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AN AGILE BEHAVIORAL MODEL FOR MONITORING THE EFFECTS OF STIMULANT MEDICATION IN SCHOOL SETTINGS

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Students are increasingly being prescribed stimulant medication to treat the symptoms of attention-deficit/hyperactivity disorder (ADHD). Although several authors have advocated specific procedures for monitoring the effects of this medication in school settings, recent evidence suggests that these procedures are not being used adequately. In this article, we delineate the components of published medication evaluation procedures and discuss the barriers to their effective implementation in diverse settings. To address these barriers, we use a flexible model for school-based medication evaluation, and we present a case example. In this model, an assessment of the acceptability and feasibility of evaluation components is integrated into a behavioral problem-solving framework. We argue that to increase the quality of the evaluation of medication in children with ADHD, it is important to balance the internal validity of assessment procedures with their feasibility and acceptability. © 2005 Wiley Periodicals, Inc.

Attention-deficit/hyperactivity disorder (ADHD) is a psychiatric diagnosis typified by developmentally inappropriate levels of inattention, response inhibition, and overactivity that result in functional impairment in more than one setting. Estimates indicate that as many as 3% to 7% of the school-age children in the United States have ADHD (American Psychiatric Association, 2000). Although there are many nonmedical interventions now available for the treatment of ADHD (e.g., DuPaul, Eckert, & McGoey, 1997), there is growing empirical support for the use of psychostimulants alone or in tandem with behavioral strategies (MTA Cooperative Group, 1999). In 1995, it was estimated that the number of children in the United States receiving medication for ADHD symptoms had reached 1.5 million, a 2.5-fold increase over a 5-year period from 1990 to 1995 (Safer, Zito, & Fine, 1996). Currently, it is estimated that 2 million children and youth in the United States are prescribed psychostimulants (Greenhill, Halperin, & Abikoff, 1999).

Although a majority of students with ADHD may experience behavioral benefits from the use of stimulants, about 20% to 30% may not exhibit a positive response (e.g., DuPaul & Rapport, 1993). Further, there is evidence that children respond to various doses of stimulants differently (e.g., Rapport, DuPaul, Stoner, & Jones 1986). For example, children may (1) be linear responders (higher doses lead to incremental improvements in behavior), (2) be quadratic responders (increased doses may lead to initial improvements, but at some point lead to negative effects on behavior), (3) be threshold responders (at some point higher doses do not lead to improvements or negative effects on behavior) or (4) exhibit some other response pattern. It is also possible for children to exhibit differential responses to treatment across multiple domains of functioning, such as academic achievement and social interactions (DuPaul, Barkley, & Connor, 1998; Hale et al., 1998; Northup, Gulley, Edwards, & Fountain, 2001).

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As the prevalence of psychostimulant use grows, school psychologists have increasingly been asked to direct their expertise to the evaluation of this medical treatment regimen. School-based medication evaluation has long been advocated as a result of the limited external validity inherent in laboratory-based assessment procedures (e.g., Pelham & Milich, 1991). Recently, several authors have pointed to the specialized training of school psychologists as being highly desirable in the assessment of medication effects. Specifically, training in single-case research design, systematic observation, and consultation makes school psychologists optimally prepared for this task (c.f., DuPaul & Stoner, 2003; Power, Atkin, Osborne, & Blum, 1994; Roberts & DuPaul, 2000).

Several authors have advocated procedures designed to gather extensive information about the effects of medication on children in schools, using single-case methodology (e.g., Gadow, Nolan, Paolicelli, & Sprafkin, 1991; Hyman et al., 1998; Pelham, 1993). Following the tradition of controlled clinical trials, they are expensive and time-consuming procedures to implement. Components of published school-based procedures typically include a double-blind, placebo-control, crossover design with random ordering of multiple doses of medication, behavior ratings and ratings of stimulant side effects from multiple informants, and direct observations of student behavior (e.g., Gadow et al., 1991; Pelham, Bender, Cadell, Booth, & Moorer, 1985). It appears that the time commitment and logistics involved to carry out such evaluations are incompatible with the responsibilities already placed on school practitioners (c.f. Reschly & Wilson, 1995). Results of a recent survey (Guerasko-Moore, 2003) suggest that more than half of school psychologists belonging to the National Association of School Psychologists do perform medication evaluations. However, this monitoring is conducted on only a few students and without design components such as placebo controls. Although scientific rigor must be a priority when examining the use of psychoactive drugs in children, it must be balanced by the acceptability of these procedures to informants and practitioners (Power et al., 1994). Balancing internal validity and acceptability is essential in the practice of professional services in schools, and resources and commitments vary widely between settings. Hence, what is needed is an evaluation model that is flexible in these disparate conditions.

In the sections that follow, we review the components of empirically studied, school-based, medication evaluation procedures. We discuss the purpose of each component, as well as the potential barriers to their implementation by school staff. After each component of evaluation is delineated, we propose a flexible approach to school-based medication. The Agile Consultative Model for Medication Evaluation (ACMME) involves assessing the feasibility of each evaluation component in a given case via specially designed parent and teacher rating scales and other methods of communication. This assessment of resources sets the parameters for each medication evaluation, and it is essential to making this process feasible. Further, the ACMME places this process within a behavioral problem-solving context (Bergan & Kratochwill, 1990) in an effort to facilitate a problem-solving framework for addressing the broad areas of impairment experienced by children and youth with ADHD.

