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USING ASSESSMENT-BASED CURRICULAR INTERVENTION TO IMPROVE THE CLASSROOM BEHAVIOR OF A STUDENT WITH EMOTIONAL AND BEHAVIORAL CHALLENGES

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We evaluated a process of descriptive assessment, functional assessment, and assessment-based intervention with an elementary-school child who was described as having emotional and behavioral challenges, but who also exhibited above-average intelligence and communication skills. During a hypothesis-development phase, information was gathered from several sources including an interview that was conducted directly with the participant. Descriptive information collected during this phase produced five hypotheses about variables maintaining the problem behavior that were then tested experimentally in the classroom environment. The resulting functional assessment data supported the hypotheses. Intervention packages based on the hypotheses were implemented sequentially across English, spelling, and math classes. The interventions were successful in increasing on-task behavior, and the improvements were maintained for the remainder of the school year.

DESCRIPTORS: classroom behavior, curriculum design, emotional and behavior disorders, functional analysis

Educators and other school personnel are sometimes challenged by students who exhibit behavioral difficulties that are incompatible with the ongoing activities and structure of a school setting. Often, these behaviors are resistant to conventional methods of classroom management. When traditional strategies prove to be ineffective, it is common for schools to either apply more severe disciplinary procedures or place students in increasingly restrictive school programs (Grosenick, George, George, & Lewis, 1991). These alternatives, however, are associated with several limitations. First, they generally address only the topographies of behaviors. As a result, amelioration of the undesirable behaviors is not always forthcoming (Carr, Robinson, & Palumbo, 1990; Lennox & Miltenberger, 1989). In addition, there is no empirical evidence that special class placement based on certain observed or inferred child characteristics results in improved behavior and enhanced learning (Brinker, 1990). Finally, many types of disciplinary procedures and special class placements are associated with restricted opportunities for positive and satisfying social and learning experiences.

In recent years, behavior management has improved substantially with developments in functional analysis and functional assessment (e.g., Dunlap & Kern, 1993; Iwata, Vollmer, & Zarcone, 1990). The purpose of these procedures is to identify environmental variables and stimuli that are associated with occurrences of the target behavior. Although this purpose has been an element of behavior analysis for many years (e.g., Bijou, Peterson, & Ault, 1968), work over the past decade has accentuated the importance of preintervention as-

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sessments and has delineated numerous strategies for obtaining assessment data (e.g., O'Neill, Horner, Albin, Storey, & Sprague, 1990). Among the more recent efforts to improve the precision of functional assessments has been the description of a two-phase process in which environmental variables are first implicated in the form of hypothesis statements (Repp, Felce, & Barton, 1988) and are then tested through direct manipulations or functional analyses (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982). This process leads to the isolation of functional variables and interventions that are driven by carefully developed hypotheses, rather than by assumptions or casual observations. The advantages of this systematic approach to identifying controlling variables include increased confidence that the identified variables are related functionally to the target behavior and a greater likelihood of intervention effectiveness in cases in which other approaches have failed.

In school settings, the curricular and instructional expectations placed on students largely define their school day. A cluster of studies has begun to examine the role of these expectations on school deportment (e.g., Haring & Kennedy, 1990). A great number of variables have been found to influence the occurrence or nonoccurrence of undesirable classroom behavior. Some of these include the level of task difficulty (Weeks & Gaylord-Ross, 1981), the manner in which instructions to complete a task are delivered (Singer, Singer, & Horner, 1987; Winterling, Dunlap, & O'Neill, 1987), and the level of interest a student shows in a task (Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Kern-Dunlap, Clarke, & Dunlap, 1990). By identifying these variables through a functional assessment, curricular features can be modified to reduce the occurrence of undesirable behavior.

A few investigations have demonstrated that a curricular intervention can produce significant and durable reductions in students' undesirable behaviors in classroom settings. In one study, Dunlap et al. (1991) began with a comprehensive functional assessment of the disruptive behaviors of an adolescent female with multiple disabilities. During the hypothesis-development stage, the authors gathered information from direct observations, rating scales, staff meetings, and extensive interviews with 28 informants. A large number of postulates concerning the student's disruptive behavior were advanced; however, a few variables were identified that were recurrent, related to observable variables, and could be manipulated within a school context. These variables resulted in four specific hypotheses that were then tested over 4 days using reversal designs. Each of the hypotheses tested was found to influence the student's disruptive behavior. Each of the hypotheses pertained to some aspect of the student's curriculum; thus, intervention required considerable revisions in the student's school activities. The intervention produced substantial reductions in all disruptive behavior, with concomitant increases in desirable, social responding.

Lalli, Browder, Mace, and Brown (1993) used functional assessments to obtain information on the antecedent and subsequent events that maintained self-injurious and aggressive behaviors in 3 students. These authors developed hypotheses with a problem identification interview, a scatter plot analysis, narrative recordings, and a descriptive analysis consisting of direct observations of antecedent and subsequent events. The interventions that resulted consisted partially of curricular modifications. For example, 1 of the students was provided with a picture book from which he could select his next activity. The authors then assessed the accuracy of the hypotheses and the effectiveness of resulting interventions. This analysis demonstrated that the assessment phase resulted in the accurate identification of the antecedent and subsequent events that maintained the target behaviors, and interventions that modified antecedent and subsequent events were effective in reducing the target behaviors. In addition, alternative adaptive replacement behaviors were also taught to the participants.

