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A comprehensive review of treatment options for children with attention deficit hyperactivity disorder

Kristin Vanderah
University of Northern Iowa

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A comprehensive review of treatment options for children with attention deficit hyperactivity disorder

Abstract

Attention Deficit Hyperactivity Disorder (ADHD), a disorder affecting between 3 and 5 percent of school-age children, manifests as a combination of three core skill deficits: inattention, hyperactivity, and impulsivity. The deficits have been found to present children with many difficulties in both home and school settings. Thus, comprehensive treatment for individuals with ADHD is of paramount importance to their development and their academic and social experiences. The content of this paper is comprised of a review of the recent research that has been published regarding the three major theoretical orientations of ADHD interventions (pharmacological, behavioral, and multimodal treatment). All of the treatment methods are discussed in terms of specific advantages and disadvantages, examples for implementation, and implications for the child, the family, and the school.

A COMPREHENSIVE REVIEW OF TREATMENT OPTIONS FOR
CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

Kristin Vanderah
University of Northern Iowa
July, 1997

RUNNING HEAD: ADHD Treatment

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Donald W. Schmits

Director of Research Paper

Melissa L. Heston

Co-Reader of Research Paper

Donald W. Schmits

Graduate Faculty Advisor

Barry J. Wilson

Head, Department of Educational
Psychology & Foundations

Aug 1 1997
Date Approved

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ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD), a disorder affecting between 3 and 5 percent of school-age children, manifests as a combination of three core skill deficits: inattention, hyperactivity, and impulsivity. The deficits have been found to present children with many difficulties in both home and school settings. Thus, comprehensive treatment for individuals with ADHD is of paramount importance to their development and their academic and social experiences. The content of this paper is comprised of a review of the recent research that has been published regarding the three major theoretical orientations of ADHD interventions (pharmacological, behavioral, and multimodal treatment). All of the treatment methods are discussed in terms of specific advantages and disadvantages, examples for implementation, and implications for the child, the family, and the school.

Attention Deficit Hyperactivity Disorder (ADHD) is currently the subject of widespread public interest and controversy, as it is considered to be a predominant clinical and public health disorder in terms of disability in both children and adolescents in the United States (Taylor, 1994; Wicks-Nelson & Isreal, 1997). Research using clinical samples has estimated that between 3% and 5% of school-age children suffer from ADHD (DSM-IV, 1994), while studies using general population samples have determined a significantly higher prevalence rate of approximately 20% (August & Garfinkle, 1989). The effects that are incurred by society as a result are extensive in terms of the financial cost of complex assessment and treatment processes, the impact on the school systems, the stress and frustration felt by family members, as well as the numerous difficulties that the suffering individuals face on a daily basis.

The skill deficits (inattention, hyperactivity, and impulsivity) that characterize ADHD present those who have the disorder with many challenges and often cause unprecedented problems in their attempts to accomplish basic family, social, and academic demands. Such problems have been found to commonly result in negative interactions with others, which in turn have the potential to significantly impact the individual's emerging personality and cognitive skills. "A child who experiences years of negative feedback, negative reinforcement, and an inability to meet the reasonable demands of family, friends, and teachers because of basic skill deficits will certainly be affected for life" (Goldstein &

Goldstein, 1990, p. 2). For these reasons comprehensive treatment for individuals with ADHD is of paramount importance to their development, their school and home experiences, and their overall personal well-being. Whether the treatment be pharmacological, behavioral, or a combination of methods, each treatment has been supported by empirical evidence and will be discussed in terms of specific advantages and disadvantages, specification of examples for implementation, as well as for family, school, and child implications.

Definition and Etiology

To obtain a broad understanding of the various treatment options, it would be beneficial to begin with a definition of this disorder and some of the hypothesized etiological explanations for ADHD. According to DSM-IV (1994), ADHD individuals can be classified as exhibiting primarily attention deficits, primarily hyperactivity-impulsivity, or as displaying a combination of the two types of behavior. Those who have been diagnosed with attention deficits typically demonstrate a limited ability to concentrate, frequent "off task" behavior, and a lack of attention to directions (Wicks-Nelson & Isreal, 1997). However, it is common that such behaviors do not generalize to encompass all situations. There may be instances in which an ADHD individual will sit and attend for hours while engrossed in a movie or a favorite game. Research suggests that it is those situations that the child defines as repetitious, boring, or routine that pose the most significant challenges to their sustained attention abilities (Weiss, 1992).

Excessive activity levels account for the hyperactive component of this diagnostic category, and have been found to be very characteristic of a large proportion of the ADHD population. Hyperactive individuals will typically display an abundance of activity that is often inappropriate and disorganized. These children "appear to have difficulty in regulating their actions according to the wishes of others or the demands of the particular situation" (Wicks-Nelson & Isreal, 1997, p. 211). The situations that are commonly associated with hyperactivity in ADHD individuals are those that are highly structured with numerous demands, as well as those involving limited activity and requiring extended attention.

Impulsivity, as a component of ADHD, is thought to be a deficiency in one's capacity to control one's own behavior. Individuals with tendencies to act impulsively typically act without considering the consequences of their actions, are limited in their ability to suppress their motoric impulses, and find demonstrating patience to be an unrealizable task at times (DSM-IV, 1994). Such individuals will often complete assignments in haste and without concern for errors, and will frequently be compelled to begin two or three activities simultaneously without persevering to completion. The characteristics of ADHD uniquely combine, making each and every ADHD child an individualized case (Barkley, 1990).

The etiological theories used to explain the origin of the disorder are beset by complexity and controversy and have been the subject of

empirical studies for decades. Despite extensive research on the etiology of ADHD, there is as yet no single, valid theory that is not fraught with inconsistencies or able to offer a single explanation for every ADHD case (Wicks-Nelson & Isreal, 1997). Therefore, many researchers, such as Barkley, Kamphaus, Goldstein, Goldstein, DuPaul, and many others, have taken an eclectic approach, believing that ADHD is a result of a variety of factors working in combination with each other, with the specific causal factors varying from person to person.

One of the first theories formulated to explain the uncontrolled, haphazard, and excessive activity of youngsters was damage or injury to the brain. Brain injury had long been correlated with the presence of behavior abnormalities. Eventually behavior deficits began to be automatically attributed to brain damage without steadfast evidence that such damage existed. For example, in a 1934 study (Kahn & Cohen) core ADHD symptoms were linked to brain stem lesions (Satz & Fletcher, 1980). However, by the 1960s scientific evidence began to disprove these claims. A study conducted by Stewart and Olds (1973) revealed that very few children diagnosed with ADHD actually displayed any such neurological damage.

The elimination of the brain injury hypothesis led to various investigations of other areas of biological functioning in search of an explanation of behavioral deficits. A defective attentional system in the brain was one of these suggested theories. According to Carlson,

Jacobvitz, & Sroufe (1995) the center for attention control is located in the stem of the brain where the neurons are the active agents. The information is transmitted between neurons through chemical agents called neurotransmitters. The treatment for neuronal transmission problems is to alter the brain's biochemistry through the use of dopamine, norepinephrine, and/or serotonin. These neurons along with the collective efforts of the frontal lobe and right hemisphere, are capable of projecting information to all areas of the brain. Researchers have postulated that it is the proper functioning of the chemical pathways, the neurons, and the system components that are responsible for regulating "the degree of activity, attention and concentration as well as the degree of impulsivity. Children with ADHD are unable to appropriately modify their degree of attention, concentration and impulsive actions" (Goldstein & Goldstein, 1990, p. 48). Therefore, it is reasonable to suspect that dysfunction of the attentional system would lead to ADHD symptoms, and could subsequently be considered to be a possible cause of the disorder.

Another theory based in biology states that ADHD is a result of an altered neurochemistry. Three different hypothesis have been developed concerning irregular brain chemistry. The dopamine hypothesis states that hyperactivity is the result of an underproduction of dopamine. Therefore researchers (Shaywitz, Yager, & Klopper, 1976) postulated that if a dopamine agonist was administered, behavioral improvements would be evident. Significant improvements were found to ensue. However replications of this study by other investigators (Mattes & Gittelman,

1983) served to refute these claims. The noradrenergic hypothesis suggests that it is an overproduction of norepinephrine that is responsible for the development of ADHD, and that stimulants are an effective treatment method because of their ability to inhibit the release of norepinephrine. Zametkin and Rappoport (1987) have provided empirical support for this theory by providing behavioral biochemical correlation data from various drug trials. Finally, those who support the serotonergic hypothesis believe that children who endure ADHD symptoms lack an adequate level of platelet serotonin (Murphy, Greenstein, & Pelham, 1993). However, further research has not been able to replicate these findings. The limitations and inconsistencies in the aforementioned hypothesis and supporting research warrant further research regarding the pathophysiology of ADHD.

Pregnancy and birth complications as a cause for attention deficits and overactivity have also been the subject of interest and research in the past decades. However, currently a notion of causality is not supported by empirical findings. One of the largest pregnancy studies (Nelson & Ellenberg, 1979) was conducted by the National Institute of Neurological and Communicative Disorders and Strokes, which involved investigating the outcomes of 55,000 pregnancies. They found that many babies who were determined to have experienced traumatic labor and deliveries did not develop any attention deficits, and some of those who did not endure difficulties were found to develop severe ADHD symptoms.

