
Attention Deficit-Hyperactivity Disorder and Its Deceivers

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Attention deficit-hyperactivity disorder (ADHD) has been described under numerous aliases in the literature for more than 60 years.¹ Initially, the focus was on the behavioral aspects and the relationship to possible brain injury. Thus the term *minimal brain dysfunction* was coined.² Even into the 1980s children with attentional problems and children with learning disabilities were classified together.³ Better understanding of the disorder allowed separation of the learning deficits from the behavioral symptoms. Subsequently, distinctions were made within the behavioral domain. A constellation of behaviors was identified, including hyperactivity, restlessness, aggressiveness, distractibility, and short-attention span. Later these 6 behaviors were combined to form 3 specific behavioral constructs: hyperactivity, impulsivity, and inattention.⁴ In recent years, the inattention or lack of vigilance has been noted to be a more consistent feature than the symptoms of hyperactivity and impulsivity. Controlling the attentional difficulties in the child was often noted to improve the behavioral aspects of the disorder.^{5,6}

Over the last 2 decades ADHD has gained increasing recognition in both the medical and lay media because, in part, of the impact that individuals with ADHD have on society. Children with this disorder often cause stress to families and demonstrate academic underachievement, poor social adjustment, and low self-esteem. Both retrospective and follow-up studies have shown that children with ADHD are at higher risk than the general population for other psychiatric disorders, such as depression, anxiety and conduct disorders, and alcohol and other substance abuse (SA) disorders.⁷⁻¹² With the increased risk of other disorders developing, there is little argument that ADHD should be taken seriously as a disorder. However, there is ongoing con-

cern that there is overdiagnosis and misdiagnosis of the disorder.¹³ In a recent review article on the diagnosis and treatment of ADHD, Goldman et al¹⁴ reassured the physician that there does not appear to be overdiagnosis or overtreatment. Despite this reassurance, physicians should be aware of the extensive number of disorders that can mimic ADHD. There are no physical findings or laboratory tests that are diagnostic of ADHD. Although imaging studies have been used in research, none are routinely used for diagnostic purposes. In addition to having a lack of concrete diagnostics tools that are foolproof in making the diagnosis of ADHD, there are also numerous disorders that symptomatically mimic ADHD. The purpose of this paper is to review ADHD and to help the physician recognize some of the disorder's numerous deceivers.

Prevalence and Etiology

In most scientific studies conducted over the past several years, there is agreement that the prevalence rate of ADHD is approximately 3% to 5% in elementary school-aged children.¹⁴ In Britain, where there is a more restrictive definition of ADHD, the prevalence rate is 0.1%.¹⁵ As in most behavioral disorders, there is a male predominance of approximately 4 to 6:1.^{16,17} Attentional disorders are present in all socioeconomic classes and cultures. The cause of ADHD is unknown. Identifiable organic causes have been found in a small percentage of children.¹⁸ Retrospective studies have shown an increase in many behavioral disorders following a number of diseases of the central nervous system (CNS).¹⁹ Genetic and neurochemical factors appear to play an important part in most cases of individuals with ADHD.^{20,21} Twin studies by Cantwell²² have demonstrated a high concordance for hyperactivity in monozygotic twins compared with dizygotic twins (Table 1).

There are numerous neurochemical postulates pointing to the central monoaminergic mechanisms, particularly the areas of the dopaminergic and cate-

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TABLE 1. Possible causative factors in ADHD

