The Nature, Clinical Assessment, and Treatment of Children with Attention Deficit Hyperactivity Disorder (ADHD): A Review of the Literature

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Abstract

Attention deficit hyperactivity disorder (ADHD) is a commonly diagnosed behavioral disorder in childhood. Symptoms of ADHD include developmentally inappropriate levels of activity, distractibility, and impulsivity. The behavior often leads to academic and social problems and may have a long-term adverse impact on a child's later life. This document is a literature review of the nature, clinical assessment, and treatment of children with ADHD, noting the treatment utilization of quantitative electroencephalography (QEEG).

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In any developing field of study, research studies are marked by numerous methodological approaches that ultimately lead to accepted clinical standards. Notable methodological problems in the clinical assessment of attention deficit hyperactivity disorder (ADHD) and other learning disabilities include various criteria (e.g., different cutoff criteria, varied diagnostic criteria, selection biases, and failure to control for ADHD subtypes and comorbidity conditions); small sample sizes; failure to operationally define and label constructs according to the measurement scale or technique used; measurement techniques that fail to capture the complex cognitive processes operative in ADHD failure to elucidate operational criteria utilized in exclusion of subjects; inattention to medication states; and failure to consider gender and developmental conditions (Barkley, 1997; Shaywitz & Shaywitz, 1988). The assessment, diagnostic, and treatment protocols for ADHD are no exception. In this article, the authors will discuss the nature, assessment, and treatment of ADHD, noting the treatment utilization of quantitative electroencephalography (QEEG).

The Nature of ADHD

The nature of ADHD and the subtype material following is taken from the following source (URL: http://www.medem.com, 1999). Attention deficit hyperactivity disorder (ADHD) is a commonly diagnosed behavioral disorder in childhood. Children with ADHD may know what to do but they are not always able to do it because of an inability to focus, impulsivity or distractibility. Estimated to affect about five percent of American children, ADHD can create problems for children at home, in school and in their peer relationships. The disorder may also have a long-term adverse impact on their later academic behavior, social lives and emotional well-being.

Symptoms of ADHD include developmentally inappropriate levels of activity, distractibility, and impulsivity. Children with ADHD often cannot sit still or pay attention in class. According to the National Institute of Mental Health, two to three times more boys than girls are affected by this disorder, although the reason for this difference is, as of yet, unclear. The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 1994) renamed the disorders formerly known as ADD and ADHD as ADHD. ADHD includes three subtypes:

1. A predominantly inattentive subtype (formerly attention deficit disorder, or ADD). Signs include becoming easily distracted by irrelevant sights and sounds; failing to pay attention to details and making careless mistakes; rarely following instructions carefully and completely; losing or forgetting things like toys, pencils, books and tools needed for a task.
2. A predominantly hyperactive-impulsive subtype (formerly attention deficit hyperactivity disorder, or ADHD). Signs include feeling restless, fidgeting and squirming; running, climbing, leaving a seat in situations where sitting or quiet behavior is expected; blurting out answers before hearing the entire question; and having difficulty waiting in line or for a turn.
3. A combined subtype, which is the most common of the three. ADHD refers to all types of attention deficit disorders, both with and without hyperactivity.

To be considered for a diagnosis of ADHD, these behaviors must appear before age seven and last for at least six months. The level of disturbance must occur more frequently and in a more severely pronounced manner than among other children in the same age group. And above all, these behaviors must create a real handicap in at least two areas of a child's life, such as school, home or a social setting. Any possible problems a child is having with his vision or hearing should be ruled out before diagnosing ADHD. Sometimes ADHD is called Attention Deficit Disorder (ADD). ADD is an older name for ADHD.

An added difficulty in diagnosing ADHD is that it often coexists with other problems. Many children with ADHD also have a specific learning disability, which means that they have trouble mastering language or certain skills, such as reading, math or handwriting. Although ADHD is not

categorized as a learning disability, its interference with concentration and attention can make it even more difficult for a child to perform well in school.

More seriously perhaps, is that nearly half of all children with ADHD – mainly boys – have an oppositional defiant disorder. These children can be stubborn, have outbursts of temper and act belligerently or defiantly. At times, these behaviors may progress into more serious conduct disorders. Children with this combination of problems may have trouble with school officials, take unsafe risks, or break laws by stealing, setting fires, destroying property or driving recklessly (ibid., 1994).

The Symptoms of ADHD

The American Psychiatric Association lists symptoms of problems found in children and adults. This information is found in the DSM-IV (1994). The manual lists the symptoms of ADHD.

Symptoms of Inattention

- Careless mistakes in schoolwork, work or other activities.
- Has a hard time sustaining attention in tasks or play
- Often does not seem to listen to what others are saying
- Often does not follow through on instructions and often fails to finish homework
- Has difficulty organizing tasks and activities
- Often avoids or dislikes tasks that require sustained mental effort
- Often loses things
- Is often distracted by other things that go on in a room
- Forgetfulness

Hyperactive-Impulsive Symptoms

- Fidgets and squirms with hands or feet in seat
- Inability to stay seated
- Climbing on things when inappropriate
- Often acts as if "motor driven" – difficulty with leisure activities
- Often talks excessively
- Difficulty waiting in lines
- Often interrupts others

The DSM-IV lists specific symptoms by designated criteria. The essential feature of ADHD is a persistent pattern of inattention and/or hyperactivity—impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development (Criterion A). Other symptoms include messy work and frequent careless mistakes in schoolwork, work, or other activities (Criterion A1a). They often have a hard time sustaining attention in tasks or play (Criterion A1b). They often do not seem to listen to what others are saying, appearing as if their mind is elsewhere (Criterion A1c). They often do not follow through on requests or instructions and fail to complete homework or other chores (Criterion A1d). They have difficulty organizing tasks and activities (Criterion A1e). There is a frequent avoidance or dislike of tasks that require sustained mental effort or close concentration such as homework or paperwork (Criterion A1f). Work habits are such that materials are often scattered, lost, or carelessly handled and damaged (Criterion A1g). They are easily distracted by irrelevant stimuli (e.g. background noise, car honking) that are usually ignored by others (Criterion A1h). They are forgetful in daily activities (E.G. missing appointments, forgetting homework) (Criterion A1i).

Hyperactivity may be manifested by fidgetiness or squirming in one's seat (Criterion A2a), by not remaining seated when expected (Criterion A2b), by excessive running and climbing on things when inappropriate (Criterion A2c), having difficulty playing in leisure or quiet activities (Criterion A2d), appearing as if they were "driven by a motor" (Criterion A2e) or by talking excessively (Criterion A2f).

Impulsivity manifests itself as impatience (e.g. blurting out answers before questions have been completed) (Criterion A2g), difficulty awaiting one's turn (Criterion A2h), and interrupting or intruding on others (e.g. butting into conversations or games) (Criterion A2i).

ADHD inattentive applies to individuals with at least six of the symptoms of inattention. These symptoms must have persisted for over six months. These symptoms must be maladaptive; that is, they will seem immature for a person's age. ADHD hyperactive applies to individuals with at least six of the symptoms from the hyperactive-impulsive list. ADHD combined type applies to individuals who have six symptoms in both of the categories of inattention and hyperactive-impulsive symptoms.

