

TEACHER USE OF DESCRIPTIVE ANALYSIS DATA TO
IMPLEMENT INTERVENTIONS TO DECREASE
STUDENTS' PROBLEM BEHAVIORS

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We conducted two field studies using a behavioral consultation approach to reduce children's problem behaviors in public school settings. The first study consisted of a descriptive analysis in which the students and their teachers were observed during naturally occurring classroom activities. The results of the descriptive analysis provided hypotheses regarding the operant function of the students' problem behaviors. The hypotheses were tested in the second experiment directly through a modified experimental analysis and indirectly through an evaluation of the treatment effects. The interventions were designed to disrupt the inappropriate response-reinforcer relation by discontinuing contingent reinforcement (i.e., extinction), providing the reinforcer contingent on appropriate play behaviors, and teaching the students verbal skills functionally equivalent to the inappropriate response. The classroom teachers were trained to implement the interventions and conduct the experimental analyses during classroom activities in which the problem behaviors occurred most frequently. The interventions were effective in decreasing the students' problem behaviors while concurrently increasing their appropriate verbal skills.

DESCRIPTORS: functional analysis, classroom settings, self-injury, aggression, behavioral consultation

Several researchers have used pretreatment assessment data to develop interventions based on the operant function of problem behaviors (see Mace, Lalli, & Pinter-Lalli, 1991, for a review). In general, these assessments have identified the role of positive and negative reinforcement in the maintenance of challenging behaviors. Aggression (Day, Rea, Schussler, Larsen, & Johnson, 1988; Mace, Page,

Ivancic, & O'Brien, 1986; Touchette, MacDonald, & Langer, 1985), bizarre speech (Durand & Crimmins, 1987; Mace & Lalli, 1991), disruption (Carr & Durand, 1985; Carr & Newsom, 1985; Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Hunt, Alwell, & Goetz, 1988), pica (Mace & Knight, 1986), self-injury (Carr & McDowell, 1980; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982), and stereotypy (Repp, Felce, & Barton, 1988) have been reduced with interventions based on pretreatment assessment data.

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Pretreatment assessment procedures have generally taken one of three forms: experimental (Carr & Durand, 1985; Day et al., 1988; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982), descriptive (Bijou, Peterson, & Ault, 1968; Touchette et al., 1985), or a combination of descriptive and experimental (Mace & Lalli, 1991). Most investigators

have evaluated the effects of environmental variables using experimental methods based on the model of Iwata, Dorsey, Slifer, Bauman, and Richman (1982). Briefly, these assessments consist of direct manipulation of a general class of consequences (e.g., attention, escape) hypothesized to maintain problem behavior during carefully controlled analogue conditions to identify functional relationships. Although effective, experimental analyses may not be practical under certain circumstances (e.g., in a classroom situation in which participation in instructional activities may preclude removing the student from the classroom; Dunlap et al., 1991). In contrast to experimental analyses, descriptive analyses permit the investigator to observe the problem behaviors during situations that normally occur within the natural environment and to identify the natural covariation between the problem behavior and specific environmental events. However, because descriptive data are correlational, an experimental manipulation to establish functional relationships is still needed (Bijou et al., 1968).

Given the benefits of both procedures, it makes intuitive sense to combine them, as in Mace and Lalli's (1991) analysis of an individual's bizarre speech. The authors collected descriptive data based on the model of Bijou et al. (1968) to identify correlations between the participant's bizarre speech and staff behavior in a residential setting. The descriptive data were then used to conduct an efficient experimental analysis by limiting the number of plausible hypotheses requiring verification and to manipulate contingencies in the experimental conditions observed to occur naturally during the daily activity.

Other authors have used a variety of pretreatment assessment procedures to formulate hypotheses regarding the operant function of problem behavior. In most cases, the hypotheses are tested directly via an experimental analysis. For example, Dunlap et al. (1991) used direct observations, rating scales, and questionnaires to identify four hypotheses relating to antecedent (e.g., choice vs. no choice) and curricular (e.g., fine vs. gross motor activities) influences on a student's disruptive behavior. The authors then tested these hypotheses

in an experimental analysis to identify the conditions associated with the greatest levels of problem behavior. Similarly, Repp et al. (1988) reported the use of unspecified direct observations to collect data on the target behavior and subsequent environmental events, and compared the effects of a treatment based on the hypothesized function of the problem behavior to a treatment based on an hypothesis commonly found in the behavioral literature. The Repp et al. (1988) study differed from those of Mace and Lalli (1991) and Dunlap et al. (1991) because Repp and colleagues tested their hypotheses indirectly via the treatment effects on the target behaviors instead of with the experimental methods used in the other two studies.