The current study was conducted for several reasons pertinent to functional assessment, curricular revision, and application in typical classrooms for students with challenging behaviors. First, the most relevant studies in this area of inquiry have all been conducted with participants who had intellectual disabilities and limited communication skills. In

the current study, we sought to investigate the functional assessment process with a participant who exhibited emotional and behavioral challenges, but whose intellectual and verbal abilities were above average.

Second, because of the student's high cognitive functioning, he was able to participate in the descriptive analysis phase. Thus, in addition to extending the application of the process to a member of a different population, this provided an opportunity to obtain assessment information from the participant directly and thereby to explore the potential value of self-report data in the process of functional assessment.

Finally, the study sought to increase the applied characteristics of the functional assessment process by conducting the investigation entirely within the ongoing context of the participant's elementary school. The student's classroom teachers were involved in all phases of the study, including the descriptive and experimental analyses.

GENERAL METHOD

Participant and Setting

Eddie, an 11-year-old boy in the fifth grade, participated in this study. According to the WISC-R, Eddie fell in the high average range of intelligence (full scale = 118). He was functioning at or above grade level in all academic subjects, as demonstrated by his performance on standardized tests and classroom examinations. In addition, his interactions with peers and adults were considered to be generally appropriate. Despite these strengths, Eddie's behavior in the classroom was frequently off task; consequently, he rarely completed his assigned classroom work. When Eddie was asked to hand in his work at the end of an academic session or when he was reprimanded for failing to complete an assignment, he engaged in tantrums consisting of episodes of crying and, occasionally, self-injury in the form of head banging or arm biting.

The setting for this study was a public elementary school special education program serving students described as severely emotionally disturbed, where Eddie had been enrolled for 4 years. The program consisted of four separate classrooms and was designed so that students switched classrooms for academic subjects to create homogeneous academic groups. Each of the classrooms was staffed by a teacher and an aide, and included seven or eight students. Three of Eddie's academic subjects (English, math, and spelling) were targeted for the functional assessment and the subsequent intervention. These subjects were selected because they were most consistently associated with Eddie's problem behaviors.

Each of the class periods for the targeted academic subjects was 45 min long. Typically, activities consisted of independent work in the form of textbook assignments or worksheets. Occasionally, a lecture by the teacher preceded independent work. A program-wide behavior management system was in effect, whereby appropriate deportment, including work completion, was rewarded with points that were exchangeable for rewards from a token store or free time at the end of the academic period.

In addition to the program-wide behavior management system, Eddie's classroom teachers had implemented programs designed to help reduce his tantrums and self-injury. For example, the class assignment was often modified for Eddie by reducing the amount of work he was required to complete to earn his points. On occasion, Eddie was provided with a kitchen timer to serve as a cue for the time allotted to complete a particular task. Eddie's teachers reported that although these modifications seemed to reduce the frequency of tantrums and self-injury, Eddie still completed little or none of his assigned classwork.

Behavioral Definitions and Measurement

Because Eddie's tantrums and self-injury consistently resulted from failing to complete his assigned classwork, it was decided to target on-task behavior for data collection and intervention. *On-task behavior* was defined as complying with teacher or staff instructions with eyes on materials or the teacher as requested. Thus, Eddie's behavior was judged to be on task if he was engaged in the assignment

as the teacher had instructed. On-task behavior was defined in this manner because the academic requirements consisted of a large amount of independent seat work. Behavior was scored as off task if Eddie failed to comply with instructions (e.g., engage in assigned work) for a period exceeding 3 consecutive seconds. This included engaging in behaviors that were incompatible with work completion, such as talking with a classmate, leaving his seat, or engaging in disruptive behaviors such as having tantrums or crying.

Throughout the investigation, data on on-task behavior were collected via a 15-s partial-interval recording system in which the first 10 s were devoted to observation and the remaining 5 s were spent on data recording. Intervals were cued by a tape recording that observers heard through earphones. Data were collected by five staff members who were familiar with the behaviors of individuals with disabilities and who had extensive previous experience with data collection. Prior to initiating the investigation, each observer practiced with the behavioral definitions. The study commenced when an 80% agreement criterion was reached on three consecutive sessions.

Data were collected for 30 min in each session of direct observation throughout all phases. All data were collected during ongoing classroom operations. The study was conducted in two phases. The first phase, functional assessment, included the development and testing of hypotheses, and the second phase incorporated the assessment results into curricular interventions.

PHASE 1: FUNCTIONAL ASSESSMENT

Hypothesis Development

The purpose of this stage of the assessment process was to identify specific relationships between features of Eddie's environment and the occurrence of desirable and undesirable behavior. A variety of descriptive assessment data were collected, including direct observations, standardized tests, and interviews. The objective was to delineate specific curricular variables that could be manipulated in order to promote desirable classroom behavior.