Other diagnostic criteria for ADHD include the need for a history of the disorder with symptoms present before seven-years of age (Criterion B). Symptoms must be present across settings. If a child is inattentive at school but not so at home or playing with friends, a diagnosis of ADHD is not expected. Symptoms must significantly reduce an individual's ability to work or learn. ADHD is

not diagnosed when a person is depressed, anxious or when the person has another disorder that can explain the ADHD-like behaviors. Symptoms must be present for at least six months before a diagnosis can be made.

Key Components of ADHD

The following material on the key components of ADHD, understanding the clinical picture of ADHD, and the cornerstones of ADHD evaluation is taken from the following internet source (URL: http://www.Idonline.org. 2000). Anastopoulos, Arthur, Temple, E. Paige, & Klinge, Ericka E., 2000, "Components of a Comprehensive Assessment of Attention-Deficit/Hyperactivity Disorder"). It is well known that symptoms of inattention, impulsivity, and/or hyperactivity are the hallmark features of ADHD. For most parents and teachers, noticing that a child is displaying these symptoms is a relatively easy task. Such behaviors stand out because of the disruption that they cause in the child's home and school functioning. What is not so easy is deciding what to do about these problems. In order to make this determination, it is usually necessary to have some sense of what might be causing them. Although ADHD very well may be responsible, there are various other childhood conditions, such as learning disorders, depression, and conduct problems which can produce symptoms that look like ADHD and therefore need to be considered as possible causes. So how does one know whether or not a child has ADHD versus something else? Although some people seem to think that you can just tell from watching a child, arriving at such a conclusion requires a formal evaluation. Unfortunately, there are many different ways to assess ADHD, and some assessment approaches are clearly more accurate and more cost-effective than others.

Understanding the Clinical Picture

At face value, establishing an ADHD diagnosis would seem to be a relatively straightforward matter. One may simply use whatever means necessary to gather information that addresses diagnostic guidelines, and then decide whether ADHD is present or not. Unfortunately, it's not quite that simple. One factor complicating this situation is the situational variability of ADHD symptoms. Contrary to popular belief, ADHD is not an all-or-none phenomenon. Either there all the time or not there at all. Instead, it is a condition whose symptoms may or may not be present depending on the situation. ADHD symptoms are much more likely to occur in situations that are boring versus interesting, in situations that are unstructured versus structured, and in situations that are low in feedback versus high in feedback. Group settings are also more problematic for children with ADHD than would be the case in one-to-one situations. Being aware of the situational variability of ADHD symptoms is central to

understanding the frequently irregular clinical presentation of this disorder; therefore, it is imperative to obtain information from individuals who observe a child across different settings. At the very least, this should include input from parents and teachers. When appropriate, other significant caretakers, such as day care providers and babysitters, should provide similar input.

Another critical factor affecting the evaluation process is the increased likelihood that children with ADHD will display secondary or co-occurring problems. For example, up to 65 percent of the children with ADHD may display secondary behavioral complications, such as noncompliance, argumentativeness, temper outbursts, lying, stealing, or other manifestations of oppositional-defiant disorder and conduct disorder. Virtually all children with ADHD experience some type of school difficulty. An especially common problem is that they don't produce adequate amounts of work, and the quality of work that they do produce is often highly variable and well below their capabilities. Up to 50 percent of children with ADHD may also exhibit dyslexia or other types of specific learning disabilities. As a result of such complications, many of these children receive some form of special education assistance. They may also experience significant problems in their relationships with other children, both in school and at home. Such difficulties sometimes involve not being able to make friends. However, keeping friends is of even greater concern, because children with ADHD frequently do things that alienate their peers, who then respond by rejecting, teasing, or avoiding them. Possibly as a result of such behavioral, academic, and/or social problems, children with ADHD very often exhibit low self-esteem, low frustration tolerance, symptoms of depression and anxiety, and other emotional complications (ibid., 2000).

Whether alone or in combination with various other conditions, ADHD can also have a significant impact on family functioning. For example, many parents of children with ADHD experience considerable frustration and stress, which very often can lead to viewing themselves as less skilled and less knowledgeable in their parenting roles. Many parents of these children may also find themselves constantly involved in resolving various school and peer relationship difficulties, which occur throughout childhood and into adolescence as well. As a result of such complications, some parents may become very depressed or angry over their inability to raise their child as they would like. For some mothers and fathers, marital tensions may arise, resulting from constant disagreements over how to manage their child's difficulties. Brothers and sisters may be affected as well – partly because their sibling with ADHD does so many things that bother them, and partly because they resent the amount of parental time and attention that the child with ADHD receives.

The Cornerstones of Evaluation

Given that the problems of children with ADHD very often go beyond the disorder itself, any assessment of this condition should address not only primary ADHD symptoms, but also other aspects of the child's behavioral, emotional, and social functioning. Equally important is the need for gathering information about the child's parents and siblings. Although obtaining this type of family information may not shed much light on whether or not an ADHD diagnosis is present, it nevertheless provides a context for understanding how problem behaviors may be maintained. Moreover, such information often serves as a basis for determining how well parents and other caretakers will be able to implement recommended treatment strategies on behalf of their child. If there is reason to believe that a parent may have difficulty helping their child, then steps may be taken to address such difficulties, either prior to or concurrent with the delivery of treatment services to the child. For example, some parents may need to receive marital therapy to reduce strains in their marriage before participating in a parent-training program aimed at teaching them new ways of dealing with their child.

Implicit in the preceding discussion is that clinical evaluations of ADHD must be comprehensive and multi-dimensional in nature to capture its situational variability, its associated features, and its impact on home, school, and social functioning. This multi-method assessment approach should include not only the traditional methods of parent and child interviews but also parent- and teacher- completed child behavior rating scales, parent self- report measures, direct behavioral observations of ADHD symptoms in natural or clinical settings, and clinic-based psychological tests. A review of prior school and medical records should also be included as part of this overall assessment process. If the child has not undergone individually administered intelligence testing, educational achievement testing, or screening for learning disabilities within the past year, then such testing should be added to the assessment battery. Similarly, if the child has not been seen recently by his or her physician, a standard pediatric examination or neurodevelopmental screening should be considered in order to rule out any unusual medical conditions that might produce ADHD-like symptoms. As needed, additional assessment procedures may be recommended, including vision and hearing screening, as well as formal speech and language assessment (ibid., 2000).

New Guidelines for ADHD Assessment

Recently, the American Academy of Pediatrics (AAP) released new recommendations for the assessment of school-age children with ADHD (URL: http:..www.pediatrics.org, 2003). Research in various community and practice settings shows that between four percent and 12 percent of all school-

age children may have ADHD, making it the most common childhood neurobehavioral disorder. Children with ADHD may experience significant functional problems such as school difficulties, academic underachievement, troublesome relationships with family members and peers, and behavioral problems.

In recent years, there has been growing interest in ADHD as well as concerns about possible over diagnosis. In surveys among pediatricians and family physicians across the country, wide variations were found in diagnostic criteria and treatment methods for ADHD. The new standardized AAP guidelines were developed by a panel of medical mental health and educational experts. The Agency for Healthcare Research and Quality provided significant research and background information for the new policy.

