

*CLASSROOM-BASED FUNCTIONAL AND ADJUNCTIVE
ASSESSMENTS: PROACTIVE APPROACHES TO
INTERVENTION SELECTION FOR ADOLESCENTS WITH
ATTENTION DEFICIT HYPERACTIVITY DISORDER*

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The present investigation evaluated the utility of classroom-based functional and adjunctive assessments of problem behaviors for 2 adolescents who met diagnostic criteria for attention deficit hyperactivity disorder (ADHD) and comorbid oppositional defiant disorder (ODD). For children with ADHD-ODD, environmental classroom variables, when systematically manipulated by teachers, were related to the occurrence and nonoccurrence of problem behaviors. Classroom interventions derived from information that was obtained during functional and adjunctive assessments and from subsequent analyses resulted in substantial reductions in problem behaviors. Teacher and student consumer satisfaction ratings indicated that the interventions were effective and feasible in the classroom setting.

DESCRIPTORS: behavioral assessment, ADHD, behavior disorders, classroom behavior modification

Attention deficit hyperactivity disorder (ADHD; American Psychiatric Association,

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1994) is a disorder characterized by problems with sustained attention, impulsivity, and overactivity. In the classroom, children with ADHD have difficulty sustaining attention to tasks, completing assigned work, following instructions, and adhering to general classroom rules (e.g., Barkley, 1990; DuPaul & Stoner, 1994). Children with ADHD may have additional diagnoses characterized by hostile, disobedient, and defiant behaviors such as oppositional defiant disorder (ODD; American Psychiatric Association, 1994). Research indicates that children with ADHD-ODD who display persistent prob-

lems in the classroom are at significant risk for later academic failure, limited educational attainment, and development of more extreme antisocial behavior (Barkley, 1990; Barkley, Fischer, Edelbrock, & Smallish, 1990a, 1990b; Weiss & Hechtman, 1993).

The most widely used and effective interventions for ADHD include stimulant medication, behavioral interventions, or both (Barkley, 1990), which have been found to reduce undesirable behaviors and enhance academic performance (DuPaul & Eckert, 1997; Fiore, Becker, & Nero, 1993). However, individual differences in response to various interventions have been noted (Whalen & Henker, 1991), and comorbid disorders such as ODD may adversely affect treatment success (Barkley, 1990).

The heterogeneity of ADHD-ODD symptoms, coupled with highly variable treatment efficacy, underscores the need for individualized treatment. Unfortunately, little information is available to provide assistance in treatment selection for the individual child with ADHD-ODD. Without a systematic method for intervention selection, practitioners often resort to trial and error, a process that can deplete scarce time and resources. Functional assessment is one promising method for intervention selection that has been increasingly touted as a superior alternative to traditional psychiatric diagnostics that are often not tightly connected to interventions (DuPaul & Ervin, 1996; Kratochwill & McGivern, 1996; Zentall & Javorsky, 1995). Although the functional assessment literature has focused primarily on problem behaviors exhibited by persons with developmental disabilities (e.g., Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994), this approach has been extended to behavior problems exhibited by children with average intelligence (e.g., Cooper, Wacker, Sasso, Reimers, & Donn, 1990).

One line of research has focused on testing variables that may maintain functions of

problem behavior through brief manipulations of consequences (e.g., Northup *et al.*, 1995). For example, Northup *et al.* conducted brief functional analyses of the behaviors (i.e., out of seat, inappropriate vocalizations) of 3 children (7 to 9 years old) who had been diagnosed with ADHD. These analyses were conducted in an analogue classroom setting, and results indicated that the frequency of problem behaviors was highest during a peer attention condition. Broussard and Northup (1995) extended the findings of Northup *et al.* to integrated public school settings. Brief functional analysis sessions were conducted in the general education classroom of 3 young students, one of whom was a 6-year-old boy who had been diagnosed with ADHD. Brief analyses suggested that his problem behavior was maintained by escape from difficult academic tasks. Systematic analogue analyses conducted by Northup *et al.*, together with other school case reports (i.e., Broussard & Northup, 1995; Lewis & Sugai, 1996; Umbreit, 1995), suggest that functional analysis may be a useful method of assessment and intervention selection in the classroom setting for young children with ADHD.

Another line of functional assessment research involves identifying functional relations between curricular variables and desirable and undesirable student behavior (for review, see Dunlap & Kern, 1996). Curricular variables that have been shown to systematically relate to target behaviors can be modified to decrease or eliminate problem behaviors. This approach to classroom intervention selection has been successfully demonstrated with students with various disabilities (e.g., Dunlap *et al.*, 1993; Kern, Childs, Dunlap, Clarke, & Falk, 1994). For example, Kern *et al.* evaluated the effectiveness of teacher implementation of five curricular manipulations (e.g., short vs. long tasks, written vs. nonwritten work) on the on-task

behavior of an 11-year-old boy with average intelligence.

