The importance of behavioral interventions and stimulant medication effects on reducing attention deficit hyperactivity disorder

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Abstract
Overall, various avenues of research state that ADHD is a complex disorder that requires treatment by multiple modalities. Most research states that a combination of medication and behavior therapy is necessary to resolve the symptoms. It should be noted that the dose of stimulant medication prescribed to a child with ADHD should be adjusted based on the child’s response to a behavioral intervention, as well as the combination of the behavioral and pharmacological treatments. Rapport et al. (1982), as well as others, have found that medication alone will not "cure" ADHD. But with multiple methods of treatment the symptoms will decrease. Nevertheless, rather than developing a reliance on medication for the treatment of ADHD, alternative behavioral interventions should be addressed prior to the commendation of stimulant medications.
THE IMPORTANCE OF BEHAVIORAL INTERVENTIONS
AND STIMULANT MEDICATION
EFFECTS ON REDUCING
ATTENTION DEFICIT HYPERACTIVITY DISORDER

A Research Paper In Partial
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of the Degree Masters of Arts

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INTRODUCTION

Statement of the Problem

Attention Deficit Hyperactivity Disorder (ADHD) is a common and prevalent disorder that affects many children and adolescents in schools today (Homer et al., 2000). The Diagnostic and Statistical Manual of Mental Disorders IV (American Psychiatric Association, 1994) describes 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.

The patterns of inattention and/or hyperactivity-impulsivity in ADHD must be present before the age of 7 and occur in at least two settings (American Psychiatric Association, 1994). The symptoms of ADHD must persist for six months and meet at least 6 observable criterion from the categories of inattention, hyperactivity, and impulsivity. It is also important to note that it is difficult to diagnose ADHD in children younger than the age of 4 because their behavioral characteristics are much more variable than that of older children and may include features that are similar to ADHD.
The diagnosis of ADHD differs from other disorder subtypes, such as the ADHD predominantly inattentive type and the ADHD predominantly hyperactive-impulsive type (American Psychiatric Association, 1994). The predominantly inattentive type of ADHD involves more symptoms of inattention and fewer symptoms of hyperactivity-impulsivity. The predominantly hyperactive-impulsive type of ADHD primarily consists of more symptoms of hyperactivity-impulsivity and fewer symptoms of inattention. This paper will focus on ADHD, combined type, which involves six or more symptoms from both the inattention and hyperactivity-impulsivity categories.

Barkley (1997) reports that an estimated 3 to 7 percent of school-aged children in the United States are currently diagnosed as having ADHD. More clearly stated, on average, one child with ADHD exists in every elementary school classroom (O’Leary, 1980). The disorder persists into the adolescent years in approximately 50 to 80 percent of the diagnosed cases. The prevalence in the number of students who exhibit ADHD is an important reason why many researchers continue to examine effective interventions, as well as why behavioral interventions are a necessity in treating ADHD. Moreover, children with ADHD are frustrating
to their teachers because they are often disruptive in class (Reeve, 1990). The children with ADHD are also at risk for academic and social problems unless appropriate behavioral interventions are designed and implemented as a part of the treatment plan.

**Types of Treatment for ADHD**

Behavioral therapies, such as contingency management and self-management programs, are essential in the treatment of ADHD (DuPaul & Barkley, 1993; Gomez & Cole, 1991; Lavin, 1991). Behavioral interventions improve problem behaviors, social skills, and academic performance in specific environments (Dulcan & Benson, 1997). Even though behavior therapy programs require maintenance and parent-teacher cooperation, they are indeed very effective at reducing target behaviors. Unfortunately, many children with ADHD are given stimulant medication only, and are not receiving the educational, social, and psychological assistance needed for the successful treatment of the disorder (Lavin, 1991).

Many children with ADHD have reduced symptoms with the use of stimulant medications (Dulcan & Benson, 1997). With the decrease in disruptive behavior that children with ADHD experience with medications, there is also an abundance of
side effects and complications that occur. Possible side effects of medications include insomnia, jitteriness, growth inhibition, and loss of appetite (Whalen & Henker, 1991). Reeve (1990) addressed the conflict between dosage level and optimal behavior and academic results. DuPaul, Barkley, and McMurray (1991) state that even when children share similar characteristics, there may be considerable variability in one's response to medication. Therefore, therapeutic dosage differs for each child who takes the medication. Additionally, target behaviors (e.g., impulse control, academic performance) may be affected differently by medications, even at the same dosage level (DuPaul & Barkley, 1993).

The combination of medication and behavioral therapy techniques, which are tailored to meet the specific needs of children, are the most effective method of treatment for children with ADHD (Landau & Moore, 1991). This combination allows for the optimal treatment of children, while addressing the individual needs of the child.

Assessment of ADHD

Although many considerations contribute to the assessment of ADHD, the parent interview is the most important assessment tool in the diagnosis of a child with
ADHD (Dunne et al., 1997; Sattler, 1988). Knowledge about a child’s family history of ADHD, other psychiatric disorders, and psychosocial adversity (e.g. family conflict, socioeconomic status) are especially meaningful because of their relationship to the diagnosis of ADHD (Dunne et al., 1997).