Finally, evaluation data for a student receiving stimulant medication in a public school setting will be presented to illustrate the implementation of the ACMME. Barriers to the implementation of the model will be discussed.

Components of Medication Evaluation Procedures

In this section we will identify components of medication evaluation procedures that typically are advocated for use in school settings. The purpose of this section is not to critically review individual measures or procedures but rather to discuss why these components are useful in the evaluation of drug response and to identify potential barriers to their implementation. Given the

flexible nature of the ACMME, it is necessary to examine components individually to permit informed decision making with regard to their inclusion or exclusion in individual assessment protocols.

Measures of drug response. Behavior-rating scales are the most widely used method for assessing children's response to medication. They are easy to score and administer, and several measures have been found sensitive to the effects of stimulant medication (see Angello et al., 2003). Rating scales are also useful for gathering information on low-frequency behaviors such as interpersonal physical aggression, which are difficult to measure with other methods, such as observations that typically last no longer than 15 to 30 minutes. Another advantage of rating scales is their ability to assess different kinds of behavior (e.g., core ADHD symptoms, academic performance, social skills, social withdrawal, stimulant side effects) across a number of informants (one or more teachers, parents, children).

Although rating scales are relatively easy for informants to complete, any useful evaluation procedure requires that informants complete them repeatedly. There is likely to be an inverse relationship between the time taken to complete these rating scales and teachers' willingness to take part in future assessment procedures. Hence, although it is advantageous to conduct a broad assessment of child behavior to measure possible positive and negative responses to medication (e.g., Northup et al., 2001; Pelham, 1993), one should take informant burden into consideration when selecting measures.

Daily report cards completed by teachers can also serve as an effective measure of treatment response (e.g., Pelham, 1993). Constructing customized rating scales by drawing from items of existing measures (Hyman et al., 1998) or selecting key variables for the creation of daily report cards (e.g., Greenhill et al., 1996) may serve as potential adjuncts to the use of standardized rating scales in their commercial form. It should be noted, however, that little is known about the psychometric properties of such hybrid instruments. Although rating scales and daily report cards offer excellent breadth of measurement, it should be noted that relying too heavily on any single assessment method or source greatly limits the strength of assessment. For example, although ratings of stimulant side effects can be useful monitoring negative reactions to stimulant medication, they must be supplemented by verbal reports of children and the adults with whom they have regular contact.

Systematic observations of students in their classrooms and other school settings (e.g., lunchroom, playground) have been demonstrated to be very sensitive to the effects of stimulant medication (e.g., Gadow, Sprafkin, & Nolan, 1996). Also, observation codes that include measurement of child social interactions may also serve to assess behavioral toxicity. This is important to consider, given that teachers may not be sensitive to negative effects of medication at high doses (c.f., Swanson, Cantwell, Lerner, McBurnett, & Hanna, 1991).

Although the use of systematic observation relieves informant burden, which one would expect to increase the acceptability of an evaluation procedure to parents and teachers, it poses other challenges. Behavioral observation is among the most widely used assessment procedures by school psychologists, with naturalistic observation (e.g., recording all behaviors as they happen with no predetermined behaviors in mind) being used twice as often as systematic observation, or those procedures involving a predetermined set of behaviors and coding conventions (Wilson & Reschly, 1996). Nevertheless, school-based medication evaluation procedures relying heavily on observations have been criticized because of a perceived lack of trained observers in school settings (Hyman et al., 1998). Certainly, the time involved in training and carrying out systematic observations poses a barrier to their use in evaluation procedures. Additional concerns may be raised by some teachers who prefer not to have too many visitors in their classroom and by parents

who voice concern about their child being singled out in class. Usually, these concerns can be alleviated when the procedures for observation are explained to teachers and parents.

Medication evaluation procedures appearing in the literature almost exclusively include double-blind, placebo controls to rule out several alternative explanations for behavioral change. The use of placebos allows the evaluator to conceal the treatment condition from the patient (or in the case of children, their parents as well). This is referred to as a *single-blind* condition, and it controls for patient reactivity to dose conditions. Also, it is useful to veil the dose condition from the evaluator, informants (e.g., teachers), and data collectors so that one can avoid bias associated with this knowledge.

Certainly, the key barrier to implementing blind procedures is the lack of commercially available placebos. If drug companies produced placebos that were identical to the drugs in their commercially available form, and if they made them available to practitioners for use in community-based medication evaluations, perhaps they would be more widely used. Nevertheless, the absence of placebos does not necessarily have to influence the blindness of observers and teachers. Specifically, it is relatively easy to keep the evaluator and teacher blind to dose conditions, especially because sustained release formulations of methylphenidate (e.g., Concerta, Metadate CD, Ritalin SR) and Adderall (mixed amphetamine salts) have reduced the need for the administration of afternoon doses at school.

Experimental Designs

Various single-case designs have been used to assess children's response to stimulant medication. Most common to the literature have been procedures wherein several doses and placebo are randomly alternated (most often in 1- or 2-week intervals), and the prescribing physician, informants, and participants are blind to these manipulations (e.g., Gadow et al., 1991). Data can be displayed with phase change lines indicating manipulation of dose and placebo conditions. Data from multiple outcome measures may be evaluated visually and statistically (c.f., Hale et al., 1998). Another research design that has been advocated for evaluating stimulant medication is the alternating treatment design (Pelham & Hoza, 1987; Pelham et al., 1990), wherein several doses of medication and placebo are alternated more rapidly (e.g., daily). Ordering of doses is varied to control for sequence effects and other confounds associated with time.