Thus, evidence of difficult pregnancies and/or labor complications are not enough to establish ADHD causality.

A recent contribution to the various etiological explanations emphasizes the role of psycho-social factors in the manifestation of ADHD symptoms. The context of development and the early interactions that a child experiences with parents and siblings are known to be very influential in the social development of children, as well as in the instillation of standards and expectations for their behavior (Taylor, 1994). Children subjected to adversity in their home environment (divorce, stress, aggression, negative parent-child interactions, poverty, etc.) may not have been granted the secure foundation needed for an adaptive adjustment to the context of school and the appending social situations (Goodman & Stevenson, 1989; Stormont-Spurgin & Zentall, 1995). However, it is important not to interpret psycho-social correlates as the sole cause of ADHD, but rather to consider these factors as possible environmental catalysts that may effect the development of ADHD symptomatology (Taylor, 1994).

A study conducted by Campbell (1995) served to investigate psycho-social circumstances and their linkage to ADHD prevalence. He concluded that families with ADHD children demonstrate more aggression and negative interactions as compared to families with non-ADHD children. In addition, a sample of individuals with hyperactivity identified their mothers as assertive and inconsistent in their disciplinary actions, and reported them to lack patience and tolerance for

their behavioral patterns. Hechtman (1991) hypothesized that it is the "controlling, intrusive parental style that is associated with ADHD that causes or worsens the child's behavior" (p. 56). However, causality claims are not warranted at this point.

When reflecting on the conglomeration of theories that have been addressed, which precludes yet others not discussed (diet, and environmental lead) it is easy to understand why the development of a reliable, valid, and effective method of treatment is an extremely perplexing and controversial issue. Since the origin of the difficulties and deficits experienced by ADHD individuals remains uncertain, the task of determining the facet(s) of the individual that should be targeted for remediation efforts becomes even more ambiguous (Goldstein & Goldstein, 1990). If the problems are thought to be rooted in biological functioning, then pharmacological treatment may be the logical and preferred approach to treatment. However, if psycho-social sources are suspected, treatment efforts may proceed in the direction of behavior modification, self-regulation and cognitive-behavioral interventions, or a combination of treatment methods.

Pharmacological Treatment

Pharmacological treatment is one of the most common remediation approaches for children diagnosed with ADHD (DuPaul & Barkley, 1993). It has been estimated that between 3 and 5% of all school-age children have been prescribed to take a form of psychostimulant medication

(methylphenidate, dextroamphetamine, or pemoline) to control their inattention, impulsivity, motor activity, task-orientation, and so on. (Wicks-Nelson & Israel, 1997; Campbell & Cueva, 1995; Biederman, 1991; Barkley, 1990). Between 60% and 90% of all children diagnosed with ADHD are treated with such stimulants, which translates to approximately 1.5 million individuals throughout the nation (Swanson, McBurnett, Christian, & Wigal, 1995).

According to the findings of several studies (Barkley, 1990; Gadow & Pomeroy, 1991; Murphy, Greenstein, & Pelham, 1993) practitioners can expect anywhere between 70% and 77% of ADHD children to respond to drug treatment and subsequently improve their behavioral patterns . However, in these investigations, among those individuals treated with placebos, between 30% and 39% also demonstrated enhanced attention and a reduction in motor activity and restlessness. In addition, between 23% and 30% of children remain unchanged or actually became worse following treatment with stimulant medication.

The use of stimulants was first reported to be an effective treatment of children with behavior disorders by Bradley (1937). It is postulated that the stimulant drugs are similar in structure to specific neurotransmitters, and serve to increase the activity of catecholamine in the central nervous system, "probably by increasing the availability of norepinephrine and/or dopamine at the synaptic cleft" (Lou, Herrickson, Bruhn, Borner, & Nielson, 1989 p. 48). Findings from an earlier study suggest that stimulants increase the activity of the central nervous

system, which serves to decrease an individual's sensitivity to stimulation, therefore improving concentration, motor coordination, and impulse control (Cantwell & Carlson, 1978). While Swanson et al. (1995) most recently proposed that the stimulants effect the central nervous system by increasing the availability of neurotransmitters through an induced release of stored neurotransmitters. The interactions between stimulants and neurotransmitters are a very intricate and perplexing processes that are still not completely understood by researchers.

Despite the inconclusive and speculative information regarding the mechanisms through which drug based treatments have their impact, it is known and accepted that psychostimulants are fast-acting drugs that readily cross the blood-brain barrier and are then rapidly absorbed in the gastrointestinal tract (Barkley, 1990). Methylphenidate (Ritalin) and amphetamine are usually administered twice per day, with behavioral effects observed within 30 minutes to 1 hour post ingestion; peak effects are noticed within one to two hours, (Swanson et al., 1995), and the termination of effects observed three and a half to five hours post-ingestion (Barkley, 1990; Pelham, Greenslade, Vodde-Hamilton, Murphy, Greenstein, Gnagy, & Dahl, 1990; Solanto & Conners, 1982). However, considerable interindividual differences may be observed with regard to these parameters.

Longer acting stimulant drugs are also available for situations where a noontime administration is not feasible, or when confidentiality of treatment is an important issue. Ritalin-SR, Dexedrine Spansules, and

Cylert (pemoline) are all slow-release forms of stimulants that are ingested once a day, with behavioral effects lasting approximately 7 to 8 hours (Donnelly & Rapport, 1985; Swanson et al., 1995). Due to research and clinical evidence that suggests that such slow-release formulas are less effective and tolerable than the standard preparations, these forms have not been widely recommended for clinical use (Pelham, Sturges, Hoza, Schmidt, Bijlsma, Milich, & Moorer, 1987; Greenhill, 1991; Swanson et al., 1995).

The typical procedure for the administration of stimulant pharmacotherapy comprises the processes of titration of dose amount (5 mg to 20 mg of methylphenidate, 2.5 mg to 10 mg of amphetamine, or 37.5 mg to 112.5 mg of pemoline) and monitoring both the benefits and side effects of the medication. Titration involves selecting a specific dose where therapeutic benefits are maximized while adverse side effects are kept to a minimum. Typically children are started on a very low dose (5 mg), and administered increased dosages (in increments of 2.5 or 5 mg) until positive effects are noted. The second process is that of maintaining the individual's proper functioning through careful monitoring. It is important to note that large individual differences are demonstrated in response to stimulants, and that individual responses are often found to vary across tasks and situations (Swanson et. al, 1995). Thus, these factors should be considered when assessing the initial trial of a stimulant drug so that an optimal dosage is established.

In addition, other research has documented that even "normal" children (those without ADHD) have been found to respond with improved performance on "low-level attention and vigilance tasks" (Rapport, DuPaul, Stoner, & Jones, 1978, p. 23) when apportioned with a typical dose of stimulant medication. This conclusion has served to invalidate previous assertions that stimulants are "paradoxical" in their effects on ADHD children. Positive responses to drug treatment do not indicate that a correct diagnosis of ADHD has been made.

Methylphenidate (Ritalin) is by far the most frequently prescribed stimulant drug (greater than 90% of ADHD individuals treated with medicine therapy) (Safer & Krager, 1988). For this reason, the focus of the discussion on pharmacotherapy treatment for ADHD will be on the effects and implications pertaining to Ritalin, or its generic term, methylphenidate.

As a result of adhering to an individualized methylphenidate treatment regimen, extensive behavioral effects have been observed by parents and professionals (Barkley, 1990; Swanson et. al, 1995). The children have been found to be increasingly able to sustain their attention to a task, with an increased ability to control their motor behavior, while also inhibiting their tendencies to respond impulsively (Rapport and Zametkin, 1988; Barkley, DuPaul & McMurray, in press). Barkley and Cunningham (1979) concluded that treatment with methylphenidate serves to reduce the restless activity incurred during structured and task-oriented conditions. In addition, they observed that the behavior of

the children treated with methylphenidate was comparable to that of their "normal" classmates in terms of the amount of task-irrelevant activity, fine motor movement, classroom disturbances, and the attending behavior demonstrated. A 1986 study (Pelham, 1986) determined that medicated children were less likely to "(a) talk out inappropriately in class; (b) to bother peers who are working; (c) to violate classroom rules or engage in other behaviors that require teacher attention; and (d) to interact aggressively and otherwise inappropriately with their peers" (p. 101). Other studies (Barkley, 1977; Klorman, Brumingham, Fitzpatrick, & Borgstedt, 1990) have found stimulants to reduce aggression, defiant behavior, acts of noncompliance, and inappropriate social behavior. However, only a minority of the individuals who do demonstrate positive results from stimulant medication improve their behavior to the extent of "normalcy." The majority (70 to 77%) show advancements in their behavioral patterns, but may need supplementary treatment options to function according to school standards (Abikoff & Gittelman, 1984).