As functional assessment moves from analogue to applied settings, issues of assessment, treatment integrity, and acceptability are of increasing importance and may impede the degree to which traditional functional assessment procedures are feasible. For reasons such as teacher preference, ease of implementation, and matching interventions to existing classroom routines or structures, teachers may be reluctant to manipulate certain events contingent on the occurrence of problem behavior. Specifically, although teachers may inadvertently or unintentionally reinforce problem behaviors (e.g., sending a student to the office for misbehaving during an academic activity), they may be reluctant to intentionally implement analogue procedures to increase problem behavior, even for the purpose of determining behavioral function (Repp & Karsh, 1994). In addition, determination of behavioral function may not be feasible in naturalistic settings when direct control over the presumed reinforcer is difficult to obtain (e.g., peer attention). Alternatively, teachers may be more willing to systematically manipulate antecedent events (Martens & Kelly, 1993). Although not a direct examination of behavioral function, this approach has the advantage of providing the teacher with information concerning the efficacy of a potential intervention strategy. In addition, in cases in which systematic control of potential reinforcing stimuli is difficult, it may be necessary to explore assessment-based adjunctive intervention strategies that support the development and systematic reinforcement of incompatible behavior.

The purpose of the current research was to address the above concerns and extend the previous literature by assessing the applicability of a model of school-based assessment that included functional assessment procedures as well as adjunctive procedures with

adolescents having a long history of problem behaviors (i.e., ADHD and related difficulties) and for whom previous interventions had been unsuccessful. The assessment model evaluated in the present investigation extends previous school-based functional assessment studies (e.g., Cooper et al., 1992; Dunlap et al., 1993; Kern et al., 1994) by including adjunctive curricular manipulations to explore whether determination of behavioral function (i.e., through the direct manipulation of maintaining or antecedent variables) is necessary for the identification of effective and socially acceptable interventions in the natural context. Another purpose was to explore the utility of a collaborative consultation model in the development and selection of hypotheses and intervention strategies. In short, we were interested in the involvement of teachers throughout the functional assessment process, with an emphasis on providing them with choices among several intervention strategies. A final goal was to evaluate the effectiveness and the acceptability of interventions derived from the assessment information for 2 individuals who had been diagnosed with ADHD and ODD.

METHOD

Participants

Both participants met the criteria for ADHD of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., *DSM-IV*; American Psychiatric Association, 1994) based on the ADHD Rating Scale-IV (DuPaul, Anastopoulos, Power, Murphy, & Barkley, 1994), information obtained during a diagnostic interview, and guardian and teacher ratings on the attention problems factor of the Child Behavior Checklist (Achenbach & Edelbrock, 1991). Both participants also met the *DSM-IV* criteria for ODD, and neither participant met criteria

for conduct disorder based on diagnostic interviews.

Joey. Joey was a 13-year-old Caucasian boy who obtained a full-scale IQ score of 98 on the Wechsler Intelligence Scale for Children (3rd ed., WISC-III; Wechsler, 1991). Joey attended the seventh grade and was referred by his teacher for concerns with excessive off-task behavior. Throughout the investigation, Joey took 20 mg of methylphenidate twice daily. Documentation indicated that medication was taken 100% of the time throughout the study.

Carl. Carl was a 14-year-old Hispanic boy who obtained a full-scale IQ score of 91 on the WISC-III (Wechsler, 1991). Carl attended the eighth grade and was referred by his writing and math teachers for concerns with behaviors that were disruptive (i.e., talking, making funny noises, making faces, gestures, or writing notes). Throughout the investigation, Carl took 10 mg of methylphenidate four times daily. Documentation indicated that medication was taken 100% of the time.

Setting

The study was conducted at a school that serves approximately 250 students, Grades 1 through 8, at Boys' Town. The program utilizes the Teaching Family Model (e.g., Phillips, Phillips, Fixen, & Wolf, 1971) that employs a comprehensive token economy. This was maintained throughout the study. Hypothesis testing and intervention conditions were conducted by the teacher within the natural classroom setting. Each classroom in the present investigation, with one exception, consisted of 7 to 12 students and one teacher. For Carl, two writing classes were combined, consisting of 14 to 24 students.

Dependent Measures and Interobserver Agreement

On-task behavior. On-task behavior consisted of attending to assigned class work in

an active (i.e., writing, reading aloud, raising hand, verbal behavior relevant to the task) or passive (i.e., eyes directed toward the task or teacher during lecture, looking at work, silent reading) manner. Off-task behavior was coded if any problem behaviors occurred within the interval (i.e., calling out, gesturing, talking to peers, playing with objects, making funny faces) or if the student was not attending to the task for 3 s or more. Data were collected using the Problem Behavior Observation Form (available from the first author). Students were observed for a 15-s interval followed by a 5-s period for recording.

Teacher satisfaction ratings. This questionnaire assessed teacher satisfaction and consisted of 10 items rated on an 8-point Likert scale ranging from 0 (*not at all*) to 7 (*very much*). Items focused on intervention effectiveness (e.g., "problem behavior improved during the intervention"), feasibility (e.g., "the intervention was time consuming to implement"), and social validity (e.g., "the student seemed embarrassed by the intervention"). The questionnaire was completed after the intervention phase and is available from the first author.

Student satisfaction ratings. A consumer satisfaction questionnaire (available from the first author) assessed the students' opinions by asking them to rate the success of the intervention (e.g., "I got more done during the intervention") and social validity (e.g., "the intervention was embarrassing"). Joey and Carl completed the questionnaire after the intervention phase.