The examination of behavior, learning, attendance, grades, and test scores at school is essential for the diagnosis of ADHD (Dulcan et al., 1997). Psychoeducational testing is also necessary to assess intellectual ability, and to search for learning disabilities that may be masked as ADHD or may coexist with ADHD (Dulcan et al., 1997; Sattler, 1988).

Moreover, parent and teacher rating scales render valuable information about child behaviors efficiently (Dunne et al., 1997). Some commonly used forms are the Child Behavior Checklist, the Connors Parent and Teacher Rating Scales, and the Barkley Home Situations Questionnaire and School Situations Questionnaire.

Finally, an evaluation by a physician is also necessary for a thorough assessment in the diagnosis of ADHD (Dulcan et al., 1997). The physician should complete a physical examination and assess drug use, possible vision
and hearing deficits, and the inquiry of environmental risk factors, such as potential lead poisoning. All of these assessment factors are imperative when diagnosing a child with ADHD.

**Outcome/Expectations**

Lavin (1991) suggests that the treatment of ADHD is most effective when multiple methods of treatment are utilized. Stimulant medication, behavior therapy, and parent training are an example of what can be effective in treating the disorder in the school or home environment. However, it is important that individual differences of the child are taken into consideration before the finality of any treatments is issued.

The purpose of this paper is to review the literature on attention deficit hyperactivity disorder, review behavioral interventions used to facilitate appropriate desired behaviors in children, ages 6 to 12, with a diagnosis of attention deficit hyperactivity disorder.
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REVIEW OF THE LITERATURE

Behavioral Interventions and Attention Deficit Hyperactivity Disorder

Behavioral modification methods can be described in two broad categories, positive reinforcement and punishment (Wolraich, 1979). Positive reinforcement programs, or token economies, praise, and tangible reinforcement, typically include some type of positive consequence for a desirable behavior that will increase the likelihood of its occurrence. Punishment (e.g. verbal reprimands, negative gestures) typically involves the removal of a positive reinforcer when an individual performs a response which is undesirable.

Many variables need to be considered when implementing behavioral techniques and interventions (Frazier & Merrell, 1997). Factors such as frequency and type of feedback given to the child, strength of reinforcers, degree of peer or classroom involvement, settings in which the intervention is implemented, length of the treatment program, and severity of the child’s ADHD disorder must be considered before a behavioral program is implemented. Addressing these variables are imperative when treating a child with
ADHD and it is necessary to consider each issue in conjunction with the prescribed plan of intervention.

In order for a behavior modification program to be effective for school age children, certain steps need to be taken (Busch, 1993). Children need to be an active participant and be involved in the design of the program, the setting of the goals, and, perhaps, the selection of the reinforcements. All of these issues should be addressed if one anticipates success in a behavioral intervention program.

Most importantly, behavioral therapy techniques have been found effective in reducing classroom disruptive behavior in children with ADHD (DuPaul & Ervin, 1996). Behavioral intervention methods on ADHD have also been shown to enhance academic performance and social functioning, improve compliance with parental commands, and reduce parental stress (DuPaul & Barkley, 1993; DuPaul & Ervin, 1996).

**Functional Assessments**

Functional assessments focuses on manipulating environmental variables to determine the best conditions in which children can perform appropriate behaviors in the classroom or home (Reid and Maag, 1998). Functional
assessments enable teachers and psychologists to accomplish three goals in children with ADHD (McBurnett, Swanson, Pfiffner, & Tamm, 1997; Reid & Maag, 1998). The first goal is to analyze and modify environmental events to prevent inappropriate behavior from occurring in the child's future. The second goal is to determine the outcome, or purpose, a behavior serves so that it can be replaced with an appropriate behavior that has a similar function. The final goal is to develop interventions to enable the child to exhibit a socially desirable behavior.

According to Reid and Maag (1998), "the effectiveness of these techniques varies depending on environmental variables such as a child's reinforcement history, classroom structure, task demands, the function of the behavior, and the goal of the intervention" (p. 12). Behaviors are caused by antecedents, a stimulus that precedes a behavior, and are either maintained, increased, or decreased, as a function of the consequences. Essentially, the intent of a functional assessment is to identify a relationship between a behavior and the environment and obtain information to modify, or change, a child's inappropriate behavior. Moreover, functional assessments go beyond the symptom of an inappropriate
behavior and delve into the motivation and purpose of the behavior (Fitzsimmons, 1998).

For example, Umbreit (1995) conducted a study on an 8-year-old boy with ADHD who displayed disruptive behavior in the classroom. A functional assessment was performed and the child’s behavior was observed using the 3-step approach. The researcher noted that disruptive behaviors were maintained by the aversion of task demands and the receipt peer attention. The assessment identified that the child’s behavior improved if he was seated away from others and worked alone during group projects. Implemented interventions involved a special work area for the child away from peers, the child did not work in groups in which his friends were a part of, the child was taught to request a break when needed, and the teaching staff ignored the child’s disruptive behaviors. The positive results in this study demonstrate that disruptive behaviors were vastly reduced by the utilization of a functional assessment and behavioral interventions.

