

**MEDICATION AND SCHOOL INTERVENTIONS FOR ELEMENTARY  
STUDENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER**

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*Attention Deficit Hyperactivity disorder (ADHD) affects increasing numbers of children in every country around the world. Children who are diagnosed with ADHD are constantly having difficulties in the classroom environment. There are various medication therapies and evidence based procedures (EBP) which teachers can employ to further assist children with ADHD. The purpose of this manuscript was to provide an up-to-date review and analysis of the various medications used to reduce ADHD symptoms. In addition was examined the various behavioral interventions for the classroom. This was done to provide classroom personnel with a set of procedures that can assist them in their work with their students with ADHD.*

ADHD is widely discussed in today's professional and lay literature. *The Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1994) defines the essential feature of ADHD as *a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development.* ADHD is currently seen as a neurobiological, developmental disability, and it has been suggested that ADHD may be (Fowler, 1992).

According to the *Diagnostic and Statistical Manual of Mental Disorders*, estimates of the prevalence of ADHD range from 3% to 5% of the school-aged population. Boys diagnosed as having ADHD outnumber girls by from 4:1 to as much as 9:1, depending on the setting, although there is some evidence that many girls with ADHD are simply never diagnosed (McKinney, Montague, & Hocutt, 1993). The disorder appears more often in first-degree biological relatives of children with ADHD (American Psychiatric Association, 1994). Symptoms of ADHD typically appear around the age of two or three but may not be recognized formally until the child enters a classroom setting (Johnston,

1991). ADHD occurs across all socioeconomic, cultural, and racial backgrounds and affects individuals of all intelligence levels (Fowler, 1992).

The characteristics of students diagnosed with ADHD include a variety of behaviors that can be categorized into three areas: distractibility, impulsivity, and hyperactivity (Barkley, 1998). According to Faison and Barniskis (1993), symptoms of distractibility include difficulty following directions, often losing things, difficulty in sustaining attention, and not seeming to listen. Symptoms of impulsivity include having difficulty awaiting turns, blurting out answers, and shifting from one uncompleted activity to another. Hyperactivity is frequently characterized by excessive fidgeting, difficulty remaining seated, difficulty playing quietly, and excessive talking. Some, but not all, children with ADHD exhibit characteristics such as noncompliance, contingency-governed traits (problems with self-management of their behavior), academic deficits, and social skills deficits (Utah State Office of Education, 1993).

Assessing and treating children with ADHD has been a persistent and often controversial challenge. Schools are encouraged to recognize the heterogeneity of the ADHD syndrome, to provide comprehensive diagnosis in cooperation with medical and other professionals, and to devise individually appropriate combinations of remedial education, medication, behavior modification, and support (DeSilver, 1992). It is important for educators to begin focusing on implementing successful interventions in their classrooms. This paper will discuss some of the current approaches to helping children affected by ADHD perform some of the basic tasks that will enable them to become more successful learners in the classroom setting.

### *Stimulant Medications*

Several million children are being treated with Central Nervous System (CNS) stimulant medications due to the fact that they have ADHD and suffer from inattention, hyperactivity, or impulsivity. The most common CNS stimulants include: Ritalin (methylphenidate), Dexedrine (dextroamphetamine), Adderall (amphetamine), and Cylert (pemoline). The use of such medication for the management of child behavior has generated some concern in the public's eye. Very young children should not typically receive stimulant medication as a treatment of first choice given the lower probability of a positive response (< 65%) and a higher incidence of side effects relative to older children (Barkley, 1998). However, stimulant medications are effective and safe treatments for the systematic management of individuals with ADHD (Barkley, 1998).

Central Nervous System (CNS) stimulants are one of the best-studied treatment applied to ADHD and are among the safest and most effective symptomatic treatments in medicine (Barkley, 1998). Most children who receive stimulants show improvement in their attention, impulse control, task-irrelevant activity, academic productivity and accuracy, handwriting, play, social conduct, and/or compliance to commands and rules (Barkley, 1998). Overall, stimulant medication has shown positive improvements in lives of ADHD children.

*Ritalin*

One of the most commonly employed, the one most frequently tried first, and generally considered the safest stimulants is methylphenidate or Ritalin. Ritalin has been used to treat ADHD since 1956. Typically, Ritalin is the medication of first choice because of its greater documentation in research, proven efficacy across a wide age range, and greater dose-response information, according to Barkley (1998). According to Copland (1994), approximately 70-80% of those diagnosed with ADHD find it effective in reducing their symptoms.

