Improving the Effectiveness of Behavioral Classroom Interventions for Attention-Deficit/Hyperactivity Disorder:

A Case Study

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Behavioral classroom interventions are an empirically supported treatment for attention-deficit/hyperactivity disorder (ADHD). This case study reports how modifications to an existing behavior management plan improved the behavioral intervention of a third-grade boy diagnosed with ADHD. A multiple baseline design across settings was used to demonstrate the effectiveness of the modified intervention. Behavioral observations indicated improvement in on-task behavior and reductions in disruptive behavior. The treatment was judged to be socially valid as the teachers overwhelmingly accepted it and modified the participant's behavior to normative classroom behavior limits. This case study illustrates the importance of evaluating and modifying existing behavioral treatments for ADHD in the classroom to increase treatment effectiveness.

THE PREVALENCE OF ATTENTION-DEFICIT/hyperactivity disorder (ADHD) is estimated to affect up to 5% of the school children in the United States (American Psychiatric Association, 1994). On average, these estimates place at least one child with ADHD in every classroom in America, making effective interventions for reducing the classroom impairment characteristic of children with ADHD a significant issue for all school personnel.

Effective classroom-based treatments for ADHD include behavior modification procedures and stimulant medication (Abramowitz & O'Leary, 1991; DuPaul & Eckert, 1997; Pelham, Wheeler, & Chronis, 1998; Swanson, McBurnett, Christian, & Wigal, 1995), the combination of these two treatments often being necessary to normalize functioning (e.g., Conners et al., 2001). Research has suggested that nearly all teachers report using some form of behavior modification in their classrooms. In a survey by Reid, Maag, Vasa, and Wright (1994), 72% of teachers reported using behavior modification with students who were classified as having ADHD. Likewise, in a survey of general education teachers, 81% reported that they usually employ behavior modification procedures in their classrooms (Fabiano et al., 2001). Rosen, Taylor, O'Leary, and Sanderson (1990) surveyed teachers, and all reported using at least a minimal behavioral intervention (e.g., praise contingent on appropriate social or academic behavior). A majority of teachers also endorsed using a range of other behavioral interventions (e.g., removing privileges, providing material rewards). Thus, for the vast majority of teachers involved in the day-to-day treatment of ADHD in the school setting, behavioral procedures are implemented to some extent; therefore teachers' familiarity with behavior modification and a framework for implementing a behavioral intervention specific to a particular child in the school setting is likely to be in place.

Because teachers commonly report using evidence-based behavior modification techniques, the serious impairment experienced by children with ADHD and associated costs in school settings seems puzzling (NIH Consensus Statement, 1998). A number of factors may result in

this discrepancy. First, typical classroom interventions used by teachers may be of insufficient intensity to result in clinically meaningful improvement for a child with ADHD. The few studies that have investigated the effectiveness of differing intensities of behavioral interventions in the classroom demonstrated that intensive procedures (e.g., immediate feedback on behavior, time out) are necessary to obtain clinically meaningful improvement for children with ADHD, opposed to less intense procedures (e.g., delayed feedback on behavior; Abramowitz, Eckstrand, O'Leary, & Dulcan, 1992; Atkins, Pelham, & White, 1989; Hoza, Pelham, Sams, & Carlson, 1992; Northup et al., 1999). Compounding the problem is that although many teachers may be familiar with behavioral interventions in the classroom, many may not receive sufficient training in behavior modification (Kratochwill & Van Someren, 1985). As a result, even though teachers and other school staff members may plan to implement a behavioral intervention in the classroom, or report doing so, the actual behavioral program a teacher implements may not be effective (e.g., the program is not intensive enough, the teacher does not know how to appropriately adjust an ineffective behavior modification plan).

When recommending treatments for students with ADHD, consultants want to consider that most teachers are familiar with behavior modification and many report using some behavior modification procedures. Based on an initial behavioral assessment, an effective intervention may be implemented by determining the aspects of an ongoing behavioral program that are ineffective and adjusting the current classroom behavioral modification program in a systematic fashion until the child's behavior improves. This approach was used to systematically adjust the treatment of a child with ADHD in a general education classroom by modifying the existing program in ways that increased its effectiveness. Treatment outcome was evaluated by behavioral observations, comparison to classroom norms, and the teachers' satisfaction with the intervention.