Initially, upon Eddie's referral, ABC data (Bijou et al., 1968) were collected throughout the school day. After only a few days of observations, these data revealed a clear pattern. Eddie was observed to engage in undesirable behavior only during academic subjects. He consistently engaged in undesirable behavior when there were academic expectations and never engaged in undesirable behavior when academic expectations were removed. During music, physical education, lunch, and free time, Eddie was almost always engaged appropriately in the ongoing activity, and no tantrums or self-injury were ever observed. These data also showed that the presence or absence of teacher attention did not appear to influence the occurrence of Eddie's off-task or undesirable behavior. Based on these observations, the authors hypothesized that Eddie's undesirable behavior was escape motivated. The goal of subsequent assessments was to determine specific curricular features that might influence escape behavior.

A functional assessment interview was conducted with each of Eddie's teachers. The interview provided information that was useful for developing specific hypotheses regarding Eddie's undesirable school behavior. This instrument (available from the authors upon request) was developed for use in classroom settings and is a compilation and modification of several other instruments (e.g., O'Neill et al., 1990). The interview consists of 22 questions designed to identify stimuli or setting events that may be causing or maintaining the target behavior. For example, informants are asked to identify circumstances under which the target behavior always occurs, circumstances under which the target behavior never occurs, how often the target behavior occurs, with whom the target behavior occurs, whether the behavior might be related to a skill deficit, whether there might be associated physiological conditions, and other questions that relate to the functions and context of the behavior.

Although the interview provided useful information, Eddie's high level of functioning and adeptness at verbalizing his preferences suggested

that information obtained directly from him might contribute further to the functional analysis. Thus, a Student-Assisted Functional Assessment Interview (available from the authors upon request) was administered to solicit information regarding features of academic tasks and the academic environment that the student considers to be related to his problem behavior. For example, he was asked when he has the most problems with the target behavior, why he has problems with the target behavior, what changes could be made so that he would have fewer problems with the target behavior, whether assigned work is too hard or too easy, whether work periods are too long or too short, whether teachers notice when he does good work, and so forth. In addition, to assist in identifying distinctive aspects of Eddie's school day that might contribute to undesirable behavior, he was asked to rate his preference for each school subject on a Likert-type scale and to identify what it is about those subjects that he likes or does not like.

Based on the information gathered during this descriptive assessment, hypotheses were formulated regarding Eddie's on-task behavior. Several criteria were used when formulating the hypotheses (cf. Dunlap et al., 1993). First, the hypotheses had to be based on information resulting from the earlier assessments. Second, the hypotheses had to identify specific variables that were testable, measurable, and could be manipulated by the teachers in the classroom setting. Finally, both the teachers and the consultants had to agree that the hypotheses represented reasonable syntheses from the accumulated information. For Eddie, five hypotheses were produced.

The first hypothesis stated that "Eddie is more likely to be engaged in his work when activities do not require excessive amounts of handwriting." This hypothesis was based on results from both the student and teacher interviews. Eddie reported that his least favorite subject was handwriting and that he found work easier if he could complete it orally or on a computer. In addition, in response to the question "Are there circumstances under which off-task behavior always occurs?" one of Eddie's teachers responded, "Paper and pencil tasks." Two of Eddie's teachers also noted neuromuscular or neurological difficulties when queried about skill deficits.

The second hypothesis was "Eddie is more likely to be engaged in academic tasks that require problem-solving skills rather than drill and practice type exercises." This hypothesis resulted from Eddie's report that he was often bored with his work and that he enjoyed learning new and different things. He also reported that he liked tasks such as completing puzzles. This hypothesis was supported by a teacher's report that Eddie found his work redundant.

The third hypothesis was "Eddie is more likely to be engaged academically when provided with multiple brief tasks during an academic session rather than a single long task." Eddie reported that he liked his work when he could finish it. This was consistent with the interviews of all of Eddie's teachers. In addition, although variable, direct observations seemed to support this.

The fourth hypothesis was "Eddie is more likely to be engaged in academics when he is reminded to attend to his work instead of being left alone for the class session." This hypothesis resulted from several sources. During direct observations, Eddie's teachers occasionally provided a designated time period for Eddie to complete a portion of his work. In these situations, a kitchen timer was used to signal the end of the allotted time. Data collectors observed increases in on-task behavior for short periods after the bell rang. During the teacher interview, one of Eddie's teachers indicated that a timer helped to keep Eddie on task. During the student interview, Eddie asserted that he sometimes had difficulty keeping his mind from wandering, even when he liked the activity. Eddie further reported that a timer "sometimes helps" but that it is "sometimes too much pressure." Thus, it was decided that a method should be devised to assist Eddie in staying on task while not putting demands of particular work completion requirements on him.

The fifth hypothesis was "Eddie is more likely to be academically engaged when he is given the option of working in a study carrel rather than being required to work in the presence of visual

distractions." This hypothesis emerged principally from the student interview in which Eddie recounted that working in a carrel had helped him attend to his assigned work.

Hypothesis Testing

Each of Eddie's three teachers selected one or two hypotheses to be tested in his or her classroom during regular academic sessions. Hypothesis 1, written versus nonwritten assignments, was tested in Eddie's English class. Data were collected during class sessions in which Eddie was required to complete written activities typical of class assignments during baseline observations. These sessions were alternated with sessions in which Eddie was provided with nonwritten means for completing the assignment. For example, rather than requiring short stories to be written by hand, a tape recorder or computer was used.