DuPaul and Ervin (1996) stress the importance of functional assessment procedures and state that they are necessary for designing effective behavioral interventions for children with ADHD. Functional assessments permit the
observed data of the behavior to be directly addressed in the design of the treatment plan. In light of the success of past research (e.g., Umbreit, 1995), functional assessments are advantageous because they take into account personal and environmental factors of a behavior, thereby assisting the production of an optimal and effective treatment. However, most importantly, behavioral interventions permit the continual modification and adjustment of the treatment plan to assess its respective effectiveness for a child with ADHD (Frazier & Merrell, 1997).

Contingency Management

Contingency management, or the application of consequences on a specific behavior, has been shown to produce high levels of on-task behaviors for children with ADHD and an increase in academic achievement (Abramowitz & O'Leary, 1991; Gardill, DuPaul, & Kyle, 1996). Some examples of contingency management plans implemented in the classroom are token economies, response cost, group contingencies, and behavioral/contingency contracts.

Token economies, or response cost, involve awarding or removing tokens or points to children who display inappropriate behaviors in the classroom (Abramowitz &
O'Leary, 1991). Reid and Maag (1998) describe specific steps to implement token economy systems for children with ADHD in the classroom. The steps include identifying the target behaviors, selecting an appropriate token or point system, establishing a basis for exchanging the tokens for reinforcers, and developing a form of reinforcers for the children to choose from.

Response cost systems, which combine positive reinforcement with punishment, have also been effective in increasing appropriate behavior in children with ADHD (DuPaul, Guevremont, & Barkley, 1992). DuPaul et al. (1992) examined a response cost system that would provide rewards for positive behaviors and a loss of privileges for the production of negative behaviors to control a child's behavior in the classroom. Results indicate that the combination of a token reinforcement and response cost system produced significant improvements in on-task behavior and productivity and a reduction in the adverse symptoms of ADHD. Similarly, Gordon, Thomason, Cooper, and Ivers (1991) studied the effects of classroom response cost on elementary school children with ADHD and found that the children showed marked improvements in on-task behavior.
However, these positive effects dissipated upon the cessation of the response cost program.

Group contingencies are another type of contingency management program that is utilized with children having ADHD. Abramowitz and O'Leary (1991) state that there are three types of group contingencies, independent, dependent, and interdependent. In an independent group contingency, a set of contingencies is applied for the entire group of students, but each child's behavior determines his or her eligibility to receive reinforcement. In dependent group contingencies, reinforcement for a group of students is dependent of the performance of an individual student. For example, a student with ADHD may be required to answer four questions in a specific period of time in order for the class to receive a reinforcer, such as an extended recess.

In an interdependent group contingency, the behavior of the entire group of students determines if the group as a whole receives reinforcement. An example of an interdependent group contingency is the Good Behavior Game (Reid and Maag, 1998). In order to play this game, students are divided into two or more groups in their classroom. Students are told that whichever group earns the most points for engaging in a specific behavior receives a class
privilege. However, each member of the group must engage in the behavior to earn points. An important benefit of this method is that it permits the cooperation of the group members while avoiding directing special attention to the child with the behavior problems.

A final type of contingency management plan is the contingency, or behavioral, contract (Reid and Maag, 1998). Behavioral contracts involve a written document that specifies a relationship between the act of a specific behavior in order to earn a specific reward. Behavioral contracts have had positive results for children with ADHD in increasing the quality and number of homework assignments that students complete (Reid & Maag, 1998). Moreover, there are several other advantages of behavioral contracts. One advantage is that the child takes an active role in deciding the amount of homework to complete and the type of reinforcer rewarded. A second advantage is that both the child and the teacher's roles and behaviors are specified and clearly stated. A third advantage is that behavioral contingencies automatically involve accountability and responsibility in order to receive the reward.
According to Rapport, Murphy, and Bailey (1982), contingency management programs are a powerful form of behavioral interventions. However, problems with these types of interventions have been noted (Rapport et al., 1982). For example, these treatments require high adult-child ratios and extensive teacher training. Nevertheless, when implemented properly contingency management programs are effective at reducing problem behaviors in children with ADHD.

**Self-Management**

Self-management is another type of behavioral intervention utilized with children having ADHD and refers to the actions and personal responsibility in which an individual takes to alter or maintain a behavior (Barkley, 1998; Hoff & DuPaul, 1998). There are multiple advantages to the implementation of self-management procedures. One advantage is that it allows the individual to control behaviors, which will increase the probability of maintaining the desired behavior. Another advantage of self-management is that past research has indicated that behavior changes from this method of intervention have great generalization potential (Hoff & DuPaul, 1998). A final advantage of self-management is that it is more time
efficient, permitting the teacher to spend more time teaching.