These single-case designs, particularly the alternating treatment design, have strong internal validity. Nevertheless, some limitations should be noted. First, these designs do not typically employ the collection of baseline data. This is unfortunate, because this shortcut fails to take into consideration practice effects resulting from repeated measurement. Although this may be less of a concern in alternating treatment designs where theoretically practice effects are spread across all dose conditions (Hyman et al., 1998). However, because baseline reports of stimulant side effects vary widely across children, it is particularly important to collect baseline side-effect ratings for comparison (c.f., Barkley, McMurray, Edelbrock, & Robbins, 1990; DuPaul, Anastopoulos, Kwasnik, & McMurray, 1996). Second, both types of evaluation designs have involved random doses and double-blind procedures, and involved the assessment of multiple behaviors over repeated measurement occasions. Given the demands already placed on school psychologists and adults who are called on as informants, such thorough evaluation procedures are not likely to be applied widely. Alternating treatment designs in particular may be intimidating to practitioners, because of the organization involved in scheduling doses, and burdensome to teachers who would be required to provide daily ratings or reports. Further, extant published medication evaluation procedures for use in schools have been short in duration. Given that ADHD is a chronic disorder, we need procedures that can be easily integrated into the school environment not for weeks, but for years (Greenhill et al., 1996).

The Agile Consultative Model of Medication Evaluation

In this section we present the ACMME (see Figure 1), a flexible school-based model for designing medication evaluation procedures that are sensitive to the barriers existing across diverse school settings. The ACMME is based on Bergan and Kratochwill's (1990) model of behavioral consultation (BC). There are several reasons why this is an advantage: (1) A behavioral framework provides a problem-solving (as opposed to medical) framework for the use of medication; (2) it is collaborative in nature, (3) the problem identification and goal setting components of the model facilitate the identification and prioritization of target behaviors that are linked to the assessment and evaluation of outcomes; and (4) many school psychologists are familiar and comfortable with this model for the formulation and evaluation of behavioral interventions, which facilitates the use of medication as a component of a more comprehensive intervention protocol.