Method

Participant

John was an 8-year 11-month-old African American boy in a general education third-grade classroom. His class included a primary general education teacher who led most class activities and a special education teacher who conducted small group reading and math classes within the general classroom. His pediatrician diagnosed him with ADHD during the first half of the school year using a parent interview and parent and teacher rating scales (i.e., Achenbach, 1991). Owing to his classroom behavior problems and poor academic progress, the committee on special education classified John as "Other Health Impaired" and developed an Individualized Education Program (IEP) because his behavior and learning problems affected his academic progress. His IEP included small group instruction in reading and math with a special education teacher, speech class once a week, and the provision of a daily behavior sheet (e.g., O'Leary, Pelham, Rosenbaum, & Price, 1976) with an opportunity to earn weekly or biweekly classroom-based rewards. John was not medicated with stimulant medication.

John was initially referred to the behavioral consultant (the primary author) because of disruptive classroom behavior. Teachers were asked to describe his impairing behaviors, and they described producing poor academic work, interrupting teachers, getting out of his seat without permission, talking back to teachers when corrected, teasing peers, and being noncompliant. These behaviors resulted in social and academic impairment. John's teachers reported that other children did not want to sit near or work with John, and the teachers often became frustrated with his classroom disruptions. Academically, he was capable in many activities, but because he was often off task, he failed to follow instructions on assignments or did not complete his work.

The teachers were also asked to describe in detail the interventions they had attempted to improve his behavior. The current intervention was a daily behavior sheet that targeted five posted classroom rules: "finish work in the time provided," "follow directions," "work quietly," "cooperate with peers and adults," and "stay on task." After each activity, John and his teacher met briefly and discussed whether he thought he met each goal on his sheet. If they reached a consensus that he met his behavioral goals, he could color in a square on a piece of graph paper. Once he colored in a predetermined number of squares, he could earn a reward (e.g., trading cards). The average latency to receiving a reward was planned to be approximately 2 weeks, but at the time of the initial meeting with the teachers, John had yet to earn a reward (the meeting was 3½ weeks after the program started). The teachers reported that although they offered even bigger rewards (e.g., baseball caps), "nothing motivated him."

Setting

John's public elementary school ranged from kindergarten to fifth grade. Thirty percent of the children in the school were eligible for free school lunch. John's teacher used a traditional classroom format and organized classes by combining independent work, small-group, and whole-class activities. In the morning, children were required to individually complete three to four small projects listed on the chalkboard and then transition to small reading or math groups. The afternoon activities typically consisted of social studies or science projects conducted in a large group format. Typical afternoon activities involved 15 minutes of large-group instruction and 45 minutes of independent or small-group work.

Dependent Measures

Observations. John and a comparison child were observed twice a day for 50 minutes, once in the morning during independent work and reading/math class and after lunch during social studies/science class. During observations, a child was coded as "disruptive" if he or she destroyed property, talked back to an adult,

teased a peer, used materials inappropriately, verbally intruded on the class, complained, or if he or she was physically aggressive or out of seat. A child was coded as "on-task" if he or she was attending to the ongoing activity (e.g., looking at the teacher when information was directed to the class). The operational definitions for the codes are available upon request from the authors.

During the observation period, the observer watched the target child and a same-sex comparison child simultaneously (a different comparison child was observed in the classroom each day by cycling through a classroom seating chart). During 15-second intervals, the observer recorded whether any disruptive behaviors occurred during the interval. After each 15-second period, a 6-second "record" period occurred during which the observer watched the target and comparison children for 1 second and assessed and recorded on-task behavior. Thus, at the end of the observation period, the percentage of 15-second intervals in which a disruptive behavior occurred and the percentage of 6-second intervals in which on-task behavior was observed were calculated and graphed for the target child. Comparison child information was averaged across days and graphed.