Genetic influences: evident in twin and family history studies
Perinatal insults
Birth asphyxia
Maternal drug or alcohol ingestion
Sequelae of infectious processes
Bacterial meningitis
Encephalitis
Reye's syndrome
Toxins
Drug ingestion in the child
Heavy metal poisoning
Sequelae of metabolic disorders
Sequelae of head trauma

cholinergic system, as playing a role in the pathogenesis of ADHD.⁴ Weis et al²³ postulated that the CNS dysfunction may be in the frontal lobes. Evans et al²⁵ suggested that attentional disorders are due to a lack of homeostasis in the CNS and that the dishomeostasis is in the frontal striatal dopamine system. Neuroimaging has advanced in this decade through functional magnetic resonance imaging, positron emission tomography, and single photon emission computed tomography. Although difficulties with methodology remain, there has been increasing agreement on the role of the prefrontal-striatal-thalamocortical circuit in ADHD. A preponderance of evidence suggests that the right-sided circuit is primary at least at the level of the basal ganglia.²⁵ Advances in this area may some day provide the ability for a firmer diagnosis in these individuals.

Diagnosis of ADHD

In the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, the American Psychiatric Association has defined ADHD with diagnostic criteria as noted in Table 2.²⁶ The essential features of ADHD include "developmentally inappropriate degrees of inattention, impulsivity and hyperactivity." Children with ADHD generally display some disturbance in each of the following areas but to varying degrees. Inattention is evident from incomplete work in school and in tasks at home. Examples are failure to follow through on instructions, frequent shifts from an incomplete task to another, and poor listening skills. There is often difficulty in concentration, such as being unable to remember what was just read or forgetting the second step of a multistep command. In the classroom, symptoms of impulsivity include blurting out answers to questions, not awaiting one's turn, responding to

assignments before hearing the complete instructions, interrupting teachers or classmates, and carelessly completing one's work. These children may be accident-prone and are often described as "acting before thinking." Instances may include reaching for a hot object on the stove or jumping from a height that is dangerous without thinking of the consequences. The most prominent feature of ADHD in preschoolers who are seen by the physician is gross motor overactivity, such as excessive running or climbing. These children have been described as having their "accelerator stuck" or their "motor running all the time." Older children and adolescents tend to be seen more often with fidgety, restless, and disruptive behavior. Many are labeled as "the class clown." Children with only inattention as a symptom pose an interesting diagnostic challenge. These are the children who essentially sit quietly causing no trouble, but fail in school because of incomplete work and missed instructions.

Differential Diagnosis

ADHD should be viewed as a diagnosis of exclusions. There are no laboratory tests that are diagnostic of ADHD, and there are no physical features that are helpful in the diagnosis. A thorough evaluation must first exclude health problems, learning disorders, behavioral disorders, psychosocial stressors, and age-appropriate overactivity (Table 3). The symptoms of ADHD should occur in all aspects of life. A "red flag" should be raised if the symptoms are only in the home or in the school.

Medical Disorders

Sensory Deficits. A child's development, attention span, and social interaction can be markedly influenced by a sensory impairment. The earlier the onset and the greater the severity of the impairment, the more significant is the impact on the child. Vision and hearing screenings are imperative in any child who has a history of inattention or hyperactivity. Often, vision or hearing deficits are not recognized early because the child does not realize what his peers can see or hear. The parents and teacher may miss the subtle clues of a sensory deficit.

Case Example. T. G. was a kindergarten student who would not sit down to work on letters or numbers. He was often up and out of his seat. At home, he was not considered to be a behavior problem. The parents recalled that he never enjoyed completing puzzles, coloring, or drawing. He was referred by the