The new guidelines, designed for primary care physicians diagnosing ADHD in children aged six to 12 years, include the following recommendations: ADHD evaluations should be initiated by the primary care clinician for children who show signs of school difficulties, academic underachievement, troublesome relationships with teachers, family members and peers, and other behavioral problems. Questions to parents, either directly or through a pre-visit questionnaire, regarding school and behavioral issues may help alert physicians to possible ADHD.

The cause(s) of ADHD are unknown. Poor parenting, food/diet, excessive television viewing or video game playing, and hormonal imbalance have been discussed as the probably cause for this disorder. These have all been investigated and determined to be unproven (Hunt, 2001). Other researchers think a genetic component exists, linking chromosome 11 to individuals who experience ADHD (Lubar & Lubar, 1999).

The Cornerstones of an ADHD Evaluation

- Parent and child interviews
- Parent- and teacher- completed child behavior rating scales
- Parent self-report measures
- Clinic-based psychological tests
- Review of prior school and medical records
- Individually administered intelligence testing, educational achievement testing, or screening for learning disabilities (only necessary if not completed within past year)

- A standard pediatric examination or neurodevelopmental screening should be considered in order to rule out any unusual medical conditions that might produce ADHD- like symptoms
- Additional assessment procedures may be recommended, including vision and hearing screening, as well as formal speech and language assessment

Part of treating ADHD is understanding the possible causes and origins of this disorder and establishing a treatment plan. The following material leads to this understanding (URL: http://www.medem.com, 2000). While it is one of the most studied conditions of childhood, the cause of ADHD is still not clear at this time. However, the research done to date has shown the following:

- ADHD is a biological disorder. Children with ADHD have problems with chemicals that send messages in the brain.
- A lower level of activity in the parts of the brain that control attention and activity level may be associated with ADHD.
- ADHD appears to run in families. Sometimes a parent is diagnosed with ADHD at the same time as the child.
- In very rare cases, toxins in the environment may lead to ADHD.
- Very severe head injuries may cause ADHD in some cases.
- Recently, scientists using imaging techniques to localize the brain areas involved in ADHD have found that specific areas (in the frontal lobe and basal ganglia) are reduced by about 10 percent in both size and activity in children with ADHD. It is not yet known whether this difference is a cause of ADHD.
- Research also has shown that there is no evidence that ADHD is caused by the following: a) eating too much sugar, b) food additives, c) allergies, or d) immunizations.

Interestingly, there is some thought that ADHD is a neurologically-based disorder caused by a deficiency of a specific neurotransmitter (norepinephrine and/or its precursors, dopa and dopamine) in a specific set of brain circuits. Depending on which areas of these circuits are involved, the individual might be hyperactive, distractive or impulsive. One treatment approach involves raising the level of the deficient neurotransmitter. There are several medications that will accomplish this. One group works by increasing the production of the transmitter (ritalin, dextroampetamine, adderall). The

second group works by decreasing the breakdown of this transmitter; thus, whatever is produced remains longer (imipramine, desipramine, nortriptyline).

People with ADHD are naturally impulsive and tend to take risks. But those patients with ADHD who are taking stimulants are actually at lower risk of using other drugs. Children and teenagers who have ADHD and also have coexisting conditions may be at high risk for drug and alcohol abuse, regardless of the medication used (ibid., 2000).

Public School Modifications

There should be a team approach in diagnosing and treating children with ADHD. Classroom adjustments – both physical and in the teacher's curriculum – may be necessary for the student with ADHD. Because not every child with ADHD will require the same adjustment or all of the adjustments covered below, the purpose of any modification should be to teach the child with ADHD the mechanisms for coping with the disorder.

Among the range of modifications for the child with ADHD:

- Modify the environment: Ask your child's teacher to place your child close to the front of the room; limit open spaces, which may encourage hyperactive behaviors; reduce distracting stimuli.
- Provide clear instructions: Keep oral instructions brief and repeat them as necessary; provide written instructions (and review them orally) for multistep processes; break up tasks and homework into small steps.
- Focus on success: Provide formal feedback (such as star charts) to reinforce specific positive behaviors; reward progress even if achievement does not meet standard requirements.
- Organize: Establish daily checklists; help your child start a homework notebook, with homework assignments listed with due date and textbooks/supplies needed; remind him to consult his notebook at the end of the day to ensure he takes home the needed supplies.
- Improve handwriting: Encourage computer usage by older children; de-emphasize untidiness/spelling errors and focus on content; offer help with handwriting skills.

- Help control impulse: Urge the child to slow down when completing answers; direct him to check his work before turning it in.
- Maintain self-esteem: Encourage performance in the child's areas of strength; provide feedback privately; do not ask him to perform a task publicly that is too difficult; focus on positive reinforcement.
- Design a specific behavior program: Target a few unacceptable behaviors with clear consistent consequences explained privately to the child; consequences; teach active reading (underlining), active listening (note taking), reading for detail and subvocalization (whispering) as a memory aid (ibid., 2000).

ADHD is a disorder that affects the lives of many families, but proper treatment and environmental changes can positively impact the lives and futures of these children. A wide variety of treatments have been used for ADHD including, but not limited to, various psychotropic medications, psychosocial treatment, dietary management, verbal and homeopathic treatments, biofeedback, meditation and perceptual stimulation/training. Studies have supported the efficacy of stimulants and psychosocial treatments for ADHD and the superiority of stimulants relative to psychosocial treatment. About 80 percent of children with ADHD demonstrate significant improvement with stimulant medication. Stimulants can be used alone or in conjunction with behavior therapy. Stimulants are classified as short-acting, intermediate-acting, or long-acting. Short-acting stimulants include Ritalin (methylphenidate), Methylin, Dexedrine and Dextrostate. Intermediate-acting stimulants include Ritalin SR, Metadate ER, Methyliln ER, Aderall, and Dexedrine Spansule. Long-acting stimulant medications for ADHD include Concerta, Metadate CD, Ritalin LA and Aderall-XR. These common stimulants are in the generic classes of methylphenidate or amphetamine. As with any drug, there are side effects to consider. Common side effects to stimulant medication to treat ADHD include decreased appetite/weight loss, sleep problems, headaches, jitteriness, social withdrawal and stomach aches. Less common side effects include dry mouth, dizziness, rebound effect (increased activity or a bad mod as the medication leaves the system), and transient tics. Very rare side effects include stuttering, increase in blood pressure, or heart rate and growth delay. Most side effects can be alleviated by changing the medication dosage, adjusting the schedule of medication or using a different stimulant.

There are no long-term studies testing stimulants or psychosocial treatments lasting several years. There is no information on the long-term outcome of medication-treated ADHD individuals in

terms of educational and occupational achievements, involvement with the police, or other areas of social functioning. Psychosocial treatment of ADHD has included a number of behavioral strategies such as contingency management (e.g. point/token reward systems, timeout, response cost) that is typically conducted in the classroom, parent training, clinical behavior therapy management and cognitive-behavioral treatment (e.g. self-monitoring, verbal self-instruction, problem-solving strategies and self-reinforcement). Many experts believe that the most significant, long-lasting gains appear when medication is combined with behavioral therapy, emotional counseling and practical support. Some studies suggest that the combination of medicine and therapy may be more effective than drugs alone. The National Institute of Mental Health is presently conducting a large study to investigate this treatment regime.