The present research evaluated a variation of the procedures used by Mace and Lalli (1991) for conducting pretreatment assessments in classroom settings. Specifically, we conducted descriptive analyses in Study 1 to develop hypotheses regarding the operant function of students' problem behaviors and then designed interventions based on these hypotheses. In Study 2, we tested these hypotheses indirectly through treatment effects on the target behavior and directly through an experimental analysis conducted in the natural setting. In the experimental analysis, the teachers supplied consequences for the target behaviors during the situations in which these behaviors most frequently occurred. By developing individual interventions based on descriptive analysis data, we were able to provide the teachers with procedures that quickly produced substantial decreases in the students' problem behaviors. In addition, our inferences regarding the hypotheses derived from the descriptive analysis were strengthened with the findings from the experimental analysis. We conducted both studies using a behavioral consultation approach suited to most school settings.

STUDY 1

METHOD

Participants, Teachers, and Setting

Three teachers of students with severe and profound mental retardation each identified 1 student

for participation because of ongoing behavior problems that interfered with instructional activities. In addition to the teacher, two instructional assistants and seven to nine students were present in each classroom. All students were dependent for ambulation, had no formal communication skills, and displayed few interactions with peers.

Al was 10 years old, had cerebral palsy, and was nonvocal. He consistently responded correctly to simple requests by pointing to a "yes" or "no" card in a picture booklet. Al's ambulation consisted of crawling and using a walker or wheelchair. His target behavior was head banging, which consisted of striking his forehead against a table, floor, wall, or his wheelchair.

Bob was 10 years old, had Down syndrome, was nonvocal, and signed only for access to the toilet. He was ambulatory and had normal fine and gross motor skills. His target behavior was aggression, which consisted of kicking, pushing, hitting, biting, or scratching a teacher.

Mary was 14 years old, had cerebral palsy, was nonvocal, and did not use signs, gestures, or picture cards. She was dependent in her wheelchair, but was able to crawl. Her target behavior was self-injury, which consisted of scratching her hand with her fingers.

The three teachers had master's degrees in special education, and their classroom teaching experience ranged from 3 to 17 years. Two of the instructional assistants had received a high school diploma, and four had a bachelor's degree. Their teaching experience ranged from 1 to 17 years.

General Procedures and Data Collection

The consultant (first author) conducted a four-phase assessment to obtain information on the general problem area (problem-identification interview), to obtain a general analysis of the activities in which the target behavior occurred most frequently (scatter plot analysis), to identify objectively the specific topographies of the target behavior and its environmental antecedent and subsequent events (narrative recordings), and to identify systematically the relationships between the target behavior and these environmental events (descriptive analysis).

Problem-identification interview. The consultant interviewed each teacher to obtain information regarding a student's age and school classification, the target behavior and contiguous environmental events, the target behavior's estimated frequency and trend, and current and previously used procedures to remediate the problem behavior (Iwata, Wong, Riordan, & Lau, 1982).

Scatter plot analysis. After the problem-identification interview, each teacher performed a scatter plot analysis (Touchette et al., 1985) of the student's target behavior over a 5-day period to identify the times when target behaviors occurred most frequently. The teachers counted the number of target behaviors that occurred during 30-min intervals and recorded these measures using the procedure described by Touchette et al. Scatter plot data were recorded in one of three categories: zero occurrences, low occurrences (1 to 10 occurrences per 30-min interval), and high occurrences (more than 10 occurrences per 30-min interval). The consultant and teacher then visually inspected the data to identify the specific classroom activities associated with high occurrences of the target behavior.

Narrative recordings. The consultant conducted three 2-hr observations during the classroom activities associated with the highest frequencies of the target behavior to identify (a) the possible combinations of environmental antecedent situations, (b) the specific topographies of environmental subsequent events, and (c) the target behavior's specific topographies. During these observations, the consultant recorded the instructional format, the instructional content, and the manner in which a teacher responded to the student's problem behavior.

Descriptive analysis. The consultant selected the antecedent and subsequent event categories for each student based on the information obtained during the narrative recordings. Operational definitions for these categories are presented in Table 1. All data were collected by the consultant using a continuous 10-s partial-interval recording procedure signaled by audiotape (Mace & Lalli, 1991). Five 1-hr observations were conducted for each student.

A second observer independently collected in-

Table 1
Operational Definitions for the Descriptive Analysis

Antecedent events		
Task	One-to-one instruction	Begins with a teacher request for the student to prepare for a personal care, daily living, vocational, or academic program and ends when the task has ended. An active performance requirement must have been placed on the target student.
	Group instruction	Begins with a teacher request for students to prepare for one of the above tasks and ends when the activity has ended.
Play	One-to-one interaction	Activities with no requests for active student responding and the student is engaged in direct interaction with the teacher.
	No one-to-one interaction	Activities with no requests for active student responding and with no direct interaction between the student and the teacher (e.g., group activity).
Subsequent events		
Attention		A vocal statement from the teacher.
Tangible reinforcement		The student gains access to a preferred item following the problem behavior.
Escape		Ten continuous seconds of discontinuation of task-related activity after the problem behavior.