TABLE 2. Diagnostic criteria for ADHD

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- A. Six or more symptoms of inattention and/or 6 or more symptoms of hyperactivity or impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level.
1. Inattention
 - a) Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
 - b) Often has difficulty sustaining attention in tasks or play activities
 - c) Often does not seem to listen when spoken to directly
 - d) Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
 - e) Often has difficulty organizing tasks and activities
 - f) Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
 - g) Often loses things necessary for tasks or activities (eg, toys, school assignments, pencils, books, or tools)
 - h) Is often easily distracted by extraneous stimuli
 - i) Is often forgetful in daily activities
 2. Hyperactivity/impulsivity
 - a) Often fidgets with hands or feet or squirms in seat
 - b) Often leaves seat in classroom or in other situations in which remaining seated is expected
 - c) Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
 - d) Often has difficulty playing or engaging in leisure activities quietly
 - e) Is often "on the go" or often acts as if "driven by a motor"
 - f) Often talks excessively
 - g) Often blurts out answers before questions have been completed
 - h) Often has difficulty awaiting turn
 - i) Often interrupts or intrudes on others (eg, butts into conversations or games)
- B. Hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years
- C. Impairment from the symptoms exists in 2 or more settings (eg, at school [work] and at home).
- D. Clinically significant impairment should be evident in social, academic, or occupational functioning
- E. The symptoms are not a result of a pervasive developmental disorder, schizophrenia, or other psychotic disorder and are not better accounted for by another mental disorder (eg, mood disorder, anxiety disorder, dissociative disorder, or a personality disorder)
- CPT code based on subtypes: the subtypes should be based on predominant symptoms for the past 6 months**
- 314.01 ADHD, combined type: if both criteria A1 and A2 are met for the past 6 months
- 314.00 ADHD, predominately inattentive type: if criterion A1 is met but criterion A2 is not met for the past 6 months
- 314.01 ADHD, predominantly hyperactive-impulsive type: if criterion A2 is met but criterion A1 is not met for the past 6 months
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school for possible ADHD. He failed his vision screening bilaterally. Ophthalmologic examination revealed severe presbyopia. Once the visual correction was achieved classroom behavior improved as did attention to task and learning.

Chronic Illnesses. Success in school for a child depends on the child's academic abilities, emotional well-being, social interaction, school attendance, and adequate school performance. Chronic medical conditions can potentially affect all of these areas. Chronic medical problems occur in up to 20% of school-aged children in the United States. School-related difficulties can develop in as many as 40% of these affected children.²⁷ Migraine headaches, absence seizures, hypothyroidism or hyperthyroidism, lead intoxication, asthma, hematologic disorders, childhood cancer, and insulin-dependent diabetes mellitus, to name a few, are all illnesses that can interfere with a child's classroom performance.¹⁸ The academic problems may be direct effects of the illnesses or results from the therapy that the child has received.

Medications alone can influence academic performance directly or indirectly because of the side effects of the drug. Asthma medications, particularly theophylline, have been implicated in creating attentional difficulties.²⁸ Rachelefsky et al²⁹ found that children with asthma who were being given asthma medication were noted by their teachers to have problems with distractibility, incomplete work, and anger control. Oral steroids may aggravate anxiety or depression and subsequently interfere with short-term memory. Anticonvulsants such as phenobarbital and diphenylhydantoin have been found to cause sedation and agitation and to interfere with cognitive function. Antihypertensive agents, such as β -blockers, can cause sedation or depression. Sedation or agitation can result from numerous antihistamine medications and thus interfere with attention span.

Before the initiation of medication treatment for a child with attention difficulties, an effort should be made to withdraw or change the medication that may have an effect on the child's classroom function. An

TABLE 3. Differential diagnosis of ADHD

Medical disorders
Sensory deficits
Chronic illnesses
Substance abuse
Tourette's syndrome
Sleep disorders
Mental disorders
Childhood depression
Bipolar disorder
Obsessive-compulsive disorder
Anxiety disorder
Adjustment disorder
Asperger's syndrome
Mental retardation
Learning disabilities
Psychosocial problems
Behavioral disorders
Parent-child relational problem
Oppositional defiant disorder
Conduct disorder

example of this would be a child taking phenobarbital for the management of a seizure disorder who comes in with the chief complaint of hyperactivity. An attempt should be made to change the child's medication from phenobarbital to another medication to manage the seizures, because hyperactivity can be a side effect of phenobarbital.