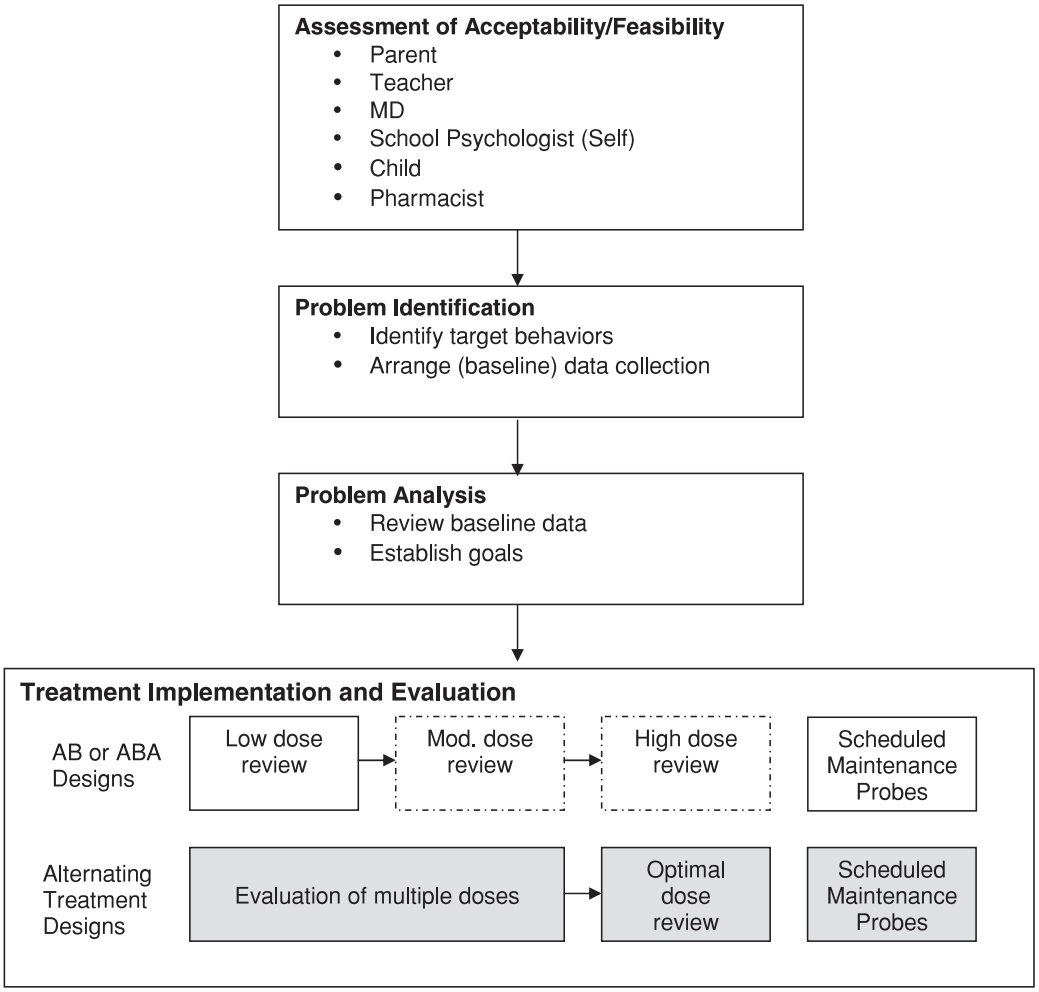

FIGURE 1. The ACMME

Several modifications have been made to the BC to make it suitable for evaluating the effects of stimulant medication in diverse school settings. First, because the evaluation of medication effects involves additional agents and settings to that of typical behavioral intervention (e.g., physicians, pharmacist), the stages of the model represent phases of communication across school and community settings as opposed to individual interviews between the consultant and one or more consultees. Further, although any consultation model must take into consideration the commitment of agents or the acceptability of the procedure (cf, Witt & Elliott, 1985), the ACMME calls for a relatively structured assessment of the commitment of multiple parties across settings, and this deserves special attention. The functions of the problem identification and problem analysis phases of the ACMME are highly similar to those of the BC; however, the treatment-evaluation phase is structured to meet the demands of evaluation involved in the assessment of one or more doses of medication. Interviews can be scheduled differentially for AB-type designs versus alternating treatment designs (see Figure 1). The various components of the ACMME will be described in more detail later in this article.

Assessment of acceptability or feasibility. Assessing the acceptability and feasibility of various components of the evaluation procedure is important for several reasons. First, this sets the parameters for the evaluation methodology. Also, the procedure helps maximize the acceptability of the evaluation to those involved, which allows for longer periods of assessment and the ability to carry out evaluations in the future. This procedure is necessarily carried out before the consultation process begins in earnest, although it may extend further into the evaluation as the process takes shape. If this assessment determines that the evaluation is not feasible, for example, if there is a notable lack of investment in the process among parties, the practitioner should consider why this is the case and see what can be done about addressing this shortfall of resources in the future. If the resources and commitment of these parties is determined to be consistent with the demands of a medication evaluation, the consultation process can get underway.

A series of contact letters and rating scales has been designed by the first author to facilitate communication between the evaluator (school psychologist) and other agents in the evaluation process. A contact letter designed for communicating with physicians describes the ACMME and offers collaboration in monitoring the medication effects on the child in question. Once there is agreement to work together on monitoring, contacts can be made by the consultant or physician to pharmacists in an attempt to obtain placebos. As mentioned earlier, placebos are an important component of medication evaluation procedures, but if it is not possible to obtain them, this should not preclude the monitoring of medication, given that the few studies that have examined controlled-versus uncontrolled-trials have found that they generate similar findings (Kavale, 1982; Sprafkin & Gadow, 1996). Nevertheless, open evaluations may overestimate the efficacy of medication.

Specialized rating scales have been designed for administration to adult informants (see Figure 2). These scales were designed to assess the acceptability of various evaluation procedures. Each item describes an evaluation measure, why it is useful to the evaluation procedure, and asks on a 3- or 4-point scale how often they would be willing to supply these data or have them collected (e.g., observations in their classroom). These rating scales can be modified to allow for the type of measurement required given the research design in use. For example, an alternating treatment design would require daily as opposed to weekly measurement, and this may effect the type of measurement used (e.g., daily report cards vs. rating scales and observations). Further, if other target behaviors or outcomes (e.g., social functioning, specific academic performance) are identified, other measures may be considered.

Problem identification. As in the BC, the goals of the problem identification stage of the ACMME are to specify the problem(s) exhibited by the child, identify the perceived discrepancy

Medication Evaluation Procedure
Teacher Input Form

Please circle the items that most accurately reflect what you are willing to commit to _____'s medication evaluation.

1. Rating scales completed by teachers (18 items long) are very useful in selecting appropriate medications for children because they can be compared to one another across time. **How often would you be willing to complete these rating scales?**

Never	1x per week	2x per week	More often if needed

2. Classroom observations collected by a school psychologist can be very useful in measuring the progress of very specific child behaviors. **How often would you be willing to have 15-minute observations conducted in your classroom, given that it did not interrupt your class routine?**

Never	1x per week	2x per week	More often if needed

3. In addition to ratings of child behavior problems, teacher ratings of medication side-effects (13 items) can be useful in ensuring that children do not get prescribed doses of medication that cause other problems. **How often would you be willing to complete these rating scales?**

Never	1x per week	2x per week	More often if needed

4. Children's work examples can provide valuable information in evaluating the positive and negative effects of medication. **Given that these products would need to be provided once a week, how many times would you be willing to provide these? Note: these can be photocopied and returned to you promptly.**

Never	4 weeks	5 – 10 weeks	Longer if needed

FIGURE 2. The ACMME Teacher Rating Scale

between actual and desired behavior, and arrange for initial data collection. Given that children may exhibit different dose responses across domains of functioning (Northup et al., 2001), it is important to establish a hierarchy of target behaviors, which will serve as an aid in decision making when stimulant effects are compared across doses and domains. We assume that before initiating the ACMME psychosocial interventions have been implemented and do not sufficiently ameliorate the problems exhibited by the child in question. Hence in most cases a working relationship will have been established with at least one consultee (parent, teacher). Although it is unlikely that the prescribing physician will attend the problem identification interview (PII), information can be exchanged via e-mail or phone. At the close of the problem identification phase, the assessment team will have been assembled, and the research design should be delineated.