Procedural integrity. To assess procedural fidelity, implementation of the manipulated variables during hypothesis testing and intervention was recorded on the Problem Behavior Observation Form. If the manipulated variable was a type of task or task structure, the data collector wrote a description of the activity (e.g., math word problems, correcting homework, class discussion) and

the way in which it was carried out (e.g., lecture, independent task, small groups, working on the computer). If teacher manipulations involved a series of steps (e.g., steps involved in a self-evaluation procedure), a treatment integrity checklist was completed.

Interobserver agreement. An independent observer (unaware of the nature of the study) collected data during a minimum of 25% of observations across participants and conditions. This observer was trained on the data-collection procedures to 80% agreement prior to the beginning of the investigation. Interobserver agreement for on-task behavior was calculated by dividing the number of agreements by the number of agreements and disagreements and multiplying by 100%.

During hypothesis testing, interobserver agreement data were collected during 33% of the observations across conditions and participants. For Joey, average total, occurrence, and nonoccurrence agreements for on-task behaviors were 94%, 70%, and 91%, respectively. For Carl, average total, occurrence, and nonoccurrence agreements on on-task behaviors were 90%, 67%, and 86%, respectively.

During intervention evaluation for Joey, interobserver agreement was taken on 30.8% of sessions during baseline and intervention conditions. Average total, occurrence, and nonoccurrence agreements were 92%, 75%, and 90%, respectively. For Carl, interobserver agreement was taken on 33% of sessions in baseline and intervention conditions during math, writing, and science classes. Average total, occurrence, and nonoccurrence agreements were 96%, 81%, and 96%, respectively.

General Functional Assessment Procedures

A collaborative consultation model was used wherein teachers participated in all phases of the functional assessment. The first

author served as the consultant. Procedures were adapted from previous literature on school-based functional assessment for the purpose of curricular revisions (e.g., Dunlap et al., 1993; Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Kern et al., 1994).

Descriptive assessment and hypothesis development. Hypotheses regarding potential intervention options were generated collaboratively and were based on (a) interviews with teachers using the Preliminary Functional Assessment Survey (Dunlap et al., 1991), (b) interviews with participants using the Student Assisted Functional Assessment Interview (Kern, Dunlap, Clarke, & Childs, 1995), (c) direct observations of teachers using the Behavioral Tracking Form (adapted from O'Neill, Horner, Albin, Storey, & Sprague, 1990), and (d) direct observations by the consultant during times and situations the teachers had identified as problematic.

Each hypothesis statement was based on two convergent sources of information (e.g., interviews and direct observations), identified specific variables that could be observed and manipulated by the teachers within the classroom context, and were agreed upon by both the teacher and consultant as reasonable, given the accumulated information (Dunlap et al., 1993). Two hypotheses were developed for each participant and are described in the Results.

Hypothesis testing and intervention development. Hypotheses generated in the descriptive analysis were tested empirically through teacher manipulations using a brief reversal design (Kazdin, 1982). Baseline conditions (e.g., typical conditions in the classroom) were alternated with conditions hypothesized to produce low levels of problem behavior (potential interventions). After hypotheses were tested, the teacher and consultant jointly selected intervention components to implement on an ongoing basis. Selection was based on efficacy and teacher

preference. The process of intervention selection for each participant is described in the Results.

Intervention evaluation. Prior to implementing interventions, teachers agreed to return to their usual teaching procedures to establish an initial baseline. Joey's intervention was tested during writing class through an ABAB design. Consistent with a multiple baseline design, intervention was staggered across three academic subjects for Carl. During math and writing classes, the intervention was briefly withdrawn.

RESULTS

Descriptive Assessment and Hypothesis Development

Joey. Information obtained from the teacher's interview and direct observations indicated that Joey was most likely to engage in off-task behaviors when he was presented with a pencil-and-paper writing task. During the student interview, Joey indicated that one of his least favorite classes was writing. Brief journal writing (i.e., 5 to 7 min) and long story writing (i.e., 20 to 25 min) were required daily activities during writing class. According to interviews and observations, teacher prompts to begin writing were unsuccessful, and Joey's off-task behaviors frequently (once or twice per week) led to office referrals. When asked what might improve his behavior, Joey stated that he would do better if he were given more time to think about what he had to write. When presented with this information, Joey's teacher agreed that he was more likely to be actively engaged in journal writing if he participated in a discussion about the topic prior to writing.

It was hypothesized that Joey's off-task behaviors might be maintained by escape from paper-and-pencil writing tasks. Thus, potential intervention strategies included (a) providing an alternative means for accomplish-

ing the writing tasks (e.g., talking into a tape recorder, writing on the computer), (b) giving Joey extra time to think about what he had to write prior to the journal-writing activity, (c) preventing escape from writing tasks by requiring Joey to complete his writing task in the office when he received a referral, or (d) allowing escape (e.g., brief breaks) from writing tasks contingent on an appropriate request.

Joey's teacher opted to provide Joey with a computer as an alternative writing method during long writing tasks, because this intervention could be implemented with several other classmates so Joey would not be singled out. Thus, the first hypothesis stated that "Joey's on-task behavior will be increased when he is given the opportunity to complete long (20 min) writing tasks on the computer rather than by hand."