Substance Abuse. SA and substance use can affect a child's academic outcome through numerous modalities. Direct effects on fetal development have been clearly documented with alcohol, cigarettes, marijuana, cocaine, opiates, and other illicit drugs.^{30,31} Indirect effects of SA have been found in children whose parents are active substance abusers. These children have an increased incidence of mental health problems, ADHD, conduct disorders, anxiety, depression, poor self-esteem, and social adjustment problems.³² There is also an increase in physical, sexual, and emotional abuse and neglect in children who are in the homes of substance abusers.³³ Clearly, any one of these problems can adversely affect academic function.

Academic difficulties can predispose a child to SA. The predisposition seems to be mediated through the development of other disorders, such as anxiety, depression, and ADHD. In these cases there may be an aspect of "self-medication" to alleviate some of the pain that the child is experiencing in life. The strongest association of drug use occurs in children in whom a conduct disorder is diagnosed. Children with ADHD who continue to have significant problems in adolescence are more likely to have SA.³² However, it

is notable that Hechtman³⁴ found that children with ADHD who were treated with stimulant medication were at no higher risk for SA than the children with ADHD who were treated with nonstimulants.

SA and substance use alone are known to have direct effects on academic functioning. Acute effects of marijuana use include impaired memory and attention. Chronic effects may include deficits in mathematical skills, verbal expression, and selective memory retrieval skills. Behavioral changes that have been found with chronic alcohol use in the adolescent include a drop in grades, increased absenteeism, decreased performance in sports, change in friends, and lethargy or mood changes.³²

Warning signs that should alert the physician to the need for further investigation of possible SA include withdrawn behaviors, memory loss, attentional problems, mood swings, a decline in academic performance, a negative change in appearance, explosive behavior, disregard for rules, increased absenteeism from school, and elopement from home.

Tourette's Syndrome. Tourette's syndrome (TS) is the most severe form of tic disorder characterized by chronic multiple motor tics and one or more vocal tics. Associated symptoms include obsessions and compulsions, hyperactivity, impulsivity, and distractibility. Social adjustments and academic functioning are often also impaired.³⁵ Several family studies indicate that the TS spectrum of behaviors is inherited as a dominant gene.³⁶ Males are affected at an increased frequency rate of approximately 1.5 to 3:1.

TS is included in this list of differential diagnoses because of the increased academic problems that children with TS have and the co-morbidity that is found between ADHD and TS. Comings and Comings³⁷ found that 62% of the patients with TS they evaluated met the diagnostic criteria for ADHD.³⁸ In fact, it has been suggested that ADHD may present as the first expression of the TS gene.³⁶ There has been ongoing controversy concerning stimulant use in the patient with TS.^{38,39} However, there is little argument that children with TS often have problems with ADHD requiring intervention.

Sleep Disorders. Sleep disorders are characterized by a disturbance in the amount, quality, and timing of sleep manifested by poor sleep settling, nighttime waking, or excessive daytime sleepiness. In nonclinical populations, 20% to 30% of children have been documented to have sleep-related problems that are regarded as significant to their families. Thirty-four percent of children with sleep problems have an increased rate of behav-

ioral and emotional symptoms and psychiatric diagnoses, including anxiety disorders, ADHD, depression, and conduct disorder.⁴⁰ Emotional and behavioral disturbances often cause disruptive sleep. Conversely, a child chronically deprived of sleep because of insufficient or disrupted sleep can have emotional or behavioral symptoms that mimic psychiatric disorders.

Case Example. E. A. is in the fourth grade. The school requested that E. A. see her physician because of irritability, poor attention span, emotional lability, and low frustration tolerance. The parents questioned the physician of the need for medication for the ADHD symptoms. However, when history was carefully taken E. A. is found to have snoring, disruptive sleep, and early morning fatigue. At this point the sleep problems should be addressed before further intervention for ADHD. Initiation of stimulant medication could exacerbate the irritability and mood lability. An examination of the airway to rule out obstruction and possibly a sleep study would be warranted in this child to rule out obstructive sleep apnea.

Mental Disorders

The mental disorders listed in Table 4 are often first diagnosed in childhood. The following disorders all have characteristics that could be misconstrued as ADHD.

