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Interventions in School Settings for Students With ADHD

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This article consists of a review of 16 research studies on treatments in school settings for children with attention deficit hyperactivity disorder (ADHD) carried out in the last decade. It includes both simple interventions and multicomponent interventions where different techniques are combined. Based on this revision, the conclusion is drawn that, based on the evidence, school-based treatments for ADHD are effective in the short run for reducing disruptive behaviors and improving on-task behavior and academic performance of children with ADHD. Issues regarding the limitations to generalizing the improvements over time and across content areas are discussed. Furthermore, results from the MTA—a study designed to compare the efficacy of behavioral treatment (BT), medical management (MM), combined treatment (BT and MM), and a routine community care control group—are discussed. The MTA findings suggest that the most effective treatment for ADHD is a multimodal intervention that frequently includes concurrent medication in addition to parent training, school interventions, and child intervention.

The notable increase in the number of children diagnosed with attention deficit hyperactivity disorder (ADHD) in the past few years has had important repercussions on the educational system. In fact, in the United States, additional expenditures by public schools on behalf of students with ADHD amounted to over \$3.2 billion in 1995 (Forness, 1998). Consequently, in addition to becoming a public health issue, ADHD has also become a relevant educational issue. Furthermore, after decades of research, there is no doubt that ADHD has a chronic nature. It shows up in early childhood and continues to a troubling degree throughout childhood and adolescence and into adulthood. The symptoms of this disorder cause alterations in school and family functioning and in relationships with classmates, and they carry with them a poor long-term psychiatric, social, and academic adjustment (Biederman et al., 2004).

Given the high prevalence of ADHD, its long-term repercussions, and its chronicity, the search for effective treatments to manage it has been a constant concern for the last

few decades. Among the wide variety of treatments used are traditional therapy, restrictive or supplemental diets, biofeedback, allergy treatments, perceptual motor training, or play therapy. Only three types of interventions, however, have received backing in the empirical literature: central nervous system stimulants, behavior modification, and a combination of the two.

Hundreds of studies document the beneficial effects of psychostimulants on the cognitive and behavioral functioning of people with ADHD. The pharmacological interventions suffer, however, from a series of important limitations (Pelham, Wheeler, & Chronis, 1998). In the first place, in spite of their obvious benefits on daily class performance, it has not been demonstrated that stimulants produce long-term changes in the general academic performance of children with ADHD or in specific areas. Along the same lines, although stimulants reduce the disruptive behavior, there is no evidence that they produce changes in the interpersonal relationships that are usually altered in adolescents and adults with ADHD. Furthermore, only between 70% and 80% of the children with ADHD show a positive response to psychostimulants, with important individual differences in the magnitude and topography of the response, so that the medication produces benefits in some aspects of the behavior but not in others. Nor do the existing studies offer evidence that the stimulants improve the long-term ADHD prognosis. As Pelham and Gnaggy (1999) highlighted, "Simply medicating children, without teaching them the skills they need to improve their behavior and performance, is not likely to improve the children's long term prognosis" (p. 226).

Summarizing, pharmacological intervention is not a panacea for treating the complex ADHD symptomatology, so it becomes necessary to look for complementary support in interventions of a psychosocial nature. Given that the appropriate development of the self-control mechanisms occurs in a complex network of social influences, these types of interventions must involve the natural contexts in which the daily life of the child takes place—that is, the home and school.

Numerous studies show that family therapy, individual therapy, and parent training usually produce benefits at home. These approaches, however, rarely help to improve the academic and behavioral functioning in school of children with ADHD. This fact indicates that the changes that occur in one setting do not usually generalize to another setting without intervention. Consequently, the responsibility for improving the identification, assessment, and delivery of appropriate and effective interventions to children and youth with ADHD falls on the school.

SPECIAL EDUCATION NEEDS OF STUDENTS WITH ADHD

The school is a setting where students are required to have skills in the planning, control, coordination, and evaluation of the procedures involved in following the norms, in appropriate interactions with adults and classmates, and in active participation in the teaching/learning process. Therefore, the school constitutes an appropriate context for promoting self-control. At the same time, however, school presents a great challenge to those students who have not achieved sufficient self-regulatory development to respond to the demands it makes.

Research offers abundant documentation on the adverse educational outcomes of students with ADHD. Globally, around 70% of children with ADHD present some type of learning difficulty (Mayes, Calhoun, & Crowell, 2000), and they are 3 to 7 times more likely than other children to receive special education, be expelled or suspended, and repeat a grade (LeFever, Villers, & Morrow, 2002). Furthermore, although the diagnosis of ADHD does not constitute its own separate category of special education, three quarters of the students receiving special education services for behavioral difficulties (Dery, Toupin, Pauze, & Verlaan, 2005), and about a fourth of the children in programs for learning disabilities (LD; Forness & Kavale, 2001), meet the criteria for ADHD.