An example of a self-management program for children with ADHD is a study conducted by Hoff and DuPaul (1998). Researchers implemented a self-management intervention program in a classroom which included students with ADHD. Students with ADHD were first told of the program and that it consisted of teacher ratings of appropriate classroom behavior that corresponds to points, which could later be exchanged for a reinforcer. Before beginning the program, the teacher and the students with ADHD discussed appropriate behaviors and the rules of the classroom, as well as that student behavior would be monitored during specific time intervals. Next, the teacher and the students compared their respective evaluations of student behavior and matched the accuracy of the scores. The purpose of this phase was to initiate individual student evaluations and accuracy. Then, the student and teacher would individually evaluate and compare student behavior. Points were distributed in this phase of the program, but only if student and teacher scores matched exactly. Finally, fading of the teacher-student score comparison occurred until the "surprise" comparisons, which occurred on randomly selected
days. Student levels of disruptive behavior decreased from 40 percent to 7 percent, depending on the student. Results indicate that disruptive behavior in the classroom of children with ADHD decreased with the implementation of the self-management program. Further, these findings demonstrate that children can effectively evaluate and maintain appropriate behaviors without teacher prompts. Shapiro, DuPaul, and Bradley-Klug (1998) found similar results in a comparable study. Researchers implemented a parallel study on disruptive behavior in a classroom with ADHD students. Results show that student on-task behavior was observed throughout the completion of the self-management program. Moreover, teachers viewed the self-management program as very successful.

Verbal Reprimands and Praise

Verbal reprimands are commonly perceived as the most frequently used method of classroom discipline (Abramowitz, O'Leary, & Puttersak, 1988). Some examples of effective verbal reprimands used by teachers in the classroom are gasps and loudness and intensity of vocalization.

Abramowitz and colleagues (1988) examined the effectiveness of long and short reprimands on students with ADHD in the classroom. Reprimands were introduced in the
beginning of class and were then alternated every other day during lunchtime. Results show that short reprimands were significantly more effective for improving off-task behaviors than long reprimands. One reason for these findings may be because long reprimands deliver more adult attention than short reprimands and this may act as a positive reinforcer for some children.

Abramowitz, O'Leary, and Rosen (1987) conducted research on the use of reprimands and compared the influences of teacher reprimands, teacher encouragement, and no feedback for students with ADHD. Results demonstrated that lower levels of off-task behavior were observed with the use of reprimands by teachers in the classroom.

The above research shows the positive effects that verbal reprimands and praise can have on children with ADHD. However, the duration and the level of severity an individual has of the disorder may affect the objective of verbal reprimands, that is to obtain desirable behavior (Gardill et al., 1996).

**Parent Training**

Parents play an essential role in the development and social experiences of a child and should be involved in the
intervention process (Sheridan, Dee, & Morgan, 1996). Sheridan et al. (1996) conducted research that has shown that parents can be trained to effectively manage the behavioral problems and noncompliance in children with ADHD. Some typical objectives in parent training are to teach parents specific techniques to use with a child having ADHD. One objective is to teach parents to interact and converse with their child in a supportive and nonthreatening manner. Another important objective is to guide and support their child's efforts to resolve their personal difficulties. A final objective is for parents to assist their child in establishing individual social goals and to utilize them in social situations.

Parent training programs often involve psychologists or therapists teaching parents the skills needed to use differential attention toward appropriate and inappropriate behavior, as well as to use time-out procedures effectively and practically (Anastopoulos, DuPaul, & Barkley, 1991; Barkley, 1998). Most importantly in parent training, though, is not that parents eliminate their child's ADHD symptoms, but that they learn methods of coping with and compensating for their child's ADHD prognosis.
Barkley (1986) developed a 10-step intervention program on the issue of parent training. This method of intervention will allow parents to hone their behavior management skills on specific behaviors of their child with ADHD (Barkley, 1998). The first step in this program is a review of ADHD. The major purpose for this step is to begin the process of increasing parental knowledge about ADHD. Included in this step is the history of the disorder, symptoms, child and family characteristics, diagnosis criteria, prevalence, causes of ADHD, and various treatment approaches.

The second step of the program is the understanding of parent and child relationships and an introduction to behavior management principles (Anastopoulos et al., 1991). Parents are advised of the four main factors that can contribute to the emergence and maintenance of a child's behavioral problems. These variables include child characteristics, parent characteristics, family stressors, and situational consequences. The importance of situational consequences is discussed and how they affect the level and maintenance of a child's behavior. For example, recognizing patterns of behaviors and the altering the consequences.
The third step in the parent training program contains the development of parental attending skills (Anastopoulos et al., 1991). In this step, the importance of attending positively to children is emphasized. Anastopoulos and colleagues (1991) suggest that parents set aside "special time" with their child to observe them in action and be as nondirective and noncorrective, in regards to their behavior, as possible. For the duration of a specific time period, parents should describe and observe the child's behavior in positive terms, while ignoring any mildly inappropriate behavior that may occur. Although many parents imply how difficult this step is to employ, they remark how it often leads to improved parenting skills and more pleasant parent-child interactions.

The fourth step of the program involves paying positive attention to compliance and appropriate play (Anastopoulos et al., 1991). In this phase, parents are advised to use their newly learned positive attending skills in other domains. For example, parents can display positive attending skills when issuing commands to children that often lead to compliance, but have been previously ignored. Parental communication methods are also discussed during this step. Parents are taught to modify the verbal
and nonverbal parameters of how they communicate commands, thereby increasing its effectiveness and child compliance.