Childhood Depression. Childhood depression is defined as an individual exhibiting a depressed mood most of the day every day.²⁶ In children and adolescents, the mood may be irritable rather than depressive in appearance. Often there is a markedly diminished interest in pleasurable activities. There may be a significant weight loss or weight gain. However, in children, a failure to make the expected weight gain may also be significant. An example would be a child aged between 2 years and puberty not making the approximate 5-lb weight gain per year. In depression, sleep problems such as insomnia or hypersomnia may be present. The depressed mood and fatigue from lack of sleep can be misinterpreted as uninterest or lack of motivation. Psychomotor agitation or retardation, which can present as hyperactivity or inattention, may also be apparent. The symptoms mentioned above, in addition to the diminished ability to concentrate and the indecisiveness that occurs in depressive disorders, could easily be misdiagnosed as ADHD.

Bipolar Disorder. There are several types of bipolar disorders depending on the amount of manic or depressive episodes. Bipolar disorder may be seen in early

TABLE 4. Necessary components in evaluation of attentional problems

History from
Parents—present illnesses, medical, family, developmental, and social histories
Child—present illnesses, review of systems, and substance abuse
Teachers—behavioral information and academic function
Physical examination
Vision screening
Hearing screening
Growth parameters
Neurologic examination
Psychologic and educational testing
Determine intelligence, academic achievement, language, skills, and mood
Laboratory tests, EEG and imaging studies (if deemed necessary from the history or examination)

EEG, Electroencephalogram.

childhood. Essentially, this disorder is a combination of depressive and manic episodes. A manic episode is a distinct period with an abnormally and persistently elevated or expansive or irritable mood.²⁶ However, the difference in a manic episode of bipolar disorder versus the hyperactivity in ADHD is that children with mania tend to have increased involvement in goal-directed activity with psychomotor agitation if unable to accomplish their goal-directed activity. In the child with ADHD, the hyperactivity component is typically not goal directed. Symptoms apparent in bipolar disorder include inflated self-esteem or grandiosity, decreased need for sleep, pressured speech, distractibility, increased involvement in goal-directed activities, psychomotor agitation, and excessive involvement in pleasurable activities with a high potential for painful consequences.^{41,42} As is obvious from the symptom list, there are several symptoms for this illness that could be confused with ADHD.

Obsessive-Compulsive Disorder. This is a disorder in which there are recurrent obsessions or compulsions that are severe enough to be time-consuming and to cause marked distress or significant impairment in function.²⁶ The obsessions can include recurrent and persistent thoughts, impulses, or images that are intrusive or inappropriate and may cause marked anxiety or distress. The recurrent thoughts are not simply excessive worries about real-life problems, such as fears or anxiety about an abusive parent. The child recognizes that the obsessional thoughts or images are a product of his own mind. Often, attempts are made by the individual to ignore or suppress the thoughts or impulses, thus causing inattention when the child is expected to concentrate. Repetitive behaviors with obsessive-compulsive disorder may be silent, such as mentally

repeating words, counting, or praying. During these obsessive-compulsive episodes these children perform quite poorly in the classroom.

Case Example. B. J. was barely passing the sixth grade, although in the fifth grade she did well. The teachers have complained of the following behaviors: she is up and out of her seat often; she never knows what she is supposed to be working on; schoolwork is rarely, if ever, completed; classmates describe her as “weird”; she will often bring up a topic that seems unrelated to what is being discussed; and she has lately become quite agitated when forced to participate in class stating “when I’m ready.” When her history was taken, B. J. admitted to having obsessive thoughts that occupied most of her time. She would spend several minutes at a time separating relatives into different areas of her brain. She stated that she was unable to complete her work until the task was done.