Because journal-writing activities were brief (and potentially less aversive), and because Joey's teacher was interested in obtaining some handwritten samples of his work, a second hypothesis was developed to address problem behavior during the short journal-writing activity. The second hypothesis stated, "Joey's on-task behavior will be increased when he is able to brainstorm with a peer prior to a short (5 to 7 min) written task." This was accomplished by pairing students to take turns brainstorming out loud about their journal topic for a 2-min period. Joey's writing teacher set an egg timer and circulated around the room to monitor brainstorming. Both hypotheses were tested during the same week in writing class. Hypothesis 1 was tested during the long (20 to 25 min) portion of writing class, and Hypothesis 2 was tested during the brief (5 to 7 min) journal-writing activity.

Carl. Descriptive observations and teacher report indicated that Carl's off-task behaviors were followed by peer attention (e.g., laughter, smiling, returned comments or gestures) and were preceded by peer solicitation

(e.g., looking his way, calling his name, making funny gestures or comments). Carl's behaviors occurred at high frequencies during descriptive observations, yet consequences from teachers were infrequent and inconsistent (e.g., warnings or prompts to discontinue disruptive behaviors were sometimes mitigated with a smile). In addition, teacher report and observations suggested that his teachers provided infrequent consequences to his peers for responding to his attention-seeking behaviors. Teachers reported that when they were able to monitor Carl closely, his problem behaviors were less frequent. This was supported by direct observation. Carl's disruptive behaviors occurred less frequently when teachers were close (i.e., within 2 m) or when teachers made eye contact with him.

This descriptive assessment information suggested that Carl's peer disruptions might be maintained by peer attention. Potential intervention strategies discussed with the teachers included (a) reducing access to peer attention (e.g., separation, reducing peer responsiveness by providing consequences to his peers), (b) providing contingencies for appropriate behavior that was incompatible with peer attention-seeking behavior (e.g., self-monitoring of on-task behavior), (c) structuring the classroom so that Carl would be less likely to engage in attention-seeking behaviors (e.g., place Carl in close proximity to the teacher and provide prompts to stay on task and not to disrupt his peers), and (d) providing more consistent and frequent reinforcement (i.e., praise, points) for on-task behavior and punishers (i.e., negative points, verbal reprimands) for disrupting peers.

Carl's math teacher indicated that she believed self-evaluation procedures would be effective and feasible to implement. Thus, the first hypothesis stated, "Carl's on-task behavior will increase when he is instructed to self-evaluate his peer attention-seeking be-

haviors and is awarded points for accuracy and low levels of problem behaviors." This hypothesis was tested through the use of self-evaluation procedures (adapted from Rhode, Morgan, & Young, 1983) in which Carl was asked to rate his appropriate behavior on a scale of 0 (*unacceptable*) to 5 (*excellent*) at the end of each class period. On the days when self-evaluation occurred, Carl's teacher placed the self-evaluation card, containing specific criteria for each numbered rating, on his desk at the beginning of math class. At the end of the class period, Carl was asked to rate his behavior while the teacher also independently rated his behavior. If their ratings were within one point of each other, points were awarded. If their ratings matched exactly, Carl received bonus points. If ratings were two or more points discrepant, no points were awarded. Points earned during self-evaluation were converted to values that were comparable to an already existing token economy and were later exchanged for privileges on the residential campus.

Carl's writing teacher preferred a classwide procedure. As a result, the second hypothesis stated, "Carl's on-task behavior will increase when he does not receive social reinforcers from his peers for his behavior." To test this hypothesis, the teacher informed all students that on certain days they would be working on peer relations. This format was chosen because Carl's teacher reported that she often spent time focusing on a selected social skill with her classes. On days in which the peer intervention was in place, the teacher delivered positive points to the students for not responding and negative points for responding to attention-seeking behaviors. Carl was not singled out as the target of the intervention.

Hypothesis Testing and Intervention Development

Joey. The results of the multielement analyses for the two hypotheses are presented in