The control that stimulants exert over the ADHD child's motor excess, disorganized, and restless behavior has also been found to have positive ramifications in terms of treated children's social interactions experienced with peers, parents and teachers (Goldstein & Goldstein, 1990). The inattention, overactivity, and impulsivity that are commonly exhibited in untreated children with ADHD often lead to social problems and a lack of peer relationships. In fact, it is estimated that between 50 and 60% of individuals with ADHD experience peer rejection to some

degree (Barkley, 1990). The act of being rejected from a peer is thought to be a directive of a poor prognosis (delinquency, academic problems in adolescence, and psychiatric problems in adulthood) (Jacobvitz, Sroufe, Stewart, & Leffert, 1990; Murphy, Greenstein & Pelham, 1993). Barkley (1990) states that "most experts agree that positive relationships with peers in the childhood years provide a critical buffer against stress as well as psychological and psychiatric problems" (p. 540). Therefore, it is essential that difficulties with peers be considered when assessing a child with ADHD, and that social skills training interventions be implemented contingent upon a presented need. Such interventions are beyond the scope of this paper, however, well-substantiated information is presented in Barkley (1990) regarding social skills and peer relationships of children with ADHD.

A variety of empirical evidence has indicated that there is a lessening of negative interactions as a result of a stimulant medication plan. When interacting with medicated ADHD children, both parents and teachers have been observed to "reduce their rate of commands and degrees of supervision over these children, while increasing their praise and positive responsiveness to the children's behavior" (Barkley, 1990, p. 580). Schachar, Taylor, Wieselberg, Thorley, & Rutter (1987) found that ADHD children treated with Ritalin (as opposed to non-methylphenidate responders) experienced more, and more frequent, positive interactions with their mother, a decrease in parental conflicts, and fewer negative confrontations with their siblings. Similar results were reported by

Barkley (1988) when he found that preschoolers under the influence of methylphenidate responded with compliance to maternal direction. An earlier study by Barkley and his colleagues (Barkley, Karlsson, Strzelecki, & Murphy, 1984) also concluded that medically treated children experience higher quality relationships with their mothers, with fewer maternal conflicts and less negative maternal attitudes (Barkley, Karlsson, Strzelecki & Murphy, 1984).

Stimulant medication has also been found to assist in the alleviation of aggressive tendencies. Although all children with ADHD do not demonstrate aggressive behavior, researchers agree (Loney & Milich, 1982; Conners & Wells, 1986) that oppositional and defiant behavior, aggression, and conduct problems are often considered secondary symptoms among children with ADHD. These additional symptoms have also been found to improve through stimulant therapy, which subsequently helps to foster improved interactions with the children's classmates (Cunningham, Siegel, & Offord, 1985; Whalen, Henker, Buhrmester, Hinshaw, Huber, & Laski, 1989; Hinshaw, Heller, & McHale, 1992). In a recent study on ADHD children, researchers reported a reduction in children's aggressive acts (primarily stealing and lying) from an average of two per day to an almost unnoticed number following their participation in a methylphenidate treatment regimen. A reduction was also noted in regard to children's tendencies to use negative verbalizations (name calling and teasing). Consequently, the ADHD child's increased appropriate behavior often leads he/she to be socially

accepted to a greater degree. However, the frequency of ADHD children's initiated interactions remains unaffected by drug treatment (Murphy, Greenstein & Pelham, 1993; Barkley, 1990). Other research findings (Goldstein & Goldstein, 1990) have indicated that social skills training programs, used as supplements to medical treatment, have the potential to further enhance the quality of the ADHD child's social interactions and feelings of competence.

Findings in regard to improvements in the academic performances of ADHD individuals as a result of medication intervention have not been as promising or as consistent as the findings in regard to the behavioral and social aspects of these children's lives. Kavale (1982) published a review of literature concerning this issue and concluded that drug treatment did enhance learning and school performance. However, another review of literature published just one year later revealed contrary information. Ottenbacher & Cooper (1983) concluded that stimulant medication has "relatively little direct effect on improving overt academic performance" (p. 362). Jacobvitz and his colleagues (1990) have found that stimulants do improve a student's ability to function in testing conditions, thus, increasing his/her scores in areas such as arithmetic and spelling. However, they explained further that the improvements observed in this study occurred far too quickly following the instigation of medicinal treatment to indicate actual increases in achievement. To date these researchers claim that, "there is no evidence

that learning, as assessed by school work and achievement tests, is enhanced by stimulant drug treatment" (Jacobvitz et al., 1990, p. 681).

Weber, Frankenberger, & Heilman (1992) revealed findings that were in accordance with previous pessimism regarding the relationship between stimulant medication and marked academic improvements. They concluded that Ritalin did not improve the academic achievement of ADHD children, even after 1 to 2 years of being medicated. The children were found to demonstrate lower reading abilities both before and after treatment as compared to control individuals. However, a further decline in academic performances become evident one year before being placed on a Ritalin treatment plan. For the majority of the children this drop occurred between their first and third grades in school, which may support a correlation between reading difficulties and the arising of ADHD symptoms. After being placed on methylphenidate a stabilization in achievement scores was noted; however, further research is needed to determine whether it was the Ritalin that was indeed responsible for the improvements, or the effects of other confounding variables (increased teacher attention, bias, treatment effects).

Alto & Frankenberger (1995) came to similar conclusions regarding stimulant effects of methylphenidate on achievement scores. The results of this study revealed that the group treated with methylphenidate demonstrated lower levels of achievement both before and after stimulant treatment as compared to a control group of individuals without ADHD (matched for gender, Verbal IQ score, and family

structure). In addition, even after treatment the medicated group continued to display deficits in the areas of Reading, Word Analysis, Basic Composite, and Complete Composite. However, it was evidenced that after being placed on Methylphenidate, the learning rates of the ADHD children were observed to closely resemble that of the control group, and the achievement skills of these children were found to stabilize, which prevented the ADHD group from falling even further behind academically.

DuPaul & Rapport (1993) set out to determine whether or not methylphenidate did indeed normalize the classroom performance of children with ADHD. They reported that stimulant treatment did enhance the efficiency and accuracy of academic performances "to a point where they were no longer statistically deviant from scores obtained by normal children (p. 190). However, interpretations at the individual level indicated that 25% of the study's subjects did not demonstrate adequate improvements in terms of their classroom performances. For these children additional school-based interventions were recommended to supplement their medication treatment. The conclusions drawn from this study should be interpreted and generalized with caution due to the fact that treatment at each dose level was limited to one week intervals. Thus, researchers are uncertain as to whether or not an initial positive response to a specific stimulant dose is indicative of continued improvement once a regular dose treatment program is maintained, and

they are unsure of the probability that the short-term gains observed in this study will ever translate into long-term academic improvements.

In addition to DuPaul & Rapport's (1993) claims, a number of other researchers have given credence to the ability of pharmacotherapy to induce improved efficiency and accuracy in academic performances (Pelham, Bender, Caddell, Booth, & Moorner, 1985b; Douglas, Barr, O'Neil, & Britton, 1986; Rapport & Zametkin, 1988). Swanson & Wagner (1991) found Methylphenidate treatment to facilitate ADHD children's ability to solve mathematical problems with increased efficiency and accuracy. In a related series of studies (Rapport, Murphy, & Bailey, 1982; Rapport, DuPaul, Stoner, & Jones, 1986; DuPaul, Barkley, & McMurray, 1991) Rapport, Du Paul and their colleagues found large numbers of ADHD children to be more productive and accurate in their academic endeavors as a result of a methylphenidate treatment regime. These effects have been found to be directly related to the dose of stimulant ingested, with the greatest improvements demonstrated at the higher dosage levels. However, it is still unknown whether or not such short-term improvements in academic functioning will develop into greater scholastic success years later.

Unfortunately, the positive effects that stimulant medication has been found to have on ADHD children's attention, and possibly on these children's academic achievement levels, there are also several mildly adverse reactions that are experienced by between 20% and 50% of Ritalin users (Goldstein & Goldstein, 1990). Barkley (1977) in a review

of literature, noted that the most frequently incurred side effects were insomnia, anorexia or loss of appetite, weight loss, and irritability. Other researchers (Barkley, 1990; Biederman, 1991; Gadow and Pomeroy, 1991) have reported that insomnia and anorexia are commonly experienced, and that stomach pain, headaches, rashes, dizziness, motor or vocal tics may also be expected to occur . It was noted that many of the reported side effects were also present during placebo conditions, indicating that some of the adverse effects (primarily those related to temperament) may be characteristic of the disorder itself rather than resulting from stimulant ingestion (DuPaul et al., 1991). In most cases, the experienced side effects are relatively mild in their severity, and can be expected to dissipate within 1 to 2 weeks following initial treatment, or upon dosage adjustment.

The emergence of a tic disorder (particularly of the mouth, jaw, and tongue) is potentially a more serious condition and may not extinguish upon the termination of stimulant treatment (Pelham, 1993). Such a condition is found to develop in less than 1% of all stimulant-treated ADHD children (Barkley, 1990; Wicks-Nelson & Isreal, 1997), and is thought to occur primarily in children who are genetically predisposed to the disorder. Therefore, it is recommended that a thorough personal and family history be conducted prior to drug administration, and that all children be carefully monitored while enduring stimulant treatment.