Note. The antecedent event categories were mutually exclusive.

terobserver agreement data during an average of 25% of the descriptive analysis sessions equally distributed across all students. Total, occurrence, and nonoccurrence agreements were calculated individually for each response using an exact interval-by-interval method. An agreement occurred when both observers concurrently but independently recorded the occurrence of a specific behavior or environmental event during a given 10-s interval. Agreement was calculated by dividing agreements by agreements plus disagreements and multiplying

by 100%. Agreement values ranged from 83% to 98% across all measures.

RESULTS AND DISCUSSION

Figure 1 contains the results of the descriptive analyses for each student. Data were analyzed using the formulas presented in Mace and Lalli (1991). The antecedent-response graphs present the probability of observing a student's problem behavior given the occurrence of an antecedent event. The response-subsequent relationship graphs present the relationship between the target response and the subsequent event within specified antecedent conditions. For response-subsequent relationships, only those antecedent conditions in which the target response was observed are provided. To be considered a session, the antecedent event had to occur for a minimum of 2 min. Therefore, the number of sessions for each data series varied within each student's analysis. The average duration of each antecedent event ranged from 5 min to 40 min per observation.

Figure 1 shows that Al's self-injury occurred exclusively ($M = 27\%$ of intervals) during the task one-to-one instructional situations, which always involved transitions between his regular and special education classrooms. The data also indicate that task-related activities were frequently interrupted both during and after Al's self-injury ($M = 35\%$). In addition, frequent attention from staff ($M = 52\%$) occurred after self-injury. Based on these occurrences, two hypotheses were formulated: (a) Self-injury was negatively reinforced during these instructional situations by escape from demands, and (b) self-injury was positively reinforced during these instructional situations by staff attention.

As shown in Figure 1, Bob's aggression occurred most frequently during play without one-to-one interaction ($M = 38\%$). These periods occurred when staff were providing instruction to other stu-

Figure 1. Results of the descriptive analyses of each student's problem behavior. Percentage of intervals of problem behavior scored during antecedent environmental events is reflected in antecedent-response relationship graphs. Percentage of intervals of subsequent events observed within 20 s of problem behaviors during given antecedent situations is reflected in response-subsequent relationship graphs.