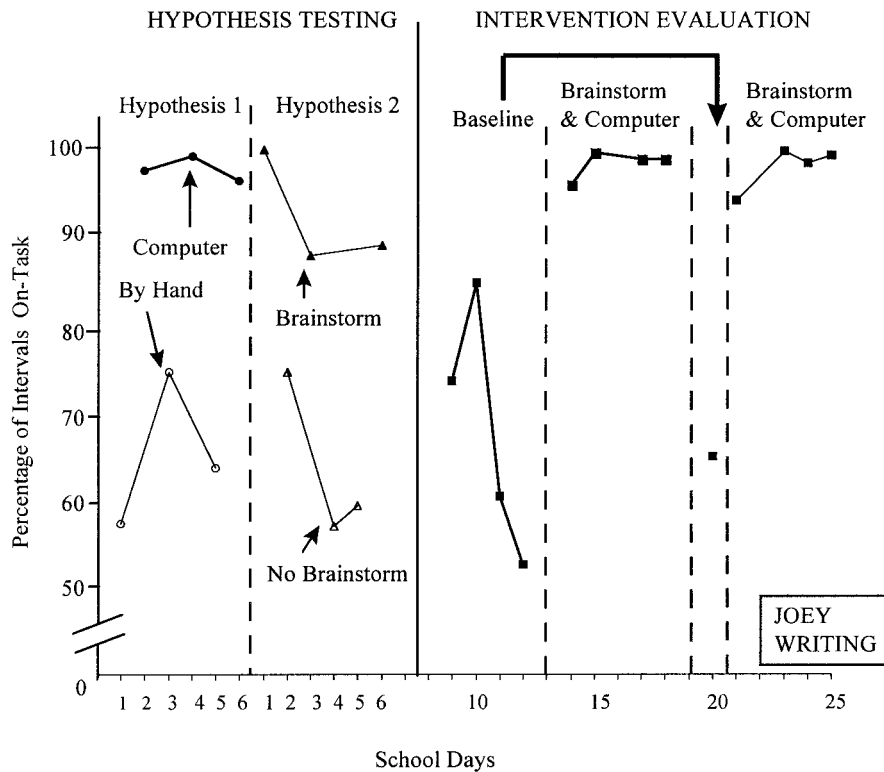


Figure 1. The percentage of intervals of on-task behavior during hypothesis testing and intervention for Joey.

Figure 1. The percentage of intervals in which Joey was on task during long writing tasks was higher when he used a computer ($M = 96.8\%$) than when he wrote by hand ($M = 64.8\%$; Hypothesis 1). Similarly, the percentage of intervals with on-task behaviors was higher when he brainstormed with a peer prior to journal writing ($M = 91.4\%$) than when no brainstorming occurred ($M = 63.2\%$; Hypothesis 2). Procedural integrity data were collected during all hypothesis-testing sessions; integrity was 100%.

Based on the results of hypothesis testing, Joey's writing teacher selected both intervention components (i.e., brainstorming and computer in writing class) as interventions to be implemented on an ongoing basis. During intervention evaluation, brainstorming occurred during the journal-writing portion of writing class, and Joey was instructed to use the computer for longer writing tasks.

Carl. Figure 2 presents the results of the two hypotheses. The percentage of intervals in which Carl was observed to be on task was higher when he self-evaluated his peer attention-seeking behaviors ($M = 92.2\%$) than when he did not self-evaluate ($M = 63.1\%$; Hypothesis 1). In addition, the percentage of intervals with on-task behavior was higher when Carl's peers received consequences for responding to his attention-seeking behavior ($M = 78.2\%$) than when peers were not given consequences ($M = 58.2\%$; Hypothesis 2).

Procedural integrity data were collected during all hypothesis-testing sessions. Self-evaluation procedures were implemented with 100% integrity (Hypothesis 1). During peer intervention, peers responded to Carl's inappropriate behavior during 62.7% of the intervals in which Carl displayed problem behavior, in comparison to 85% of the in-

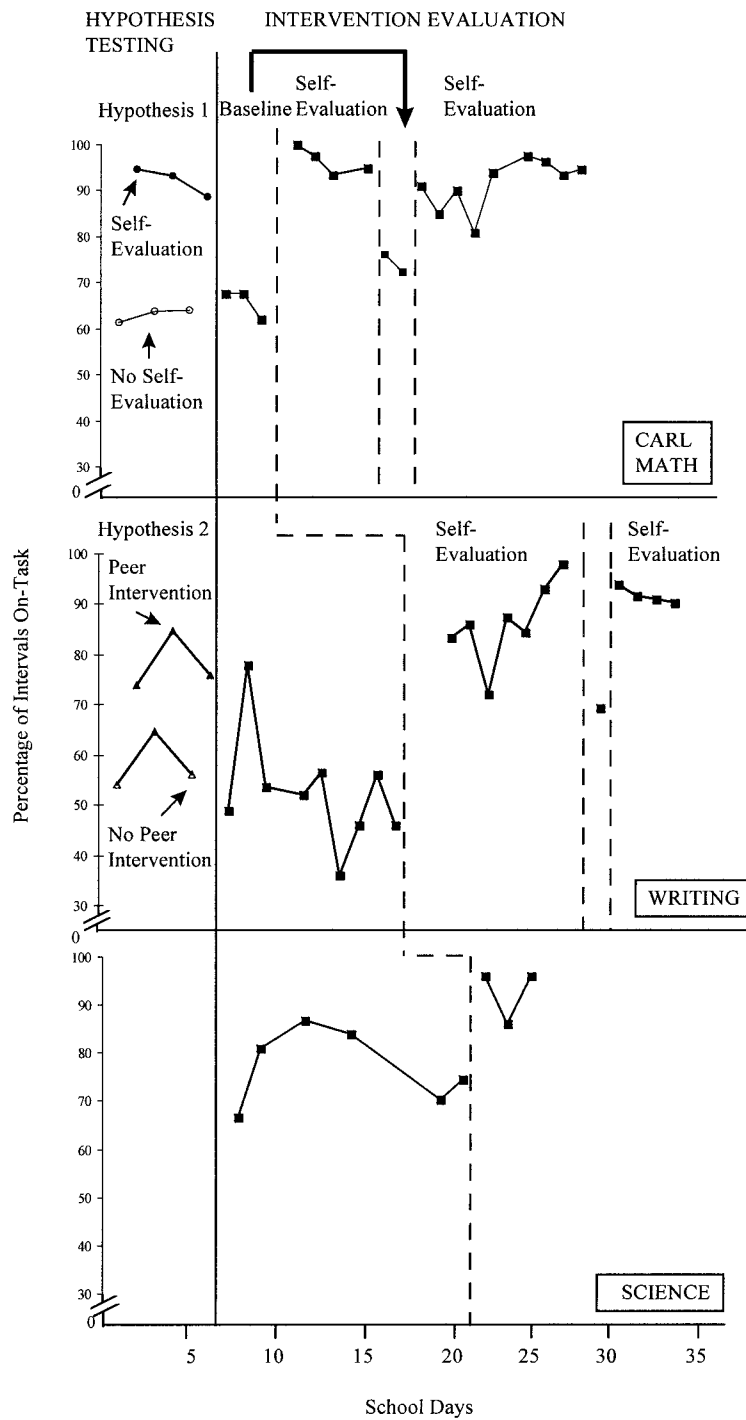


Figure 2. The percentage of intervals of on-task behavior during hypothesis testing and intervention for Carl.