Interobserver agreement was assessed on 15% of observation days in both the morning and afternoon observation periods and during the baseline and intervention phases. Thus, agreement was assessed across times of day and intervention phases. Interobserver agreement was calculated by dividing the number of agreements by the total number of observations on an interval-by-interval basis for the target and comparison child observations. Agreement for disruptive behavior averaged 89% (range = 76%–98%) and for on-task behavior 86% (range = 75%–98%), and agreement rates were comparable across time of day, intervention phases, and for target child and comparison child observations.

John's percentage of disruptive and on-task behavior intervals during baseline and intervention phases were summarized and graphed. These behaviors were compared to classroom norms generated by averaging the comparison peers' disruptive and on-task behavior, providing an index of overall effect and the social validity of the intervention (Foster & Mash, 1999; Walker & Hops, 1976).

Consumer Satisfaction. Consumer satisfaction is an important index of the social validity of treatment (Foster & Mash, 1999). Therefore, the teachers who implemented the intervention were asked to complete a rating scale that asked about their satisfaction with the consultation, intervention, and outcome of treatment. The format of the ratings was a 7-point Likert scale with 1 signifying *strongly disagree* and 7 signifying *strongly agree*. The items were modified from those used by Pelham, Gnagy, Greiner, and MTA Cooperative Group (2000) and were

1. The professional was generally helpful;
2. The professional offered useful information;
3. The professional was a good listener;
4. I would work with this staff member again;
5. The interventions used fit this child's special needs;
6. The intervention plans made sense for my situation and classroom structure;
7. Overall, I am satisfied with the behavioral interventions this student received;
8. The major problems that caused this child's referral are much improved;
9. I am satisfied with this student's progress; and
10. I would recommend the interventions this student received to another teacher who has a student with ADHD.

Procedures

After the initial teacher interview with John's primary general education teacher and the special education teacher (who taught John's small reading and math groups in the morning) and baseline measures were collected, the behavioral consultant met a second time with the teachers. In this meeting, the teachers were presented with graphed data that indicated John's current levels of disruptive and on-task behavior and the class norms for disruptive and on-task behavior (see Figures 1 and 2). Given that John's behavior was outside the class norm for both categories, the consultant suggested some modifications to the current behavioral intervention. These suggestions aimed to modify possible antecedents and consequences of John's negative behavior.

First, the consultant suggested decreasing the latency to reward for John. Given that he had yet to experience a reinforcer for his behavior, it was hypothesized that frequent and consistent rewards might improve his behavior. John's teachers were reluctant to provide large, tangible daily rewards but agreed to make a daily activity contingent on appropriate behavior. They reported that John enjoyed playing his hand-held computer game, and, when asked, John reported that he would like to earn computer game time during lunch and before dismissal. Therefore, it was decided that access to his hand-held computer game would be made contingent on meeting 75% of his daily behavior goals. The intervention initially targeted John's afternoon behavior only, but because of the success of this afternoon intervention, it was eventually modified to provide an opportunity to play his hand-held computer game in the morning and afternoon. The goal of this modification was to increase the frequency of positive consequences earned for appropriate behavior.

Second, John's teachers had not provided feedback on his progress toward his daily behavior goals until after each class was over, and he often spent long periods of time off-task or engaging in disruptive behavior before a teacher intervened. It was also observed that John typically responded to teacher feedback (e.g., reprimands) about his inappropriate behavior by exhibiting on-task and appropriate behavior. Thus, feedback to John regarding his negative behavior was an effective consequence. It was recommended that he receive immediate feedback whenever he began to exhibit a behavior incompatible with his behavior goals. Meeting a behavior goal was operationalized as fewer

than three reminders for each target behavior (e.g., two or fewer reminders for following directions would mean John met this goal for the period or as it was put to John, "Three strikes and you're out"). These criteria were based on the teacher's estimate of John's typical rule-violating behavior during each class. Operationalizing John's behavior targets modified an antecedent of his behavior because he now knew exactly how many rule violations resulted in his failure to earn the reinforcer, in contrast to the prior approach of him and his teacher arriving at a consensus about whether he met his goal.