Some additional concerns regarding the use of stimulant medication have been the focus of other empirical studies over the years. The

suppression of physical growth in both height and weight have been identified as possible long-term side effects of stimulants that have concerned many researchers and clinicians. Mattes & Gittelman (1983) studied individuals who had received stimulant treatment for up to four years, with an average daily dose equivalent to 40 mg of methylphenidate. The results illustrated a reduction in the rate of weight gain, and in height gain to a lesser significance. These effects were found to be highly correlated with the dose ingested, and with the extent of treatment endured. Therefore, it is probable that such complications could be avoided through lower dosage administration, in addition to suspending the use of medication treatment during non-school hours, weekends, and holidays so that growth can rebound (Gittelman-Klein & Mannuzza, 1988). Pelham (1993) speculated that growth suppression may be a result of a reduced appetite, while another study (Hastings & Barkley, 1978) has indicated that stimulants have a direct effect on the level of growth hormones in the blood which may contribute to reductions in an individual's rate of height and weight gain (Barkley, 1990). However, there has been no evidence to date to suggest that stimulants have a significant effect on a child's adult height and weight (Barkley, 1990).

The effects of stimulants on cognitive-motivational factors in ADHD children have also been a prevalent concern of both parents and educators. It has been postulated that children may begin to attribute their successes and improved performances to their medication, rather

than to their own efforts (Pelham, 1993). Pelham (1993) conducted a study regarding this issue and came to the conclusion that ADHD children tended to "make internal attributions (i.e., selected their own efforts and abilities as the explanation for their behavior) on their good days...and tended to make external attributions on their bad days (i.e., blamed their pill for their failures)" (p. 209). These results were independent of the type of medication ingested (stimulant, placebo, or no medication at all). Thus, the attributions that the children made (internal or external) were not necessarily a result of their medication condition, but rather depended on their success (or lack thereof) in the program that day. However, when the individuals in this study and others (Milich, 1994) were treated with medication they were found to be far more likely to have a successful day and encompass internal attributions, as compared to the placebo treatment condition. The improvement that medication may bring to the individual's experiences at school may assist him/her in achieving "feelings of competence and self-control and...also help them to realistically appraise their abilities" (Wicks-Nelson & Isreal, 1997, p. 231). Due to the often convoluted research findings pertaining to this issue, and the expression of continued concern by practitioners, parents, and teachers, further research may be beneficial in identifying the effects of medication on a child's use of appropriate attributions.

A final issue to be cognizant of involves the prominent critique regarding the misdiagnosis and overdiagnosis of ADHD, and subsequent

illegitimate prescriptions for pharmacological treatment. There has been a proclivity for teachers, school systems, and occasionally parents, to seek a stimulant prescription to provide a "quick fix" to problems incurred either at home or in school (Wicks-Nelson & Isreal, 1997). Contrary to this development, many experts (Swanson et al., 1995; Jacobvitz et al., 1990; DuPaul, Barkley & McMurray, 1991) have recommended that other strategies be implemented prior to, and in addition to remediation through stimulant interventions in an effort to reduce the possibility of lasting adverse side effects. While the numerous and extensive benefits of drug therapy have been acknowledged, it is also important to consider the many limitations that have been presented, and invariably guard against the unwarranted use and abuse of stimulant medication in response to ADHD symptomatology.

Direct Contingency Management Procedures

Behavior modification is another well substantiated approach to the treatment of ADHD children. This approach involves the participation of parents and teachers in the implementation of behavior management methods in both home and school settings. Within this operant treatment paradigm, two major classes of intervention procedures will be addressed. Direct contingency management involves the engineering and institution of reinforcement (the use of a consequence to strengthen a behavior) and response cost contingencies (the act of punishing by taking away reinforcers) (Woolfolk, 1995) for individual children (Hinshaw & Erhardt, 1993). A direct application of these contingencies in a

classroom or home settings constitutes the implementation of a direct contingency management system. Clinical behavior therapy is a contrasting, but more frequently utilized approach which entails consultation with parents and teachers, or others involved with the child, through which they are guided toward the implementation of behavior management strategies such as social reinforcement, ignoring, time-out, token economies, privilege loss, and so on. (Hinshaw & Erhardt, 1993). Teachers and parents are trained through attending a series of group sessions that serve to educate them regarding the power of behavioral consequences to control inattention, impulsivity, appropriate social interactions, adherence to directions, and effort and performance among ADHD children (Wicks-Nelson, & Isreal, 1997). The intention of this method is for "natural change agents to modify cues and contingencies for child behavior so that improvements will accrue to home and school settings" (Hinshaw & Erhardt, 1993, p. 237). Both clinical behavioral therapy and contingency management techniques have presented significant findings that have demonstrated a reduction in ADHD symptoms; however, the magnitude of the effects have generally been regarded as inferior when compared to those attained through pharmacological treatment efforts (Braswell & Bloomquist, 1991; Pelham, Carlson, Sams, Vallano, Dixon & Hoza, 1993; Wicks-Nelson & Isreal, 1997).

Positive Consequences

Positive consequences (praise, teacher attention) have always been considered a fundamental technique in the management of ADHD individuals within a direct contingency management system. A series of studies (Acker & O'Leary, 1987; Rozen, O'Leary, Joyce, Conway, & Pfiffner, 1984) was conducted in effort to define the role of praise in ADHD treatment programs. The outcomes indicated that the presence or absence of praise has not been determined to correlate with rates of on-task behavior. However, these studies found that when the teachers ceased to admonish the students, a dramatic deterioration in student behavior was noted. Furthermore, when praise was adjoined to a negative consequences already in use, no additional behavioral enhancements were observed. Barkley (1990), on the other hand, gives credence to the use of praise and attention, and has found them to be very valuable management tools if the appropriate behavior is specified, and if the delivery is without delay. He further asserts that the withdraw of praise and attention (ignoring) contingent upon inappropriate behavior, is also effective in bringing about behavioral improvements. When the two strategies (praise and ignoring) are used concurrently the efficacy of the behavior management program is believed to be enhanced (Barkley, 1990). However, he warns against the use of ignoring as a remediation approach for behaviors that are not thought to be maintained by contingent attention.

In another recent series of investigations (Acker & O'Leary, 1987; Pfiffner & O'Leary, 1987; Rosen et al., 1984) evidence is presented that suggests that positive reinforcement programs, such as teacher praise and token reinforcements, are not always sufficient techniques to use in the remediation of the core ADHD behaviors. It is the punishment contingencies, such as response cost, time out, and verbal reprimands, that have been found to instigate significant behavioral improvements with or without supplemental positive reinforcements (Hinshaw & Erhardt, 1993; Abramowitz & O'Leary, 1991).

It is widely accepted that the administration of punishments induce avoidance behavior. The avoidance that is instigated as a result of the punishment contingencies serve to actually motivate the child to stay on-task, and to avoid those actions that are presumed to eventuate as punishment (Houlihan & Van Houten, 1989). These results endorse an emphasis on punishment strategies in the development and implementation of behavior management programs for children with ADHD.

Response Cost

Response cost is defined as "the concurrent application of reinforcement for appropriate behavior and a loss of a positive reinforcer or penalty following inappropriate behavior" (DuPaul, Gueveremont, & Barkley, 1992, p. 256). It is an example of a punishment contingency that has been deemed to be an effective management procedure for children

with ADHD (Atkins, Pelham, & White, 1989). This procedure has been investigated through the use of an Attention Training System (ATS) which was designed to concur with the definition of a response cost program. This apparatus electronically administers immediate positive and negative feedback to children in the form of points that correspond to the number of minutes that the child has remained on-task. For example, a child that is on-task for five minutes would be given five points, however, if a two minute interval of off-task behavior followed, then two points would be revoked. The results of a 1991 study (Gordon, Thompson, Cooper, & Ivers, 1991), revealed that the ATS greatly facilitates children with ADHD by dramatically improving their level of sustained attention during the treatment phase as compared to baseline measures. However, the behavioral gains were not found to persist upon the discontinuance of the ATS program. In addition, it should be considered that the findings of this study were obtained in a clinical setting, therefore, the effects of a generalization to school conditions is beyond the scope of the collected data. Nevertheless, it was concluded by the researchers that such a "strategic combination of predictable positive rewards and consequences that are immediate and meaningful may represent the most effective overall approach to the behavioral management of classroom inattention" (p. 157).

A similar investigation was conducted two years later (DuPaul, Gueveremont, & Barkley, 1992), only this time the procedure was implemented in a self-contained classroom environment using two boys

(six and seven years old), both meeting the criteria for ADHD. The interpretation of the results indicated significant improvements regarding a reduction of ADHD symptomatology, and increased on-task behavior and product completion rates. The gains that were noted were found to exceed those of which were observed during a previously implemented token reinforcement system. However, since this study was conducted in a special education classroom with only two young students, cautious generalizations are sanctioned in terms of implementing an ATS response cost program in a large, mainstream classroom, comprising older students. However, in accordance with the conclusion drawn by the previous study, these researchers also agree that a "contingency management program that employs immediate and salient contingencies, like the ATS, remains one of the most effective treatment approaches for ADHD" (p. 223).

A replication of this study was conducted in 1995 (Evans, Ferre, Ford, & Green, 1995), this time with an older student (an eleven year old fifth grader) and coupled with a token reinforcement program. The token reinforcement element entailed an opportunity for the child to exchange his earned tokens for a reinforcer of his choice. The findings were found to concur with prior results, in that the program was found to be effective in reducing the frequency of off-task behavior in this child diagnosed with ADHD.