tervals when no intervention was in place. Teachers applied consequences to the peers' reactions in 51.1% of the intervals in which peer responses to Carl's problem behavior occurred during the peer intervention, as opposed to 4% of the intervals when no intervention was in effect.

Both teachers and the consultant agreed that the self-evaluation procedure would be implemented as the sole intervention because (a) it was easier to implement, (b) procedural integrity was higher, and (c) it was equally effective. Carl's self-evaluation intervention was evaluated across math, writing, and science classes.

Intervention Evaluation

Joey. Data reflecting the percentage of intervals on task during writing class are presented in Figure 1. During baseline, on-task behavior was variable, with a downward trend and a mean of 67.7% (range, 54.2% to 83.3%). Following implementation of the intervention, the percentage of intervals on task was stable and increased to a mean of 96% (range, 93.7% to 98.3%). When the intervention was briefly withdrawn, the percentage of intervals on task dropped to 62.7%. With the reimplementing of the intervention, on-task behavior improved, with a mean of 95.4% (range, 90.7% to 98.7%). Procedural integrity data were taken during all sessions and indicated that both brainstorming and computer procedures were implemented with 100% integrity.

Carl. The percentages of intervals in which Carl was on task during math, writing, and science classes are presented in Figure 2. In all three classes, the percentage of intervals on task increased immediately following implementation of the intervention and remained high throughout the intervention phases. During baseline phases (including the brief reversals), on-task behavior averaged 69.1% (range, 61.3% to 76%) in math, 54.2% (range, 36% to 78.7%) in

writing, and 78% (range, 66.7% to 88%) in science. During self-evaluation phases, on-task behavior increased to 93.1% (range, 81% to 100%) in math, 88.2% (range, 72% to 98.7%) in writing, and 95.1% (range, 88% to 98.7%) in science.

During baseline and intervention, procedural integrity data were taken on 96% of the sessions across math, writing, and science classes. Procedural integrity was 100% in all sessions except two. During writing class, Carl's teacher failed to implement one of the five self-evaluation steps (i.e., teacher rating of the student's behavior independently) on two occasions, resulting in a mean integrity of 81.8% of the intervention sessions in this class.

Consumer satisfaction ratings. Joey's ratings of the combined computer and brainstorming intervention indicated 100% satisfaction. Carl's ratings of the self-evaluation intervention indicated 83.3% (35 out of a possible 42 points) satisfaction. Teacher ratings were also positive (94.3% for Joey's teacher; $M = 87.1%$, range, 81.4% to 97.1%, for Carl's teachers).

DISCUSSION

The results support the utility of school-based functional assessment for adolescents with ADHD-ODD. Information gathered from multiple sources led to the collaborative development of plausible hypotheses that were validated during manipulations of classroom variables by teachers. Furthermore, interventions resulted in improvements in students' behavior. These findings extend previous research on functional assessment for students with ADHD (e.g., Northup et al., 1995) in several important ways.

First, the present evaluation was conducted in the natural setting without disruption of the ongoing class routine. Second, the functional assessment process was conducted

with 2 students who were in their early adolescence and had been diagnosed with ADHD and comorbid ODD, whereas previous investigations (e.g., Umbreit, 1995) focused on younger students with ADHD only. This is important because children with ADHD often continue to exhibit problems during adolescence, and their risk for the development of more severe problems increases with age (Barkley, 1990).

Behaviors exhibited by students with ADHD-ODD were found to be systematically related to environmental variables in the present investigation. The present findings, in conjunction those of similar previous studies (Broussard & Northup, 1995; Lewis & Sugai, 1996; Northup et al., 1995; Umbreit, 1995), illustrate the important role of the environment and its relation to problem behavior displayed by students with ADHD. In addition, the current study demonstrates a systematic strategy to assist in developing effective individualized interventions with this population.

Measures of procedural fidelity indicated that teachers manipulated variables as planned for three of the four hypotheses tested. Manipulations involving antecedent procedures (i.e., writing on the computer; brainstorming) were implemented with higher integrity than those interventions that involved contingent delivery of consequences (i.e., peer intervention). These findings are consistent with previous research suggesting that consequence-oriented interventions are sometimes viewed by teachers as difficult and time consuming to implement (see Martens & Kelly, 1993). However, it is important to note that significant improvements in behavior were observed even when implementation of the peer intervention was only moderately consistent.