During baseline, John's teachers continued to use the system of weekly rewards, and he earned no rewards during this phase. The use of his hand-held computer game during this time was noncontingent. During the intervention conditions, John's teacher placed a checkmark on his daily behavior sheet if he earned his daily reinforcer(s), and John was not allowed access to the computer game unless he met the operationalized behavioral expectations. To ensure John did not have access to his computer game unless he earned it, his teacher kept it in her desk except for the times John earned his reward.

Three major changes were made to the teachers' current behavior modification program:

1. John was afforded the opportunity to earn daily rewards based on his classroom behavior.
2. Teachers were asked to provide immediate feedback to John when he violated classroom rules.
3. The behavior criteria on John's goal sheet were operationalized as fewer than three violations of each classroom rule.

It was hypothesized that the increased opportunity to earn rewards coupled with specific behavioral targets and immediate feedback would improve the effectiveness of the classroom behavior modification program.

This case study used a multiple baseline design across activities (morning activities and afternoon activities; Kazdin, 1998). After conducting a baseline assess-

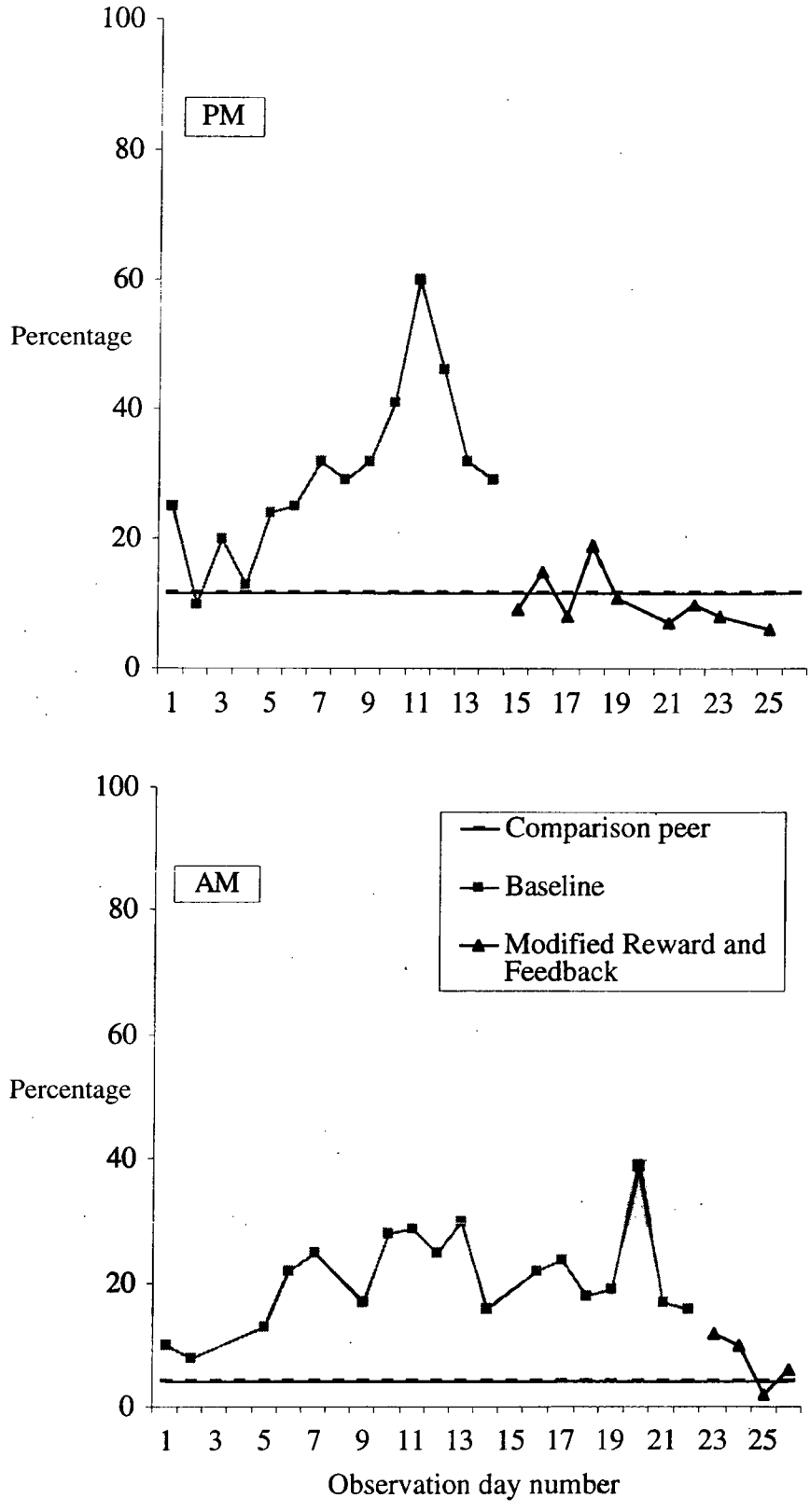

FIGURE 1. Percentage of disruptive behavior for John in the morning and afternoon. The top panel represents afternoon behavior, and the bottom panel represents morning behavior.