The academic and behavioral problems of children with ADHD are caused to a large degree by a self-regulation problem, a system that essentially includes three components: an attentional component, an inhibitory component, and a strategic and organizational component (Douglas, 2005). The *attentional component* refers to the effort or “energetic” aspect of the cognitive processing. The *inhibitory component* refers to the processes that control the impulsive or inappropriate responses. Finally, the *strategic component* refers to the “higher order” organizational processes that direct the cognitive processing, among which preparation and planning, working memory, and set-shifting stand out.

Students with ADHD fail at the learning tasks that require adequate levels of attention, inhibition, and active involvement. There are observable signs in the classroom related to failure in attentional effort, such as the number of errors made by students with ADHD on easy items even though they are capable of doing more difficult ones, the increase in errors at the end of performing activities, or the difficulties in finishing assigned tasks. To this situation is added a low motivation toward success: Students with ADHD spend less time studying and put out less effort to achieve educational objectives (O’Neill & Douglas, 1991).

Likewise, the students with ADHD usually fail at performing tasks requiring organizational capabilities due to an ineffective use of the higher order processes: using working memory, working fluently, being alert, and monitoring their work. *Error monitoring*—that is, the ability to detect the error and adjust performance while working—is another higher order organizational process impaired in children with ADHD (Schachar, Chen, & Logan, 2004). These deficits appear to especially affect the children with ADHD who present comorbid LD (Seidman, Biederman, Monuteaux, Doyle, & Faraone, 2001). Finally, the academic performance of students with ADHD is negatively affected by the disturbing behaviors that they frequently manifest in class (being out of their seats, interrupting the teacher during explanations, making inappropriate noises, fidgeting, etc.), which are serious obstacles to the teaching/learning process.

On the other hand, children with ADHD usually also suffer some form of social rejection from their peers. Various factors related to low behavioral inhibition may explain this situation. In the first place, deficits in the self-regulation of affect—a lack of ability to separate the affect or emotional charge from the informational content—produce a low tolerance to frustration, a tendency toward emotional outbursts, an excessive personalization of events, and a less objective approach in evaluating conflictive social situations. Another of the explanatory factors for the low social competence of children with ADHD has to do with a delay in the internalization of language, which is the basis for ac-

quiring the norms that direct behavior and moral development (Barkley, 1997). Furthermore, children with ADHD usually experience problems in the everyday use of communicative language—that is, they do not use it correctly as a cognitive and social tool for transmitting information and habitually resolving conflictive situations in social interactions (Tannock & Schachar, 1996). Finally, children with ADHD in schools exhibit a high rate of disruptive and antisocial behaviors.

INTERVENTIONS FOR STUDENTS WITH ADHD IN SCHOOL SETTINGS

Given the magnitude of the academic and social problems of students with ADHD, and the importance that the school has as the basic context of their development, it becomes essential to define and plan educational services that respond to their special education needs. This is especially true considering that, as a recent study concluded, there is greater parent involvement in the school-based services than in the clinic-based services (Atkins, Graczy, Frazier, & Abdul-Adil, 2003).

Specifically, the purpose of this article is to describe the empirical effectiveness of treatments for children with ADHD delivered in school settings, thus understanding their educational needs from a pedagogical perspective. The studies were found in the Psyc Info and ERIC databases by crossing the terms *Attention Deficit Hyperactivity Disorder*, *Attention Deficit Disorders*, and *ADHD* with other key words related to interventions in the school context: *Classroom Behavior Modification*, *Educational Programs*, *School Based Intervention*, and *Special Education*. The search was limited to the years between 1996 and 2005, given that excellent reviews already exist of studies before 1996 on psychosocial treatments in general (Pelham et al., 1998) and classroom intervention for ADHD in particular (DuPaul & Eckert, 1997).

For the final selection of the 16 studies included in this review, the following criteria were used: (a) empirical studies in which the participants presented a diagnosis of ADHD or behavioral problems related to the typical symptoms of the disorder, (b) studies in which an intervention took place, and (c) studies in which the intervention was carried out in a school context. Given that the articles that met these prior conditions referred to very heterogeneous treatments with regard to their content, we made the decision to organize them into two different categories: simple interventions and interventions with multiple components.

Simple Interventions

The interventions that were included in this category (see Table 1) focused on the application of behavior modification techniques (Fabiano & Pelham, 2003; Northup et al., 1999; Van Lier, Muthen, Van der Sar, & Crijnen, 2004), cognitive-behavioral techniques (Ardoin & Martens, 2004; DuPaul & Hoff, 1998; Mathes & Bender, 1997), or environmental changes that involve modifications in the usual classroom dynamics (Powell & Nelson, 1997; Ridgway, Northup, Pellegrin, LaRue, & Hightsoe, 2003).