Ritalin is a mild central nervous system stimulant that impedes the transmission of impulses important for attention, concentration, impulse control, and appropriate activity level (Copland, 1994). With Ritalin the usual practice is to start a child at a low dose, 2.5 to 5 mg given once or twice daily. It is available in a short-acting and long-acting (time release) tablets. The typical half life of Ritalin ranges from approximately three to five hours. For time-released Ritalin, its effects range from seven to ten hours. Ritalin comes in both tablet and liquid form and is fairly inexpensive.

Ritalin has been shown to improve the life of a child with ADHD. For example, Weiss (1975), found, in a five-year-follow-up study, that Ritalin made ADHD more manageable both at school and at home. Ritalin has been shown to decrease motor activity, impulsivity, and disruptive behavior, increase attention, improve socialization, increase work completion and accuracy, and improve test scores (Teeter, 1998)

The effectiveness of Ritalin is apparent; however there is still a chance that side-effects may occur when taking the medication. Not every child will experience any or every side-effect, but Ritalin should still be taken with caution. Some side-effects that an ADHD child may experience while taking Ritalin are: insomnia, appetite loss, nausea, vomiting, abdominal pains, thirst, headaches, irritability, moodiness, and growth suppression. In addition, time released Ritalin appears to be less effective than regular Ritalin (Barkley, 1998).

*Dexedrine*

Dexedrine, another popular stimulant medication, has been used with ADHD kids since 1937 and is not used much lately as it once was. Despite its effectiveness, Dexedrine is used much less than Ritalin. Estimates suggest that 4% to 6% of those on stimulant medication for attention disorders are taking this medication (Safer & Krager, 1988; Virginia DOE, 1990).

Dexedrine is typically given in doses about half those of Ritalin because of the greater potency of the former compound. Dexedrine comes in both tablet and liquid form and like Ritalin is quite inexpensive.

Most clinicians and researchers support the use of behavioral interventions in the early years when possible. However, when they are not effective, the use of Dexedrine has been found quite helpful (Speltz et al., 1988). Dexedrine has been shown to benefit the

life of a child with ADHD. It's effectiveness is similar to Ritalin in that it has been shown to decrease motor activity, impulsivity, and disruptive behavior, increase attention, improve socialization, increase work completion and accuracy, and improve test scores (Teeter, 1998). However, Dexedrine has also been shown to subdue emotional responses, increase reflexivity and ability to monitor the self, increase interest level, and improve school performance (Teeter, 1998).

As with Ritalin there are side-effects that may occur when taking this medication, however not every child will experience all or any of these symptoms. Some side-effects that an ADHD child may experience on include are: insomnia, appetite loss, nausea, vomiting, abdominal pains, thirst, headaches, irritability, moodiness, and growth suppression.

#### *Adderall XR*

A new stimulant, Adderall XR (a combination of amphetamine and dextroamphetamine) has recently been approved for use with children and adults with ADHD (Barkley, 1998). It is believed that medications like Adderall XR may help restore a chemical balance in the areas of the brain that control our ability to focus and pay attention to tasks.

The Adderall XR capsule contains two types of beads containing the same medication and is designed to work effectively in a convenient, single morning dose. One type of bead releases medication right after Adderall XR is taken and the other type of bead releases additional medication beginning about 4 hours later. The extended-release dosing of medication can make taking ADHD medication more convenient for patients, since in-school or after school dosing is not required.

Adderall XR is a once a day treatment for attention-deficit/hyperactivity disorder. Adderall XR capsules contain a mixture of different amphetamine salts. Amphetamines are central nervous system stimulants. Adderall has been shown to significantly improve the three main symptoms of ADHD: inattention, hyperactivity, and impulsivity by taking a single morning dose. It has been shown to decrease distractibility, improve attention span, and increase the ability to follow directions and finish tasks. Adderall XR improves the ability to think before acting (decreases impulsivity) and decreases hyperactivity.

#### *Cylert*

Pemoline, also known as Cylert, is a new drug on the market and has been used a great deal since 1975. Cylert's introduction into the U.S. was greeted with much enthusiasm, for it was the first stimulant to hold promise of round-the-clock control of symptoms. However, due to both side effects and its lack of the degree of positive benefit achieved with Ritalin and Dexedrine make it the third or fourth choice medication (Copeland, 1994).