Anxiety Disorder. Anxiety disorder is defined as excessive anxiety and worry occurring most of the time, for at least 6 months. Symptoms include restlessness, easy fatigability, difficulty concentrating, irritability, muscle tension, and disturbed sleep.²⁶ Anxiety disorders are among the most common childhood psychiatric disorders and may affect up to 15% of children and adolescents. The internalizing symptoms of anxiety disorders, such as excessive fatigability and difficulty concentrating, can be confused with ADHD, primarily the inattentive type. Symptoms such as whiny, irritable behavior and the refusal to attend school can mimic the externalizing features of ADHD.

Adjustment Disorder. This is a relatively common disorder of childhood in which emotional or behavioral symptoms develop in response to a stressor, such as the death of a close family member, a move, or a recent parental divorce, that has occurred within 3 months of the onset of the stressor.²⁶ Inattention, poor sleep, or behavioral difficulties from exposure to the stressors may develop. The resultant effects of an adjustment disorder may be problems with conduct or emotional function or poor academic performance.

Asperger’s Syndrome. In 1944 Hans Asperger, a Viennese pediatrician, described a group of children, predominately boys, who had a specific pattern of behaviors. The behaviors included lack of ability to form friendships, no empathy, intense preoccupation in special interests, one-sided conversations, and clumsy movement.⁴³ However, international recognition of this disorder did not occur until the 1990s.⁴⁴ In the last 5 years there has been growing interest in the features and diagnosis of

Asperger’s syndrome. The essential features of this disorder include a severe impairment of social interaction, as manifested by poor use of nonverbal behaviors; poor peer relationships; and a restricted repertoire of behaviors, interests, and activities. There are no delays in cognitive, language, or motor development. Adaptive skills are also normal. The disturbance causes significant impairment in social and academic functioning. Because of their poor social interaction and lack of social reciprocity, these children are often viewed as inattentive, and they function poorly in the classroom.⁴⁵

Mental Retardation. Mental retardation is significantly subaverage intellectual functioning: an IQ of 70 or less with concurrent deficits in adaptive functioning.²⁶ Mental retardation does not preclude the diagnosis of ADHD; however, the mental age must be taken into consideration when looking at “age appropriate hyperactivity.” For example, a 6-year-old child with moderate mental retardation would have a cognitive level of a 2- to 3-year-old child. Thus, the activity level normalcy should be judged from that of a 2- to 3-year-old child’s level.

Learning Disabilities

The diagnosis of a learning disability (LD) is made when a child’s academic achievement on individually administered standardized tests is significantly below what would be expected for age, education, and level of intelligence.⁴⁶ Typically, the significant discrepancy is at or greater than 2 SD (around 15 points) between IQ and academic achievement. The LD can occur in reading, mathematics, written expression, or language and can be either receptive or expressive in nature. Early signs of an LD might include delayed speech, difficulty following commands, fine motor delays, poor memory skills, clumsiness, trouble differentiating left from right, inattention, and a dislike of learning to read or write. Before identification of the LD, these children are often mistaken for having ADHD. In a regular classroom, a child with an LD could appear inattentive because the work would be beyond his skill level. Remediation through tutorial help or special classes is necessary for these individuals. As in children with ADHD, there is a male-to-female predominance between 3 to 1 to 9 to 1. ADHD does increase the risk for LDs.⁴⁰ Numerous studies have noted a 30% co-morbidity rate between ADHD and LD. Research does suggest a high rate of depressive symptoms in adolescents with LDs.⁴⁶ Early identification and remediation of an LD will likely lessen the negative impact on the child.

TABLE 5. Questionnaires helpful in evaluation of ADHD

Questionnaire	Completed by teacher	Completed by parent	Completed by patient	Comments
ACTeRS	X	X		Breakdown given in 4 areas: attention, hyperactivity, social skills, and oppositional behavior
The Conners' Index	X	X		Evaluates internalizing and externalizing behavior
The Child Behavior Checklist (Achenbach)	X	X	X	This scale is not limited to the evaluation of children with ADHD but further delves into other behavioral areas (such as somatic complaints, depression)

ACTeRS, ADD-H Comprehensive Teacher Rating Scale.