Pfiffner & O'Leary (in press) reported on the findings of a series of studies (Rapport, Murphy, & Bailey, 1980, 1982; Atkins, Pelham, & White,

1989; Cantwell, 1993) that also endorsed the use of programs that involve response cost measures to treat core ADHD behaviors. The conglomeration of results indicated that response cost contingency management programs lead to greater academic accuracy and productivity, as well as on-task behavior when compared to programs of which the sole focus is on reinforcing desirable behavior.

Peer-Mediated Contingencies

Contingent peer attention or peer-administered contingencies are strategies that have incorporated the idea of response cost, only rather than teacher mediated, these programs are mediated by other students in the classroom. Macciomei (1993) investigated this ADHD treatment methodology. The classmates used for the purpose of this study were instructed to praise on-task behaviors (sitting quietly, following directions, working independently) and to withdraw praise, or to ignore disruptive and intrusive behaviors (loud voices, bothersome acts, inattention) demonstrated by the specified children with ADHD. Marked benefits for both the classroom teacher and the ADHD student were exposed in terms of decreasing the amount of time spent engaged in off-task behavior, which served to increase attending to instructional material, and enhance rates of productivity.

Barkley (1990) noted several advantages of implementing peer-mediated contingencies with ADHD students. First, school-age peers often have more opportunities to observe each others' behavior and provide accurate, immediate, and consistent consequences. Second,

generalization to other situations may be fostered through peer reinforcement. Third, the children assigned to implement the intervention may improve their behavior as well. Fourth, peer-mediated programs are often more practical and less time-consuming as compared to teacher-mediated approaches (O'Leary & O'Leary, 1977; Barkley, 1990). The implementation of such a program allows "the teacher to have control over a wider range of contingencies that affect target children's inappropriate behavior, making any teacher administered reinforcement more powerful" (Abramowitz & O'Leary, 1991, p. 225).

However, there are several precautions that must also be considered when using peer-administered contingencies. Foremost, there is the potential for peers to be affected by peer pressure, fear of rejection, and differential definitions of misconduct, which may follow excessive leniency and over-distribution of reinforcement. In addition, in some circumstances peers may have a tendency to administer consequences in a controlling and punitive manner. Therefore, it is recommended that students not be relegated to manage the execution of negative consequences, and that teachers adequately train and supervise the peer confederates (Pfiffner & O'Leary, in press; Barkley, 1990).

The effectiveness of such a management program was the focus of a recent study which was conducted to investigate the differential effects of teacher and peer attention on the disruptive classroom behavior of children with ADHD (Northup, et. al, 1995). Northup and his colleagues used a multi-element design which comprised alternate teacher attention

and peer attention conditions that were followed by differential reinforcement of other behavior (DRO) treatment probes. During the DRO probes, the individuals with ADHD were given the opportunity to earn time with a peer of their choice contingent upon the nonoccurrence of the specified target behaviors. Coupons (equivalent to two minutes of peer time) were placed on the student's desk contingent upon their display of on-task behavior. The outcome of this study indicated that the contingent peer attention conditions resulted in a significantly higher percentage of sessions in which the target behaviors (out of seat behavior and inappropriate vocalizations) were demonstrated (41% to 80%) as compared to the teacher attention conditions (0% to 6%). Thus, teachers may be more efficacious than peers in conducting behavior management programs. However, since substantial reductions or zero occurrences of target behaviors were achieved during the DRO treatment probes, it is attested that peer attention can function as a powerful reinforcer in the process of managing the behavior of individuals with ADHD.

Token Economy

A classroom token economy is an example of a behavior management program that is mediated by the teacher, which may or may not involve a response cost element. A token economy may focus on remediating a variety of academic, behavioral, and social difficulties, or it may center on improving one or two target behaviors (Abramowitz & O'Leary, 1991). Proper execution entails the teacher to administer tokens

contingent upon a student's demonstration of on-task behavior. At the end of the day (or week), the child is allowed to exchange his/her tokens for an activity, object, or privilege. When a response-cost element is involved, tokens are taken away following rule violations or the display of off-task or disruptive behavior. Although many educators may be disinclined to incorporate negativity into their ADHD management approach, and therefore may be hesitant to take away tokens that a student has earned, teachers need to bear in mind that ADHD individuals are inclined to benefit from such reductive techniques. In the event that a student begins to lose more tokens than he/she has gained, a program evaluation and/or adjustments may need to be constructed. It may be necessary to modify the behavioral criteria, time intervals may need to be reduced, or the reinforcers and consequences employed may require modifications (Pfiffner & O'Leary, 1987). It is possible to implement such programs with a whole class of students as a classroom management technique, or with a select group of individuals who require additional assistance in regard to controlling their behavior.

Token economy behavioral management systems, however, are not without their limitations (Robinson, Newby, & Ganzell, 1981). Teachers must devote a significant amount of time and effort into implementing immediate and continual reinforcements (tokens), while the response cost contingencies also require attentive monitoring. As a result of the intensiveness of token systems and the constraints of the classroom it may not be feasible to adhere to the program throughout the course of an

entire day, which may make mainstreaming difficult for those who are accustomed to such contingencies in their special education settings.

The purpose of the aforementioned study conducted by Robinson et al. (1981) was to determine whether or not a token economy system could be used to improve the academic performances of students who have been identified as hyperactive. For the eighteen boys (all of which were attending a special classroom, and five of which were currently taking medication to control their overactivity) that participated in this study, the number of assignments completed under regular conditions was found to increase by nine times upon the implementation of a token system. The tokens that were administered consisted of different colored tokens which could be exchanged for fifteen minutes of "play time" on electric video games. Tokens were earned upon the completion of tasks that involved reading or the use of new vocabulary, or for assisting others who had not yet accomplished those tasks. Although all eighteen students demonstrated an increase in their academic performance, it is unclear whether these results can be generalized to mainstream classrooms, or to conditions that do not entail video games.

One of the first studies regarding the effectiveness of a token system was conducted by O'Leary, Becker, Evans, & Saudargas (1969). This investigation involved seven second grade students who were indicated by the teacher as demonstrating "a great deal of undesirable behavior" (p. 4). The first part of the study involved implementing

management tactics that included rules, educational structure, and praising appropriate behavior while ignoring disruptive behavior. The findings revealed that disruptive behavior was not reduced as a result of these procedures. However, with the introduction of the token system a significant decline in the frequency of disruptive behavior was observed in six of the seven children. The follow-up data that was provided indicated that the teacher was eventually able to fade the use of the tokens and exchange them for the existing educational reinforcers (stars, candy, praise). Since this study was not conducted using specifically children diagnosed with ADHD, it is uncertain as to whether or not these results could be generalized to this population of individuals.

Since this study, there have been numerous others (Rapport, Murphy, & Bailey, 1982; Robinson et al., 1981; Barkley, 1989; DuPaul, 1991) that have documented efficacy for the use of classroom token economies. DuPaul's (1991) investigation incorporated a variety of strategies (token reinforcement, contingency contracting, response cost, time out, and home-based contingencies) into a comprehensive classroom management system that he used with children identified with ADHD. He documented significant improvements in regard to behavioral control (a reduction of the demonstration of core ADHD behaviors) and academic performance (improved rates of productivity) as compared to that of normal classroom conditions.

Time Out

Time out is an example of a mild punishment contingency that is often effectively used as a consequence in direct contingency management programs. This process involves removing the child from a reinforcing event contingent upon noncompliant behavior (Hinshaw & Erhardt, 1993). The purpose of time out procedures are to alert the child to his/her noncompliant behavior, and then to allow him/her to return to the situation, providing the child with a second attempt to demonstrate compliance (Goldstein & Goldstein, 1990). The time the child is to spend in time out is recommended to be equal in minutes to the child's age in years, although there are other factors that must be considered in determining an appropriate duration for time out, such as the child's history with time out, and the type of time out condition being utilized (Kendall, Nay, & Jeffers, 1975; White, Nielson, & Johnson, 1972). Upon the obedience of the time out condition the child may be dismissed from the time out chair and contiguously provided with a reissuance of the initial request for compliance (Barkley, 1990). If the child proceeds to disobey for a second time, the time out procedures are to be repeated (some researchers have recommended to extend each subsequent time out period by one minute) until compliance is achieved. When the child does finally comply, he/she should be reinforced for his/her appropriate behavior (Goldstein & Goldstein, 1990).

If time out procedures are chosen as a classroom management it is essential for educators to consider that time out may actually be a

reinforcer for some ADHD individuals who act out in order to escape the academic demands of the present situation. In this case, other reductive strategies must be employed, and/or the classroom environment may need to be altered to increase the child's interest and attention, which may include modifications to the tasks and activities, and a reevaluation of the reinforcers used with the child (Abramowitz & O' Leary, 1991).

Time out has been found to be a very influential procedure for reducing disruptive behavior, and remediating aggression in children with ADHD who display this coexisting problem (Bean & Roberts, 1981). This procedure has also demonstrated effectual results with even the most disruptive individuals, "because it restores order by removing the disrupter, reduces the opportunity for peer approval..., reduces the opportunity for students to manipulate situations, affords the students the opportunity to gain self-control, and may allow the student to demonstrate appropriate behavior before exiting time-out" (Goldstein & Goldstein, 1990, p. 356). However, the implementation of time-out procedures is not a simple task, and typically requires highly trained teachers. Therefore, it is recommended to be used only with those children with ADHD who demonstrate extremely disruptive and noncompliant behavior (Abramowitz & O'Leary, 1991).