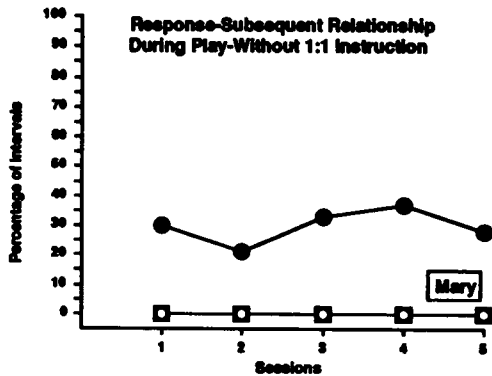
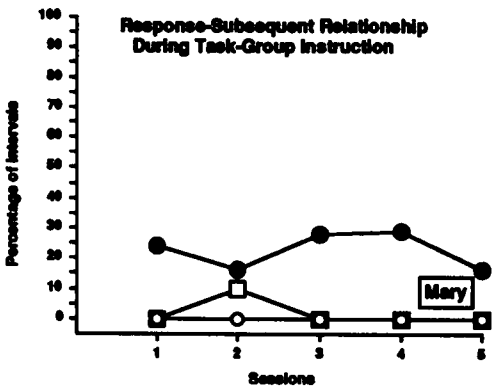
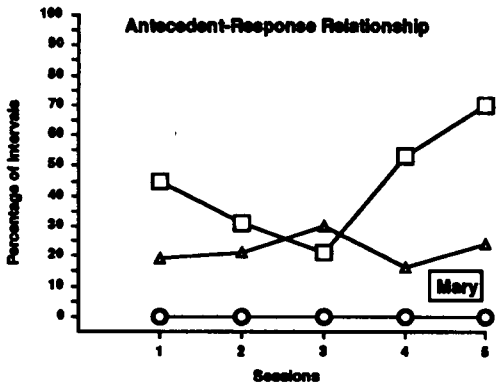
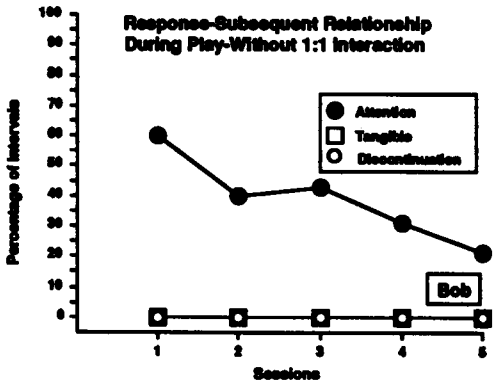
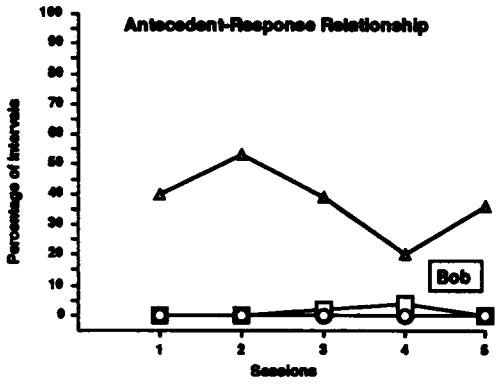
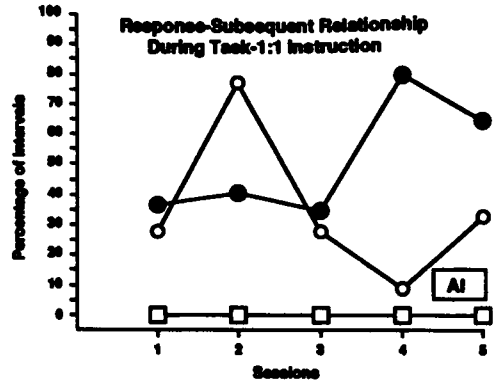
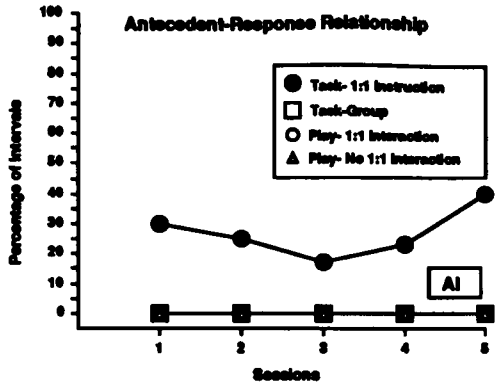


Table 2
Target Behaviors, Hypothesis, Adaptive Behavior, and Intervention Rationale for Each Student

Student	Problem behavior	Hypothesis	Verbal behavior	Rationale
Al	Self-injury	Attention/escape	Choice making	High levels of SIB-attention + escape in tasks in DA and high levels of SIB in EA with contingent escape
Bob	Aggression	Attention	Initiate interaction	High levels of AGG-attention when low attention in DA and high levels of AGG in EA with contingent attention
Mary	Self-injury	Attention	Initiate interaction	High levels of SIB-attention when low adult attention in DA and high levels of SIB in EA with contingent attention

Note. SIB = self-injury; AGG = aggression; DA = descriptive analysis; EA = experimental analysis. SIB- or AGG-attention refers to the target response-reinforcer relation observed in the descriptive analysis.

dents and Bob was allowed access to a variety of objects located within a designated area. Approximately 39% of Bob's aggressions during these situations were followed by teacher attention. These occurrences suggest that Bob's aggression was maintained by the teacher's attention. Aggression occurred in only 1.2% of the intervals in sessions during the task-group situations and, therefore, is not graphically represented because the teacher did not consider these situations to be problematic.

Mary engaged in self-injury most frequently during task-group instruction ($M = 44\%$) and play without one-to-one interaction ($M = 22\%$) (Figure 1). Mary's self-injury produced teacher attention on an intermittent basis during task-group instruction and play without one-to-one interaction, and her self-injury produced tangible reinforcement in only one session during task-group instruction. These occurrences suggest that Mary's self-injury was maintained by teacher attention during these situations.

Following the descriptive analyses, the consultant analyzed the data to generate hypotheses regarding the operant function of each student's problem

behavior in order to develop two interventions for each student. The first intervention was designed to test indirectly the hypotheses derived from the descriptive analysis by placing the problem behavior on an extinction schedule and by providing reinforcement for appropriate behaviors (i.e., differential reinforcement of alternative behavior, or DRA, schedule), and the second intervention was designed to teach the students appropriate behaviors functionally equivalent to the problem behaviors. The target behaviors, hypotheses, and rationale for intervention selection for each student are presented in Table 2.