Cylert is a central nervous system stimulant, which is structurally unlike Dexedrine and Ritalin. It has a pharmacological activity similar to that of the other stimulants but has little effect on the autonomic nervous system. Researchers believe that Cylert is superior

to Dexedrine and Ritalin for some learning tasks (Stevenson, Pelham, & Skinner, 1984) and is a better medication for a few children (Dykman et al., 1976).

Cylert was formulated to be administered only once a day, with a half-life of seven to eight hours. This white, tasteless, odorless powder is rapidly absorbed from the gastrointestinal tract and most commonly achieves peak plasma levels within two to three hours. It is important to note that Cylert has not been approved for use in children under the age of six years old.

Despite being the medication of choice for a few patients, the lack of equivalent effectiveness for most ADHD children, the possibility of liver damage, and the necessity of frequent blood tests are significant disadvantages for Cylert and have rendered it relatively unpopular. As with the other stimulant medications Cylert has side-effects that could affect a child taking the medication. Some side-effects that an ADHD child may experience while taking Cylert are: insomnia, appetite loss, nausea, vomiting, abdominal pains, thirst, headaches, irritability, moodiness, and growth suppression.

#### *Evidence-Based Behavioral Intervention and Teaching Strategies*

Many school professionals are in need of effective strategies for enhancing academic performance and managing behavior for students with Attention Deficit Hyperactivity Disorder (ADHD). Current research has shown behavioral interventions effective in reducing ADHD symptoms (DuPaul & Eckert, 1997). Some of the various behavioral and teaching strategies that have been shown to be effective with children and adolescents with ADHD follow.

#### *Token Economies and Response Cost Systems*

Token economies and response cost systems have been effective in improving many aspects of classroom behavior for ADHD students (Ganzell, Newby, & Robinson, 1981). The token economy/response cost system of reinforcement involves awarding or removing tokens or points contingent upon behavior.

There are three basic types of token programs. The first is based on a reward program, in which the desired behavior is reinforced with the presentation of tokens that can be exchanged for consequences such as activities or prizes. A second type of program, response cost, involves the removal of tokens and loss of consequences when the desired behavior occurs (Iwata & Bailey, 1972; Sullivan & O'Leary, 1990). The third type of program is a combination of the first two programs where tokens are provided for appropriate behavior and removed for behaviors that need to be reduced (McLaughlin, 1981).

The key to the token economy system is to discover what is reinforcing to each particular group of students. This can be done by asking the student what he or she prefers to earn, or through watching their everyday behavior and discovering what reinforcers that child will work for. When working with ADHD students, teachers must remember to change

the reinforcers or rewards frequently. Reinforcers tend to lose their reinforcing value more quickly with ADHD students than *normal* students (Barkley, 1990).

Response cost programs that are built into reinforcement systems are highly effective for reducing off-task behaviors, incomplete work assignments, and inattention (Fiore, Becker, & Nero, 1993). Studies have consistently found that positive reinforcers alone do not produce consistent behavioral changes in children with ADHD (Abramowitz et al., 1987; Pfiffner & O'Leary, 1987; Pfiffner et al., 1985; Rosen et al., 1984). Barkley (1989) also states that when treating children with ADHD, response cost, or loss of privileges, with token reinforcement is more effective than reinforcement alone.

### *Daily Report Card Systems*

Daily report cards are a great way to provide a reinforcer to the child as well as sustaining good relations with the child's parents. A Daily Report Card system is a contingency arrangement between a child, parents, and teacher (McLaughlin, Williams, & Howard, 2003). The use of the daily report card system is a successful method for altering classroom academic and social behavior (Atkson & Forehand, 1979; Smith, Williams, & McLaughlin, 1983). The daily report card system can be useful for improving talk-outs, out-of-seat, on-task behavior and class work performance and completion.

Daily report cards are individualized for each student and contain a list of target behaviors that the child should meet. The target behaviors show both academic and behavioral progress. It is best to start with only a few target behaviors and then add others as the child becomes acquainted with the process and expectations of the daily report card system. ADHD students often have trouble bringing home assignments, completing work, and then returning the completed work to school the following day (Barkley, 1990), so in addition home-work related activities can also be included.

Interaction between the teacher, student, and parent is essential in the daily report card system. The student is given a report card to give to their parents when they return home from school. This report card contains information on the child's target behaviors for that day. It is crucial that the parents understand the format of the daily report card and what the target behaviors are that the child is trying to meet. Once the parents have received the daily report card, *consequences are delivered by the parents to the child contingent upon receiving the card indicating the specific, desirable behaviors have occurred*" (McLaughlin & Webb, 1985).

