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Attention-Deficit Hyperactivity Disorder

Introduction

In 1998, the National Institutes of Mental Health agreed that attention-deficit hyperactivity disorder (ADHD) is indeed a legitimate psychologic condition even though its definition has not been fully pinned down. ADHD is a syndrome generally characterized by the following symptoms that first occur before the age of seven:

- Inattention.
- Distractibility.
- Impulsivity.
- Hyperactivity.

Some experts further categorize ADHD into three subtypes:

- Behavior marked by hyperactivity and impulsivity, but not inattentiveness.
- Behavior that is marked by inattentiveness, but not hyperactivity and impulsivity.
- A combined type.

There are some issues with these criteria, and arguments exist for both an over- and underdiagnosis of this problem. Defining ADHD is made particularly difficult because one-third of the cases is accompanied by learning disabilities and other neurologic or emotional problems. It is likely that the term attention-deficit hyperactivity disorder will eventually give way to subgroups of problems that include some of these general symptoms.

General Description of a Child with ADHD

Symptoms of ADHD show up very early on. Studies now indicate that ADHD symptoms in preschool children with ADHD do not differ significantly from older children. (One mother reported that three days after delivery, nurses were referring to her ADHD son as "Wild Willie.")

The classic ADHD symptoms include inattention, distractibility, impulsivity, and hyperactivity. However, these symptoms often do not always adequately describe the child's behavior, nor do they describe what is actually happening in the child's mind. Some experts are focusing on deficits in so-called "executive functions" in the brain to understand and describe all ADHD behaviors. Such impaired executive functions in ADHD children can cause the following problems:

- Inability to hold information in short-term memory.
- Impaired organization and planning skills.
- Difficulty in establishing and using goals to guide behavior, such as selecting strategies and monitoring tasks.
- Inability to keep emotions from becoming overpowering.
- Inability to shift efficiently from one mental activity to another.

Hyperactivity. The term hyperactive is often confusing for those who expect to observe a child racing unceasingly about. A boy with ADHD playing a game, for instance, may have the same level of activity as the

other children without the syndrome. If a high demand is placed on the ADHD child's attention, however, then his motor activity intensifies beyond the levels of the other children. In a busy environment, such as a classroom or a crowded store, for example, ADHD children often become distracted and react by pulling items off the shelves, hitting people, or spinning out of control into erratic, silly, or strange behavior.

Impulsivity and Temper Explosions. Even before the "terrible two's," impulsive behavior is often apparent; the toddler may gleefully exhibit erratic and aggressive gestures, such as hair pulling, pinching, and hitting. Temper tantrums, normal in children after two, are usually exaggerated and not necessarily linked to a specific negative event in the life of an ADHD child. One of the most painful events a parent may experience is an abrupt and aggressive attack that may occur after cuddling a young ADHD child. Often this reaction seems to be caused not by anger, but by the child's apparent inability to endure overstimulation or displays of physical affection.

Attention and Concentration. ADHD children are usually distracted and made inattentive by an overstimulating environment (such as a large classroom). They are also inattentive when a situation is low-key or dull. Some experts believe that certain parts of the brain in ADHD children may be underactive so that they fail to be aroused by nonstimulating activities. In contrast, however, they may exhibit a kind of "super concentration" to a highly stimulating activity (such as a video game or a highly specific interest). Such children may even become over-attentive, so absorbed in a project that they cannot modify or change the direction of their attention.

Impaired Short-Term Memory. Many experts now believe that an essential feature in ADHD, as well as in learning disabilities, is impaired working, or short-term, memory. People with ADHD are unable to "hold" groups of sentences and images in their mind until they can extract organized thoughts from them. Such people then may not necessarily be inattentive so much as be unable to remember a full explanation (such as a homework assignment) or unable to complete processes that require remembering sequences, such as model building. In general, children with ADHD are often attracted to activities (e.g., television, computer games, or active individual sports) that do not tax this working memory or produce distractions. Children with ADHD have no differences in long-term memory compared with other children.

Inability to Manage Time. Studies suggest that children with ADHD have difficulties being on time and planning the correct amount of time to complete tasks. (This may coincide with short-term memory problems.) In one study, although children with probable ADHD were able to self-report many ADHD symptoms, they tended to believe they used their time wisely, in contrast to reports by their teacher.