For Al, the first intervention used a guided compliance procedure to maintain on-task responding and provided attention contingent on appropriate task-related behavior rather than his self-injury during transition times. Al's adaptive behavior was to choose his next scheduled activity by pointing to a photo in a picture booklet, thus allowing him access to preferred activities contingent on appropriate behavior rather than on self-injury. This was in contrast to the existing procedure, in which the teacher allowed Al to discontinue voluntarily his

independent ambulation, provided him with disapproving comments, and allowed free access to preferred activities contingent on self-injury.

For Bob's initial intervention, the teacher discontinued the disapproving comments after Bob's aggression but provided attention contingent on appropriate play behavior during play without one-to-one interaction. These procedures differed from the existing approach, in which the teacher reprimanded Bob contingent on aggression. Bob's adaptive behavior was to present the teacher with a play item to initiate interactions during these situations.

Mary's initial intervention was similar to Bob's and was implemented during play without one-to-one interaction and task-group instruction. Mary's adaptive behavior was to touch the teacher on her arm to obtain the teacher's attention during situations in which she was without other interaction.

In Study 1, we identified the situations in which the students engaged in problem behaviors most frequently and possible response-reinforcer relations. Based on these findings, we proposed hypotheses regarding the operant function of the students' problem behaviors and tested the validity of these hypotheses in Study 2.

STUDY 2

METHOD

Participants, Setting, and Response Definitions

The participants and settings were the same as in Study 1. The teachers implemented all interventions for the students' target behaviors in the classrooms or other areas where the students received instruction (e.g., lunchroom, playground, school hallways).

Al's adaptive behavior was to make choices by pointing to an object in his picture booklet to select his next activity. Al's alternative behavior during task one-to-one instruction allowed him to obtain a preferred item or activity in a socially appropriate manner, thus eliminating the motivation to engage in self-injury to escape an aversive situation.

Bob's adaptive behavior was requesting interaction by waving his hand in an arc-like motion to say "hello" while presenting a play object to the teacher. By initiating interactions in this manner, Bob appropriately obtained the teacher's attention during his play without one-to-one interaction, thus lessening the motivation to engage in aggression to obtain the same reinforcer.

Mary's adaptive behavior was requesting interaction by approaching the teacher and appropriately tapping her on the arm during play without other interaction or task-group instruction. This response allowed Mary to obtain attention in a socially appropriate manner, which decreased her motivation to engage in self-injury to obtain the teacher's attention.

Data Collection

Baseline, treatment, and follow-up. The consultant served as the primary data collector on a daily basis and prompted the teachers to approach the student during the DRA procedures and the adaptive skills training conditions. All baseline, treatment, and follow-up observations lasted 20 to 30 min and were conducted four to five times per week, with the exception of the follow-up probes, which were conducted once per week for a 4-week period after training. Data collection for Al began in the last 5 to 10 min of the regular education class and continued during the transition between classes and the first 5 to 10 min of the special education class. All other students' data were recorded in their special education classroom.

The data collector(s) used a continuous 10-s interval recording procedure to record all responses. Al's and Bob's problem behaviors were recorded using a count-within-interval procedure, and Mary's were recorded using a partial-interval method. We used a partial-interval procedure for Mary because it was difficult to determine a clear onset and cessation of her self-injury. The target adaptive behaviors were recorded using a count-within-interval procedure. Adaptive responses were scored as either teacher or student initiated. A *teacher-initiated* response was defined as one in which the teacher

provided the discriminative stimulus for the adaptive response (e.g., "Al, show me what you want to do"). A *student-initiated* response was defined as one in which the student emitted the response without the teacher's request (e.g., Al opened a picture booklet and pointed to a symbol without the teacher's discriminative stimulus).

Interobserver agreement. Interobserver agreement was calculated for each target behavior as described in Study 1. Agreement measures were obtained during 25% of the sessions, equally distributed across participants and phases of the study. Interobserver agreement values averaged 85% to 98%.

Procedure

Baseline. Baseline data were collected after the descriptive analysis observations but before the consultant gave feedback to the teachers. The consultant did not provide the teachers with feedback or instructions for the students' behavior during baseline; therefore, teachers responded to the students' problem behavior as they did in the descriptive analysis conditions.

Teacher training. After baseline, the consultant conducted two training sessions with the teachers, each session lasting approximately 4 hr. During the first session, the consultant described the hypothesized operant function of the students' problem behaviors. The consultant and teachers then discussed procedures for selecting an intervention based on the hypothesized function of a student's response, observing and recording the target behaviors, blocking or interrupting the problem behavior if it presented a physical risk, and using DRA (Delamater, Conners, & Wells, 1984). After this discussion, the consultant selected an intervention and trained the teachers to use individualized procedures to decrease the frequency of the students' problem behaviors. During training, the consultant provided instructions and demonstrated the appropriate procedures, observed the teachers' practice of the specified procedures, and provided immediate feedback in the form of descriptive praise and error correction.