Sachs (1973), investigated the use of time out procedures with children with behavior problems. The children referred for behavior problems were placed in a time out room for five minutes upon their demonstration of off-task or disruptive behavior. The results of this

method of behavior management were found to be efficient and effective. The subjects demonstrated a visible reduction in their off-task and disruptive behaviors, and were classified by their teachers as more attentive. However, since the subjects of this study were not formally diagnosed with ADHD, it may not be appropriate to generalize these findings to the ADHD population.

In a more recent series of classroom studies regarding the management of hyperactive children (Acker & O'Leary, 1987; Pfiffner & O'Leary, 1987; Rosen et al., 1984) found punishment contingencies, such as reprimands and time out, to be effective in reducing the subjects' overactivity during class time. These procedures demonstrated effectiveness even when positive reinforcement strategies were not used concurrently.

Other researchers (Carlson et al., 1992; Henry, 1987). have concluded remarkable results when time out is used in conjunction with other behavior management procedures. Carlson and his colleagues (1992) implemented a comprehensive behavior management program (comprising token reinforcement, classroom structure, rules, feedback, time-out, and a home-based daily report program) with a group of twenty-four ADHD boys between the ages of six and twelve. The findings revealed a positive influence on the children's self-perceptions of their school achievement; significantly lower rates of disruptive behavior, and higher rates of on-task behavior as compared to regular classroom conditions. In addition, it was noted that the demonstrated

improvements were comparable to that of low dosages of stimulant medication. However, positive academic improvements were not noted as a result of this behavioral program.

Henry (1987) used the concept of time out within a parent training model in which he taught parents how to attend, reward, ignore, give commands, and use time out. The participants of this study were six sets of parents all of which have a child diagnosed with attention deficit disorder with hyperactivity. The conclusions derived from this investigation proved to be in accordance to Patterson's (1976) study, from which he found time out to be the most effective treatment component of a behavior management program. Henry concluded that the "learning of a time out procedure for noncompliance provided each parent with a more effective technique than simply attending and ignoring" (p. 111). Time out was found to be an "essential component" to the treatment program, assisting to increase the compliance rate of all six children with ADHD. Each subject attained a rate of successful task completion that was equal to or greater than 95% (five of the six subjects rate was recorded to be 100%). However, all of the subjects incurring the time out procedure were also receiving medication therapy *and symbolic modeling, therefore, the generalization of these results is limited.*

The recommendations derived from these and other empirical investigations are that although teachers typically prefer to implement positive techniques, they are forewarned that an exclusive reliance on

praise to maintain on-task behavior in ADHD students will likely prove to be ineffectual. As DuPaul, Guevremont, & Barkley (1992) have concluded, "the use of positive reinforcement by itself is usually insufficient to maintain improved classroom performance and must be combined with mild punishment contingencies to obtain optimal behavioral control and academic productivity" (p. 205). Therefore, token economies involving response-cost, other response cost programs (ATS, peer-mediated contingencies, home-school contingencies), or punishment techniques (reprimands, time out), or may be needed in the process of reducing disruptive behavior and promoting academic achievement (Pelham et al., 1993; Gordon, Thomason, Cooper, & Ivers, 1991).

Parent Training

Parent training is the most commonly used method of clinical behavior therapy, which is the second class of interventions within the realm of behavioral treatment of ADHD (Hinshaw and Earhardt, 1993). This comprehensive mode of treatment entails consultation with parents through which they are guided toward the implementation of behavior management strategies such as social reinforcement, ignoring, time out, token economies, response cost, and so on (Hinshaw & Erhardt, 1993). The training and education parents regarding the many aspects of ADHD, and the appropriate approaches to the remediation of core ADHD behaviors serves to assist children with ADHD in both home and school settings (Hinshaw & Erhardt, 1993).

It is the parents of ADHD children that typically have the greatest investment in effectively managing the behavior of their child. In addition, they are also thought to be the most influential in manipulating the environment so as to promote positive behavior changes (Newby & Fischer, 1991). This task, however, can be quite extensive and one of great complexity. Thus, parent training sessions are often required to provide parents with the skills needed to restructure the environmental demands and contingencies in the home to facilitate the development of compensatory skills such as compliance to rules, on-task behavior, and appropriate social interactions that enable their child to cope with his/her disability.

Barkley (1987) has found that it is noncompliant behavior that is the most common parental complaint regarding the behavior of their child with ADHD, which also functions as the fundamental basis for negative parent-child interactions. In an environment comprised of noncompliance, an eventual escalation trend is probable, where noncompliant behavior by the child instigates parental negativity, which in turn enhances the tension, eventually creating an atmosphere conducive to further deviant behavior (Newby et al., 1991). Barkley's (1990) training program focuses on eliminating noncompliance, as well as addressing the social processes of the family that are presumed to be responsible for the origination and maintenance of ADHD behavior. This training program includes three fundamental principle goals for improvement. The first goal is to improve parental competence in the

management of their child's behavior. Secondly, parents are educated regarding the factors and the social learning theories that may be playing a role in the development and the maintenance of ADHD behavior. The third goal involves the improvement of child compliance with parental requests and rules. Emphasis is placed on the importance of consistency, immediacy, and specificity in the issuance of consequences to their children (Newby et al., 1991).

This training/counseling approach is currently used by Barkley and his colleagues at the University of Massachusetts Medical Center to work with parents of ADHD children (Barkley, 1990; DuPaul, Gueverement, & Barkley, 1991). The program consists of ten steps that are accomplished through weekly training sessions in which parents are guided toward better management of noncompliant behavior in their child. The ten steps are briefly summarized below.

1. Parents are educated regarding the nature, course, prognosis, and etiology of ADHD.
2. Child attributes, parent attributes, situational consequences, and family associated with child opposition and noncompliance is discussed.
3. Parents are trained to increase the frequency of positive interactions with their child. The demonstration of appropriate behavior should be acknowledged while inappropriate actions should be ignored.

4. Parents are trained to issue brief commands (not those that are posed in the form of a question--"Will you please clean up your room?"), and to simplify tasks to improve compliance. They are also encouraged to engage in independent play with their child.
5. Parents are educated regarding the implementation of a token economy which serves as a reinforcing system for the child upon his/her completion of chores.
6. The parent's use of the token economy is monitored, and parents are trained in the appropriate use of time-out and other response-cost procedures to be used as a result of noncompliance.
7. Behavior management strategies currently in use by the parents are reevaluated, and parents are directed to use time-out whenever it is needed.
8. Parents are encouraged to employ management techniques in public places.
9. A review of learned techniques and information is conducted with the parents. They are then provided with suggestions and strategies to use in future situations.
10. Four to six weeks following dismissal from the training/counseling program, a "booster" session is held to monitor progress, and to refine behavior management methods as needed.

This program is a fundamental part of a comprehensive clinical behavior therapy program. However, not all parents will be willing to partake in the training sessions, and others need only school remediation methods (Wicks-Nelson & Isreal, 1997).

There does exist a substantial body of research that sanctions the validity of parent training programs to manage and control the core features of ADHD, while also serving to ease to stress that is often endured by parents under such circumstances. Both the Barkley (1987) and the Forehand & McMahon (1981) program reported positive treatment effects for increasing child compliance, promoting positive parent-child interactions, and enhancing behavior management skills. Patterson & Fleischman (1979) employed a similar program with parents and concluded that 76% of the families that were involved in the training indicated levels of problem behavior to be within the normal range upon completion, and that 84% of those families whom were available for a one year follow-up reported similar success.

A more recent study (Anastopolous, Shelton, DuPaul, & Guevremont, 1993) evaluated the changes experienced in parent functioning as a result of their participation in a parent training program. They concluded that parents who successfully completed the training program were found to benefit from lowered levels of parenting stress, an increase in parenting self-esteem; in addition improvements in the behavior of their ADHD children were noted.

Cunningham (1990) developed a parent training model that offered a facilitative approach, involving coping-modeling and problem-solving, rather than a direct instruction approach that has previously been popular. His program attempts to empower parents to function as active agents in the process of change. Parents are educated through the use of modeling strategies and instructed to use collaborative problem-solving approaches. To supplement this method of parent training, a social skills program for children was instituted prior to the parent sessions. Through involvement in the training sessions the children were taught to use appropriate social skills when relating and interacting with their parents and peers. The children were then encouraged to acknowledge and cooperate with their parents' newly acquired strategies. Upon the completion of the two programs, the authors found that children were able to listen to directions better, follow rules with an increased frequency, function with greater independence, and demonstrate more suitable behavior overall. Correspondingly, the parents who had completed parent training were likely to be "more positive, consistent, relaxed, flexible, confident and satisfied in their interactions with their children" (Cunningham, 1990, p. 455). However, the authors indicated that further research is needed in this area to identify the specific impacts of such multi-modal interventions on the social environment and the well-being of the parents and child.