Problem analysis. Similar to the BC, the goals of the problem analysis phase of the ACMME are to review baseline data and establish tentative goals for the intervention. Assignment of goals

for target behaviors can be helpful in determining the minimally effective dose or the lowest dose required to obtain the desired behavioral effect.

Treatment implementation and evaluation. The treatment-implementation and treatment-evaluation phases have been combined in the ACMME and differ in structure, depending on the type of research design employed. If using a typical AB-type design, the team should meet at the end of each dose phase, whereas in an alternating treatment design, a single meeting can be convened once the child has been exposed to all dose conditions enough times to enable generalization of the findings (c.f., Pelham, 1993). However, stimulant side effects should be monitored continuously to detect significant increases from baseline conditions wherein appropriate action should be taken, for example, discontinue stimulant trail, reduce dose. Finally, once the initial therapeutic dose is prescribed, maintenance probes should be scheduled. In some cases it may be relatively easy to collect these data (e.g., if a teacher routinely conducts curriculum-based progress monitoring). Nevertheless, these data should be monitored to ensure that the dose changes occur as needed, and that the medication is being administered with integrity.

Case example. As an example of how the ACMME can be used in a public school setting, we present the following case. Henry was an 8-year-old Caucasian boy who was enrolled in a third-grade general education classroom in a public elementary school in Northeastern Pennsylvania. Parental and school reports indicated that he was being considered for grade retention because of his challenging behavior and poor academic performance in reading and spelling. Although Henry was not receiving any special education services, parental and teacher reports indicated that a number of home and classroom interventions had been implemented without success. Henry was diagnosed with ADHD, combined type, after a comprehensive evaluation completed by staff within the ADHD program in the outpatient pediatric clinic where he received primary healthcare services. Henry's parents were asked if they were willing to participate in systematic medication monitoring, and after parental consent was obtained, a mutually agreeable meeting date was scheduled to conduct the PII.

Prior to the initial PIIs, Henry's teacher and mother completed the ACMME Teacher and Parent Rating Scale, respectively (see Figure 2 for an example). These rating scales were very similar, and they were used to determine the acceptability of various medication evaluation procedures.

Henry's parents and teacher completed the ADHD Rating Scale-IV, home and school versions (ADHD-IV; DuPaul, Power, Anastopoulos, & Reid, 1998), respectively, during baseline and intervention. The home and school versions of the ADHD Rating Scale-IV are norm-referenced questionnaires designed to gather information from parents and teachers with regard to child symptoms of ADHD (see Angello et al., 2003 for reviews of this and other instruments).

The Side Effects Rating Scale (SERS; Barkley, 1981) was used to assess stimulant side effects. The SERS is a 17-item questionnaire that asks informants to rate each symptom (behavior) from 0 (absent) to 9 (serious). Parental report using the SERS was collected weekly throughout the intervention phases.

Classroom academic behavior was measured using the Behavioral Observation of Students in Schools (BOSS; Shapiro, 1996). The BOSS is a systematic observational system that allows users to estimate levels of engagement and nonengagement in a classroom setting. For purposes of visual simplicity, the categories of active engaged time and passive engaged time were combined to create a general measure of on-task behavior, and the three off-task behaviors (motor, verbal, and passive) were summed to generate an off-task composite. Because more than one type of off-task behavior could be scored within a single interval, these scores are not simply the inverse of the on-task measure.

The Academic Performance Rating Scale (APRS; DuPaul, Rapport, & Perriello, 1991) was used to measure student academic performance in the classroom. The APRS is a 19-item questionnaire that asks teachers to estimate student performance on a variety of academic skills and outcomes.

The consultant for the medication evaluation procedure was a fourth-year doctoral student in a school psychology program. This consultant conducted all interviews and collected all of the data presented here.

Problem identification. During the initial PII interview, it was established that Henry's mother was most concerned with Henry's lack of attention in school and its effect on his academic performance. Through collaboration, the primary behavior of concern, "attention to schoolwork," was operationalized and, ultimately, resembled the academic engagement (i.e., on-task behavior) and nonengagement (i.e., off-task behavior) behavioral definitions offered by Shapiro (1996). When framed within these behavioral terms, she expressed her desire to help Henry increase his "on-task" and decrease his "off-task" behavior. Finally, referring to her earlier responses on the ACMME Parent Rating Scale, a method for monitoring Henry's baseline engagement and nonengagement was collaboratively determined and agreed on. The method included using parent-completed rating scales, which would target his level of inattention at home, as well potential side effects of the medication. In addition, direct observation within the classroom (at least once a week) was agreed on, if acceptable to the teacher, to establish baseline responding at school. Finally, permission to contact Henry's teacher was received, and a second meeting date and time (for the problem analysis interview) was scheduled.