Students and teachers reported high levels of satisfaction with the interventions designed from the functional assessment information. In general, teachers rated the inter-

ventions as practical, feasible, and successful. Both students reported that the interventions were not embarrassing, helped to improve their behavior, and would likely benefit other students. These findings are consistent with the literature on treatment acceptability, which suggests that interventions designed through collaborative consultation between a teacher and school psychologist are rated significantly more acceptable than are interventions designed by school psychologists or teachers alone (Kutsick, Gutkin, & Witt, 1991).

For both students, a functional relation was demonstrated between environmental variables and problem behavior. However, in most cases, hypotheses involved antecedent manipulations (i.e., use of the computer during writing tasks) or adjunctive manipulations (i.e., brainstorming, self-evaluation) and thus provide no formal evaluation of maintaining variables. Because the consequences that maintained problem behavior were not directly manipulated in these cases, behavioral function remains unknown. One exception was that peer attention, which was hypothesized to maintain Carl's inappropriate behavior, was directly manipulated. Procedural integrity for this assessment was low (i.e., peers continued to attend to Carl's inappropriate behavior but at lower levels), however, so it is also difficult to draw firm conclusions regarding the functional role of peer attention. Still, the current findings show that antecedent assessments may be used to develop effective treatments for problem behavior even when the consequences responsible for problem behavior are not clearly identified. This was particularly important in Carl's case because the assessment results showed that it was difficult to eliminate the consequence that was hypothesized to maintain his problem behavior (i.e., the peer intervention reduced but did not eliminate peer attention for Carl's inappropriate behavior). Self-evaluation was

selected (over the peer intervention) because integrity was better, it was preferred by teachers, and hypothesis testing showed that it was an effective treatment, even though it did not alter the hypothesized response–reinforcer relation (i.e., the relation between disruptions and peer attention).

The results of the idiosyncratic interventions may not generalize to other classroom settings in which the student is currently involved or to future settings. In this study, a comprehensive token economy was in place in each classroom. In addition, the classroom settings included a small number of students (i.e., 7 to 12) in contrast to average classroom size (i.e., 25 to 30) in a public school setting. Thus, these unique contextual features may limit the generality of the effects of the specific intervention strategies to other settings and students. Both students were taking medication throughout the course of the study. This limits the degree to which we can assume that the interventions would have been effective if the medications were withdrawn. As noted by Northup *et al.* (1995), it is important to consider the separate and combined effects of behavioral interventions and medications in the treatment of ADHD.

Finally, the dependent variable was on-task behavior rather than academic productivity, and this makes it difficult to determine whether changes in academic performance occurred. For Joey, both teacher and student intervention ratings suggested that academic performance and work productivity improved. Similarly, Carl's science teacher, writing teacher, and his self-ratings suggested that his academic performance and work productivity improved as a result of the self-evaluation intervention. Carl's math teacher reported that, although Carl's work productivity appeared to improve somewhat, his academic performance (i.e., quiz grades) did not. This teacher did, however, report that the self-evaluation intervention im-

proved the academic performance of other students by reducing Carl's distracting behavior.

In general, these findings support the utility of functional assessment as a process through which classroom intervention strategies can be selected and evaluated for adolescents with ADHD-ODD. In particular, the present investigation provides support for a classroom-based model of functional assessment that emphasizes the development of intervention strategies that are feasible and acceptable to teachers and students. Although more research is warranted, these preliminary findings support the use of assessment-based approaches to intervention selection for students with ADHD-ODD in school settings.

REFERENCES

- Achenbach, T. M., & Edelbrock, C. S. (1991). *Manual for the cross-informant program for the child behavior checklist*. Burlington: University of Vermont, Department of Psychiatry.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Barkley, R. A. (1990). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment*. New York: Guilford Press.
- Barkley, R. A., Fischer, M., Edelbrock, C. S., & Smallish, L. (1990a). The adolescent outcome of hyperactive children diagnosed by research criteria: I. An 8-year prospective follow-up study. *Journal of the American Academy of Child and Adolescent Psychiatry*, *29*, 546–557.
- Barkley, R. A., Fischer, M., Edelbrock, C. S., & Smallish, L. (1990b). The adolescent outcome of hyperactive children diagnosed by research criteria: III. Mother-child interactions, family conflicts, and maternal psychopathology. *Journal of Child Psychology and Psychiatry*, *32*, 233–256.
- Broussard, C. D., & Northup, J. (1995). An approach to functional assessment and analysis of disruptive behavior in regular education classrooms. *School Psychology Quarterly*, *10*, 151–164.
- Cooper, L. J., Wacker, D. P., Sasso, G. M., Reimers, T. M., & Donn, L. K. (1990). Using parents as therapists to evaluate appropriate behavior of their children: Application to a tertiary diagnostic clinic. *Journal of Applied Behavior Analysis*, *23*, 285–296.