In contradiction to empirical evidence previously addressed that lends support to the efficacy of parent training, there exists substantial

documentation that undermines this verification. A recent study (Ialongo, Horn, Pascoe, Greenberg, Packard, Lopez, Wagner, & Puttler, 1993) investigated the effects of a multi-modal treatment regimen which included psychostimulant therapy, parent behavior training, and child self-control instruction. Ialongo and his colleagues hypothesized that the psychostimulants would serve to increase the child's attention and concentration while reducing his/her hyperactivity and impulsivity to facilitate learning during the course of the self-control training sessions. Upon the discontinuation of the medication, it was thought that the self-control training would serve to maintain the treatment advancements that were obtained through stimulant therapy. The researchers further reasoned that the parent and teacher training sessions would foster maintenance and generalization of treatment results by reinforcing appropriate behavior and encouraging the child as needed. However, nine months after the termination of the medication treatment, the subjects displayed virtually no indications that they had benefited from the other methods of treatment. The behavioral gains that were achieved during the medication phase were not observed to be maintained or generalized as a result of the self-control training or parent and teacher training procedures.

A similar study (Horn, Ialongo, Pascoe, Greenberg, Packard, Lopez, Wagner, & Puttler, 1991) was conducted that set out to investigate the additive effects of psychostimulants, parent training, and self-control therapy on ADHD behavior. Again, it was concluded that the combined

approach of the multi-modal treatment was no more effective than the use of medication as the sole form of therapy. Although the medication acted to normalize the individual's level of inattention and impulsivity as measured by the Continuous Performance Test (CPT), the self-control training did not serve to improve social skills and enhance peer interactions. In regard to the parent training, no differential treatment effects were noted between the experimental and control groups .

In spite of these disaffirming conclusions, parent training and counseling programs are still recognized as the second most widely implemented treatment approach for ADHD (Goldstein & Goldstein, 1990), and are thought to be an integral part of a comprehensive treatment plan (Wicks-Nelson & Isreal, 1997). Although medication therapy may be the most effective method in improving the core symptoms of ADHD in children, parent training sessions serve to educate parents regarding the various aspects of this disorder which is not accomplished through a medically administered treatment regimen. Educationally qualified parents are then able to achieve a deeper understanding of their child's behavioral patterns, which in turn allow them to develop appropriate expectations regarding their child's behavior, social interactions, and academic success. Subsequently, parents of children with ADHD can expect to experience lower levels of parenting stress and an increase in parenting self-esteem as a result of their participation in the training or counseling sessions.

Multi-modal Treatment

The next question that researchers sought an answer to is whether or not the behavioral gains observed as a result of behavioral treatment programs compared to those engendered from pharmacological therapy. Using a double-blind research design, Jalongo et al. (1993), set out to understand the separate and combined effects of these treatment modalities on the amelioration of core ADHD behaviors.

Ninety-six children diagnosed with ADHD were randomly assigned to one of six treatment conditions: (1) medication placebo alone, (2) low-dose of stimulant therapy alone, (3) high-dose of stimulant therapy alone, (4) medication placebo implemented with behavioral parent training and child self-control instruction, (5) low-dose stimulant therapy implemented with behavioral parent training and self-control instruction, and (6) high-dose stimulant therapy implemented with behavioral parent training and self-control instruction.

The researchers hypothesized that learning would be facilitated through the administration of stimulants by increasing their attention and reducing overactivity and impulsivity. Thus, they reasoned that once the medication was discontinued, the child would be able to maintain the behavioral gains experienced during the medication condition by implementing his/her newly acquired self-control skills. In addition, the training of the parents and teachers, was also expected to assist the child in maintaining and generalizing the improvements by serving to prompt and reinforce the use of the child's newly learned skills.

However, nine months after all treatment regimens were ceased, there was essentially no evidence to support the hypothesized claim that "the combined conditions would produce greater maintenance of treatment gains than would medication alone" (p. 182).

As evidenced by the unveiled results, stimulant therapy was found to be highly effective in treating ADHD symptoms, however to maintain the gains it is determined necessary to endure lengthy periods of drug treatment. If such long-term drug treatment is not desired, Ialongo and his colleagues offered suggestions as to ways to improve the treatment effects of the behavioral methodologies such as more intense and multi-method training (including videotaped modeling) for the parents and teachers, and to design the child behavior instruction sessions so as to target academic problems as well.

An opposing view to multi-modal ADHD treatment was introduced by Nathan (1992). He referred to previously conducted multi-modal therapy studies (Borden & Brown, 1989; Whalen & Henker, 1991) and issued a dissent regarding the short-term implementation of the behavior modification programs, a disapproval of the comparisons that were made between the effects of behavior modification programs and specific dosages of medication, and a disregard of the discouraging results that were documented. He believes that the use of multi-modal treatment regimens "produces therapeutic benefits greater than the sum of each modality's contribution" (p. 283). Since his ideas and beliefs are based in psychodynamic thought, he endorses the use multi-modal psychodynamic

therapies with both the individual and the family to treat ADHD symptomatology. To properly implement multiple treatment modalities, he further asserts that one must understand the dynamics of the child with ADHD (fears, emotions, resistances, and estrangements), which is considered to be critical information that is needed to develop and coordinate other interventions. Understanding the child in this way allows the child to feel "part of," rather than "manipulated by" treatment methods (p. 287).

Additional research was needed to arrive at a consensus regarding the effects of multi-modal ADHD treatment. Pelham et al. (1993) set out to determine empirically the separate and combined effects of methylphenidate and behavior modification on ADHD symptomatology. Their research involved the participation of thirty-one ADHD boys (between the ages of five and nine) who were attending a summer treatment program. The data indicated that the separate administration of behavior modification techniques and methylphenidate served to significantly increase rule-following behavior and time on-task, while inhibiting disruptive behavior. However, when the two interventions were combined, it was found that the combination was more effective than the use of behavior modification alone, yet "yielded limited improvements beyond that afforded by methylphenidate alone" (p. 512). Thus, implicating that behavioral interventions may be contemptible if a pharmacological intervention is implemented. There are several limitations of this research procedure that may hinder the generalization

of the ADHD treatment claims. The first is that the conclusions are based on short-term outcomes, there is little valid, empirical evidence that supports the long-term effects of a medication only treatment regimen. The long-term effectiveness of a treatment plan incorporating both medication and behavior treatment has never been the focus of investigative efforts. Second, it is thought that the two interventions may have a complimentary effects on children with ADHD. It may be that the medication serves to control some of the core symptoms (attention and overactivity) while the behavior modification strategies may work on others (aggression, on-task behavior). Thus, the researchers indicated that regarding their findings, "limited additional value of behavior modification given medication---may not always hold" (p. 513).

The most recent article published pertaining to multi-modal ADHD treatment programs was a review of literature written by Richters and his colleagues (Richters, Arnold, Jensen, Abikoff, Conners, Greenhill, Hechtman, Hinshaw, Pelham, & Swanson, 1995). They found the consensus among the emerging literature to be that "no single treatment alone is likely to yield significant long-term, cross-domain therapeutic gains in an unselected, heterogeneous group of hyperactive children" (p. 994).

Considering that every child with ADHD is a unique case, some researchers (Hechtman, 1993; Horn et al., 1991; Satterfield et al., 1987) believe that such individual differences should be considered when drawing up a treatment plan. They have recommended that the

children whose most pronounced deficits are incurred in academics, academic skills training may be most beneficial and all that is needed. Others who present problems in terms of overactivity and impulsivity may require medication therapy, and with respect to the severity of the demonstrated difficulties additional interventions (social skills training, family therapy) may be necessary. Yet, other children with ADHD may yield significant improvements as a result of behavior modification programs, without the administration of medication. Satterfield's (1987) study used this philosophy to guide his research.

A one-year follow-up study to Satterfield's (1987) study indicated that matching the treatment modalities to the individual needs of the children with ADHD (including careful titrations of medication, family therapy, parent training, and group therapy) "yielded unexpectedly positive outcomes" (p. 995) in terms of overall improvements. However, several limitations in the validity of this study were identified, which included a nonexistent control group, a lack of blind assessment and progress monitoring procedures, and the use of a small sample of subjects. These variables serve to confound the results and limit the extent of interpretations and generalizations of the collected findings.

The empirical evidence derived from the aforementioned studies and literature review makes it difficult to arrive at a single conclusion that either supports or refutes the use of multi-modal therapy in treating ADHD. All of the researchers have presented valid evidence, however, the findings have all been noted to be laden with some degree of research

design limitations and bias. One of the biggest confounding variables is in the identification of the ADHD subjects to use in the sample. As was mentioned by Richters and his colleagues (1995), children with ADHD "are likely to have significantly different patterns of comorbidity, family backgrounds, and functional deficits" (p. 995). Therefore, giving credence to one treatment modality, or a combination of treatments, is a complex task when considering that the problems targeted for remediation efforts are subject to significant individual differences. Since a treatment methodology that will provide a cure for ADHD has not yet been established, the recommendations from this series of literature would be to treat each ADHD case according to the deficits that are presented; to carefully monitor the child's improvements during treatment; and to change or provide additional treatment if a need is presented.

Summary

The condition of ADHD is defined in regard to three diagnostic features which comprise inattention, impulsivity, and hyperactivity. To determine a correct ADHD diagnosis, evidence of these behavioral manifestations must be apparent in at least two settings before the child is seven years of age, and there must be "clear evidence of clinically significant impairment in social, academic, and occupational functioning" (DSM-IV, 1994, p. 84). It is important to consider that the hallmark characteristics of ADHD uniquely combine, making each and every child with ADHD an individualized case.