TABLE 1
Studies in Which Simple Interventions Were Developed for Students With ADHD

<i>Reference</i>	<i>N</i>	<i>Dependent Variables and Measures</i>	<i>Intervention Contents</i>	<i>Results</i>
Ardoin & Martens (2004)	4 Age: 9–11	Classroom behavior observation. S.E. questionnaire: student's rating of time engaged in disruptive behaviors.	3 conditions: S.E., S.E. + accuracy training, and S.E. + accuracy training + contingencies. Duration: 20 sessions	S.E.; disruptive behavior diminished in one child. S.E. + accuracy training; disruptive behavior diminished in three children.
Du Paul & Hoff (1998)	3 Age: 9	Classroom behavior observation. Teacher rating. Acceptability of treatment.	Token reinforcement/systematic verbal feedback; student S.E. with teacher reinforcement. Duration: NE	Students decreased their level of disruptive behavior in the classroom and recess environment closer to the level of their classroom peers.
Fabiano & Pelham (2003)	1 Age: 8.11	Behavioral observations: disruptive behavior; "on-task" behavior. Consumer satisfaction.	Activity contingent on appropriate behavior; feedback on negative behavior. Duration: 13 days.	Decrease disruptive behavior and increase "on-task" behavior. Teachers highly satisfied with all aspects of the treatment and its outcome.
Mathes & Bender (1997)	3 Age: 8–11	Behavioral observations: "On-task" behavior.	Reinforced S.E. Duration: NE.	Increase "on-task" behavior.
Northup et al. (1999)	4 Age: 7/8	Behavioral observations: inappropriate vocalizations, out of seat, playing with objects, and "off-task" behavior. Number of resolved mathematics problems.	4 conditions: contingent teacher reprimands, nonexclusionary time-out, no interaction, and alone. Medication status (MPH or placebo) was alternated across days. Duration: 9 sessions.	Addition of behavioral consequences may further enhance MPH effects.
Powell & Nelson (1997)	1 Age: 7	Behavioral observations: noncompliance, being away from his desk, disturbing others, staring off, and not doing work.	The student was given a choice of academic assignments. Duration: 20 sessions.	Decrease undesirable behaviors.
Ridgway et al. (2003)	3 Age: 8	Behavioral observations: behaviors, inappropriate vocalizations, out of seat, fidgeting, and playing with objects.	Introduction recess time into the school day: going outdoors onto a typical playground for 10 min. Duration: 3 days.	Levels of inappropriate behavior were substantially higher on days when the participants did not have recess.
Van Lier et al. (2004)	363 1st grade	Problem behaviors at school, ADHD, ODD, and conduct problems.	Good Behavior Game. Duration: 24 months.	Decrease ADHD problems.

Note. ADHD = attention deficit hyperactivity disorder; ODD = oppositional defiant disorder; S.E. = self-evaluation; NE = nonspecified; MPH = methylphenidate.

The two studies (XXXXX, XXXX; XXXXX, XXXX) in which contingency management techniques were applied exclusively to reduce the characteristic problems of ADHD differed in their sample sizes, the diagnostic status of the participants, the duration of the intervention, and the prior training of the teachers. In both cases, however, they basically applied reward procedures that proved to be effective in managing disruptive behaviors in the classroom.

Fabiano and Pelham (2003) used a single-subject design. The intervention was carried out by the teacher in the normal classroom for 2 weeks with a primary school student diagnosed with ADHD who was not receiving stimulants. The training of the teacher was carried out by a consultant, although neither the length of time nor the type of training done is specified. The intervention, which produced a reduction in the disruptive behavior and an increase in the task-focused behavior, included three key elements: (a) provide the student with rewards frequently, (b) provide immediate feedback when the child breaks the rules of the classroom, and (c) withhold the reward when the student breaks each class norm three times.

In the study by Van Lier et al. (2004), the children who participated were in the first grade, but they did not have a clinical diagnosis of ADHD. The teachers received three training sessions on the functioning of the Good Behavior Game, a behavior management program that is based on obtaining rewards for performing appropriate behaviors and following the class norms. To do this, the teachers and students together chose the norms of the class and the rewards for following them, dividing the children into four teams with the same number of disruptive and nondisruptive children. Furthermore, the teachers received supervision by advisors or internal school supervisors throughout the duration of the program. The intervention, which was carried out at the group level and maintained for a prolonged time (24 months), considerably reduced the ADHD-related problems compared to the participants in the control group.

The information provided in the study by Northup et al. (1999) is of great practical interest as it highlights the interactive effects between common classroom contingencies and methylphenidate (MPH) on disruptive and off-task behaviors in children with ADHD. The intervention was performed by graduate and undergraduate students in psychology and education during a summer program with four second- and third-grade students treated individually. A condition was also introduced called "medication versus placebo," which was alternated daily for each student.

The psychosocial intervention consisted of four conditions: (a) contingent teacher reprimands: The teacher gave immediate feedback every time an unacceptable behavior occurred; (b) brief nonexclusory time-out: The child's chair was immediately turned to face away from the desk and all other people and activities, and staff members moved away from the student contingent on the occurrence of a target behavior; (c) no interaction: Staff members always maintained a proximity of approximately 3 m, but ignored all student behavior; and (d) alone: Students were assigned tasks that they did by themselves, without the presence of the teacher. The students presented fewer disruptive behaviors and completed a greater number of mathematics problems in the conditions of time-out and reprimand than in the other conditions and in the medication condition than in the placebo condition. Consequently, the results suggest that, to achieve the most beneficial medication effects, active supervision and monitor-

ing of children's behavior is needed, and the addition of behavioral consequences may further enhance the MPH effects.