The fifth step involves establishing a home token system (Anastopoulos et al., 1991). Parents are taught how to implement a token system in their homes. This system is especially useful because positive attending and ignoring strategies are typically ineffective alone for managing children with ADHD. In this step, tokens, or rewards, are used only for compliance with initial parental commands.

The sixth step of the program involves the use of response cost and time out from reinforcement (Anastopoulos et al., 1991). This phase introduces the punishment approach to the already implemented token system. Parents are instructed to deduct tokens from the child if noncompliance of rules or requests is observed. Time outs and time outs from reinforcement are also mentioned as a method to deal with a child's noncompliance. Parents are encouraged to identify one or two specific behaviors that should be addressed by time outs because most other noncompliant behaviors are currently handled by the response cost system.

The seventh step in the parent training program consists of extending time out to other problem behaviors.
(Anastopoulos et al., 1991). This step mainly includes an analysis and refinement of current parental efforts of the implemented systems of token and response cost. If parents feel comfortable enough, they are encouraged to extend time outs to other specific noncompliant behaviors their child displays.

Step eight involves the management of children’s behavior in public places (Anastopoulos et al., 1991). Throughout this step, parents are instructed how to generalize these newly learned techniques to other environments outside of the home. To assist parents in this acclimation, they are taught how to avoid challenging situations with their child by reviewing rules and consequences before entering a possible problematic situation or environment.

Step nine discusses the issues of handling future behavioral problems (Anastopoulos et al., 1991). The purpose of this phase is primarily to allow the parents and the parent trainer, or psychologist, to review and evaluate the effectiveness of the procedures. This phase also permits the discussion of what should be done to absolve future behavioral problems.
The tenth, and final step, in the program involves a parental evaluation of the program a specified time period after it was implemented (Anastopoulos et al., 1991). This phase can also be used as the addition of a "refresher" course, if suggested by the parent.

The implementation of this 10-step program has had effective results (Barkley, 1998). Research has demonstrated that families who use this technique on children with ADHD have experienced increased child compliance, as well as improvements in parenting skills (Anastopoulos et al., 1991). However, the most powerful parent training programs use a combination of written materials, verbal instruction, contingency management, and the behavioral rehearsal of specific skills (Dulcan et al., 1997). The combination of the multiple behavioral intervention techniques used in this method allows for its observed effectiveness and positive results.

Role of Medication and Attention Deficit Hyperactivity Disorder

Biological Basis of ADHD

Over the past decades, multiple causes have been linked to ADHD. The media has suggested that food additives and sugar are responsible, however, there has not been any
empirical evidence to support this statement (Searight, Nahlik, & Campbell, 1995). Evidence does support the idea that people with ADHD have demonstrated a greater incidence of neurological difficulties with fine and gross motor skills, such as coordination and balance. Despite the fact that research indicates that maternal cigarette smoking and alcohol consumption during pregnancy may increase the risk of this neurological damage, no consistent evidence has been found supporting that statement.

Attention deficit problems are thought to be caused by the inability of the central nervous system (CNS) to produce enough neurotransmitters in high demand situations, for example, school work (Busch, 1993). The amount of neurotransmitters, Norepinephrine (NE) and dopamine (DA), that are produced may not be sufficient and are responsible for sending messages for attending behavior and behavior attributed to focusing in difficult situations (Barkley, 1998; Busch, 1993).

Maturation of the CNS and lack of neural control over these areas also appear to be responsible for the look of immaturity that children with ADHD so often display (Busch, 1993). Low blood flow to certain areas of the brain, especially the prefrontal cortex and the premotor strip,
show evidence of a biological basis for ADHD and its symptoms. According to Searight et al. (1995), deficits in these areas of the CNS appear to leave frontal lobe dysfunction. Further, children who have difficulties with self-monitoring and behavioral disinhibition have been suggested to experience frontal cortex maturational problems.

Additionally, the evidence that ADHD is genetically acquired as symptoms are also shown in some parents and close relatives, (Biederman, Farone, & Keenan, 1990) further supports the biological foundation of ADHD. Furthermore, the attentional system appears to be sensitive to even minor environmental damage, including lead poisoning, head injury, or thyroid disorders, all of which can lead to a diagnosis of ADHD (Busch, 1993).

Stimulant Medication

The application of stimulant medication is the most common treatment for children with ADHD (Baren, 1995). Methylphenidate hydrochloride (Ritalin), Dextroamphetamine (Dexedrine), and Pemoline (Cylert) are three types of medication that are typically given to people who are diagnosed as having ADHD (Searight et al., 1995). Stimulants are clearly effective in the short term and have
been prescribed to people with ADHD like symptoms over the past 60 years (Dulcan & Benson, 1997). More knowledge is known about stimulant medication use in children than any other type of drug.