In considering treatment programs, both parents and their children may need special help to develop techniques for managing the patterns of behavior. Several intervention approaches are available and different therapists tend to prefer one approach or another. Psychotherapy works to help people with ADHD to like and accept themselves despite their disorder. Cognitive-behavioral therapy helps people work on immediate issues. Rather than helping people understand their feelings and actions, it supports them directly in changing their behavior. Social skills training can also help children learn new behaviors. In social skills training, the therapist discusses and models appropriate behaviors like waiting for a turn, sharing toys, asking for help or responding to teasing, then gives children a chance to practice. Support groups connect people who have common concerns. Parenting skills training gives parents tools and techniques for managing their child's behavior. Following are a few treatments that have not been scientifically shown to be effective in treating the majority of children or adults with ADHD:

- Biofeedback
- Restricted diets
- Allergy treatments
- Medicine to correct problems in the inner ear
- Megavitamins
- Chiropractic adjustment and bone re-alignment
- Treatment for yeast infection
- Eye training
- Special colored glasses

A Summary of the History of ADHD

The following textual summary of the history of ADHD is taken from the following Internet source (URL://http://www.faithchristianmin.org, 2000). The first doctor to do research about attention deficit never actually knew the disorder by that name. George Fredrick Still described the syndrome in a series of lectures to the Royal College of Physicians in 1902. In this series of 20 lectures, Still spoke of children who were aggressive, defiant, resistant to discipline, excessively emotional or "passionate". Showing little "inhibitory volition", these children were lawless, spiteful, cruel, dishonest, impaired in attention, overactive, prone to accidents, and a greater threat to other children due to aggressiveness. According to Still, these children displayed a major, chronic "defect in moral control".

Also, in what appears to be an almost prophetic foreshadowing of the work of Russell Barkley, Still speculated that the children had a decreased threshold for inhibition of response to stimuli. In keeping with the prevailing mindset of the time, Still labeled his patients as having a "defect of moral control", although he did recognize a hereditary link in the disorder. This idea that behavior could have an organic cause rather than simply being a result of "bad parenting" was a radical concept in the early 20th century. The fact that these findings were published in the British medical journal *Lancet* did give some credibility to this new theory.

An ocean away and a little more than a decade later, American doctors were discussing children who had problems similar to those described by Still. The one thing that many of these children had in common, other than their ADD-type symptoms, was that they were survivors of the encephalitis epidemic in 1917-1918.

Numerous papers describe children with "post encephalitic behavior disorder" as impaired in attention, regulation of activity and impulse control. Like Still's patients, these children were also socially disruptive and many had memory problems. This connection between encephalitis and a "Defect of Moral Control" further verified that not all behavior was an act of the will. However, it also brought about a rationale for ADD that went something like this: "The Encephalitis outbreak left these children with brain damage; because other children who had not been exposed to the outbreak also exhibited some of the same symptoms, they too must have been brain damaged in some way as well." The term "brain damaged" was used to describe some of these children.

The recognition that many of these children, although quite different from their peers, were still too bright to have been brain damaged to any great extent, the term "minimal brain damage" (MBD) became popular. This diagnosis became so popular that it was assumed that even if there was no

obvious brain damage, or at least none that could be measured by objective medical testing, it was thought that the child must still be brain damaged. Another problem was that this label was too broad to be effective. For example, children who today would be described as learning disabled, developmentally delayed, ODD or ADD, were all grouped under one heading, MBD. Another important event in the era of MBD was the discovery in 1937 that amphetamines reduced disruptive behavior in many of these children, specifically in those who were hyperactive and/or impulsive.

Hyperactivity was first described in the late 1950's. This description came to be generally accepted by the psychological community as the correct name for the disorder. The category of "hyperkinetic reaction of childhood" was used in the second edition of the Diagnostic and Statistical Manual of Mental Disorders (1968). While this new term certainly had validity for those who had symptoms of what would later be called ADHD, it still seemed to ignore the fact that many children exhibited attention deficits without any signs of hyperactivity. It was still apparent that more research was needed even on something as seemingly simple as what to call these behaviors. By the 1970's, over 2,000 studies were published on hyperactivity. The defining features were over activity, impulsivity, short attention span, low frustration tolerance, distractability, and aggressiveness. Overactivity was thought to be the primary feature. It was commonly believed that these symptoms would disappear by puberty. Although many researchers believed biology, rather than environment, was the cause of these symptoms, others were not so sure. The Feingold Association was the most prominent of several groups who began to look at environmental toxins as a cause of hyperactivity and other learning and behavior disorders (ibid., 2000).

In 1965, Ben F. Feingold began his studies of the link between certain foods and additives and their effect on some individuals' behavior and ability to learn. It was not until June, 1973, that he presented his findings to the American Medical Association. Although these theories developed a significant popular following, they have not yet been openly embraced by the mainstream medical community. In 1972, Virginia Douglas, in a Presidential address to the Canadian Psychological Association, presented her theory that deficits in sustained attention and impulse control were more likely to account for the difficulties of these children than hyperactivity. She argued that hyperactive children were not necessarily more distractable than other children and that sustained attention problems could emerge under conditions where no distractions existed. Thus, the focus and research began to shift from hyperactivity to attention issues. Douglas's colleague, Gabriel Weiss, found in his long-term follow-up studies that as children reach adolescence, hyperactivity may diminish, but the

attention and impulse problems may persist. This was a new idea. Previously the general consensus had been that ADD was a childhood disorder that somehow "disappeared" in adolescence, and certainly by adulthood..

The DSM-III recognized these new developments. Perhaps the most controversial change from the DSM-II was the subdivision of the previous category of Hyperkinetic Reaction of Childhood. This resulted in the following two categories: Attention-deficit with hyperactivity (i.e., ADHD) and attention-deficit disorder without hyperactivity (ADD/WO). Thus, it became possible to diagnose a patient as experiencing an impairment of attention without actually being hyperactive. In subsequent revisions, the DSM-III further subdivided the category. The DSM-III-R used the term "Undiffeerentiated Attention-deficit Disorder" (UADD) and restricted its use to disturbances in which the prominent feature was the persistence of developmentally inappropriate and marked inattention that was not a symptom of another disorder, such as Mental Retardation or Attention Deficit Hyper-activity Disorder or a disorganized and chaotic home environment. The DSM-III-R also substituted two disorders, Attention Deficit Hyperactivity Disorder (ADHD) and Undifferentiated Attention deficit Disorder (UADD), for the previous ADD terms (ibid., 2000).