Hypothesis 2, drill/practice versus problem solving, was tested in math class. During drill/practice sessions, Eddie was required to complete routine drill problems similar to those ordinarily assigned during class sessions. These problems primarily required computational skills, such as completing multiple-digit addition, subtraction, multiplication, or division problems. These sessions were alternated with sessions in which Eddie was presented with activities requiring problem-solving skills, such as reading a menu and determining the total cost, including tax, of a meal.

The third hypothesis, short versus long tasks, was tested in spelling. The content of the assigned tasks during both conditions was identical and consisted of completing worksheets and writing his assigned weekly words three times each. Typically, Eddie received a three- to four-page packet of exercises associated with his weekly spelling words (e.g., fill in the blank) that were to be completed by the week's end. In addition, twice weekly he was expected to write each of his 20 spelling words three times each. In general, it took Eddie's classmates most or all of the 40-min class period to complete an activity, such as writing spelling words. Sessions in which Eddie was assigned his regular work were alternated with sessions in which short tasks were provided. During these sessions, Eddie was presented several short tasks (e.g., a single worksheet activity, followed by writing five of his words three times each, followed by another single worksheet activity). Each of the activities during short-task sessions was designed to last approximately 10 min.

Hypothesis 4, having to do with a reminder to attend to his task, was tested in English class. It was decided that Eddie would be taught to self-monitor his on-task behavior. This strategy was selected because it provided an auditory cue similar to the kitchen timer, did not specifically focus on work-completion demands, and required little additional teacher time. Eddie was given a tape recorder that sounded a bell every minute. Following the sound of the bell, he was instructed to respond to the statement "I am on task" by indicating "yes" or "no" on a self-recording sheet placed on the corner of his desk. Simultaneously, one of the data collectors also marked whether Eddie was on task. At the end of each academic session, the data collector compared his or her mark with Eddie's and provided Eddie with feedback on the accuracy of his responses. Self-monitoring sessions were alternated with sessions in which the self-monitoring materials were not available.

The fifth hypothesis, carrel versus no carrel, was tested in math. During the carrel sessions, Eddie was placed in a three-sided study carrel facing the back of the room, which blocked his view of the rest of the classroom. Class sessions in which he was seated in a carrel were alternated with sessions with a typical seating arrangement, where Eddie sat in an individual desk beside other students.

Design and Interobserver Agreement

Using a reversal design, all of the hypotheses (with the exception of Hypothesis 4, self-monitoring) were tested across consecutive class sessions, with one session conducted per class period. Each hypothesis was tested in one of three academic subjects. The first three hypotheses were tested concurrently, followed by testing of the fourth and fifth hypotheses. In accordance with a reversal sequence, conditions were alternated across days.

Due to time constraints, the testing of Hypothesis 4 (self-monitoring) was compressed into three consecutive class sessions, with two conditions occurring each day (ABBAAB). Each condition in this analysis lasted 15 min, during which time data were collected in a manner consistent with the other hypotheses.

Interobserver agreement was collected during 59% of the sessions, distributed across experimental conditions. Interobserver agreement for on-task behavior was calculated by dividing the number of agreements by the total number of observations and multiplying by 100% to obtain a percentage. The mean agreement for on-task behavior was 93% (range, 78% to 100%).

Results

The results of the reversal analyses for each of the five hypotheses are presented in Figure 1. The data showed that Eddie's on-task behavior was higher when he was offered nonwritten means of producing a product (Hypothesis 1), when his assignments required problem-solving skills rather than drill/practice (Hypothesis 2), when he was asked to complete several short tasks rather than a single long task (Hypothesis 3), when self-monitoring procedures were in place (Hypothesis 4), and when he was seated in a study carrel (Hypothesis 5).

PHASE 2: INTERVENTION

The results from Phase 1 suggested that specific curricular modifications could be made to increase Eddie's on-task behavior. Because the targeted academic subjects were taught by three different teachers, it was decided that the classroom interventions should be tailored to accommodate each teacher's style of teaching and intervention preference. To do so, an ordered list was formulated based on several criteria: (a) the strength of the variable as indicated by the reversal manipulations, (b) the ease with which the teachers believed they could implement the suggested modifications, and (c) the intrusiveness of the procedures. Thus, self-monitoring was ranked highest, and working in a study carrel was ranked lowest. From this list, each teacher selected a combination of three variables to modify in his or her classroom.

Baseline

Three academic subjects (English, spelling, and math) were targeted for intervention. During baseline, the typical classroom procedures were in place, including the program-wide behavior management system. Various individualized approaches were implemented for Eddie (as well as for other students); however, none of these was associated systematically with the baseline or intervention conditions. As was the case before the study commenced, classwork that Eddie failed to complete during the school day was sent home to be completed at night.

Intervention and Follow-Up

Intervention in each classroom consisted of a package of variables selected by the teachers from the hierarchy formulated after the hypothesis-testing phase. All three teachers chose to (a) use self-monitoring procedures in the manner described in Phase 1 and (b) shorten the length of tasks by providing several brief tasks during academic sessions rather than a single long task. In addition, the math instructor chose to modify the content of Eddie's lessons by reducing the amount of drill/practice problems and providing additional problem-solving activities, and the English and spelling instructors chose to provide alternatives to handwriting for some of the written work.