The majority of hyperactive children improve with the use of medication (Dulcan & Benson, 1997). Stimulant effects on attentional, academic, behavioral, and social aspects are highly variable. DuPaul et al. (1991) state that medications typically affect a child’s behavior, attention, cognitive and academic performance, as well as social relationships. Some common behavioral improvements experienced on medication are a decrease in motor activity, fighting, provocative behaviors, negativism, classroom disruptions, noncompliance with authoritative commands, and argumentativeness, while increasing the attention span, concentration, and goal directness of the student in the classroom (Gomez & Cole, 1991). Cognitive and academic performance improvements are traditionally seen as an increase in the academic productivity and accuracy of the student. Stimulants have also been found to improve the quality and social interactions between the children with ADHD and their parents, peers, and teachers (Barkley, Karlsson, Strzelecki, & Murphy, 1984). Likewise, children
with ADHD on medication were found to be less aggressive with peers and behave more appropriately with other children. However, whether an individual is considered to have positive effects by the medication depends on the improvement influenced by the drug and its relative side effects.

Side Effects of Stimulant Medication on ADHD

Gomez and Cole (1991) state that while as many as 70 to 80 percent of ADHD patients respond well to medications, an estimated 30 percent of children who are on such medication do not improve. There are also concerns about possible side effects that are caused by the use of such medications. Whalen and Henker (1991) note that every drug has unintended and unwanted side effects. Some examples of these side effects include, loss of appetite, stomachache, headache, insomnia, jitteriness, social withdrawal, psychotic reactions, mood swings, weight gain, inhibited height growth, and, in rare cases, motor tics or hallucinations (DuPaul et al., 1991; Perrin et al., 2001).

Research has shown that children who receive too high a dose of stimulant medication may become over-focused or may appear dull or over restricted throughout a school day (Perrin et al., 2001). However, this adverse reaction can
often be addressed by an adjustment in the dosage level (DuPaul et al., 1991). A noteworthy suggestion to eliminate the prolonging of these side effects is the clinical recommendation of drug holidays during summers and periods when school is not in session to assist in the subsidence of the side effects of these stimulant medications (Perrin et al., 2001).

**Implications of Medications for ADHD**

An important effect of these medications on children with ADHD is that they also exert similar physiological and behavioral effects (i.e. sustained attention, less disruptive behavior) in the normal population (DuPaul et al., 1991). Searight et al. (1995) stress the significance of this finding as an indication of how drugs cannot be heavily relied upon to verify the diagnosis of ADHD. The approach of medicating children with ADHD first and then implementing a behavioral treatment program is not recommended by physicians, psychologists, or other health professionals (Pelham et al., 1993). Furthermore, this information leads some researchers to question the need and importance of the utilization of drugs to treat ADHD, as well as question the over-prescribing that occurs with stimulant medication on ADHD.
Moreover, research by Swanson et al. (1993) found that the stimulant medication effect on academic performance on children with ADHD to be relatively low, if not do nothing to enhance academic achievement. Researchers stated that drugs do little for the 25 to 40 percent of hyperactive children for whom the medications are prescribed. Additionally, a large portion of children who do respond to medication also have experienced improved behavior on a placebo. The authors stress the effect of the medication is only a temporary suspension of the symptoms and not a cure for the disorder. O’Leary (1980) agrees with these findings in that classroom disruptive behavior decreases in children with ADHD, but some cognitive functions may be inhibited by the use of stimulant medications.

According to Reeve (1990), an important fact about stimulant medications that is not commonly discussed is the optimal dosage level for cognitive effects, such as memory and attention, versus activity level. Research indicates that the level of medications needed for positive cognitive effects is much lower than what is required for motor activity level. Thus, if the medication is assessed by how much the activity level has decreased, than there is a high
probability that the dosage level is too high to achieve positive effects on school and academic performance.

An important implication of stimulant medications is that they are responsible for the child’s self-reliance on medication (Armstrong, 1996). Research suggests that children may attribute their improved behaviors to their medication rather than inner resources (Armstrong, 1996). Children on medication for ADHD may experience detrimental effects on their self-perception and attributions (Houlihan & Van Houten, 1989). The use of drugs to control symptoms of ADHD may also result in a compliant, but academically incompetent student (Ayllon, Layman, & Kandel, 1975). Other children may neglect their own underlying issues (e.g. emotional, psychological) and behavior problems and expect the medication to be the absolute answer (Armstrong, 1996).

It is imperative to note that while between 70 and 80 percent of children with ADHD respond positively to medication, the remainder of children do not (DuPaul et al., 1991; Gomez & Cole, 1991). The no responding children either exhibit no response or experience worse symptoms while on medication, thus implying the need for alternative treatments and approaches for desirable results in treating ADHD.
Prior to recommending medication to a child who is diagnosed as having ADHD, physicians and psychologists advocate that other possible avenues are further explored before stimulants are prescribed (Barkley, 1998). DuPaul and colleagues (1991) suggests that six factors be evaluated before medication is given. First, the severity of the child's ADHD symptoms and disruptive behavior should be assessed. For example, the greater the severity of the attention and behavioral difficulties, the more likely stimulants should be apart of the treatment. Second, an examination of past treatments and interventions (e.g. parent training, token reinforcement) should be investigated before medication is issued. Third, anxiety disorders or symptoms of anxiety disorders should be considered. Often a child who exhibits both ADHD and a type of anxiety disorder does not respond well to the use of stimulants. Fourth, parental views should be taken into consideration before issuing medication. Some parents are against the use of medication and would rather research its effects to make a more informed decision for their child. Fifth, the presence of adult supervision should be apparent prior to the administration of medication, as well as to be aware of the side effects of the medication. Sixth, a
child's attitude toward the medication should be made clear and the reasoning for it should be explained. This is true especially for older children who are aware of the side effects and therefore will not want to take the medication.