The individualization of the specific symptoms and behavioral manifestations of this disorder are partially the result of a variety of factors working in combination with each other, with the specific causal factors varying from person to person. Although many researchers have afforded etiological theories derived from an assortment of domains, a single valid theory has not been developed to offer an explanation for every ADHD case.

A variety of theories based in biology have been hypothesized to explain the origination of this disorder. A defective attentional system was one of these suggested theories. Others are based on beliefs of altered neurochemistry, such as the dopamine hypothesis, the noradrenergic hypothesis, and the serotonergic hypothesis. However, all of these posited theories have demonstrated inconsistencies in their research support, thus, warranting further research to substantiate their etiological claim.

The most recent contribution to the realm of causal explanations are the effects of psychosocial factors, particularly the context of development and the early interactions experienced by the child. Children subjected to continual adversity throughout their course of development are thought to be without a sense of security that is requisite for adaptive and appropriate functioning in school and the appending social situations. Both controlling and intrusive parenting styles have been linked to the development of ADHD character patterns.

Since the origin of the deficits incurred by individuals with ADHD remains an uncertainty, further ambiguity is perpetuated in terms of determining effective methods of treatment, and the behaviors that should be targeted for remediation efforts.

Pharmacological treatment is documented as the most common remediation approach used for children diagnosed with ADHD. Within this domain of treatment, Methylphenidate (Ritalin) is by far the most frequently prescribed stimulant drug. As long as treatment is maintained, it can be expected that between 70% and 77% of ADHD children will positively respond to this drug. Those who have demonstrated notable improvements from stimulant administration have been found to have increased attending abilities, an enhanced capacity to control one's behavior, and an inhibition of one's tendencies to respond impulsively. In addition, stimulant medication has also been found to assist in the alleviation of aggressive tendencies, which helps to foster improved interactions with classmates and often can lead children with ADHD to be socially accepted to a greater degree. However, the evidence to support academic gains as a result of medication intervention have not proven to be as promising as the data collected in regards to attending behavior and impulse control.

Behavior modification is another well substantiated approach for the treatment of ADHD children. Direct Contingency management procedures include the use of positive consequences by parents and

teachers, which have been found to be insufficient in terms of managing the core ADHD symptoms. Therefore, punishment contingencies are typically required to further manage the classroom and home behavior of children with ADHD.

Response cost is an example of a punishment contingency that has been deemed to be an effective management procedure for children with ADHD. This procedure has been investigated through the use of an ATS which was designed to concur with the definition of a response cost system. The results of extensive investigative efforts regarding the effects of this treatment model on children with ADHD have been found to be very positive, leading to greater academic accuracy and productivity, as well as on-task behavior.

Aside from teacher or parent administered consequences, contingent peer attention or peer administered contingencies have also been the focus of many empirical investigations, and have been found to produce marked benefits in regard to controlling ADHD behavioral patterns (decreased off-task behavior, and increased attention). However, there are several precautions that must be carefully considered before implementing this method of management.

Other behavioral procedures deemed to be effective when used with children with ADHD include token economies, and time out. Numerous studies have documented efficacy for the implementation of token economies. The findings have specifically indicated that significant improvements were noted among children with ADHD in terms of

increased academic performance and productivity, and reduced disruptive behavior patterns. Time out procedures have also received recognition as an influential strategy in reducing disruptive behavior and off-task activity, and have been found to result in even greater gains when used in conjunction with other behavior management procedures.

Parent training is the most commonly used method of clinical behavioral therapy, which is a second class of interventions within the realm of behavioral treatment. Parent training is of particular importance because of the notable influence that parents have in manipulating their child's home environment and because of the great investment that parents have in effectively managing their child. Barkley designed a parent training program that includes three principal goals for improvement. The first is to improve parental competence in the management of their child's behavior. Second, parents are educated regarding the factors that encourage misbehavior. The third goal involves the improvement of child compliance of parental requests and rules. Recent research has concluded that as a result of participation in parent training programs, parents have been found to benefit from lowered levels of stress, an increase in parenting self-esteem, and noted improvements in the behavior of their child with ADHD.

The final issue that was addressed was whether or not the behavioral gains observed as a result of behavior modification compared to those engendered from pharmacological therapy. A variety of empirical evidence pertaining to this issue was reviewed, however, with

the presentation of supportive and refutive studies, it is impossible to arrive at a single conclusion regarding the efficacy of multi-modal treatment for children with ADHD.

Discussion

Although much of the ADHD treatment research seems to be quite pessimistic in terms of making progress toward normalizing ADHD behavior beyond the administration of psychostimulants, not all confidence should be forfeited. It is unequivocal that behavioral interventions and parent training do improve the characteristic ADHD behaviors, and reduce the tension and anxiety endured by parents. However, academic deficiencies and social concerns will often require further psychoeducational interventions developed according to the specifics of both the individual and the situation. In addition, it may be necessary that the interventions be more intense, time unlimited, and with application in a variety of settings to assure generalization of treatment gains, and to increase the probability of achieving significant behavioral improvements.

Within the field of school psychology, children with ADHD symptoms are being referred for assessment and evaluative purposes with exponential frequency. Thus, ADHD treatment options and intervention procedures are a constant area of concern and a continual point of contention among teachers, parents, and school support staff. The critics would say that the condition of ADHD is an overdiagnosed and often misdiagnosed disorder. Furthermore, since the overwhelming

majority of children diagnosed with ADHD are treated pharmacologically, the problem of misdiagnosis can be one of great asperity if children are administered drug treatment without medical legitimacy. To prevent calamity from occurring, school psychologists (or other school support personnel) must have a profound understanding regarding the diagnostic criteria for ADHD, the primary manifestations of the disorder, and an appropriate conceptualization of the difficulties that may be incurred by children with ADHD; an awareness of the likelihood of comorbidity with learning difficulties, social and conduct disorders, and depression; an understanding of the many etiological explanations; and knowledge of the ADHD developmental course and prognosis, in addition to the information presented in this paper regarding the various methods of treatment and the corresponding benefits and limitations.

Extensive research has been conducted pertaining to most of the ADHD assessment categories, with much of the collected ADHD data widely accepted as accurate. However, the issue of the conceptualization of ADHD, as well as the etiological explanations of ADHD have both proven to remain somewhat of an uncertainty despite numerous research studies.

Over the years there have been significant changes in the diagnostic definition of ADHD. In the second edition of the DSM (*The Diagnostic and Statistical Manual of Mental Disorders*) the core feature of hyperactivity was accentuated which lead to the identification of the disorder as a Hyperkinetic Reaction of Childhood. The third edition (DSM-III)

reconceptualized the syndrome and recognized the inability to sustain attention as the primary deficit rather than problems concerning over activity. Individuals displaying such symptomatology were classified as having Attention-Deficit Disorder, which could occur with or without the dimension of hyperactivity. In the revision of this edition (DSM-III-R) the core features of attention deficits and hyperactivity were both acknowledged with equated prominence. The disorder was then relabeled Attention-Deficit Hyperactivity Disorder (ADHD). The most recent contribution to this field of study is the DSM-IV. This version considered the accumulated research regarding the core features of ADHD and whether or not there are valid subtypes of this disorder. It was determined to divide the core features of ADHD into two categories of symptoms which comprised Inattention-Disorganization and Impulsivity-Hyperactivity.

The search for an etiological explanation for ADHD is another domain that has been the subject of much research, however a viable justification that can be applied to every ADHD case has yet to be disclosed. The reason that knowledge of the etiology of this disorder is of potential significance is because of the notable implications for treatment. If the problems are thought to be rooted in biological functioning, then pharmacological treatment may be the logical and preferred approach to treatment. However, if psychosocial problems are suspected, treatment efforts may proceed in the direction of either behavior modification, self-regulation and cognitive behavioral

interventions or in a combination of treatment methods. There are many variables that have been used to elucidate the origin of this disorder. Biological functioning, pregnancy and birth complications, genetic factors, diet, environmental lead, and psychosocial factors have all received varying degrees of support from empirical or qualitative research investigations. However, since over the past several decades there have been several different definitions of ADHD, the collection of samples of individuals with ADHD used for the purpose of these studies have been diagnosed according to divergent identifying criteria. "Therefore, what research findings may be applicable to a given case depend on how attention deficit disorder is defined" (Kamphaus & Frick, 1996, p. 42). This discrepancy has contributed to an abundance of conflicting research results, and to the overall perplexity in naming a sole factor to explain ADHD. Currently, the rationale that is generally accepted is that there are many different variables, and combinations of variables, that implicate the onset of this attention disorder.

ADHD is becoming an extremely prevalent problem within the school systems. In many cases it is the responsibility of the school psychologist to conduct an assessment of the presented problems, to determine a correct diagnosis for such behavioral disorders, and subsequently to recommend effective and efficient home and school interventions. With the continually changing conceptualization of ADHD, and the research challenge to uncover further insight as to the enigma of the ADHD etiology, it is imperative that school psychologists stay

abreast regarding the most current literature and diagnostic features. Up to date knowledge pertaining to these factors is imperative to the profession of school psychology so as to accurately determine the ADHD subtype and to clearly identify the child's specific needs, as well as to develop appropriate remediation techniques. Despite the extensive and continual research, ADHD is still considered to be a complex and multidimensional disorder in which there are still many areas that are in need of further investigation.

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