During the follow-up phase, the procedures implemented during intervention were kept in place; however, the self-monitoring procedures were faded so that Eddie was monitoring his on-task behavior at 5-min intervals rather than 1-min intervals.

Design, Measurement, and Interobserver Agreement

The effectiveness of the assessment-based intervention packages was evaluated using a modified multiple baseline across academic subjects design. Although the intervention components of the package were identical in English and spelling, one of

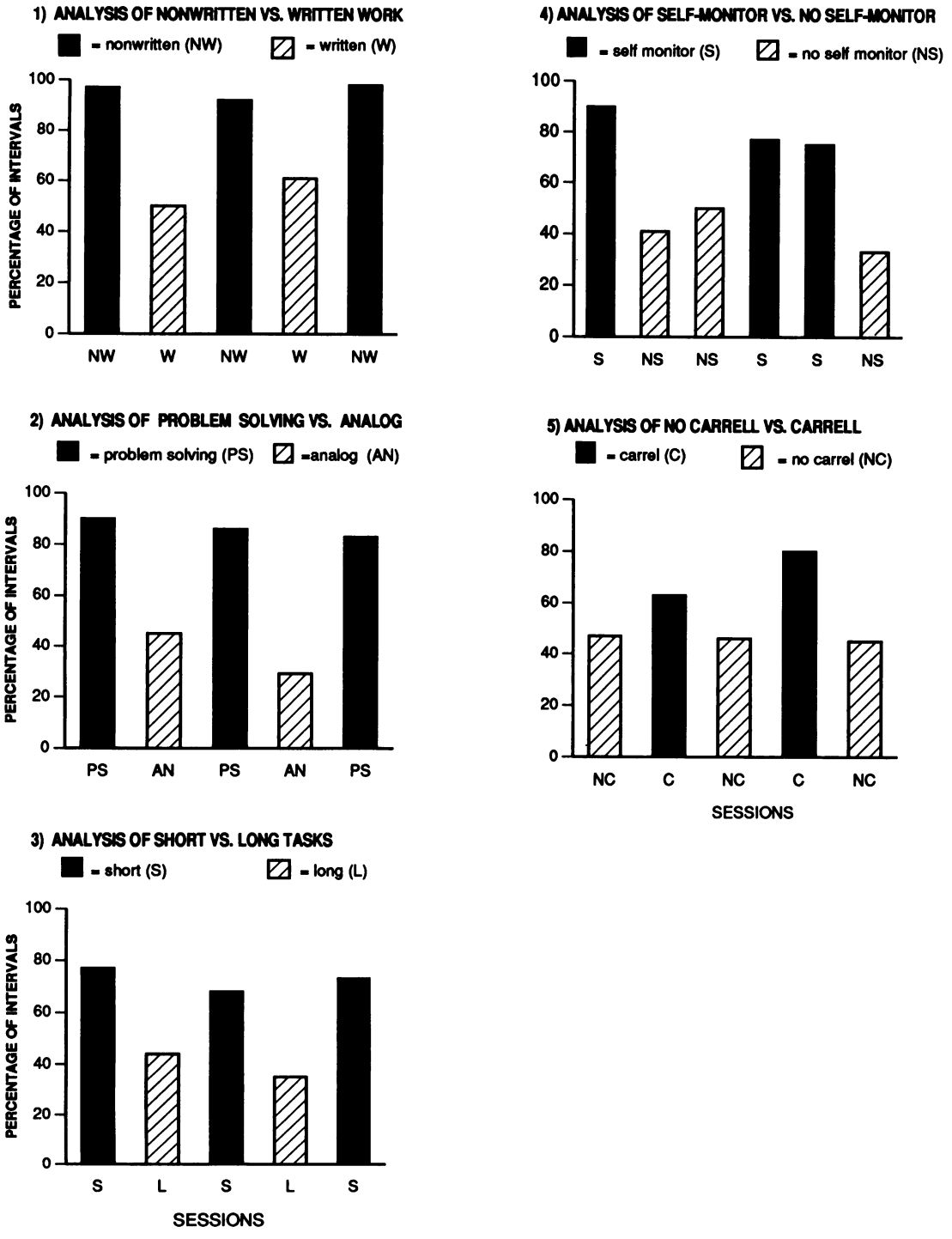

Figure 1. Results of the hypothesis-testing phase of the functional assessment process. Percentages of intervals with on-task behavior are shown for the five hypotheses.

the intervention components (i.e., problem solving) was different in math. Follow-up data were collected once every 2 weeks for a period of 8 weeks. Interobserver agreement was obtained during 51% of baseline sessions, 53% of intervention sessions, and 78% of follow-up sessions. Interobserver agreement exceeded 86% for each session throughout all phases of the intervention.

In addition to the direct observation measures described above, Eddie was asked to complete an activity rating form at the end of each academic session. This required responding to the question, "How much did you like (spelling, English, math) today?" by circling a 1, 2, or 3 on a Likert-type scale, with 1 indicating "I didn't like it," 2 corresponding to "It was okay," and 3 indicating "I liked it a lot."