The consultant conducted the second training

session after the experimental analysis and prior to implementing the students' adaptive skills training. During this session, the consultant reviewed the teachers' use of the extinction procedures and the corresponding effects on the students' target problem behaviors, and then selected the target adaptive behavior for each student based on the hypothesized function of the student's inappropriate response. In addition, the consultant and the teachers reviewed systematic instructional procedures for teaching the adaptive behaviors (e.g., prompting, differential reinforcement, data collection). The consultant then used the procedures described in the first training session to train the teachers.

Experimental design. A combination multiple baseline across 3 students and a component analysis design was used to assess the effects of the analysis-derived interventions on the students' problem behaviors. The component analysis consisted of the gradual withdrawal of different components of the intervention package to observe the effects on the target behaviors. The hypotheses from the descriptive analyses were tested using a reversal design in which the teachers provided consequences contingent on problem behaviors.

Treatment Conditions

General procedures. The teachers provided social interaction (i.e., vocal comments) or access to objects for all appropriate behaviors in each phase. All sessions were conducted during the naturally occurring classroom activity in which the problem behavior occurred most frequently, and all procedures were implemented by the teachers. During adaptive skills training, the consultant instructed the teachers to respond to the problem behaviors as they did during the reversal conditions to evaluate the independent contribution of the adaptive skills training on the frequency of the problem behavior. After baseline, the teacher implemented an extinction plus DRA phase for each student.

Extinction procedures for all students. The purpose of this component was to reduce the frequency of the problem behaviors by discontinuing the contingent presentation of the presumed reinforcers. During these conditions, the teachers dis-

continued providing the students with attention after the occurrence of their problem behaviors because the descriptive analyses suggested that these behaviors were maintained by adult attention. Al's teacher also used guided compliance to maintain on-task responding as part of Al's extinction, because the descriptive analysis indicated that his self-injury allowed him to escape from a nonpreferred activity. For guided compliance, the teacher immediately pushed Al's walker or wheelchair contingent on any off-task behavior after self-injury and continued guiding Al until he resumed independent ambulation (usually within 5 to 10 s). Al was allowed to stop ambulating independent of self-injury.

Differential reinforcement of alternative behaviors for all students. This component was included to provide the presumed reinforcer contingent on appropriate behaviors. The teacher provided the student with a positive comment concerning his or her task-related or play behaviors on a fixed-interval (FI) schedule, which was gradually and systematically increased (e.g., FI 30 s, FI 60 s, FI 90 s) based on the frequency of the problem behavior in the previous session.

Specific procedures for Al. A reversal component that consisted of ignoring self-injury and allowing interruption was included to test the negative reinforcement hypothesis for Al's self-injury by allowing him to escape from a task-related demand while implementing an extinction schedule for attention. During these conditions, the teacher allowed Al to interrupt the task-related activity but did not provide reprimands after self-injury. During any occurrences of self-injury, the teacher stood behind Al and waited for him to resume ambulating.

Adaptive skills training for Al. The elevated levels of Al's self-injury observed in the reversal conditions supported an escape hypothesis. Therefore, the teacher taught Al to choose his next scheduled activity by pointing to a photo in his picture booklet (Carr, Newsom, & Binkoff, 1980). The teachers selected a pool of classroom activities and placed photographs of the objects used in each activity in a picture booklet. Before Al left the

special education classroom, the teacher placed four photographs along with a "yes" and a "no" card in the picture booklet, which was then strapped on his walker or wheelchair. At the end of the regular education class, the teacher handed Al the booklet and said, "Al, it's time to go back to our classroom. Show me what you want to do when we get back." The teacher physically guided Al to point to a photograph if he failed to respond to the request within 5 s. The teacher provided descriptive praise and access to the selected activity or object following all correct responses.

Specific procedures for Bob and Mary. A reversal component that consisted of contingent attention was designed to test the attention hypothesis for Bob's and Mary's problem behaviors by providing the students with contingent attention on a variable-ratio (VR 3) schedule.

Adaptive skills training for Bob. Because the increase in Bob's aggression during the reversal phase supported an attention hypothesis, the teacher taught Bob to wave his hand in one continuous arc-like motion (Carr & Durand, 1985; Hunt et al., 1988) and to give the teacher a play object to initiate social interactions. The teacher approached Bob on an FI 5-min schedule, said "hello, Bob," and waved her hand in the previously described manner. The teacher physically guided Bob to wave his hand and to give her a play object if he did not respond to her request within 5 s. After a minimum of 1 min of interaction, the teacher resumed instructing the other students, and Bob continued his free time in the designated area until the next signaled time interval. In the second adaptive skills training phase, the schedule was changed to an FI 15-min schedule, and the teacher interacted with Bob for a minimum of 5 min.