In the "Cognitive Behavior Modification" (CBM) approach, students develop self-controlled behavior by means of self-mediated strategies, such as self-instructions, cognitive modeling, problem-solving strategies, self-monitoring, self-evaluation, and self-reinforcement. Paradoxically, although the internalization of self-statements is the basic determinant in the normal development of the regulatory process of behavior, the CBM techniques have not been used very much with participants diagnosed with ADHD. Only three of the studies selected in our review analyzed the efficacy of a cognitive-behavioral approach—specifically, self-evaluation—although this was applied with some different nuances.

In the research by Mathes and Bender (1997), the self-evaluation was carried out individually in the classroom. The teacher also evaluated the students at 10 daily intervals lasting 1 min each. In these observations, the behavior was considered on-task behavior if the student was seated and directing his or her attention toward the right place (chalkboard, teacher, class notebook, or self-evaluation notebook). Any behavior different from those previously named (e.g., looking around, playing with objects, or getting out of his or her seat without permission) was considered off-task behavior. The results indicated that the self-evaluation proved effective for increasing the "task-centered" behavior of the students. Even in the follow-up phase, where the children were told not to self-evaluate themselves and their record book was taken away, the percentage of task-centered tasks continued to be higher than the baseline.

Likewise, the study by DuPaul and Hoff (1998) suggests that self-management, and specifically self-evaluation, is a viable alternative to the traditional contingency management approach for decreasing the disruptive behavior of students in elementary school exhibiting ADHD behaviors. The three students who participated in this study were trained by their teachers in the use of self-evaluation according to the following stages: teacher evaluation, matching training, and systematic fading. Due to this three-stage sequence in the intervention, however, the decrease in the level of disturbing behaviors with self-evaluation cannot be attributed to the self-management procedure alone. Furthermore, the behaviors of the participants were first brought under control through an externally managed token economy system and later transferred to the control of the students themselves. As we concluded, however, the results are promising because the students maintained the changes in the absence of teacher feedback, with the gains observed across both structured and unstructured environments. At any rate, it has yet to be seen whether students can continue to use self-management effectively for long periods of time, as DuPaul and Hoff did not collect follow-up data for disruptive behavior, nor did they evaluate the effectiveness of self-management alone for an extended period of time.

Additional information about the self-evaluation approach comes from the study by Ardoin and Martens (2004), whose objective was to examine the accuracy and sensitivity of students' ratings before and after training, as well as the effects of accuracy training on performance. In their study, the participants were four students between the ages of 9 and 11 who exhibited behaviors consistent with ADHD. Although none of the students accurately rated his or her behavior prior to training, all of them met the criteria of two consecutive matches of their target behaviors, which suggests that accuracy training can be

effective. Furthermore, self-evaluation alone decreased disruptive behavior for only one student, whereas self-evaluation plus accuracy training decreased the disruptive behavior of all four students. The importance of the accuracy training becomes even clearer due to the fact that once this training was withdrawn, the level of disruptive behavior increased for three of the four students.

The introduction of modifications into certain conditions of the normal school dynamic has also been shown to result in an improvement in typical hyperactive behaviors in students with ADHD in primary school. Specifically, the study by Ridgway et al. (2003) showed that the existence of a rest period or recess during the school morning significantly reduced behaviors that were “off task,” such as inappropriate verbalizations, getting out of one’s seat, being disobedient, and playing with objects, compared to when this rest period was eliminated. In their study, Powell and Nelson (1997) demonstrated that allowing the student to choose between performing three different tasks that made up part of the academic curriculum, rather than not letting him choose, reduced inappropriate behaviors like disobedience, getting out of his seat, bothering others, and not working.

Interventions With Multiple Components

In the studies included in this category (see Table 2), behavioral or cognitive-behavioral techniques were combined with other types of psychological interventions, such as counseling sessions, training in social skills, or training in study skills (Anhalt, McNeil, & Bahl, 1998; Arco, Fernández, & Hinojo, 2004; Barkley et al., 2000; Evans, Axelrod, & Langberg, 2004; Hoza, Mrug, Pelham, Greiner, & Gnagy, 2003; Miranda & Presentación, 2000; Miranda, Presentación, & Soriano, 2002; Shelton et al., 2000). The eight articles reviewed refer to seven different programs, as the study by Barkley et al. deals with the same treatment and the same participants as the one by Shelton et al., except that in the latter study, results obtained 2 years after the intervention are presented.