A second PII was conducted with Henry's teacher using the same format as indicated earlier. Prior to the interview, she completed the ACMME Teacher Rating Scale, which was subsequently used to shape the methods employed in medication monitoring. Henry's teacher also expressed great concern regarding his difficulty focusing on classwork and staying in his seat. She stated that also he had difficulty completing and turning in his homework. Because of the similarity of their concerns, a similar behavioral framework was offered to operationalize the problematic behaviors. Henry's teacher agreed that the engagement and nonengagement definitions sufficiently described her primary concerns. She reported that his nonengagement was more pronounced in the afternoon, especially later in the week, and most consistently problematic during independent language arts assignments. Finally, in line with her earlier responses, she offered to repeatedly complete brief rating scales to assess his level of nonengagement as well as his academic performance. In addition, she permitted frequent direct observation of his behavior within her classroom during independent language-arts assignments, targeting afternoons later in the week. The importance of establishing baseline responding was discussed and a second meeting date and time was scheduled.

Problem analysis. During the problem analysis interview (PAI), baseline data were examined. Henry's teacher remarked that his behavior appeared to have recently improved. Although she indicated that the observed behavior seemed somewhat atypical (more positive than expected), she agreed that the data were sufficient. In addition, she endorsed the continued use of current target behaviors as well as data collection procedures. A goal was set to increase Henry's academic engagement to 50% of intervals, from an average of 32% of intervals from the three baseline assessments. This represented a 36% improvement and was considered reasonable. An additional goal was set to reduce Henry's off-task behaviors by 30%. Henry's teacher was not in favor of additional academic or behavioral interventions. She reported being overwhelmed with other duties. Henry's mother was satisfied with the baseline data and indicated that Henry's behavior continued to be problematic at home and school. She reported that the target behaviors remained appropriate and agreed to the goals set by Henry's teacher and to continue the current evaluative methodology.

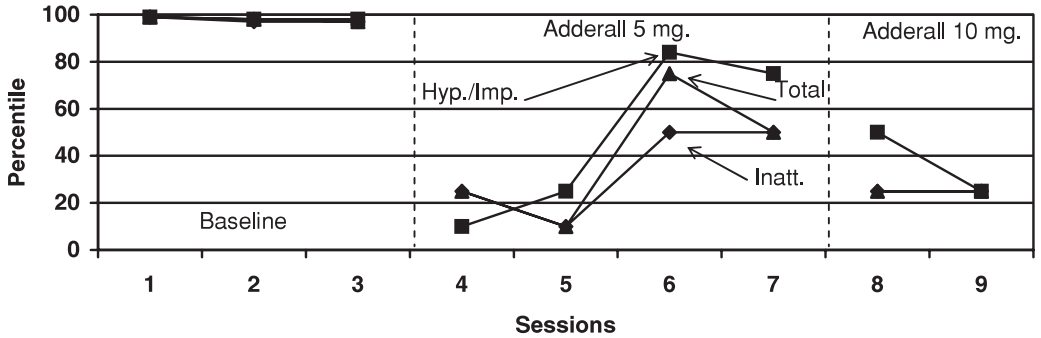

FIGURE 3. ADHD-IV: Home data

Although Henry's mother voiced her desire to implement psychosocial interventions to address his challenging behaviors at home, she reported a stronger interest in pharmacotherapy. Henry's primary care provider attended the meeting and facilitated the discussion regarding the potential benefits and risks associated with stimulant medication treatment as well as how he would implement a trial, including the safeguards he would take. After active discussion, Henry's mother supported a trial of stimulant medication to address Henry's significant inattention and overactivity. The treatment team endorsed the continued data collection methodology and set a tentative date and time for a treatment-evaluation meeting.

Treatment implementation and evaluation. Following the PAI, Henry's primary care physician prescribed the stimulant medication Adderall XR (5 mg per day). As discussed during the PAI, the physician recommended starting the medication at this low dose and subsequently titrating, as necessary, in an attempt to identify the minimally effective dose. Because of this preference, as well as his and the family's reluctance to use a placebo, the team agreed on an AB design to evaluate the effectiveness of the medication. At the time of treatment implementation, Henry's teacher was blind to the medication regimen (e.g., timing, dose, etc.). This initial 5 mg dose of Adderall XR was in place for approximately 4 weeks. At the end of the fourth week, the treatment team reviewed the collected data, especially with regard to the predetermined goals, and considered whether the medication dose should be changed. According to informant responses on the teacher- and parent-completed ADHD-IV Rating Scales (Figures 3 and 4), a change in behavioral