Adaptive skills training for Mary. The increased frequency of Mary's self-injury during the reversal phases supported an attention hypothesis; therefore, the teacher taught her an adaptive response that produced social interaction (Carr & Durand, 1985; Hunt et al., 1988). The teacher taught Mary to initiate interaction by appropriately tapping a teacher on the arm. The teacher approached Mary on an FI schedule (FI 3 min or FI

5 min) and said to Mary, "Say hello." The teacher physically guided Mary to emit the adaptive response if she did not respond independently within 5 s. Each correct tapping response not physically guided by the teacher was followed by descriptive praise. The teacher interacted with Mary for approximately 1 min before resuming instruction with the other students.

Follow-up probes for all students. The consultant conducted follow-up observations after training in each baseline. During follow-up, the consultant did not provide the teachers with instructions or feedback.

RESULTS AND DISCUSSION

The results of the interventions are presented in Figure 2. During baseline, Al averaged six self-injurious responses per minute. Introduction of extinction plus DRA produced a substantial decrease in the frequency of self-injury ($M = 1.4$), and no self-injury was observed in the next phase when the DRA procedure was discontinued. Al averaged 2.5 and 5.5 self-injurious responses per minute in the two reversal phases, respectively. Results in the two adaptive skills training phases showed low levels of the problem behavior and an average of approximately five adaptive responses per session ($M = 4.8$; range, 2 to 8). Of these adaptive responses, an average of 1.0 per session was student initiated. Follow-up probe data indicated that the low levels of self-injury were maintained, as were the high levels of the target adaptive behavior.

Bob averaged 3.3 aggressions per minute during baseline. Extinction plus DRA produced a substantial reduction in the frequency of aggression ($M = 0.4$ per minute), and low frequencies were maintained in the next phase ($M = 0.6$) when the DRA procedure was discontinued. Bob's aggression returned to near-baseline levels during each reversal phase, averaging 2.8, 2.3, and 2.8 responses per minute, respectively. Adaptive skills training resulted in no aggression and a corresponding increase in the targeted adaptive behaviors. During the adaptive skills training phases, Bob averaged approximately five adaptive responses per session. Of

these, approximately two were student initiated ($M = 1.7$).

Mary frequently engaged in self-injury during the initial baseline phase ($M = 57\%$ of intervals). Extinction plus DRA decreased Mary's problem behavior ($M = 10\%$). Mary's self-injury averaged only 2% when the DRA procedure was discontinued in the next phase. Mary's self-injury returned to baseline ($M = 46\%$, 57%, and 60%, respectively) in the three reversal phases. The adaptive skills training phases produced near-zero levels ($M = 1\%$ and 0%) of self-injury and a corresponding increase in the target adaptive response. Mary averaged one student-initiated adaptive response per session ($M = 1.1$) in both adaptive skills training phases.

GENERAL DISCUSSION

The findings of the present study add to the literature supporting the effectiveness of using pretreatment assessment data to design individualized treatments for problem behavior. The descriptive analysis allowed us to identify possible reinforcers (e.g., attention, escape from nonpreferred activities) that may have contributed to the maintenance of inappropriate behaviors. After these reinforcers were identified, the teachers responded in a manner that removed the hypothesized function of the target response, and implemented DRA procedures to provide reinforcement contingent on appropriate behaviors. Although the DRA schedules were discontinued after the first phase (i.e., extinction plus DRA), the teachers reported interacting with the students on a more frequent and regular basis throughout the day than they had prior to the study. Finally, the teachers taught the students socially acceptable behaviors to obtain the reinforcers previously produced by their problem behavior.

The descriptive analyses allowed us to observe possible reinforcement contingencies between the target behaviors and environmental events as they naturally occurred during problematic classroom situations. By identifying these possible functional relations, we were able to concentrate our resources on a narrow range of situations and to implement