**Individual and Combined Effects of Medication and Behavior Therapy on Attention Deficit Hyperactivity Disorder**

A study was performed which compared the ingestion of stimulant drugs on the effects of attention and concentration, cognitive abilities, intelligence and achievement tests, and perceptual, motor, and memory on students with ADHD (Kavale, 1982). The results show, and coincide with past studies (Rapport, Stoner, DuPaul, Birmingham, & Tucker, 1985), that drugs appear to be effective and produce increased scores and positive outcomes for the students who are diagnosed with ADHD. The consistent positive effects from the medication on behavioral symptoms of ADHD were apparent. Major improvements in the academic learning and performance of the subjects were also due primarily to the medication. This study supports findings that illustrate how popular medications are when addressing the needs of a student with ADHD.
Pelham et al. (1993) found similar results concerning the effect of academic performance on children with ADHD. Researchers found that behavior modification and medication both improved classroom behaviors, however, only medication had a beneficial effect on the academic performance of the children.

Researchers also investigated the combined effects of stimulant medication and behavior modification integrated in the classroom over an 8-week period to 24 ADHD diagnosed boys (Carlson, Pelham, Milich, & Dixon, 1992). The children, aged 6 to 12, were divided into two twelve-person groups and each received a placebo and medication and the behavioral treatment classroom and the controlled classroom. Behavior management classroom conditions consisted of token reinforcements, classroom structure, rules, and feedback, time out, an honor roll system, and a home based daily report program. The results indicate that the implementation of both the medication and the behavior therapy improved the classroom behavior of the children with ADHD. Both treatments individually resulted in improved classroom behavior, but the combined treatment was superior to the separate interventions. Some positive effects experienced by the children were lower rates of
disruptive behavior and higher rates of on-task behavior and following rules. Results also suggest that high dosages of medication are required to optimize classroom performance, but only in the absence of behavior modification. Thus, this study proposes that implementing behavior modification programs can reduce the total dosage of medication given to children with ADHD. These results are consistent with past findings (Pelham, Schnedler, Bologna, & Contreras, 1980; Rapport, Murphy, & Bailey, 1982).

Perrin et al. (2001) emphasized that treatment plans for children with ADHD require parents, families, schools, and the child to continue a long-term plan that includes the utilization of medication and environmental and behavioral interventions. Although these interventions seem time consuming and demand constant efforts for parents, teachers, and the child it is necessary to observe a desirable outcome for the well being of the child. A common cause of nonresponse, or failure, to a treatment plan is the lack of adherence to the plan of action. The child's progress should be continuously monitored and changes to the treatment plan, if needed, should be addressed in a timely and productive manner.
Hall and Kataria (1992) performed a study on children with ADHD. Researchers examined the two treatment techniques on subjects on and off stimulant medication. The three groups the subjects were exposed to were the control group, the behavior modification group, and the cognitive training group. Self-control, impulsivity, and the subjects' ability to sustain attention were measured. Results show that when medication was combined with the cognitive training intervention the subjects' ability to respond to impulsively was decreased. Researchers also note that some children with ADHD may become too excited over the possibility of a reinforcer that their performance actually deteriorates. The anticipation of a reward produces eagerness for the reward and the child therefore becomes impulsive and will act to quickly. Further, some believe that behavior modification programs can decrease creativity and intrinsic motivation (Armstrong, 1996).

DuPaul and Barkley (1993) also performed research on the issue of drug and behavioral interventions on two children with ADHD. The children were given either medication or a placebo and a behavioral modification treatment plan. The behavioral plan consisted of a contingency management plan and a response cost contingency
plan. The reinforcement and response cost contingency plans were given based on the child's academic productivity, behavior control, or both. Results indicate that the children had a marked decrease in disruptive behavior with and without the use of medication. These results demonstrate how effective and useful behavioral intervention programs are in the reduction of the symptoms of ADHD.

Gadow (1985) compared medication and behavioral interventions on children with ADHD and found that behavioral interventions decreased disruptive behaviors. Research shows that behavioral interventions were superior to medications in enhancing academic performance of the children.