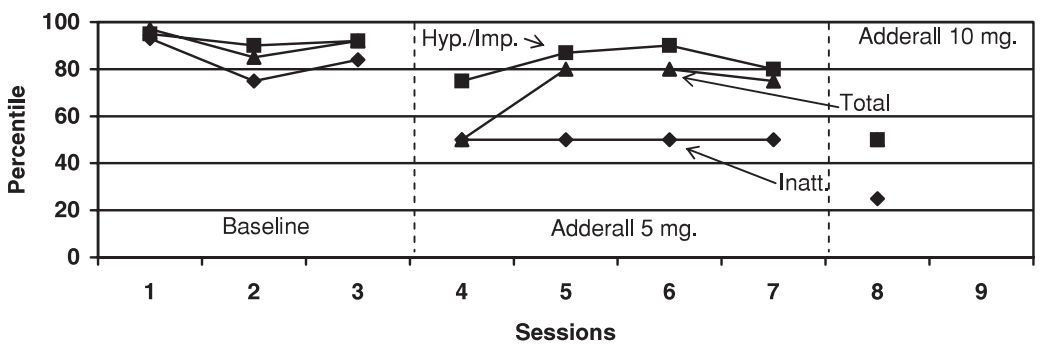

FIGURE 4. ADHD-IV: School data

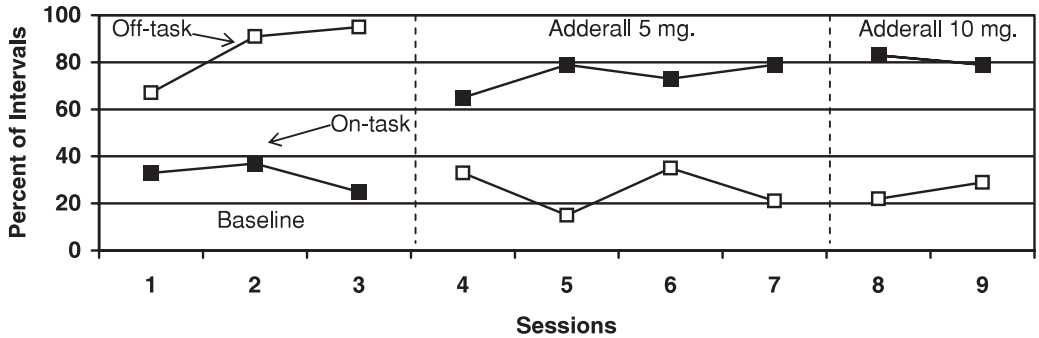

FIGURE 5. Classroom observations

response following the introduction of the stimulant medication was observed. More specifically, changes were reflected in total score, inattention, and, to a lesser degree, hyperactivity-impulsivity. Direct observation data (Figure 5) suggested similar improvement following the introduction of medication. That is, the average level of observed engagement and nonengagement exceeded the goals set by the treatment team. Teacher endorsements on the APRS (Figure 6) also suggested improvement on a number of items, including academic productivity and success. Parent ratings of stimulant side effects (Figure 7) showed a dramatic reduction in behavioral symptomatology following the introduction of medication; this included the alleviation of considerable parental concern regarding insomnia. It should be noted that in addition to tracking of the overall level of side effects, individual side effects, particularly insomnia, were monitored closely.

Although improvement was generally noted across the multiple measures in the school setting, and the predetermined goals were exceeded, Henry's behavior at home remained unacceptable to his parents. Members of the treatment team questioned whether further improvement might be gained from increasing the dose of the medication. In light of these concerns and the low level of reported side effects, the team agreed to increase Henry's medication, and his primary care physician prescribed Adderall XR 10 mg daily. Henry's response to this dose was reviewed for 2 weeks. Unfortunately, the end of the 10 mg phase coincided with the last day of the school year, thus precluding further evaluation in the school setting.

Reductions in problematic behavior were noted both by home and school informants (see Figures 3 and 4), as well as somewhat higher rates of observed engagement in the classroom (see Figure 5). In addition, academic performance continued to increase (see Figure 6), and few reported

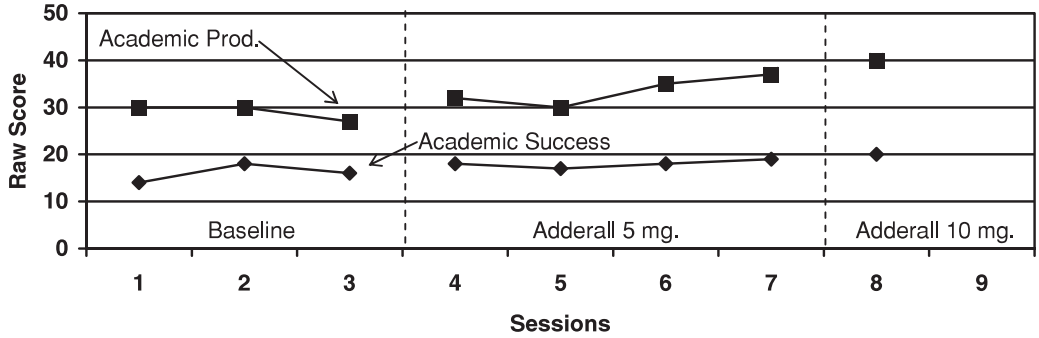

FIGURE 6. Teacher-reported academic performance

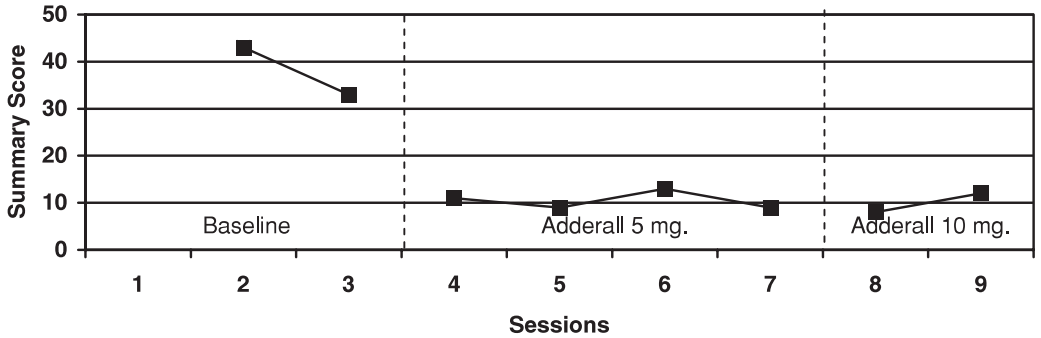

FIGURE 7. Parent-reported stimulant side-effects

adverse side effects were reported. Hence, although 5 mg was the minimally effective dose for the initially agreed on target behaviors, the team agreed that Henry should continue to receive the 10 mg dose of Adderall XR.