Whether or not a consistent translation of teacher reports into consequences at the child's home has been established, is dependent on the success of the program. The parents need to be consistent with consequences in the home in order for the daily report card system to be effective. Parents may want to set up their own token economy at home, to establish set reinforcers for the child. In order for this system to be effective, parents must be active in communicating with the school, and be willing to devote some time working with their child.

### *Cognitive Behavioral Training System*

Cognitive behavioral training is a type of intervention that teaches the ADHD child to regulate their own behavior. In this approach, self-monitoring skills are emphasized in order to teach children self-control (Fraser, 1992). According to Kendall, 1993, cognitive difficulties of ADHD children can be traced to their inability to *stop, look, and listen*. Students involved with behavior and cognitive interventions should be taught problem solving skills as problem identification, alternative thinking, consequential thinking, and means-ends thinking (Landau & Moore, 1991). The ultimate goal of cognitive behavioral training is to teach the ADHD child to identify a problem, select a strategy, and think about the consequences of their actions. This therapy ultimately seeks to replace the child's impulsivity and replace it with a logical thought process.

This strategy simply takes the covert sequence that most people go through in completing a task or interaction and makes it overt for students who have difficulty (McLaughlin et al. 2003). According to McLaughlin, Williams, & Howard, 2003, there are six steps to self-instruction: Model a classroom task while repeating aloud the steps you are taking to complete the task, have students complete the task while you verbalize aloud, have students complete the task while they verbalize, have students complete the task while whispering, have students complete the task while making lip movements, and have each student complete the task while thinking about the steps in task. Following these six steps will lead the ADHD child to be successful in overtly completing a task or interaction.

### *Positive and Negative Reinforcement*

Research has shown that, when used in isolation, praise and teacher attention does not produce systematic and consistent change in the classroom behavior of children with ADHD (DuPaul, Guevremont, & Barkley, 1991). Rosen (1994), found that removal of positive reinforcers, such as teacher praise, approval, or other privileges, did not improve children's behavior unless negative consequences, such as loss of privileges, were also employed as part of the plan.

It is still important that teacher's use positive reinforcement such as teacher praise and attention when working with children with ADHD. However, the use of negative consequences may be essential for behavioral change in children with ADHD. It should be noted that caution is necessary when using negative feedback. Furthermore, Carlson (1997) reported that response cost conditions decreased motivation whereas reward conditions increased interest in the task. If the goal is to increase intrinsic motivation, reinforcements may be more powerful in the long run.

### *Combining Medication and Behavioral Interventions*

When behavior therapy is combined with stimulant medication children show superior adjustment compared to children on Ritalin alone on teacher ratings (Klein & Abikoff, 1989). Combinations of medical therapy and behavioral interventions have been shown to be the most clearly effective procedures to date (McLaughlin et al. 2003).

Dr. Swanson, who has studied attention disorders for twenty years, found, in a major study of older adolescents, that those who received psychological and educational assistance in addition to medicine were significantly better adjusted than those who received medication alone (Swanson, 1988). The findings of Cantwell (1985), suggest that there are long-term benefits only from a multidisciplinary treatment program.

Pelham et al., 1993, found that the addition of medication to a behavioral treatment program benefited 78% of boys, whereas 41% benefited from the addition of a behavior management program to medication intervention. Medication improved compliance with teacher requests, increased work productivity in the classroom, and reduced disruptive behavior and aggressive interactions with peers. Pelham et al. (1993) support the combined use of long-term behavioral interventions for children with ADHD on medication.

### *Conclusions*

In recent years ADHD has become an important educational issue. Psychostimulant medication seems to be the choice for children with ADHD, because it can improve the neural substrate of behavioral inhibition and the executive functions dependent on such inhibition. Unfortunately, it has not been shown that academic performance improves at the same level. Therefore, psychostimulant medication is not the only means by which ADHD children can improve their behavior and academic performance.

It has been shown that the combination of both stimulant medication and behavioral interventions produces far better results in children with ADHD. Ideally, the combination of behavioral and academic interventions, with stimulant medication is the way to achieve better results in classroom behavior and academic performance of children with ADHD. School-based interventions are proving to be extremely successful when paired with a psychostimulant medication.

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