying by 100%. Mean agreement for occurrences across student behavior was 89% (range, 33% to 100%), and mean agreement for nonoccurrences of student behavior was 95% (range, 80% to 100%). Mean agreement of occurrence across instructor behavior was 93% (range, 78% to 100%), and mean agreement for nonoccurrence of instructor behavior was 95% (range, 82% to 100%).

Social Validity Assessment

The first social validity assessment consisted of four questions from the Motivation Rating Scales

(MRS) derived from research by Koegel and colleagues (Dunlap & Koegel, 1980; Koegel & Egel, 1979) and was used to assess the outcomes of the intervention. The questions focused on the student's (a) general behavior, (b) interest, (c) happiness, and (d) productivity. Each question was scored on a 6-point Likert-type scale anchored at end and mid-points with descriptions appropriate to the specific question. Eight personnel from two classrooms for students with severe disabilities and a supported employment organization served as raters. Raters were shown four 30-s scenes (all scenes were randomly sampled) of students during baseline in Phase 2 and four 30-s scenes of students during the final days of intervention of the same phase. Each student was rated separately, with selection and presentation of videotaped scenes from the initial and final sessions viewed in a mixed order.

The second social validity assessment used the same raters to score a different set of videotaped scenes using the Treatment Evaluation Inventory (TEI) (Kazdin, 1980). A subgroup of eight questions from the TEI were used to assess the acceptability of the intervention. For each question, a 7-point Likert-type scale was used, with anchors at end and midpoints related to the specific question. Raters first received a verbal description of the intervention and were then shown a sequence of four randomly selected 30-s videotapes of each student during the intervention, starting from the initial intervention, the second quarter, the third quarter, and then the final days of the investigation.

RESULTS

Phase 1: Descriptive Analysis of Antecedent Conditions

Students' problem behavior and positive social affect are presented in Figure 1. Each student displayed the same pattern of behavior. Students engaged in problem behavior most frequently when high levels of task demands were made by the instructor, irrespective of the frequency of the instructor's social comments. Positive social affect was most frequent when a high frequency of social comments occurred in the absence of task demands.

Figure 1. Results of the descriptive analysis in Phases 1 (left panel) and 3 (right panel) for Edgar, Sally, and Ernest. Data are presented as problem behavior per minute (upper panel) and positive social affect (lower panel) across sessions for each of the four conditions.

Figure 2. Results of the antecedent manipulation on students' problem behavior. The results are reported as the occurrence (per minute) of problem behavior and positive social affect for each student, and the occurrence (per minute) of task demands and social comments made by the instructor.

Across students, a mean of 3.6 (range, 2.4 to 4.9) and 0.4 task demands were presented during high- and low-demand conditions, respectively. For social comments, a mean of 6.1 (range, 3.6 to 8.7) and 0.06 (range, 0 to 0.8) occurred during high- and low-comment conditions, respectively.

The accuracy of responding and noncompliance to task demands showed that students tended to emit a higher proportion of correct responses during the low-demand conditions. Edgar, Sally, and Ernest responded correctly 84% (range, 57% to 100%), 70% (range, 41% to 93%), and 44% (range, 17% to 60%) of the time during high-demand conditions, and 92% (range, 50% to 100%), 70% (range, 50% to 100%), and 70% (range, 0% to 100%) of the time during low-demand conditions, respectively.

Phase 2: Experimental Analysis of Antecedent Conditions

Problem behavior and positive social affect.

Figure 2 shows the occurrence (per minute) of problem behavior and positive social affect for each student, along with the instructor's task demands and social comments. During baseline, problem behavior occurred at high frequencies, as did the instructor's task demands, with low levels of positive social affect and social comments observed. For Edgar, reducing task demands and increasing social comments resulted in low frequencies of problem behavior and consistently high levels of positive social affect. As task demands were increased across sessions, Edgar's problem behavior rarely occurred, except during Session 23. During the final six sessions, 3.6 task demands per minute were made, with only 0.2 problem behaviors occurring per minute (range, 0 to 0.6). For Sally, the reduction of task demands and increase in social comments produced decreases in problem behavior, but did not initially alter the occurrence of social behavior. During the reintroduction of task demands, Sally's problem behavior remained infrequent, but positive social affect increased as task demands were increased until a stabilization occurred following Session 30. During the final six

sessions, 3.7 task demands per minute occurred, with only 0.3 problem behaviors per minute (range, 0.1 to 0.5).