- Cooper, L. J., Wacker, D. P., Thursby, D., Plagmann, L. A., Harding, J., Millard, T., & Derby, M. (1992). Analysis of the effects of task preferences, task demands, and adult attention on child behavior in outpatient and classroom settings. *Journal of Applied Behavior Analysis, 25*, 823–840.
- Dunlap, G., & Kern, L. (1996). Modifying instructional activities to promote desirable behavior: A conceptual and practical framework. *School Psychology Quarterly, 11*, 297–312.
- Dunlap, G., Kern, L., dePerzel, M., Clarke, S., Wilson, D., Childs, K. E., White, R., & Falk, G. D. (1993). Functional analysis of classroom variables for students with emotional and behavioral disorders. *Behavioral Disorders, 18*, 275–291.
- 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.
- DuPaul, G. J., Anastopoulos, A. D., Power, T. J., Murphy, K., & Barkley, R. A. (1994). *The ADHD Rating Scale—IV*. Unpublished manuscript, Lehigh University.
- DuPaul, G. J., & Eckert, T. L. (1997). The effects of school-based interventions for attention deficit hyperactivity disorder: A meta-analysis. *School Psychology Review, 26*, 5–27.
- DuPaul, G. J., & Ervin, R. A. (1996). Functional assessment of behaviors related to attention-deficit/hyperactivity disorder: Linking assessment to intervention design. *Behavior Therapy, 27*, 601–622.
- DuPaul, G. J., & Stoner, G. (1994). *ADHD in the schools: Assessment and intervention strategies*. New York: Guilford Press.
- Fiore, T. A., Becker, E. A., & Nero, R. C. (1993). Educational interventions for students with attention deficit disorder. *Exceptional Children, 60*, 163–173.
- Iwata, B., Dorsey, M., Slifer, K., Bauman, K., & Richman, G. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27*, 197–209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2*, 3–20, 1982)
- Kazdin, A. E. (1982). *Single-case research design*. New York: Oxford University Press.
- Kern, L., Childs, K. E., Dunlap, G., Clarke, S., & Falk, G. D. (1994). Using assessment-based curricular intervention to improve the classroom behavior of a student with emotional and behavioral challenges. *Journal of Applied Behavior Analysis, 27*, 7–19.
- Kern, L., Dunlap, G., Clarke, S., & Childs, K. E. (1995). Student-assisted functional assessment interview. *Diagnostique, 19*, 29–39.
- Kratochwill, T. R., & McGivern, J. E. (1996). Clinical diagnosis, behavioral assessment, and functional analysis: Examining the connection between assessment and intervention. *School Psychology Review, 25*, 342–355.
- Kutsick, K. A., Gutkin, T. B., & Witt, J. C. (1991). The impact of treatment development process, intervention type, and problem severity on treatment acceptability as judged by classroom teachers. *Psychology in the Schools, 28*, 325–331.
- Lewis, T. J., & Sugai, G. (1996). Functional assessment of problem behavior: A pilot investigation of the comparative and interactive effects of teacher and peer social attention on students in general education settings. *School Psychology Quarterly, 11*, 1–19.
- Martens, B. K., & Kelly, S. Q. (1993). A behavior analysis of effective teaching. *School Psychology Quarterly, 8*, 10–26.
- Northup, J., Broussard, C., Jones, K., George, T., Vollmer, T. R., & Herring, M. (1995). The differential effects of teacher and peer attention on the disruptive classroom behavior of three children with a diagnosis of attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis, 28*, 227–228.
- 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 Press.
- Phillips, E. L., Phillips, E. A., Fixen, D. L., & Wolf, M. M. (1971). Achievement Place: Modification of the behaviors of pre-delinquent boys with a token economy. *Journal of Applied Behavior Analysis, 4*, 45–59.
- Repp, A. C., & Karsh, K. G. (1994). Hypothesis-based interventions for tantrum behaviors of persons with developmental disabilities in school settings. *Journal of Applied Behavior Analysis, 27*, 21–31.
- Rhode, G., Morgan, D. P., & Young, K. R. (1983). Generalization and maintenance of treatment gains of behaviorally handicapped students from resource rooms to regular classrooms using self-evaluation procedures. *Journal of Applied Behavior Analysis, 16*, 171–188.
- Umbreit, J. (1995). Functional assessment and intervention in a regular classroom setting for the disruptive behavior of a student with attention deficit hyperactivity disorder. *Behavioral Disorders, 20*, 267–278.
- Wechsler, D. (1991). *Manual for the Wechsler Intelligence Scale for Children* (3rd ed.). San Antonio, TX: Psychological Corporation.
- Weiss, G., & Hechtman, L. T. (1993). *Hyperactive children grown up: ADHD in children, adolescents, and adults* (2nd ed.). New York: Guilford Press.
- Whalen, C. K., & Henker, B. (1991). Therapies for hyperactive children: Comparisons, combinations, and compromises. *Journal of Consulting and Clinical Psychology, 59*, 126–137.
- Zentall, S. S., & Javorsky, J. (1995). Functional and

clinical assessment of ADHD: Implications of DSM-IV in the schools. *Journal of Psychoeducational Assessment* (Monograph Series: Special ADHD Issue), 22–41.

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STUDY QUESTIONS

1. What are some of the behavioral characteristics and risks associated with the diagnoses of ADHD and ODD?
2. How did the authors develop and test their hypotheses about behavioral function?
3. Briefly describe the treatments used with each participant and the behavior-change mechanisms by which these interventions probably influenced behavior.
4. What was the potential limitation of the contingency contained in Carl's self-evaluation procedure?
5. Results of the study showed that the interventions produced increases in on-task behavior. Although this finding is significant in light of the participants' diagnoses, how is it limited, and what additional measures would have strengthened the study?
6. How do the results extend previous research on functional assessment for students with ADHD?
7. What unique contextual features of the study may have affected the generality of the findings?

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