In the decade from 1980 to 1989, thousands of new research studies were published, making ADHD the most studied childhood psychiatric disorder of the decade, and most likely in the entire history of pediatric psychology. Not only was ADHD the most studied of childhood disorders, it is perhaps the most labeled. The DSM-IV defined the disorder as subtypes based on the predominant symptom pattern. The syndrome that was once covered under the blanket term "Minimal Brain Damage" now has an entire menu of divisions and subtypes:

- Attention Deficit/Hyperactivity Disorder Predominantly Inattentive Type;
- Attention Deficit/Hyperactivity Disorder Predominantly Hyperactive Impulsive Type;
- Attention Deficit/Hyperactivity Disorder Combined Type

Another important development in the mid 1980's was the outlining of Attention Deficit Disorder, Residual Type by David Woods. The idea that ADD continued on into adulthood, rather than somehow disappearing as the child grew older, was accepted relatively quickly by the psychiatric and medical communities. Even more interesting is the manner in which this concept was so quickly accepted by the general public. Public interest mushroomed in the 1990s and seemed to become hyperfocused. Russell Barkley's book, simply titled *Attention Deficit Hyperactivity Disorder,* is

perhaps the best history of ADD up to this time. In a more popular vein, the book *Driven to Distraction* by Edward Hallowell and John Ratey was published in 1994. This book became standard reading for many parents of children with ADD. As these parents read about the disorder their children lived with, they began to recognize more and more of these symptoms in their own lives. Thus, the popularity of research and books dealing with adult ADD increased dramatically. With this increased interest of ADD in general and adult ADD in particular, Attention Deficit Disorder expanded from being only an educational issue to one of employment and eventually law. Perhaps the culmination of this was the inclusion of ADD as part of the Americans With Disabilities Act and other legislation at the local, state and federal levels (ibid., 2000).

Assessment of ADHD

The following material on the assessment of ADHD is taken from the following source (Prifitera & Saklofske, 1998). As with any disorder, assessment of ADHD is essential. One approach to the assessment, and diagnosis of ADHD, has been to utilize paper-and-pencil tests. However, to use a test with any degree of confidence requires that it be reproducible, reliable and valid (Sattler, 1992). The reliability and validity of a test may be sensitive to an exceptional condition like ADHD and, therefore, its use with this population rests on data attesting to its psychometric integrity. We will review several studies that have recently examined the psychometric properties of the WISC-III with reference to children with ADHD (Schwean & Saklofske, , 1998).

The ACID profile, a pattern of low scores on the Arithmetic, Coding, Information, and Digit Span, has been advanced as a means of assessing children with ADHD (Prifitera & Dersh, 1993). Although Dykman, Ackerman, and Oglesby (1980) reported a lower mean score on the ACID subtests of the WISC–R for their sample of children with ADHD, a similar pattern has been found in other exceptional populations. Using the WISC-III standardization data, Prifitera and Dersh (1993) compared the percentage of children in the standardization sample with ACID profiles to percentages in an LD and an ADHD group. Their calculations indicated that although the full ACID pattern was minimal in the standardization sample (1.1%), it was much more common in the LD (5.1%) and ADHD (12.3%) samples. Current thinking is that while the ACID profile may contribute to the identification of an exceptionality, it has limited utility for the differential diagnosis of ADHD.

In analyzing the above ACID results, Kaufman (1994) noted that the contribution of the Information subtest is minimal. Differences between clinical and nonclinical groups are largely

attributable to the subtests comprising the FD and PS factors. He suggested not using the ACID profile and focusing instead on the SCAD profile (Symbol Search-Coding-Arithmetic-Digit Span). Although Kaufman acknowledges that the SCAD has no greater utility than the ACID profile for differentially diagnosing ADHD, he argues that the SCAD profile, being composed of subtests that largely measure process, is not as vulnerable to contamination of content as is the ACID profile. He further argues that a discrepancy between the SCAD and PO subtests versus the SCAD and VC subtests is likely to be degraded by learning or language impairments. Data are presented to show that groups of LD and ADHD children differ significantly from normal children in the magnitude of the discrepancy between PO and SCAD subtests and that large PO-SCAD differences are more likely to occur for abnormal than normal samples. Kaufman provides empirical tables for computing SCAD/PO and SCAD/VC differences, as well as a SCAD Index score, and presents numerous interpretive guidelines. The reader is encouraged to consult Kaufman (1994) for further elaboration.

Finally, Bowers et al. (1992) suggest that the Wechsler's Deterioration Index (WDI), an index of cognitive deterioration that comprises the "hold" (Vocabulary, Information, Object Assembly and Picture Completion) versus "don't hold" (Digit Span, Similarities, Coding and Block Design) subtests, and is computed using the following formula:

$$\text{WDI} = \frac{\text{hold} - \text{don't hold}}{\text{hold}}$$

may serve as a useful screening index of ADHD or support behavioral and observational indications of ADHD. On the basis of WISC-R results, Bower et al. compared the WDI of LD, ADHD and behaviorally disordered (but not ADHD) groups to nondisabled children. Although WDI did not predict LD status or severity, the WDI scores did significantly distinguish children with ADHD from non-ADHD samples. The authors argue that elevated WDI scores may suggest a lag in the development of some types of intellectual functions associated with attention, concentration, and abstract thinking. At this juncture, future research is clearly needed to clarify the conceptual and diagnostic utility of the WDI in evaluating children with ADHD (Schwean & Saklofske, 1998).

No disorder in the history of childhood psychopatholgy has been subject to as many reconceptualizations, redefinitions and renaming as ADD. At the heart of this activity is the simple fact that the disorder is characterized by considerable heterogeneity. Research findings underscore the diversity among children with attention disorders.

The psychometric properties of the WISC-III provides a good measure of intellectual performance in children with ADHD. The test yields a measure of the child's cognitive strengths and weaknesses, useful in the development of individualized intervention and has utility in contributing to a diagnosis of a possible abnormality (Kaufman, 1994). The test is not, however, diagnostic of ADHD, nor should one expect it to be. There is no single definitive assessment instrument for diagnosing ADHD. The information-gathering processing should rely on a multimethod assessment strategy. An essential component of such broad-based assessment is intelligence tests, as they provide a description of intellectual abilities and also serve as a vehicle for ruling out other disorders that may share features or coexist with ADHD (e.g., retardation, learning disabilities) (Prifitera & Saklofske, 1998). Because of the limitations of diagnosing ADHD by clinical assessment instruments, another field evolved. The field focused on brain activity itself. Following is a discussion of the emergence and use of a technology used to measure brain activity.

Quantitative Electroencephalography and Neruotherapy

The field of computerized neurophysiology (now commonly known as quantified or quantitative electroencephalography [QEEG]), like other fields intertwined with the emergence of computer science in the middle of the century, has grown exponentially in recent years. Observation of electrical signals from the nervous system goes back as early as 1848 when researchers such as Duboi-Reymond reported the presence of electrical signals as a marker of a peripheral nerve impulse.

The notion that features of measurable electrical activity can describe brain functions remained relatively obscure for nearly 50 years until Hans Berger published an article in 1929 describing a pattern of oscillating electrical activity recorded from the human scalp. Berger's notion was that if the electroencephalogram (EEG), as his technique came to be called, could be used to measure and define biological markers corresponding to human behaviors more precisely, such a technique could prove to be useful diagnostically and therapeutically by measuring the impact of interventions (Cantor, 1999).