When the intervention was introduced for Ernest, frequent positive social affect and infrequent problem behavior were observed. As task demands were increased, positive social affect decreased. Following an abrupt increase in problem behavior in Session 36, Ernest's problem behavior gradually increased across sessions as task demands increased. Beginning in Session 49, an alternation in the frequency of task demands across sessions was made. These task-demand probes showed that a decreased frequency of task demands was related to decreases in problem behavior and increases in positive social affect. Task demands were then stabilized at 1.7 per minute for the final 6 days, with problem behavior occurring a mean of 0.4 times per minute (range, 0.3 to 0.6) and social behavior occurring 2.2 times per minute (range, 1.9 to 2.6). At a 4-month follow-up, the patterns among instructor and student behavior observed at the end of the intervention had been maintained for all students.

Work productivity. For work productivity, Edgar's and Sally's correct responses increased to levels above baseline following the antecedent manipulations. Edgar and Sally increased their mean percentage of correct responses to task demands from 85% and 54% during baseline to 92% and 90% during the intervention, respectively. In addition, Edgar infrequently emitted incorrect responses ($M = 0.2$ per minute) or noncompliance ($M = 0.1$ per minute) throughout Phase 2. For Sally, incorrect responding decreased from a baseline mean of 1.9 per minute (range, 0.8 to 2.5) to 0.1 following intervention (range, 0 to 0.6). Ernest eventually emitted 1.3 correct responses per minute by the end of the intervention, relative to a baseline frequency of 1.7 responses per minute (this was due to fewer instructor demands). However, Ernest increased his percentage of correct responses to task demands from 42% during baseline to 76% during intervention. For Ernest, incorrect responding was reduced from a baseline mean of 2.2 per minute (range, 1.5 to 2.6) to 0.4 following instruction (range, 0.3 to 0.6). This pattern of behavior was

maintained at the 4-month follow-up for all students.

Phase 3: Descriptive Analysis of Antecedent Conditions

Students' problem behavior and positive social affect during Phase 3 are presented in Figure 1. For Edgar and Sally, low levels of problem behavior were observed across all four conditions, even when presented with a high frequency of task demands in the absence of social comments. For both students, positive social affect was most frequent in the presence of high levels of social comments. Edgar displayed a pattern similar to that of Phase 1, with problem behavior occurring frequently during high-demand conditions and positive social affect occurring frequently only during the LD, HC condition.

The accuracy of students' performances and the occurrence of noncompliance showed a largely undifferentiated pattern across conditions. Edgar's, Sally's, and Ernest's correct responding occurred 86% (range, 78% to 100%), 73% (range, 67% to 90%), and 43% (range, 20% to 70%) of the time during high-demand conditions and 88% (range, 50% to 100%), 82% (range, 50% to 100%), and 42% (range, 0% to 100%) of the time during low-demand conditions, respectively.

Task demands during high-demand conditions for Edgar, Sally, and Ernest occurred 4, 4.1 (range, 4 to 4.2), and 4 times per minute, respectively, and 0.4 times per minute for all students during low-demand conditions. For Edgar, Sally, and Ernest, social comments during high-comment conditions occurred 6 (range, 5.9 to 6), 6.3 (range, 5.6 to 7.9), and 6 (range, 5.6 to 6.2) times per minute, respectively, and 0.01 (range, 0 to 0.2) times per minute during low-comment conditions for all students.

Social Validity Assessment

The results from the MRS indicated that positive increases were noted for all categories for each student. Edgar and Sally were judged to have improved substantially across all four categories (e.g., Edgar's median scores before and after intervention

were 2.2 and 4.1, respectively). Ernest was perceived as having improved substantially in general behavior, interest, and happiness (median scores before and after intervention were 1.8 and 2.9, respectively), with productivity showing only a marginal increase (from 2.1 to 2.4). The TEI assessment indicated that the independent variable was considered to be a socially acceptable means of reducing inappropriate behavior, and these raters viewed it as a treatment they would be willing to use.