General characteristics of the studies. The sample sizes in the studies on complex interventions range from 1 (Anhalt et al., 1998) to 209 (Hoza et al., 2003). Two samples could be considered “large-scale” interventions due to the number of participants in the samples (Barkley et al., 2000; Hoza et al., 2003), and three others included an acceptable number of participants (Arco et al., 2004; Miranda & Presentación, 2000; Miranda et al., 2002). There was only one study that used fewer than 10 participants (Evans et al., 2004) and another where a one-case design was used (Anhalt et al., 1998).

The settings for the interventions were heterogeneous. In general, the programs were developed in either ordinary classrooms (Anhalt et al., 1998; Barkley et al., 2000; Miranda et al., 2002) or support classrooms where the students met with the primary counselor (Evans et al., 2004). Some interventions took place in the school setting, but after normal school hours (Miranda & Presentación, 2000), or in a summer camp (Hoza et al., 2003).

There was also considerable variation as far as the duration of the treatments was concerned. The majority of the programs had a moderate length, lasting between 16 and 30

TABLE 2
Studies in Which Multiple Component Interventions Were Developed for Students With ADHD

<i>Reference</i>	<i>N</i>	<i>Dependent Variables and Measures</i>	<i>Intervention Contents</i>	<i>Results</i>
Anhalt et al. (1998)	1 Age: 6	Classroom behavior observation. Behavioral rating.	ADHD classroom kit. Duration: 8 days.	Classroom behavior: improvement of "on-task" and appropriate behavior; decrease in hyperactive behavior.
Arco et al. (2000)	23 Age: 8.7	Neuropsychological tests. Behavioral rating.	Cognitive-behavioral techniques, interpersonal problem-solving training, reflexivity-impulsivity training, tutorial for parents and teachers. Duration: 30 sessions 45 min 4 months.	Neuropsychological tests: improvement on MFF20, and arithmetic and coding WISC subtests. Behavior ratings: improvement in parent and teacher ratings.
Barkley et al. (2000); Shelton et al. (2000)	158 Age: 4.8	Clinical diagnostic interview, parent ratings of child behavior, teacher rating of child behavior, psychological testing, clinic and classroom behavioral observations.	Behavior modification techniques, self-control training, social skills training, anger control training, daily school report card. Duration: 9 months (complete school year).	Classroom intervention children showed improvement in adaptive functioning, behavior, aggression, attention, and externalizing problems. Two-year posttreatment follow-up results (Shelton et al., 2000) indicated no differences between the treated and untreated groups.
Evans et al. (2000)	7 Age: 12	Parent and teacher behavior ratings. School grades.	Challenging Horizons Program.	ADHD rating scale: improvement in all teacher ratings and in parent ratings of inattention. Academic functioning and classroom behavior: improvements in the large effect size range.

(continued)

TABLE 2 (Continued)

<i>Reference</i>	<i>N</i>	<i>Dependent Variables and Measures</i>	<i>Intervention Contents</i>	<i>Results</i>
Hoza et al. (2003)	209 Age: 8.98	Ratings of improvement and normalization during the treatment. Quality of buddy relationship: ratings of parents and teachers.	Behavioral point system, Peer-oriented interventions, sports skills training, academic remediation, dyadic peer intervention. Duration: 8 weeks.	Improvement and normalization was related to quality of buddy relationships.
Miranda & Presentación (2000)	32 Age: 9.7	Parent and teacher ratings of child behavior. School performance.	2 conditions: "Stop and Think program"; "Stop and Think program" + Anger control technique. Duration: 22 sessions 1 hr 3 months.	Both interventions produced improvements in children's behaviors. Results were maintained 2 months after treatment.
Miranda et al. (2002)	29 Age: 8.6	Neuropsychological tests, parent and teacher ratings, classroom behavioral observation, school performance.	Behavior modification and cognitive-behavioral techniques; instructional management strategies. Duration: NE.	Significant improvement of children's behavior at home and in the classroom setting. Improvement in performance on neuropsychological tests was small.

Note. NE = nonspecified; ADHD = attention deficit hyperactivity disorder; MFF20 = Matching Familiar Figure Test; WISC = Weschler Intelligence Scale for Children.

sessions (Anhalt et al., 1998; Arco et al., 2004; Miranda & Presentación, 2000), although others lasted an entire school year (Barkley et al., 2000) or were of an intensive nature, as they took place at a summer camp (Hoza et al., 2003).

In half of the studies, the authors described the procedure used to train the teachers and who was responsible for doing so. In one case (Barkley et al., 2000), a teacher who was an expert in the program techniques and an educational psychologist who was an expert in early intervention trained the teachers and provided support for the teachers carrying out the intervention. In another study (Miranda et al., 2002), there were training sessions for regular classroom teachers on general knowledge about ADHD, behavior modification procedures, instructional management procedures, and cognitive-behavioral techniques (self-instruction and reinforced self-evaluation). In addition to the previously mentioned contents, the teachers who participated in another study (Arco et al., 2004) attended sessions on methods for solving interpersonal problems, reflexive-impulsive cognitive style, and social-skill training. In yet another study (Anhalt et al., 1998), the teacher, in addition to receiving theoretical training on consequences for appropriate behavior, consequences for inappropriate behavior, and peer-mediated interventions, was involved in 2-hr didactic sessions devoted to an interactive explanation, discussion, and role play of the techniques. Finally, in vivo coaching took place in the classroom.