In the 1930's and 1940's, the EEG became the object of much interest in the realm of psychiatric and neurological sciences by researchers such as Gibbs, Holwell, Davis, Donald Linsey, Grey Walters and Herver Jasper. These studies suggested a relatively greater preponderance of certain EEG features in clinical populations compared to normal individuals. However, it became increasingly apparent that the EEG was, at best, a tool that could be used for confirmation of clinical disorders such as epilepsy and brain trauma.

As digital computer technology developed in the 1960's and 1970's, it became feasible to assess and quantify precisely many more EEG parameters than is possible through human visual inspection of raw EG waveforms. With these developments the field of QEEG came into existence (ibid., 1999). Specifically, QEEG is a technology used to measure electrophysiological activity in the brain. This new diagnostic technique measures the minute electrical activity of a person's brain and the individual's unique brain physiology (function). Computerized statistical procedures are then used to compare the person's brain-wave patterns with those of scientific databases that have been developed over twenty years in major research laboratories and hospitals. This type of statistical analysis is particularly useful in evaluating difficult or borderline cases of ADHD.

But how does QEEG differ from other brain tests? X-rays, CAT scans and MRIs, are all used to measure brain anatomy, or structure. The EEG, on the other hand, measures brain physiology, or function. Another test that measures brain activity is the Positron Emission Tomography scan (PET). Specifically, a PET scan measures the metabolic activity of the brain. PET is a good test for localizing regions of altered activity within the brain. Unfortunately, PET scans involve injection of radioactive labels. This procedure is considered unsafe for repeated use over a short time period or with pregnant women and small children. Moreover, the PET scan is an extremely expensive procedure available only at regional medical centers.

Radiation risk, cost prohibitive pricing and limited availability are also true of other imaging techniques such as rCBF (which measures regional cerebral blood flow), MEG (which assesses brain electromagnetic activity), and MRS (magnetic resonance spectroscopy). In contrast to other tests, analysis of brain waves using QEEG technology is safe, easy to administer, relatively inexpensive and widely available. Subtle brain dysfunction can be detected early in the course of a disease using a specific method for recording, transmitting, and analyzing digital EEG signals.

Brain Wave Fact Sheet

An excellent source for the discussion of brain waves is found in the following source (URL: http://www.webcom.com/bmainc, 2003). Alpha waves represents a sort of "idle" state, or "ready but not doing much" state and is normally fairly large over the back third of the brain when the eyes are closed and when you are awake. Alpha disappears when we either get mentally busy (e.g., open the eyes, start doing intense mental work even with the eyes closed) or when we become drowsy. Thus the presence of alpha waves can show the presence of an awake, resting state. If alpha waves are present at a fairly high voltage when the eyes are open, this would usually indicate an inattentive, day dreamy

state. In fact we often see this sign in adolescents and adults with attentional difficulties. Alpha is the dominant wave pattern. When we get mentally busy and engaged, we should see alpha "block," or alpha waves reduced significantly in size. In its place we see mostly smaller, quicker "beta" waves. The report that results from this analysis is an assessment of mental functioning based on measurements of brain waves – the fluctuation, usually rhythmical, of electric impulses produced by the brain. Research has documented that these brain signals are related to many aspects of thinking, behavior and emotion. Brain waves occur at various frequencies, some fast, some quite slow and are identified according to their frequency, or wave speed. Generally it is agreed that brain waves should be grouped as follows:

- Delta brain waves are the slowest frequency with the highest amplitude, present primarily during sleep (0.5 – 4 H_3).
- Theta brain waves are present when daydreaming or fantasizing. Creativity and intuition are associated with theta waves (4 – 8 H_3).
- Alpha brain waves are associated with a state of relaxation and basically represent the brain shifting into idling gear, relaxed and disengaged, waiting to respond when needed (8 – 13 H_3).
- Beta brain waves are of low amplitude and faster frequency and are associated with intellectual activity and outwardly focused concentration (Beta 1, 16 – 20 H_3; Beta 2, 20 – 32 H_3; 5MR Beta, 12 –16 H_3).

Everyone has some degree of each of these brainwave bands present in different parts of the head. Delta brainwaves also occur when areas of the brain go "off line" to take up nourishment. If one becomes drowsy, delta and slow theta brain waves creep in. If one is anxious and tense, excess high frequency beta is present. All types of brain waves are always present regardless one's state of mind, with the dominant frequency describing one's level of consciousness. Interestingly, 98% of the human EEG lies between zero and 30 hertz. No frequency is "better" or "worse" than any other. In fact, each is essential to a healthy human. However, problems arise when humans have the improper mix of frequencies for dealing with a task.

For instance, individuals with ADHD, learning disabilities and head injuries tend to have excess slow waves (usually delta, slow theta, and, sometimes, excess alpha. When excess slow wave activity is present in the (frontal) part of the brain, it is difficult to control attention, behavior, and emotions. Such individuals may have problems with concentration, memory, controlling impulses and

moods, or with hyperactivity. They may not be able to focus well and may exhibit diminished cognitive efficiency. In adults who have suffered from ADHD since childhood, the brain is inefficient in burning its sugar-like fuel, glucose. That finding marked the beginning of the general acceptance that brain chemistry and human mental activity are intricately interwoven (ibid., 2003).

Neurotherapy

With the research findings about brain chemistry and QEEG, it would be logical to seek a clinical application. Neurotherapy is the clinical application of EEG biofeedback. It is a procedure that enables an individual to change the amplitude, frequency or coherency of the neurophysiological dynamics of his or her own brain. The electrical signals from the brain are picked up by metal disks placed on the scalp in a simple, painless procedure. A computer analyzes the brain waves. The computer display lets the person know when he or she is producing desirable patterns consistent with alertness. The computer is set up to sound and generate displays that act as "feedback" about the brain waves. This feedback makes learned self control possible.

Neurofeedback, a form of EEG biofeedback, has developed very rapidly. Joel and Judith Lubar were the first to develop this methodology for treatment of hyperactivity, learning and attention problems in the mid-1970's. The following material on neurofeedback was taken from the following source (Lubar & Lubar, 1999). But in the last decade, there has been a burgeoning interest in this area. Some clinics treating complex disorders claim success rates from 70 to 90%. Medications are effective for only about 60-70%, or sometimes 75% with multiple medications. Behavior therapy seems to be effective for about 40-50% of the children. With neurofeedback, if one selects the children, adolescents or adults properly, there is long-term carryover. After patients are phased out of treatment, some may need occasional "booster" sessions. The Lubars have followed dozens of individuals for over a decade and have found that the behavioral changes assessed by the Connor's Parent Scale have been maintained long after the treatment was over

The first criterion for QEEG treatment consideration should involve behavior and history. Does the individual experience significant academic, organizational and social adjustment difficulties? Has the individual been independently evaluated as having attention deficit disorder with or without hyperactivity, oppositional disorder, conduct disorder or other comorbidities by a variety of measures including psychometrics, behavior rating scales and academic performance? Note that reaction to medication is not included as a criterion since stimulant medications will improve cognitive functioning on a short-term basis for most individuals, regardless of whether or not they have an

attention deficit disorder. If individuals experience increased theta or alpha activity with respect to beta, which is two or more standard deviations from a control group, they may also have a neurological marker for the disorder and might be good candidates for neurofeedback interventions. However, there may be individuals whose ratios are within the normal range, but still may be good candidates for neurofeedback if it can be shown within 10—15 sessions that they are experiencing significant improvements in the areas that most typically demarcate their disorders (ibid., 1999).