Discussion

In line with the emphasis of this miniseries, in this article we attempt to address a gap between research and practice in the evaluation of stimulant medication in school settings. Although several researchers have developed elegant school-based medication evaluation procedures, they have yet to be adopted widely by school practitioners (e.g., Guerasko-Moore, 2003). A potential factor contributing to this underutilization may be the actual or perceived feasibility of one or more components of the evaluation protocol. For example, the acquisition of placebos alone can be challenging to school practitioners. In addition, informants may resist procedures that involve repeatedly completing multiple rating scales. Several extant models have addressed the issue of informant load through the use of systematic observation (Gadow et al., 1991), hybrid rating scales (Hyman et al., 1998) and daily report cards (Pelham, 1993). However, other components of these models (e.g., random ordering of doses, double-blind placebo control) do not seem to afford sufficient flexibility to be generally applied. Although the acceptability of these procedures to teachers was reported to be adequate in the settings in which they were employed, it is unclear whether such procedures would be acceptable for longer periods of time. Furthermore, of equal importance is the acceptability and feasibility of these procedures to school practitioners.

The case study of the ACMME we have presented is far from an ideal evaluation. There were numerous threats to internal validity (e.g., placebo effect, no control for confounds regarding time), and the assessment was relatively narrow (minimal assessment of social withdrawal, no direct assessment of academic skills, no systematic follow-up of medication effects). One way to increase the confidence one has in the effect of medication is to add a reversal to the AB design. In an ABAB design the replication of treatment effect would improve internal validity. Such a reversal would likely be met with some resistance by stakeholders, and this must be considered. However, this second no-treatment condition can be much shorter than the initial baseline. Another possibility is the use of an alternating treatment design, where effects of time are controlled. Even without placebos, one could compare one or more doses to repeated no treatment conditions. Although effects for time and order of conditions are controlled for in an alternating treatments design, there remains the possibility that effects from one condition can carry over to the next. For example, if a child responds well to one or more dose conditions and meets with success in school,

this may increase the likelihood that the next day will be successful (both in actual terms and in with regard to informant ratings) whether the child is taking medication or not. The rapid alternation of conditions could indeed demonstrate a false placebo effect. Also, as noted earlier, alternating treatment designs can be intimidating to practitioners, because of the added burden of scheduling doses, and demanding to informants and data collectors, because of the daily measurement requirements.

Although we assessed the acceptability of design components a priori, we did not collect data on consumer satisfaction. Nevertheless, at least anecdotal reports indicated that the ACMME procedure was acceptable to informants, the consultant, and the prescribing physician. Furthermore, this procedure represented a marked improvement over the assessment practices typically employed by this physician (i.e., typically only parental verbal report).

Practitioners interested in applying the ACMME while facilitating medication monitoring in schools should regard the following considerations. The case example presented here was heavily dependent on the efforts of the doctoral student who served as consultant. This consultant easily bridged the school and clinic environments in part as a result of prior experience working within both settings as well as a prior relationship with the primary care physician. A school psychologist, however, with little experience consulting within medical settings or interacting with healthcare professionals, may encounter additional, unexpected barriers (e.g., logistical complications, privacy issues) that may impede the provision of acceptable and effective services.

Further research in this area should attempt to identify those personal characteristics or environmental variables within the healthcare ecology, including physician prescription practices and preferences, and how they relate to acceptable, feasible, and effective medication-monitoring methodologies. Indeed, evaluating the prescribing physician's willingness to use, for example, placebos or an alternating treatment design will certainly influence the nature of the assessment. In addition, school psychologists should assist families and health care providers to sufficiently arrange measurement methodologies to ensure sustainability of assessment once the consultant is removed from the process. This "self-sufficiency" or maintenance of continued measurement is vital for effective, long-term medication monitoring.

Practitioners may also want to consider the advantages of conducting a functional behavioral assessment (FBA) prior to or during baseline assessment. It is likely that an FBA would help facilitate more appropriate interventions by allowing the treatment team to identifying the function(s) of problematic behaviors and develop targeted interventions, both at home and at school. Although often overlooked by researchers and clinicians, an FBA could also be used to identify those variables within the academic ecology that impede or poorly support improved academic responding. Interventions that target these variables or functions, used either individually or as a component (i.e., with stimulant medication), would appear to increase the likelihood of achieving successful outcomes.

Although the publication of clinical trials has typically and necessarily placed an emphasis on internal validity, the practice of titrating medication outside of federally funded research studies must balance such experimental control with social validity. It often seems that concerns regarding internal validity often constrict, outweigh, or inhibit clinicians from implementing strategies or interventions that would ultimately benefit the students and families they serve. Practitioners will ultimately need to discover ways to balance the requirements necessary for sufficient internal validity against the ecological and social validity of the methods and procedures they use.

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