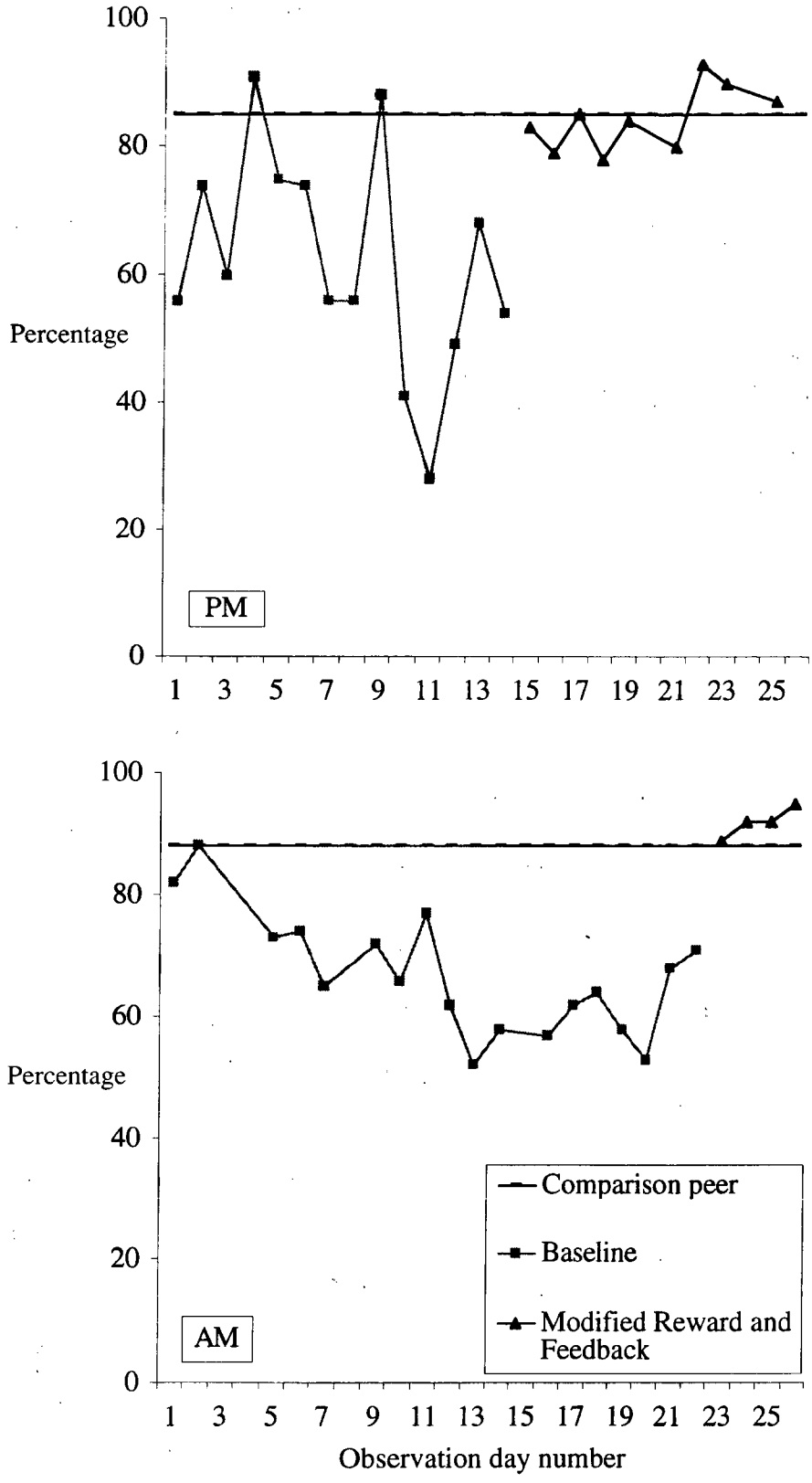

FIGURE 2. Percentage of on-task behavior for John in the morning and afternoon. The top panel represents afternoon behavior, and the bottom panel represents morning behavior.

ment, the intervention began in the afternoon and eventually included the morning as well.

RESULTS

Behavioral Observations

Figure 1 displays the percentage of intervals John exhibited disruptive behavior during baseline and intervention conditions. Missing data points are school absences, whole school assemblies, or times when John participated in a one-to-one speech class. As the graph indicates, baseline behavior in the morning and afternoon was variable, and one effect of the intervention was to decrease variability. In the afternoon, the percentage of intervals in which John exhibited disruptive behavior before the intervention was 29.86% (*SD* = 12.91). After the modifications were made to his behavioral program, the percentage of disruptive behavior intervals decreased to 10.33% (*SD* = 4.18). This is within the normative range of disruptive classroom behavior for his classmates, which equaled 11.65% (*SD* = 9.12). In the morning, the percentage of intervals John exhibited disruptive behavior was 21.00% (*SD* = 7.71). The intervention resulted in a decrease to 7.50% (*SD* = 4.43). This is within one standard deviation of the classroom norm for the mornings (*M* = 4.35, *SD* = 5.02; the standard deviation for the normative rate of disruptive behavior was larger than the mean because of one outlier day where the percentage disruptive for the comparison peer was 21%. Removing this outlier from the analysis results in a mean of 3.75 and a standard deviation of 3.18, placing John just outside one standard deviation of the normative group).

Figure 2 displays the percentage of intervals John displayed on-task behavior during baseline and treatment phases. The graph closely mirrors John's disruptive behavior, as baseline behavior was variable relative to intervention behavior, and the introduction of the modifications to his behavioral program resulted in improvement. In the afternoon, before the modifications were made to his behavioral program, John's percentage of intervals in

which he exhibited on-task behavior was 62.14% (SD = 17.43). On-task behavior increased to 84.33% (SD = 5.05) after the intervention, which was within one standard deviation of the class norm (M = 85.17%, SD = 10.27). In the morning, the percentage of intervals in which John exhibited on-task behavior improved from an initial rate of 66.78% (SD = 9.82) to 92% (SD = 2.45) after the introduction of the intervention. This percentage on-task was within the normative limits for on-task behavior in the morning (M = 88.2%, SD = 7.94).

Consumer Satisfaction

One month after contact with the consultant ended, teachers were asked to anonymously report on their satisfaction with procedures. Ratings were obtained from John's primary and special education teacher because both worked with him during baseline and intervention phases, and the special education teacher created the original behavioral intervention. Both teachers responded with a rating of 7 to every item on the scale, indicating that they strongly agreed with the items and were highly satisfied with all aspects of the treatment and its outcome.