Procedural fidelity was assessed by determining the percentage of sessions in which each of the intervention components was implemented. This analysis was possible because, throughout the baseline and intervention phases of the study, data collectors recorded a description of each activity in which Eddie was engaged. This included recording when a new activity began and describing the activity (e.g., worksheet drill, word problems) and the manner in which the activity was carried out (e.g., on computer, with tape recorder). This allowed an analysis of task length, curricular content, materials, and the amount of written work assigned. In addition, Eddie's self-monitoring recording sheets provided permanent product data to assess implementation of the self-monitoring component.

During baseline, self-monitoring procedures were never implemented in any subject. During intervention, self-monitoring procedures were implemented during 100% of the sessions in each academic subject. Short tasks were never assigned in spelling, were assigned in 36% of the sessions in English, and were assigned in 5% of the sessions in math during baseline. During intervention, short tasks were assigned during 100% of Eddie's spelling sessions, 64% of his English sessions, and 60% of his math sessions. Nonwritten tasks were never implemented during baseline in spelling or English. During intervention, nonwritten tasks were implemented in 78% of spelling sessions and 36% of English sessions. In math, problem-solving tasks were never assigned during baseline and were assigned in 85% of the sessions during intervention.

Results

Data for on-task behavior in spelling, English, and math are presented in Figure 2. During baseline, variable levels of on-task behavior occurred in each of the three academic subjects. In all cases, on-task behavior increased immediately following implementation of the intervention and remained high throughout the intervention and follow-up phases. During spelling, Eddie's mean on-task behavior in baseline was 62% (range, 33% to 70%). Following implementation of the intervention, his on-task behavior increased to a mean of 93% (range, 72% to 100%). In English class, Eddie's mean on-task behavior during baseline was 62% (range, 30% to 76%), with an increase to 93% (range, 85% to 98%) during intervention. Similar increases were observed during math class. Eddie's mean on-task behavior during baseline was 62% (range, 21% to 97%) and 89% (range, 84% to 100%) during intervention.

In addition to these increases in on-task behavior, Eddie's teachers reported substantial improvements in work completion. This phenomenon was difficult to evaluate formally due to escalating task requirements and differing task assignments. However, assignments in spelling were generally comparable across conditions, and records kept by the data collectors from this classroom showed that only 14% of Eddie's assignments were completed during baseline, whereas 62% were completed during intervention.

Although the differences were not always large, the results from Eddie's activity ratings revealed higher mean ratings in all of his academic subjects after intervention was implemented. From baseline to intervention, respectively, Eddie's mean ratings increased from 1.7 to 2.3 for spelling, 2.0 to 2.5 for English, and 2.4 to 2.7 for math.

To assess the accuracy of Eddie's self-monitoring, the data collectors compared their recordings of Eddie's on-task behavior to Eddie's recordings on