Contents of the interventions. The majority of the interventions were based on a combination of several of the following procedures: token economy, extinction, response cost and time out, self-instructions, reinforced self-evaluation, training in social abilities, assessment for parents and teachers, and training in study skills or instructional management procedures. Token economy was used in four interventions as one component within a broad range of techniques (Barkley et al., 2000; Hoza et al., 2003; Miranda & Presentación, 2000; Miranda et al., 2002). In another program—the ADHD Classroom Kit—however, a token economy represented the basic nucleus of the treatment (Anhalt et al., 1998). Specifically, the Rewards Target Game in the Kit consists of the children receiving “happy faces” for following the class rules and the teacher’s instructions, whereas they receive “sad faces” when they present disruptive behaviors. Several times a day, the students who had accumulated more happy faces than sad exchanged them for one of the possible rewards, such as playing games, acting silly, and obtaining tangible rewards. In other studies, in addition to the token economy, the teachers applied classic punishment procedures, such as response cost and time out, with the objective of reducing or eliminating students’ inappropriate behaviors (Barkley et al., 2000; Miranda & Presentación, 2000; Miranda et al., 2002).

Together with the behavior modification procedures, CBM techniques—self-instructions, reinforced self-evaluation, and anger control—were frequent components of the school-based programs for treating ADHD. The purpose of the self-instructions was to teach the students to regulate their behavior by learning a series of instructions that they memorized, internalized, and applied to different school tasks (Arco et al., 2004; Barkley et al., 2000; Miranda & Presentación, 2000; Miranda et al., 2002). With the reinforced self-evaluation, the students learned to self-evaluate their behavior according to previ-

ously established guidelines, and they received a reward if they filled out the self-evaluation correctly (Arco et al., 2004; Miranda et al., 2002). Some treatment programs instructed the participants in identifying signs of anger and using relaxation techniques and self-instructions, techniques directed toward controlling their own behavior (Barkley et al., 2000; Miranda & Presentación, 2000).

Social-skill training was generally based on the teaching and behavioral practice through role playing of a wide range of skills, such as asking questions, listening, cooperating, complimenting, and so forth (Arco et al., 2004; Barkley et al., 2000; Evans et al., 2004). A different procedure was used in the ADHD Classroom Kit. The children had to perform some activities following the cooperative learning methodology, which provided them with opportunities to practice social skills daily in the classroom (Anhalt et al., 1998). Another approach was based on a buddy system, a dyadic peer intervention in which each of the children was paired with a buddy according to his or her sociometric preferences and other factors like coincidences in academic or sports interests, which encouraged them to cooperate and develop ties of friendship (Hoza et al., 2003). There are even studies in which sports activities were programmed so the students could use the social skills that they had learned in an enjoyable and less structured context (Evans et al., 2004; Hoza et al., 2003).

In the studies in our review, little attention was paid to teaching the students study skills like note taking, written expression techniques, strategies for being organized in their school work, and so forth (Evans et al., 2004; Hoza et al., 2003). Nor was much importance given to advising the teachers on the most appropriate instructional management procedures for students with ADHD. In one isolated case (Miranda et al., 2002), however, the teachers received specific instructions about possible modifications and adaptations to be made with regard to patterns for rearranging the physical space, the presentation of explanations, and the use of instructions and feedback in the performance of tasks and examinations.

Finally, parent training was included in some of the studies reviewed, although the contents and duration of this training varied. In one study, the parent training sessions in contingency management techniques (Barkley et al., 2000) consisted of (a) the causes of defiant behavior, (b) positive attending skills and praising, (c) attending to child compliance and improving parental command effectiveness, (d) rewarding children for non-disruptive behavior, (e) setting up a home token system, (f) time out and response cost, and (g) managing children in public places with think-aloud think-ahead strategies. The range of parent training techniques was greater in the studies in which, in addition to behavioral techniques, sessions were programmed that provided training in cognitive-behavioral techniques, social skills, and problem solving (Arco et al., 2004). In another case, the training and participation of the parents was carried out at a monthly meeting where topics of interest for families were discussed: homework management, supporting positive peer relationships, and medication (Evans et al., 2004).

Evaluation of the results of the studies. In general, all of the interventions showed positive results, with improvements found in the majority of the dependent variables evaluated, regardless of the way that the evaluation was carried out or its

content: cognitive tests, behavioral observations, academic performance, and behavioral estimations by parents and teachers. Due to the characteristics of programs with multiple components, and the fact that none of the studies included in its objectives the analysis of the efficacy of its different components, however, it is not possible to determine which specific techniques produced the improvements that occurred in the interventions.