Psychosocial Disorders

A clearly recognized etiology of academic difficulties includes psychosocial malfunctioning in the family.⁴⁷ The presence of stress in a child's home predicts poorer outcome for the child's academic performance. During the period of time when the family experiences a divorce, illness of a parent, relocation, or death of a close family member, tension is high. Children often suffer academically because of anxiety, lack of organization, and stress that is going on in the home.

Sexual, physical, or emotional abuse or physical or emotional neglect likely causes children to function poorly because of the preoccupation with issues going on at home or the fearfulness of what is going to happen to them next. A chaotic home, which does not afford a child the opportunity to appropriately prepare for school, can cause the child to have symptoms that mimic the disorganized, forgetful behavior of child with ADHD.

Behavioral Disorders

Parent-Child Relational Problem. This is a diagnostic term used when there is an abnormal or impaired interaction between the parent and the child.²⁶ The problem areas typically are in communication, overprotection, and discipline. When the history is taken, it is apparent that the child's problems occur in the home. Typically, adults outside of the home do not have the difficulty that the parent experiences with the child. Counseling with the parent to teach appropriate parenting skills are necessary to alleviate this problem.

Oppositional Defiant Disorder. This is defined as a recurrent pattern of defiant, disobedient, and negative behaviors toward authority figures that persists for 6 months.²⁶ The behaviors are apparent in all aspects of the child's life. Specific behaviors that might be confused with ADHD include refusing to comply with the requests of adults, displaying deliberately annoying behaviors, being touchy, and being easily annoyed by others.

Conduct Disorder. This is the most serious of the behavior disorders commonly seen in children. In

children with conduct disorder, major societal rules and the rights of others are violated.²⁶ These children often initiate aggressive behaviors and react aggressively to others. Deliberate destruction of property is a common occurrence, as are thievery and deceitfulness. Early onset of drug use and sexual acting out are also frequent features. Often as young children these individuals had symptoms of oppositional defiant disorder. Academic problems and ADHD are common in these children. Aggressive placement in behavioral therapy is important for these children as well as appropriate medication treatment for the symptoms of ADHD if the diagnosis is made.

Evaluation (Table 4)

History

Taking history is the initial and most important step in the evaluation of a child with attentional and school problems. A history should be taken from the parent, the child, and the teachers. Interviewing the parents provides information regarding the onset, duration, and severity of symptoms as well as the traditional medical information, including medical history, family history, and social history. A review of symptoms should be taken from the parent and the child. Specific areas of great importance include complaints of vision or hearing, sleep problems, and chronic pain. It is helpful to obtain information from the child without the parent present, especially in the older child, to explore the possibilities of abuse, drug use, depressive symptoms, or other mood disorders or obsessive symptoms. Teacher information is imperative in making the diagnosis to determine what symptoms are noted at school. Several questionnaires are available for both parents and teachers to complete that are helpful in gathering information in a systematic and timesaving manner (Table 5).⁴⁸ The Conners' Index for parents and teachers evaluates not only inattention and hyperactivity but also other inter-

nalizing and externalizing behaviors, as does the Child Behavior Checklist for parents and teachers. The ADD-H Comprehensive Teacher Rating Scale has also achieved wide acceptance. Additionally, there are several questionnaires that can be given to children with good reading skills to evaluate self-esteem and depressive and obsessive symptoms.

Physical Examination

Vision screening for both near and far vision and audiometric testing should be completed at the onset of the evaluation to exclude sensory deficits. If a question arises in the area of vision or hearing, then a more comprehensive evaluation should be completed before psychological testing. Plotting the child's height and weight on a standardized chart gives the examiner an indication of the growth status. The head circumference is the most important measurement, because a head too small or too large may indicate the need for an imaging study. The presence of minor congenital anomalies might suggest a dysmorphic syndrome, such as fetal alcohol syndrome or fragile X syndrome. Careful physical examination may also demonstrate abnormalities that could contribute to inattention and hyperactivity, such as hyperthyroidism or hypothyroidism, physical or sexual abuse, or anemia. A 1-on-1 setting, like the examination room, is not an ideal setting to determine the level of attention or hyperactivity especially in the older child unless the level of the disorder is severe. Observation in the classroom and on the playground with peers reveals much more useful information.