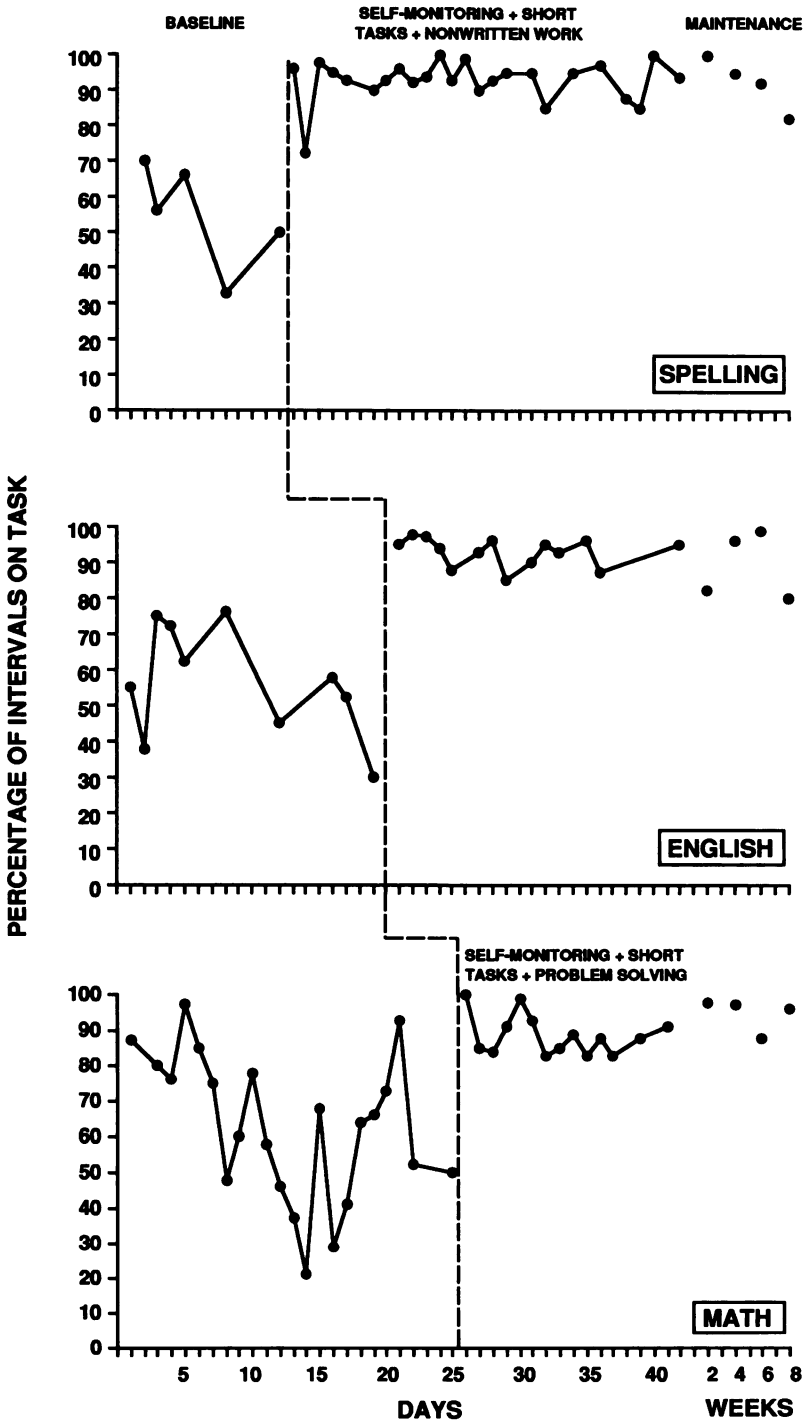

Figure 2. Percentage of intervals with on-task behavior across the three classes.

his self-monitoring sheets. This was done for 3 weeks following the implementation of intervention in each academic subject. The data revealed high agreement between the responses recorded by Eddie and those recorded by the data collectors. The mean agreement in spelling, English, and math, respectively, was 91% (range, 50% to 100%), 92% (range, 82% to 100%), and 89% (range, 75% to 100%).

DISCUSSION

This study contributes to the literature on functional assessment and assessment-based interventions in several ways. The participant was above average in intellectual functioning and served as a direct contributor to the functional assessment process. The potential of participants to serve as informants in functional assessments is worth exploring in greater detail because it may serve to expedite the information-gathering process. However, it is also possible that many individuals would not be reliable in reporting their own behavior. Although Eddie proved to be an excellent observer, the reports of other children, especially those who experience emotional and behavioral challenges, may not be so dependable. It would be useful to conduct research into these questions.

The results of this investigation also provide support for curricular modification as an effective intervention. The intervention consisted primarily of manipulating several curricular variables related to the content, length, and mode used to perform tasks. The consequences for undesirable behavior were not modified. This provides further evidence that problem behavior in classroom settings may be ameliorated in a positive manner by modifying curricular variables that are identified through a functional assessment.

Further, the functional assessment and intervention process reported here represented a collaborative effort between the authors and school personnel involved in Eddie's educational programming. The hypotheses were developed conjointly, and the experimental manipulations and interventions were implemented by Eddie's teachers during his regular school day. Because of this joint effort, the intervention was one that was both feasible and practical. We believe that such an effort is critical for developing interventions that teachers are both able and willing to implement. In fact, not only did our follow-up data indicate that the procedures continued to be implemented several months after the study ended, but the teachers were also observed to implement the procedures with other students.

Finally, the activity ratings completed by Eddie suggested a preference for the revised curriculum. However, to facilitate Eddie's completion of this rating, the scale consisted of only three response options. This might account for the small differences that were obtained between baseline and intervention. Nonetheless, the higher ratings obtained during intervention suggest the need for further research on the interrelationships among student performance, preferences, and assessment-based interventions.

A few caveats in the present study should be acknowledged. The independent variable was a package of curricular modifications that were based on functional assessment data, but, in fact, the composition of the package varied across the three classrooms depending on the selections of the teachers. Because the intervention differed across classrooms, it is not possible to point to a single intervention (i.e., package) as being replicated experimentally. It is reasonable to say, however, that the multiple baseline design demonstrated the efficacy of multicomponent packages based on functional assessment. In certain respects, this may be more important. Functional assessments lead to interventions that are tailored to meet not only the characteristics of an individual but also the specific context in which the behavior is assessed. The process of selecting an intervention should be based on various sources of information, including the classroom environment. In this case, the packages implemented by the teachers were based on both the functional assessment data and the preferences and expectations of the teachers. It is quite possible that the latter ingredient served to increase the utilization and maintenance of the procedures.

The fact that the interventions were packages

also means that one cannot isolate the contributions of each individual component. It is conceivable that any one of the manipulations alone might have resulted in the observed improvements in Eddie's behavior; in fact, this is suggested by the data obtained during the functional assessment phase of the study. However, we concur with several other authors (e.g., Horner et al., 1990; National Institutes of Health, 1990) that multiple interventions may be required for effective and durable behavior changes. In addition, the apparent practicality of the interventions (as judged by the teachers), in combination with the fact that no individual component produced 100% on-task behavior during the functional assessment, suggested that it was reasonable to combine them during the intervention phase.

Because the interventions required modification of a standardized ongoing curriculum, the appropriateness of Eddie's revised curriculum should be considered. We believe that increased individualization in the curriculum of all students would significantly contribute to the general goals of public education. For example, in Eddie's particular case, poor fine-motor skills contributed to difficulties with writing tasks. The substitution of an alternate method of completing his assignments not only reduced his undesirable behavior but also allowed him to continue to progress academically. However, it should be stressed that long-term goals must be considered in the context of curricular modifications. Specifically, skills that students will need later in life should not be neglected. If escape behavior results from a skill deficit, and that skill is one that is essential, then additional long-term planning will be required to teach the skill. Once serious problem behaviors are no longer the primary concern, academic requirements can be gradually modified.