The results of different parent standardized rating scales indicate that the parents perceived that, after the intervention, the children with ADHD showed fewer problematic behavior, inattention, and hyperactivity/impulsivity symptoms, and they had significantly higher levels of adaptive functioning than those who had not received the treatment. On teacher ratings of child behavior, the children receiving classroom interventions also showed significantly fewer behavioral problems and lower scores on aggression and attention problems than did those children who were not receiving the intervention (Anhalt et al., 1998; Arco et al., 2004; Barkley et al., 2000; Evans et al., 2004; Miranda & Presentación, 2000; Miranda et al., 2002; Shelton et al., 2000).

In contrast with the use of behavioral rating scales, there were few studies that included tests of cognitive processes to evaluate the efficacy of the intervention. But the two studies in which a battery of this type of measure was used pointed out that, in the posttreatment evaluation, the students with ADHD improved their scores on various tests of attention, impulsivity, and planning (Arco et al., 2004; Miranda et al., 2002).

Nevertheless, the most significant information on the efficacy of the interventions was offered by those variables that have a high ecological value due to their importance in daily life functioning and in long-term adaptation (school grades or observations of academic performance or behavior). In the Challenging Horizons Program, a school-based mental health program for students with ADHD, significant improvements were obtained on the grades of the children who participated (Evans et al., 2004). Along the same lines, in another study in which the teachers were trained in instructional management procedures for children with ADHD in addition to behavioral and cognitive techniques, significant improvements occurred in the students' grades in language, mathematics, and natural sciences (Miranda et al., 2002).

Likewise, the behavioral observations point to substantial benefits of the school-based programs, as either an increase in the appropriate behaviors and behaviors focused on the task (Anhalt et al., 1998), or a decrease in disturbing behaviors like bothering classmates, getting up, or acting aggressively (Miranda et al., 2002), or significant improvements on the subscale of outward behavioral problems evaluated by the Children's Behavior Checklist-Direct Observation Form (Barkley et al., 2000).

One extremely interesting question has to do with the possible generalization over time of the improvements obtained in the intervention programs. Unfortunately, not many studies have included a follow-up evaluation, but the few results available highlight the need to maintain the treatments for a prolonged period of time, possibly due to the chronic nature of the disorder. Thus, when the follow-up evaluation was carried out a short time after the initial evaluation (2 months), the results remained at the same levels of improvement as on the posttreatment evaluation (Miranda & Presentación, 2000; Miranda et al., 2002). In contrast, when the follow-up evaluation was made 2 years after

the intervention, no difference was observed between the students who had received the treatment and those who had not on the parent and teacher ratings of child behavior or on the measures of parenting competence and stress (Shelton et al., 2000).

THE ROLE OF PSYCHOSOCIAL INTERVENTIONS IN THE PHARMACOLOGICAL TREATMENT OF ADHD

The Multimodal Study of Children with Attention-Deficit/Hyperactivity Disorder (The MTA Cooperative Group, 1999) is the largest mental health treatment study of children. In it, 579 children with combined subtype ADHD participated, aged between 7–10 and 9–9 years, who were randomly assigned to one of the following treatment conditions for 14 months: medical management (MM), behavioral treatment (BT), combined MM and BT, and routine community care control group (CG).

BT consisted of training parents in behavior modification techniques, a school-based intervention, and a summer treatment program. The parent training consisted of eight sessions for each family once a week. The 8-week summer intensive program was carried out by counselors advised by the therapists in charge of training the parents and advising the teachers. The behavioral interventions took place in groups in recreational settings, and they included a system of token economy, time-out, social reinforcement, modeling, and training in problem solving and social and sports skills. Finally, the school-based intervention included 10 sessions where the teacher was trained in strategies to manage contingencies in the classroom, as well as 12 weeks of work with the child by a paraprofessional trained in behavioral techniques. Furthermore, throughout the school year, the teachers filled out a daily report on the child's progress on previously selected behaviors. The child took this report home, and the parents reinforced the positive behaviors with rewards.

MM began with a test of MPH for 28 days using 5 dosages: 5 mg, 10 mg, 15 mg, or 20 mg, and higher dosages for children who weighed more than 25 kg. The doctors collected information from the teachers on the responses of the children to the different dosages, selecting the most appropriate dosage for each case. For the participants who did not respond positively to the MPH, other medications were tried until the right one was found. In addition, in the monthly medical visits, the dosages of medication were adjusted for each child, and they were only reduced when there were adverse secondary effects.

Combined treatment included both BT and MM, but in this treatment modality the participants received lower dosages of MPH than the participants assigned to the medication-only condition. Finally, in the routine community care treatment (CG), the participants received community care. Specifically, 108 children received medication for 14 months—generally MPH—which was administered twice a day in most cases. The rest of the children received psychotherapeutic treatments.