Neurologic Examination

Although a number of "soft" neurologic signs have been noted over the years in children with ADHD and other behavioral or learning disorders, there are no specific neurologic signs that are diagnostic of ADHD.^{49,50} The soft signs documented in the past include mixed laterality, choreiform movements, dysdiadochokinesis, mirror overflow phenomenon, and poor performance in a variety of fine and gross motor tasks. However, all of the soft signs mentioned above can be found in healthy children. In 1984, Shaywitz et al⁵¹ noted that a composite set of items within various areas of the neuromaturational evaluation can help discriminate healthy boys from boys who have an LD or an attention-deficit disorder. The test items that were thought to be helpful included short-term memory, fine motor proficiency, synkinesis, and awareness of laterality.

Psychologic Testing

There are no specific findings on the psychologic assessment of children with ADHD. However, there are patterns in some test results that are frequently present in children with ADHD. The Wechsler Intelligence Scale for Children-III (WISC-III) is widely accepted for testing children because the test measures a variety of both verbal and performance skills. Characteristic findings in children with ADHD are relatively poor scores on the subtests Arithmetic, Coding, Information, and Digit Span. These subtests are collectively referred to as the ACID profile or freedom from distractibility factor and are more sensitive to attention, concentration, and vigilance.⁵² The Continuous Performance Task (CPT) or Computer Visual Vigilance Tasks have been introduced for use in evaluating children with attention and vigilance difficulties.^{53,54} A direct relationship has been found between CPT commission errors and the dosage of medications used in the treatment of ADHD. These tasks introduce a useful area that is rapidly developing to help evaluate these children better.

Educational Testing

The Woodcock-Johnson Psycho-Educational Battery yields achievement scores that can be compared with the intellectual ability as measured by the WISC-III. This comparison is helpful, because a child with an LD will have scores far lower on academic achievement tests than his intellectual scoring would indicate he should have. Discrepancies in verbal and performance scores on the WISC-III also point to possible LDs. More specific educational testing, such as the Woodcock-Johnson or similar educational tests, can further reveal the specific areas of LDs.⁵⁵

Laboratory Examination

There are no routine laboratory tests that are specifically recommended in the diagnosis of ADHD. Laboratory procedures should be performed when the history or physical examination suggests possible underlying medical problems such as anemia, hypothyroidism, lead intoxication, or chromosomal disorders such as fragile X syndrome.

Imaging Studies and Electroencephalogram

An electroencephalogram should be obtained in children who have a questionable history of staring spells. Imaging studies should be obtained in a child with microcephaly or nonfamilial macrocephaly.

Imaging should also be completed when an abnormal result from a neurologic examination is noted. Single photon emission computed tomography, positron emission tomography, and magnetic resonance imaging studies may be useful in the future in the diagnosis of patients with ADHD.²⁵ Advances in this area with further research evaluating brain structure and function in these children will give a firmer basis for use of these instruments.

Summary

There is a myriad of disorders that can mimic ADHD. Often parents or teachers, through their own investigation, will determine the diagnosis for their child's school problems as ADHD, when in fact, the difficulties are unrelated to ADHD. A carefully taken history, observation, and interaction with the child are needed. An evaluation of the school situation will help to indicate if the child's primary problem is behavioral, academic, medical, psychiatric, social, or attentional. Psychologic and educational testing is necessary to completely delineate the child's problems and needs. The greatest service that a physician can give children with academic problems is to approach each child in a systematic, scientific, and professional manner to determine the best treatment for the child and to demonstrate the most favorable outcome.

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