Finally, because only 1 student participated in this study, the generality of the findings is limited. Further research will be required to demonstrate the efficacy of functional assessment and curricular revision with students who share Eddie's characteristics. It will also be useful to replicate the various phenomena that were part of this study, including the student interview and the procedures of in-classroom hypothesis testing (Dunlap et al., 1993). Still, this process is gaining familiarity in the fields of behavior analysis and educational psychology. In this respect, the current data add important elements to this expanding endeavor.

REFERENCES

Bijou, S. W., Peterson, R. F., & Ault, M. H. (1968). A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. *Journal of Applied Behavior Analysis, 1,* 175–191.

Brinker, R. P. (1990). In search of the foundation of special education: Who are the individuals and what are the differences? *Journal of Special Education, 24,* 174–184.

Carr, E. G., Robinson, S., & Palumbo, L. W. (1990). The wrong issue: Aversive versus nonaversive treatment. The right issue: Functional versus nonfunctional treatment. In A. C. Repp & N. N. Singh (Eds.), *Perspectives in the use of nonaversive and aversive interventions for persons with developmental disabilities* (pp. 361–379). Sycamore, IL: Sycamore.

Dunlap, G., & Kern, L. (1993). Assessment and intervention for children within the instructional curriculum. In J. Reichle & D. Wacker (Eds.), *Communicative approaches to the management of challenging behavior problems* (pp. 177–203). Baltimore: Paul H. Brookes.

Dunlap, G., Kern-Dunlap, L., Clarke, S., & Robbins, F. R. (1991). Functional assessment, curricular revision and severe behavior problems. *Journal of Applied Behavior Analysis, 24,* 387–397.

Dunlap, G., Kern, L., dePerczel, M., Clarke, S., Wilson, D., Childs, K., White, R., & Falk, G. (1993). Functional analysis of classroom variables and the responding of students with emotional and behavioral disorders. *Behavioral Disorders, 18,* 275–291.

Grosenick, J. K., George, N. L., George, M. P., & Lewis, T. J. (1991). Public school services for behaviorally disordered students: Program practices in the 1980s. *Behavioral Disorders, 16,* 87–96.

Haring, T. G., & Kennedy, C. H. (1990). Contextual control of problem behavior in students with severe disabilities. *Journal of Applied Behavior Analysis, 23,* 235–243.

Horner, R. H., Dunlap, G., Koegel, R. L., Carr, E. G., Sailor, W., Anderson, J., Albin, R. W., & O'Neill, R. E. (1990). Toward a technology of "nonaversive" behavioral support. *Journal of the Association for Persons with Severe Handicaps, 15,* 125–132.

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982). Toward a functional analysis of self-injury. *Analysis and Intervention in Developmental Disabilities, 2,* 3–20.

Iwata, B. A., Vollmer, T. R., & Zarcone, J. H. (1990). The experimental (functional) analysis of behavior disorders: Methodology, applications, and limitations. In A.

C. Repp & N. N. Singh (Eds.), *Perspectives in the use of nonaversive and aversive interventions for persons with developmental disabilities* (pp. 301–330). Sycamore, IL: Sycamore.

Kern-Dunlap, L., Clarke, S., & Dunlap, G. (1990). *Increasing the "meaningfulness" in curriculum content to reduce problem behaviors in a severely emotionally disturbed student.* Paper presented at the 10th annual convention of the Florida Association for Behavior Analysis, Orlando, FL.

Lalli, J. S., Browder, D. M., Mace, C. F., & Brown, D. K. (1993). Teacher use of descriptive analysis data to implement interventions to decrease students' problem behaviors. *Journal of Applied Behavior Analysis, 26,* 227–238.

Lennox, D. B., & Miltenberger, R. G. (1989). Conducting a functional assessment of problem behavior in applied settings. *Journal of the Association for Persons with Severe Handicaps, 14,* 304–311.

National Institutes of Health. (1990). Treatment of destructive behaviors in persons with developmental disabilities (consensus development statement). *Journal of Autism and Developmental Disorders, 12,* 403–429.

O'Neill, R. E., Horner, R. H., Albin, R. W., Storey, K., & Sprague, J. R. (1990). *Functional analysis of problem behavior: A practical assessment guide.* Sycamore, IL: Sycamore.

Repp, A. C., Felce, D., & Barton, L. E. (1988). Basing the treatment of stereotypic and self-injurious behaviors on hypotheses of their causes. *Journal of Applied Behavior Analysis, 21,* 281–289.

Singer, G. H. S., Singer, J., & Horner, R. H. (1987). Using pretask requests to increase the probability of compliance for students with severe disabilities. *Journal of the Association for Persons with Severe Handicaps, 12,* 287–291.

Weeks, M., & Gaylord-Ross, R. (1981). Task difficulty and aberrant behavior in severely handicapped students. *Journal of Applied Behavior Analysis, 14,* 19–36.

Winterling, V., Dunlap, G., & O'Neill, R. (1987). The influence of task variation on the aberrant behavior of autistic students. *Education and Treatment of Children, 10,* 105–119.

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