DISCUSSION

Phase 1 results showed that task demands were related to increased levels of problem behavior, and that instructor's social comments were related to increased levels of positive social affect for students. This differential effect of instructor behavior on student behavior was manipulated in Phase 2, where low frequencies of task demands were interspersed with high frequencies of social comments. Task demands were then faded in across sessions. The procedure resulted in reductions of problem behavior for all students, with task demands being increased at or above baseline levels for Edgar and Sally. A third phase, replicating Phase 1, showed that for Edgar and Sally, task demands were no longer associated with problem behavior (even in the absence of social comments), demonstrating that manipulating antecedent events can alter the effects of task demands on problem behavior.

Unlike the effects observed for Edgar and Sally in Phase 3, the effects of task demands were not altered for Ernest, but reductions in problem behavior and increases in work productivity occurred when task demands were systematically varied in Phase 2. This suggests that the procedures used in this investigation can serve as a type of "titration" analysis of varying demand levels that do and do not occasion problem behavior. The observation that the effect exerted by task demands over problem behavior is a continuous and not a dichotomous function is an important one. The possibility of assessing optimal levels of task demands that do not occasion problem behavior as a continuous and

manipulable process is a technology in need of further analysis.

A number of plausible behavioral mechanisms may have been responsible for the results obtained. One explanation focuses on social comments as establishing stimuli (Michael, 1982) that function to reduce the "aversiveness" of task demands. It is possible that verbal stimuli emitted by a teacher, when presented in succession prior to the delivery of a discriminative stimulus for task performance (or problem behavior), function as establishing stimuli that alter the negative/positive reinforcer values associated with subsequent task demands. Thus, social comments may have been more powerful than other establishing stimuli related to a learning history with specific tasks (i.e., nonpreferred tasks). This establishing stimulus conceptualization appears to be consistent with the findings of other investigators (Carr et al., 1976; Horner et al., 1991; Mace et al., 1988; Singer et al., 1987) and may, in part, provide a common behavioral process underlying the various procedures that manipulate antecedent events as a means of reducing escape-related problem behavior.

Another explanation for the current findings is negative reinforcement extinction (NRE) (Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990). In task-demand situations, NRE functions to reduce problem behavior by repeatedly presenting a demand but not allowing the student to escape via problem behavior. In the current study, NRE could have occurred because the procedural arrangement throughout Phase 2 repeatedly presented task demands regardless of the student's problem behavior. However, in the current investigation, NRE as an effective contingency is questionable. Students could ignore task demands, and no programmed contingency required a student to perform a task when a demand was delivered. In addition, the extended baselines for Sally and Ernest, in which the fixed rate of demand presentation was in effect, did not produce evidence of extinction.

The effects of fading alone should also be considered as a plausible cause for the reductions in problem behavior. However, because of the combined interspersal and fading procedure, the current

design does not permit unambiguous statements regarding the effects of fading in task demands on problem behavior.

In addition, response covariation should be considered (Parrish, Cataldo, Kolko, Neef, & Egel, 1986). The procedures may have allowed task compliance or correct responding (e.g., positive reinforcement) to replace escape-related problem behavior (e.g., negative reinforcement), resulting in an inversion of the levels of behavior observed during baseline. It should also be noted that although social comments were scheduled independent of student responding, they could have functioned adventitiously to reinforce task-related behavior.

The current findings offer a novel approach for reducing the problem behavior of students with severe disabilities. Important findings regarding stimulus control from the basic research literature have been shown to be of utility in the reduction of problem behavior (Touchette et al., 1985). As researchers continue to explore the role of stimulus control in relation to behavior in both basic and applied analyses, additional techniques may become available for behavior reduction based upon the manipulation of antecedent events. A technology of behavior management based upon antecedent conditions and stimulus control awaits further development.

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Received July 16, 1992

Initial editorial decision September 14, 1992

Revisions received December 8, 1992; July 22, 1993;

September 7, 1993; November 19, 1993

Final acceptance November 22, 1993

Action Editor, David P. Wacker