Abramowitz, Eckstrand, O'Leary, and Dulcan (1992) conducted research on stimulant medication and behavioral interventions for children with ADHD. Researchers found that for some children with ADHD, a behavioral treatment program is sufficient for decreasing disruptive behavior and is comparable to results achieved from medication. However, some children obtain desirable results through medication and behavior modification. These results express how important individual child and ADHD symptoms are in
treating the disorder and that behavioral interventions are a necessity in treating the disorder.
Chapter III
SUMMARY/CONCLUSION

Overall, various avenues of research state that ADHD is a complex disorder that requires treatment by multiple modalities (Baren, 1995). Most research states that for optimal results and success in treating children with ADHD a combination of medication and behavior therapy is necessary to resolve the symptoms of ADHD (Ballard et al., 1997). It should be noted that the dose of stimulant medication prescribed to a child with ADHD should be adjusted based on the child's response to a behavioral intervention, as well as the combination of the behavioral and pharmacological treatments (DuPaul & Barkley, 1993). Rapport et al. (1982), as well as others, have found that medication alone will not "cure" ADHD, but with multiple methods of treatment the symptoms will decrease (O'Leary, 1980; Pelham et al., 1993; Perrin et al., 2001). Nevertheless, rather than developing a reliance on medication for the treatment of ADHD, alternative behavioral interventions should be addressed prior to the commendation of stimulant medications (Maag & Reid, 1994).

Behavioral intervention treatment programs have been shown to decrease disruptive target behaviors in children.
with ADHD, as well as improve social skills and academic performance (Dulcan & Benson, 1997). However, the greatest weakness of behavior modification programs is their failure with lack of maintenance and the little success in which these programs can be generalized to other settings and environments. The most promising programs to treat ADHD are those which take place in both the home and school environments, focus on specific behaviors, and provide consistent contingency methods. Practicing a constant and predictable methodology of employing consequences is particularly important in the maintenance and effectiveness of the program (Searight et al., 1995).

In order to be effective, behavior treatments must be extensive and intensive (Landau & Moore, 1991). Parents, teachers, and psychologists must be involved to implement and carry out a proper contingency program for the child with ADHD. Additionally, it is necessary that the treatment program is occurring in a variety of domains and settings for generalization and maintenance to take place.

Both stimulant medications and behavioral interventions are useful in decreasing the symptoms of ADHD in children (Baren, 1995). Although, it must be noted that each child is an individual and each individual responds
differently to methods of treating the disorder (Frazier & Merrell, 1997). Therefore, a child-by-child assessment is necessary so that an effective technique of treatment can be developed based on a child's individual needs and behavioral interventions can be properly employed (Armstrong, 1996).

**Future Research and Limitations**

Future research should investigate both behavioral interventions and stimulant medications on children with ADHD in more long-term, longitudinal studies. Few researchers have examined the effects of medication and behavior modification treatment programs separately or alone for long periods of time and much can be gained from this undertaking. The efficacy and safety of both these procedures should be studied for months to years to evaluate their certain effectiveness (Perrin et al., 2001).

Additionally, future research should include a rigorous assessment of the alternative approaches to treating ADHD. Little research has been conducted on the use of vitamins, herbs, or occupational therapy when treating the disorder (Perrin et al., 2001). A great deal can be gained from the study of these interventions such
as, whether or not they are effective in reducing the symptoms of the disorder.

Future research may want to examine the parental role of a child with ADHD, as well (Lucker & Molloy, 1995). Understanding why a child behaves a certain way is a complex task. Parents may want to blame themselves for their child’s disorder and it may be interesting to explore how this affects a child with ADHD and its symptoms.

Limitations to the present research on behavioral interventions on a child with ADHD are the effectiveness of these types of treatments on older children. Research has supported behavioral modification techniques for children in preschool and elementary school, but little research shows its effectiveness on older adolescent children with ADHD (Lucker & Molloy, 1995).

An important second limitation to the present findings is the issue of how normal children without ADHD are affected by the use of stimulant medication (Searight et al., 1995). It is difficult to address the effectiveness of medication on children with ADHD when others who take the medication experience improved attention. This is an imperative finding because it demonstrates how little is
known about stimulant medication use and why it effects each person, with or without ADHD, who takes it.

**Implications for School Psychologists**

An implication for school psychologists about the assessment and treatment of children with ADHD is what the most ideal intervention plan for children with ADHD involves. The discussion of which treatment is viable is still under investigation by many researchers (Gomez & Cole, 1991). It is obvious that medication can diminish symptoms of ADHD, but it is also important to remember that these medications work for people who do not have ADHD as well. This demands close communication between parents, teachers, psychologists, and physicians. School psychologists must be aware of the "quick fix" medications provide to children with ADHD and avoid the temptation to medicate children because of its timely effect.

School psychologists must also understand the various types of interventions available to treat children with ADHD (Baren, 1995). The understanding of the procedures for functional behavior assessments is necessary for the assessment and development of effective interventions and why the problem behaviors may occur (Vollmer & Northup, 1996). The multiple methods of treatment such as,
medication and behavior therapy, have many side effects and attributions associated with them. It is imperative that school psychologists are aware of the positives and negatives of each treatment and implement the most optimal intervention for a child with ADHD.

Additionally, the present information shows how important it is for school psychologists to look at each child individually and examine his or her symptoms of ADHD (Armstrong, 1996). School psychologists must adopt the notion of looking at the whole child while addressing a disorder and find the most effective intervention for that child. Most children respond to different methods of treatment in different ways, so it is essential for school psychologists to examine the whole child, and not just the disorder itself.
References