The analyses showed the superiority of the MM, compared to the BT and CG, in improving the symptoms of ADHD. The CT proved more effective than the BT in reducing inattention, according to the estimations of the parents and teachers. It also reduced parent estimations of hyperactivity–impulsivity, oppositional behaviors, and internalized

symptoms, and improved reading scores. Likewise, CT proved superior to CG in five functioning domains: aggressive/oppositional behaviors estimated by parents, internalized symptoms and social skills according to information from teachers, parent–child relations, and reading performance. Finally, both the MM and the BT proved significantly more effective than the CG at improving social skills and parent–child interactions, respectively.

Although the CT did not increase the benefits of the MM in improving ADHD symptoms, we refined this global conclusion. Analyzing the number of times that each treatment held first place for its efficacy on 19 dependent variables, we found that the CT appeared in first place 12 times, the MM four times, the BT twice, and the community intervention only once. This panoramic view offers a much more positive vision of the possibilities of the combined treatments. In addition, it should be pointed out that the therapeutic effects attributed to the CT were achieved using lower dosages of medication than those used in the MM.

Later, Swanson et al. (2001) applied complementary methodological approaches to the first analyses carried out in the MTA study. The results of these secondary analyses corroborated the initial findings obtained. Thus, the highest percentage of improvement occurred in the children who received the CT (68%), followed by the MM (56%), the BT (34%), and the routine community care (25%). Consequently, the CT was about 12% more successful than the MM. This is important, considering that the children who followed CT received lower dosages of medication than the children assigned to MM.

CONCLUSIONS AND GUIDELINES FOR THE FUTURE

The review of studies on interventions in classroom settings with children with ADHD shows their effectiveness in controlling the main symptoms of the disorder, as well as other problems commonly associated with it (e.g., disruptive behaviors in the classroom or off-task behaviors). Various arguments support the practical value of these findings. In the first place, it is important to note that the interventions in classroom settings involve strategies that can be used with success in a real-world setting—the school. It is also true that up to 30% of children treated with medication respond negatively to this kind of intervention and that parents often prefer treatments that include psychosocial intervention to medication alone (Pelham et al., 1999). Finally, but not less important, is the fact that providing routine community care for children with ADHD does not adequately address their educational needs (LeFever et al., 2002); therefore, it is necessary to carry out more specific educational actions.

The generalizability of the findings is limited to a certain extent by the age of the samples, as the majority of the studies that support the effectiveness of school-based programs were carried out with students from primary school or, in some cases, with children from kindergarten. Therefore, our review does not provide information about whether adolescents with ADHD would have an equally positive response to these types of school-based programs or whether their situation would be better dealt with by using other types of approaches (e.g., systemic therapy or psychotherapy). On the other hand, it is true that, in the last decade, the studies on school-based treatments for ADHD have adequately used the

scores on parent and teacher rating scales or the diagnostic criteria from the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev.; XXXXX, XXXX) or the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; XXXXX, XXXX) for the selection of participants. As comorbidity was generally not controlled for (behavior disorders, learning disabilities, anxiety, etc.), however, these studies cannot provide information about the mediator role that the presence of comorbid conditions can play in the response of children with ADHD to school-based interventions.

Further research in this area should attempt to identify those personal characteristics, such as age or comorbid conditions, that have a modulating effect on the efficacy of the school-based programs directed toward children with ADHD. It would also be necessary to delve more deeply into the possible influence that certain factors, such as the structure of the programs and their duration, or other environmental variables, such as the application setting (support classroom or ordinary classroom), have on the results.

Our review shows that self-evaluation decreases the disruptive behavior of students exhibiting behaviors of ADHD. It also shows the effectiveness of multicomponent BT packages where training has been included on self-instruction, problem solving, and social skills. Although none of the studies analyzed had the objective of determining how self-management techniques increase the value of BTs, it seems plausible that they might aid in the maintenance and generalization of the results of the intensive behavioral programs.

Other issues open to future investigation would be to demonstrate the generalization effects over time of the interventions in school settings and carry out research on how to maintain the effects over time. As occurs with stimulants, there is no evidence of the long-term effectiveness of the interventions in school settings for children with ADHD. On the contrary, only one study among those reviewed did a follow-up evaluation 2 years after ending the intervention program, and it did not provide positive results (Shelton et al., 2000). Given the chronicity of the disorder, the programs in classroom settings, just like the pharmacological interventions, will probably have to be maintained over a long period of time before they can be eliminated completely.

Finally, the findings of the multimodal studies support the guidelines of the American Academy of Pediatrics, which emphasizes the benefits of psychosocial interventions in conjunction with pharmacological interventions to improve functional outcomes of children with ADHD (American Academy of Pediatrics, 2000). This type of action obviously requires a regular and intensive collaboration between the health services and the schools. Consequently, teachers and other school professionals will need to work with clinics to develop adequate communication strategies for ensuring the success of the medical/educational management plan. In this sense, it is necessary to be realistic and keep in mind factors like the acceptability of the treatments. Furthermore, the teachers will need enough training to be able to put complicated intervention strategies into practice, and without ongoing support, they will probably not continue with the intervention over time.

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