Discussion

Clinical Implications

Powerful behavioral effects were observed in this case illustration by modifying John's existing behavioral program in systematic ways based on a comprehensive assessment of his current impaired behavior and the environmental classroom contingencies that contributed to the behavior. The modifications of increasing John's opportunity to earn rewards and operationally defining the criteria John needed to meet for behavioral goals, coupled with increasing the immediacy of the feedback he received regarding his behavior, substantially increased the effectiveness of the classroom behavioral program. These relatively minor modifications resulted in such an improvement that his behavior improved to within the normative range of functioning. Notably, these modifications were obtained by increasing the intensity of the behavior modification program, and John's behavior was normalized relative to classroom peers without adjunctive stimulant medication (see also Atkins et al., 1989). The teachers were highly satisfied with the consultation and intervention procedures. Overall, these results illustrate how behavioral procedures with demonstrated efficacy in research or analogue settings (e.g., Abramowitz et al., 1992) can be used effectively in a general education setting.

This case also illustrates how teachers may use behavioral interventions in the classroom (Rosen et al., 1990) but may lack the ability to effectively modify behavioral interventions to individualize them for students with ADHD. This suggests that one task for professionals working with teachers is to evaluate the integrity of existing classroom interventions and their appropriateness for children with ADHD. This case also suggests that the framework for implementing intensive behavioral interventions may be in place in many classrooms, requiring only a few adjustments to increase the intervention intensity (e.g., reducing the reward latency). A benefit of working within a teacher's current system may be that teachers are more likely to implement and adhere to a modified intervention similar to one that they already use and understand (e.g., Reimers, Wacker, & Koeppl, 1987) in contrast to an unfamiliar system.

Research Implications

A methodological aspect of this case study also merits some discussion. As Walker and Hops (1976) recommended, the use of peer norms can greatly facilitate the interpretation of treatment effects. In this case study, the classroom norms provided an excellent standard against which to compare treatment effects because the percentage of disruptive and on-task behavior varied across setting, and the child improved to within classroom norms in both settings. Without these norms, one might inaccurately conclude that the child's behavior did not significantly improve in the afternoon because the mean percentage of inappropriate behavior was higher than in the morning. It appears that classroom norms are an important indicator of treatment outcome, and, because classrooms vary in terms of structure, activities, and teacher tolerance for inappropriate behaviors (Vitaro, Tremblay, & Gagnon, 1995), decisions on clinical outcomes should be based on individualized classroom norms specific to each activity/setting of interest.

Limitations

Although clinically meaningful effects were found in this case study, some limitations should be noted. A major limitation of this investigation is that only two baselines were used in this study. The conclusion that the procedures used in this example were effective would be strengthened if a third baseline was used or if the design included replications of the procedures with additional teachers and participants (Kazdin, 1998). Related to this first limitation, the data collection period for the second intervention period (i.e., in the morning) was relatively brief. Another limitation of this case study is that no follow-up data are available because the school year ended before any could be collected. Therefore, this case study is only a practical illustration of a method for implementing effective behavioral modification procedures in the classroom, and future studies must be conducted to determine the effectiveness of this approach on classroom behavior, teacher acceptability, and maintenance of treatment gains.

The utility of this approach is limited to teachers who currently have a classroom behavioral intervention established. Teachers using interventions that are not evidence-based for ADHD will likely need to receive extensive education and practice in behavioral techniques. Also, the observations of the child were not blinded, given the logistical difficulties of keeping an observer blind to a behavioral intervention.

In addition, although John's mother gave her permission to make access to the computer game contingent on his classroom behavior and was informed of John's progress by his teacher, she was not directly involved in the intervention. John's parent was a single mother, and she could

not attend meetings during the school day because of work commitments. Parental involvement is an important predictor of long-term academic outcome (e.g., Jimerson, Egeland, Sroufe, & Carlson, 2000), and lack of parent involvement in this case is an additional limitation. Future studies might investigate ways to reduce barriers to parent participation in school-based treatment (e.g., using conference calls, holding meetings on the weekend/evenings).

Summary

In summary, this report suggests that many teachers would benefit from consultations that aim to improve the effectiveness of existing behavior modification programs. Such modifications should be attempted before moving to more intensive and therefore costly treatments (e.g., stimulant medication, special education classrooms) because as this case study illustrates, minor modifications to an existing behavioral intervention can result in clinically meaningful behavior changes.

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