If neurofeedback treatment is to be undertaken, it must be emphasized that the average number of sessions is 35—50, and comprehensive treatment requires, if not demands, the integration of neurofeedback with a variety of other treatment protocols. The protocols often include medication. In addition, a long-term follow-up is required. Patients must be separated from the treatment gradually and followed for several years on an occasional basis to ensure that the gains attained are not lost. Patients should not be given false hope that a small number of sessions are going to remediate drastically their disorder. There is no definitive cure for attention deficit disorder (with its comorbidities) regardless of the treatment protocol! The purpose of neurofeedback is to help the clients function more like individuals without ADHD, which may or may not result in the reduction of medication. Hopefully, neurofeedback will result in better academic, cognitive and social functioning. At the present time there are no comprehensive replicated studies indicating that small numbers of sessions (less than 25) lead to long-term success. Until this is established, claims regarding this possibility should be undertaken with extreme caution; otherwise they border on a gross misrepresentation of what can be accomplished with neurofeedback regardless of the frequencies and locations trained, or whether the training was done with referential or bipolar montages or with a particular manufacturer's feedback system. The fact remains that ADHD is one of the most complex disorders that is treated with EEG or other forms of biofeedback and requires an enormous amount of effort, both on the part of the patient and the therapist (ibid., 1999).

Where Is This Technology Available

One has to wonder why this revolutionary science is not better known, particularly since so many scholarly articles have been published about the technology. The reason is that, until now, this sophisticated medical technology was available only at a relatively few, highly specialized locations. Using the unprecendented powers of the Internet, Lexicor Medical Technology in Denver, Colorado – through DataLex online data analysis – has centralized specialized methods and expertise, thereby multiplying their value to previously impossible proportions and making this diagnostic science more

widely known and available than ever before. At Lexicor.org, patients and doctors can learn about the science of brain wave analysis. Health care practitioners can also order the analysis of brain wave information and have it processed and reported back to them, all via the Internet. Now, patients and their doctors have online access to this exciting technology (URL: http:// www.lexicor.org, 2003).

According to a recent Harris Poll, more than 25 million people used the Internet last year to seek mental health assistance. Lexicor is forging partnerships with the major medical web sites. These partnerships will create a conduit to channel concerned patients and their healthcare practitioners to the education and services available at Lexicor.org. Brain wave analysis is based on decades of scientific development. However, since the science is only now becoming more widely available, many people have not heard of the process yet, including many doctors. With the databases used in preparing a DataLex report, it is possible, with close to 95% accuracy, to discriminate the brain wave patterns of persons with ADHD, or other conditions, from normal brain wave patterns. It is possible to distinguish ADHD brain wave patterns from that characteristic of learning disabilities, and to detect subtleties of other conditions that need to be recognized, evaluated and treated. QEEG is the only widely available technology that can be used for this purpose today. Lexicor markets their report as a fundamental QEEG diagnostic. The report is intended to validate whether a person's data correlates with ADHD profiles. Lexicor has clearly documented their success in increasing the percentage of beta activity in the brain and decreasing the percentage of theta activity (the desired result for the improvement of attention and concentration). See Lexicor.org on the Internet for a description of their products.

Results of the treatment of ADHD with neurofeedback are promising for individuals demonstrating certain quantitative EEG and behavioral characteristics. Disorders of ADHD are complex and have a wide range of symptoms, etiologies and therapeutic interventions. Neruofeedback offers patients a psychophysiological treatment when combined with other traditional therapies, and it produces significant improvement for many patients. Although more research is being conducted, neurofeedback has been successfully applied for over three thousand children, adolescents, and adults. Neurofeedback is not a cure, but is a powerful adjunctive technique.

Candidates for Neurofeedback

- Anyone with primary diagnosis of ADHD
- Low average, average, or above average intelligence

Ineffective for the Following Candidates

- Mental retardation childhood psychosis

- Severe depressive or bipolar illness
- Significant seizure disorder where medications interfere with learning (i.e., sedating medications)
- Hyperkinesis, with multiple medications or high dosages with monotherapy

Possible Improvements of Symptoms

- Attention, focus and concentration
- Task completion and organizational skills
- Impulsiveness
- Mild hyperactivity

Results of Neurofeedback

- Improved behavior and learning
- Improvement in school grades
- Increased self-esteem
- Better job performance
- Greater realization of innate potential
- Higher intelligence test scores
- Improved scores on parent-teacher rating scales

Another reason for integration of neurofeedback with other therapies is that a majority of children who experience ADHD come from dysfunctional families. Many of these children do not live with both biological parents. In many cases, there is a stepparent, and in many cases, the child has been adopted by parents without ADHD. Parents may blame their child's behavior on poor genetics or on some other kind of biological defect, but yet respond to their inappropriate behaviors through punishment. Children with ADHD as a group are often physically and emotionally abused more than unaffected children at home, in school, and, as adolescents and adults, in work settings and by peers and colleagues. All of this leads to a desperate feeling of inadequacy that, if not dealt with as part of a treatment, also reduces the overall success of the program. Which type of intervention to use depends to a great extent, of course, on the training of the therapist. Some therapists tend to be more behavioral, psychodynamic or family oriented, while others may use more cognitive behavioral or rational emotive techniques. It seems that, ultimately, it is the skill of the therapists, their understanding of the ADHD syndrome, their correct assessment and remediation of the patient's

comorbidities and the family issues surrounding and exacerbating the patient's symptoms, that lead to a successful long-term outcome (Lubar & Lubar, 1999).

It appears that there are many children with ADHD who really need to be on medication at least part of the time. Without medication, their hyperactivity would be so pervasive that they would be unmanageable in any therapeutic situation. There are other individuals for whom comorbidities such as depression, impulsiveness or obsessive behavior need to be dealt with in a pharmacological manner. For this reason it is totally inappropriate to tell an individual with ADHD that the purpose of treatment is to free them from medication. The purpose of the treatment is to obtain better control of the various aspects of this syndrome, to be able to recognize how it is creating problems and to be better able to cope with it. If, in the process of the training, they are able to reduce their medication and maintain the same level of control that they had with a full medication regimen, then medication reduction trials could be used in conjunction with the referring physician or medical specialist. Sometimes stimulant medication can be reduced partially, and in some cases it can by phased out completely. A number of individuals who have been in neurofeedback training have had the medication dropped entirely. This is ideal if it should occur, but by no means should it be promised to a prospective client or parent of a client.

There are other cases in which a stimulant medication may be reduced or eliminated entirely, but it continues to be essential that the patient remain on a tricyclic antidepressant, alpha blocker, or in some rare cases, an antipsychotic or anticonvulsive medication. Just as neurofeedback is a powerful adjunctive treatment used in combination with other treatments, it is equally correct to say that psychotherapy or medication are also powerful adjunctive treatments that may need to be used frequently in conjunction with neurofeedback.. A multicomponent model is by far the most successful approach at the present time (ibid., 1999).