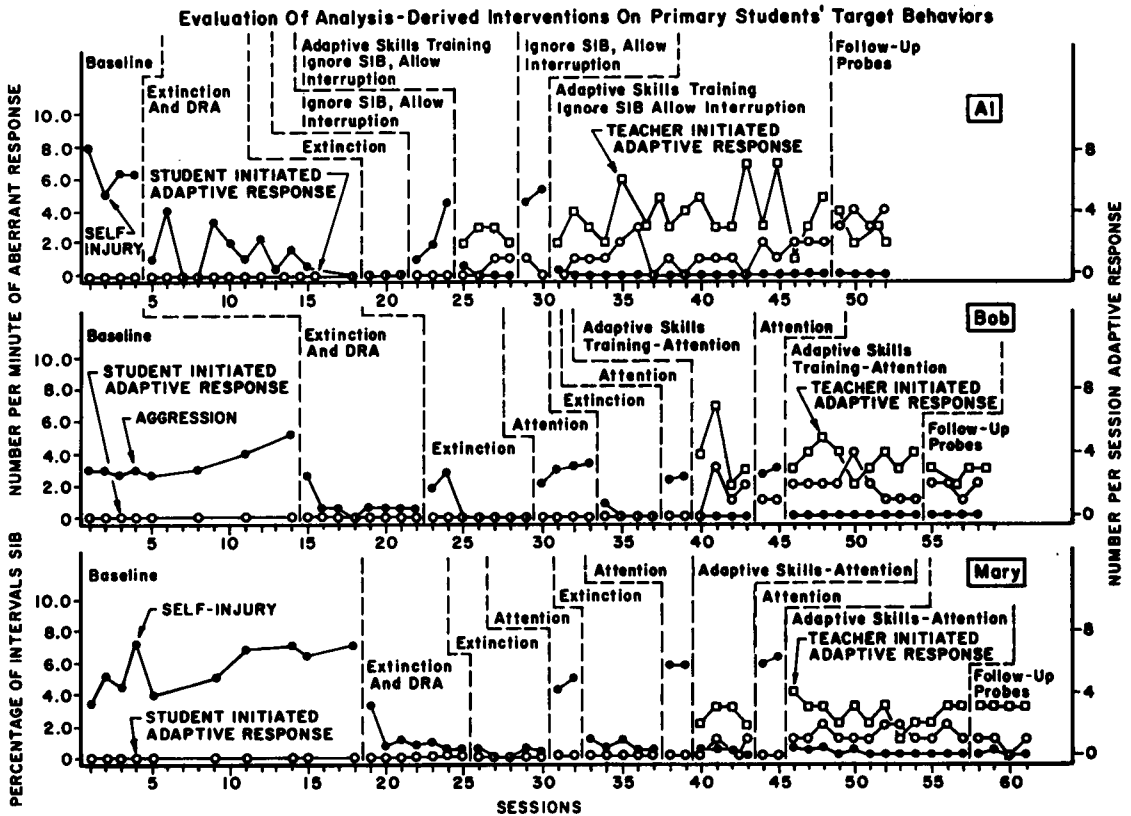


Figure 2. Results of interventions on students' target behaviors during experimental conditions, shown as number per minute for target problem behaviors (left y axis) and number per session for target adaptive responses (right y axis).

interventions that placed the response-reinforcer relation on an extinction schedule immediately. Decreases in frequency of problem behavior during the initial intervention phases provided support for the hypotheses derived from the descriptive analyses and allowed us to test only one hypothesis in the experimental analysis. Thus, this approach resulted in efficient assessment.

Further support for the hypotheses derived from the descriptive analysis was obtained during the experimental analysis. In previous experimental analyses (e.g., Iwata, Dorsey, Slifer, Bauman, & Richman, 1982; Mace & Lalli, 1991), the role of different environmental variables on the frequency of individuals' inappropriate responding was assessed during tightly controlled analogue conditions with an experimenter manipulating the consequences. In the present study, we extended this model by conducting the experimental analysis in

the natural environment with teachers providing the reinforcers. This allowed us to conduct all assessments in the classrooms and to avoid removing the students from the instructional environment. The procedure limited the differences between the experimental analysis and natural conditions and, therefore, the amount of inference needed between the findings obtained in the different settings. Analyzed collectively, the findings from the initial treatment and reversal phases supported our original hypotheses and became the basis for selecting the specific adaptive skills targeted for training.

Although extinction plus DRA suppressed the frequency of the problem behaviors, the students remained dependent on the teachers to provide the reinforcers. We implemented mand training to facilitate the maintenance and generality of the treatment effects. Untrained care providers may not consistently implement the extinction schedule or

provide the students with response-independent reinforcement (i.e., the DRA schedule) on a schedule sufficient to continue to suppress problem behavior. Teaching the students to request activities or attention provided them with a socially appropriate way to produce a natural community of positive reinforcement.

A logical progression in the use of pretreatment assessments is to move away from a behavioral consultation approach and to train direct-care staff members to conduct the procedures. Training these staff members to perform the assessments would increase their applicability for community settings by improving their efficiency and cost effectiveness and would lessen the reliance on consultants for ongoing assistance (Dunlap *et al.*, 1991). This seems to be reasonable, because parents (Cooper, Wacker, Sasso, Reimers, & Donn, 1990) and teachers (Sasso *et al.*, in press) have been successfully trained to use similar pretreatment assessment procedures. The continued refinement of functional analysis procedures will facilitate their more widespread use in community settings. The present study advances the technology by extending the applicability of a comprehensive functional analysis to a public school setting.

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