Conclusion

In community samples of school-aged children, the prevalence rates of ADHD generally ranged from 4% to 12%, with similar or lower rates in pediatric samples. The most frequently co-occurring disorder is oppositional defiant disorder (33%) followed by conduct disorder and anxiety disorder (each about 25%). Approximately 20% have co-occurring depressive disorders, and 12% to 22% have learning disabilities. Anxiety, depression and learning disabilities co-occur more frequently in children with the inattentive subtype of ADHD, and disruptive behavior disorders co-occur more frequently in children presenting with hyperactive/impulsive symptoms. With regard to assessment,

the authors have discussed behavior rating scales and medical screening tests. ADHD specific scales are reliable and valid for the assessment of the disorder, but global or broad domain scales are not. There is evidence to support the use of QEEG in the identification of ADHD.

The findings of this review have significant implications for practice and research. Given the prevalence rates of ADHD, primary care physicians should be prepared to identify children with the disorder. Clinicians should use ADHD specific rating scales completed by caregivers and teachers in their efforts to identify children suspected for ADHD. Ratings from multiple informants should be employed to ascertain the DSM-IV criterion of cross-situational symptom display. Broadband scales may be useful in the identification of problems or symptoms that may co-occur with ADHD, but their use in diagnosing ADHD is not supported. However, the use of QEEG to diagnose ADHD is indicated. In addition, a thorough history of symptoms and the effect of these symptoms on the child's current functioning should be evaluated. Each child's treatment must be tailored to meet individual needs (URL: http://www.medem.com, 2001). In most cases, treatment for ADHD should include the following:

- A long-term management plan with
  - Target outcomes for behavior
  - Follow-up activities
  - Monitoring
- Education about ADHD
- Teamwork among doctors, parents, teachers, caregivers, other health care professionals and the child
- Medication
- Behavior therapy
- Parent training
- Individual and family counseling

Treatment for ADHD uses the same principles that are used to treat other chronic conditions like asthma or diabetes. Long-term planning is needed because these conditions continue or recur for a long time. Families must manage them on an ongoing basis. In the case of ADHD, schools and other caregivers also must be involved in managing the condition. Educating individuals involved is a key part of treating a child. Parents will need to learn about ADHD. They will need to learn about the

condition and talk to people who understand it. This will help one manage the ways ADHD affects a child and family on a day-to-day basis. It also will help children learn to help themselves (ibid., 2001).

At the beginning of treatment, there should be three to six "target outcomes" (goals) for a child's behavior. These goals will guide the treatment plan. A child's target outcomes should focus on helping him or her function as well as possible at home, at school and in the community. The following are examples of target outcomes:

- Improved relationships with parents, siblings, teachers and friends
- Better schoolwork
- More independence in self-care or homework
- Improved self-esteem
- Fewer disruptive behaviors
- Safer behavior in the community (e.g., when crossing streets)

The target outcomes should be

- Realistic
- Something your child will be able to do
- Behaviors that you can observe and measure (e.g., with rating scales)

A child's treatment plan will be set up to help a child achieve these goals. ADHD represents a major public health problem. Children with ADHD usually have pronounced difficulties and impairments resulting from the disorder across multiple settings. They can also experience long-term adverse effects on academic performance, vocational success, and social-emotional development.

Despite progress in the assessment, diagnosis and treatment of ADHD, this disorder and its treatment have remained controversial in many public and private sectors. The major controversy regarding ADHD continues to be the use of psychostimulants both for short-term and long-term treatment. Although an independent diagnostic test for ADHD does not exist, evidence supporting the validity of the disorder can be found. Further research will need to be conducted with respect to the dimensional aspects of ADHD, as well as the comorbid (coextisting) conditions present in both childhood and adult ADHD. Therefore, an important research need is the investigation of standardized age- and gender-specific diagnostic criteria.

The impact of ADHD on individuals, families, schools, and society is profound and necessitates immediate attention. A considerable share of resources from the health care system and various social service agencies is currently devoted to individuals with ADHD. Often the services are

delivered in a nonintegrated manner. Resource allocation based on better cost data leading to integrated care models needs to be developed for individuals with ADHD. Basic research is needed to better define ADHD. This research includes the following: (1) studies of cognitive development, cognitive processing and attention/inattention in ADHD and (2) brain imaging studies before the initiation of medication and following the individual through young adulthood and middle age. Further research should be conducted with respect to the dimensional aspects of this disorder, as well as the comorbid (coexisting) conditions present in both childhood and adult ADHD. Therefore, an important research need is the investigation of standardized age- and gender-specific diagnostic criteria. The impact of ADHD should be determined. Studies in this regard include (1) the nature and severity of the impact on individuals, families, and society of adults with ADHD beyond the age of 20 and (2) determination of the financial costs related to diagnosis and care of children with ADHD (ibid., 2001).

The selection of treatments typically includes stimulant medications, especially for children who have the hyperactive form of ADHD. Amphetamine sulfate (benzedrine) was first prescribed by Bradley in 1937. The other common treatment is behavior therapy. Treatments may include neurofeedback, behavior therapy, drug therapy and all the possible combinations with and without family and individual psychotherapy.

Additional studies are needed to develop a more systematized treatment strategy. These include:

- Studies of the inattentive type of ADHD, especially since it might include a higher proportion of girls than the subtypes with hyperactivity/impulsivity
- Studies of long-term treatment (treatment lasting longer than one year), which are needed because of the persistence of the disorder.
- Prospective controlled studies, up to adulthood, of the risks and benefits associated with childhood treatment with psychostimulants.
- Studies to determine the effects of psychotropic therapy on cognitive function and school performance.
- Studies of the effects of instructional treatments on the academic achievement of children with ADHD.
- Studies to determine whether the combination of stimulants and psychosocial treatments can improve functioning with a reduced dose of stimulants.

- Studies to determine the risks and benefits associated with treating children younger than age five with stimulants.
- Studies of the effects of various stimulants in adolescents and adults.

Greater attention should be given to developing integrated programs for diagnosis and treatment. These include the following:

- Model projects to demonstrate methods of training educaors to recognize and provide appropriate special programs for children with ADHD.
- Incorporation of classroom strategies to effectively serve a greater variety of students and thereby reduce the need for ADHD referral and diagnosis.
- Determination of the extent to which individuals with ADHD are being served in postsecondary education and, if so, where they are being served, with what types of accommodations, and with what level of success.

In this paper, the authors have reviewed the ADHD literature. For additional ADHD source information, see Appendix A for a references resource guide. We have discussed the nature, history, clinical assessment, and treatment of children with ADHD, advocating the treatment utilization of quantitative electroencephalography. Since ADHD affects so many children, and since ADHD symptoms include developmentally inappropriate levels of activity, distractibility, and impulsivity, future research into the nature, assessment, and treatment of ADHD is critical. How many children have grown up to experience continued academic and social problems, not understanding the long-term adverse affects of ADHD on their lives. Based on the review of the ADHD literature, the prospects for the treatment of ADHD are very encouraging.

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Appendix A
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