Lack of Adaptability. ADHD children have a very difficult time adapting to even minor changes in routines, such as getting up in the morning, putting on shoes, eating new foods, or going to bed. Any shift in a situation can precipitate a strong and noisy negative response. Even when they are in a good mood, they may suddenly shift into a tantrum if they meet with an unexpected change or frustration. In one experiment, ADHD children were able to closely anchor their attention when they were directly cued to a specific location, but they had difficulty shifting their attention to an alternative location.

Hypersensitivity and Sleep Problems. ADHD children are often hypersensitive to sights, sounds and touch, and complain excessively about stimuli that seem low key or bland to others. Sleeping problems usually occur well after the point at which most small children sleep through the night. In one study, 63% of children with ADHD had trouble sleeping.

Diagnostic Criteria for Attention-Deficit Hyperactivity Disorder in Children

A. Either 1 or 2 should be present:

1. Should have 6 or more of the following symptoms of inattention, persisting for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

- Often fails to give close attention to detail, makes careless mistakes.
- Often has difficulty sustaining attention in tasks or play.
- Often does not seem to listen when spoken to directly.
- Often does not follow through and fails to finish tasks.
- Has difficulty organizing tasks and activities.

- Avoids or dislikes tasks requiring sustained mental effort.
- Often loses things necessary for tasks or activities.
- Is often easily distracted by extraneous stimuli.
- Is often forgetful in daily activities.

2. Should have 6 or more of the following symptoms of hyperactivity-impulsivity persisting for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

- Often fidgets or squirms when sitting.
- Has difficulty remaining seated when required to do so.
- Often runs about or climbs excessively in inappropriate situations.
- Has difficulty playing quietly.
- Is often "on the go," acts as if "driven by a motor."
- Often talks excessively.
- Often blurts out answers to questions before they have been completed.
- Has difficulty waiting for his or her turn.
- Often interrupts or intrudes on others.

Note: Patients with A1 symptoms are diagnosed with ADHD, predominantly inattentive type; those with A2 are diagnosed with ADHD, predominantly hyperactive-impulsive type; those with both A1 and A2 are diagnosed as ADHD, combined-type.

B. Onset of some symptoms before the age of seven. It should be noted that children with the inattentive subtype often are not diagnosed until they are above seven years of age.

C. Symptoms occur in two or more settings (for example home and school).

D. Clear evidence of significant impairment in social or academic functioning.

E. Not caused by a pervasive developmental disorder, schizophrenia, or any other psychotic disorder, and is not better accounted for by another mental disorder, including anxiety or depression.

Diagnostic and Statistical Manual of Mental Disorders: 4th Edition (Text Revision), Washington, DC., © 2000 American Psychiatric Association.]

Risk Factors

In the US, the diagnosis of ADHD in children increased from 1.1% of office visits in 1990 to 3.6% in 1996, or from nearly 950,000 to over 2,400,000 children. Estimates of prevalence of the disorder range from 2% to 18% depending on where and how the studies were conducted. ADHD is a genuine disorder, but it should be strongly noted that the US accounts for 90% of worldwide prescriptions for stimulants for ADHD. It is not known whether this reflects a real increase in ADHD or a better ability to recognize it. Or it may be an indication of a culture that places excessive value on normalcy and academic achievement at the expense of more frequent diagnoses.

Gender and ADHD

ADHD is most often diagnosed in boys, but there is some evidence that it is underdiagnosed in girls because they may be less likely to exhibit aggressive behaviors and so go unnoticed. Until recently, all major studies were conducted using boys as subjects. Important studies on girls with ADHD are now underway and to date, a major study is reporting that girls with the condition experience the same multiple impairments as boys do.

Adults with ADHD

Although ADHD is primarily thought of as a childhood disorder, diagnoses of attention-deficit disorder in adults are definitely on the rise. It was estimated that methylphenidate (Ritalin) was prescribed in nearly 800,000 adults in the US in 1997, nearly three times the number in 1992.

Attention Deficit Disorder In Adults

How Is Attention Deficit Disorder Identified in Adults?

Some research suggests that ADHD affects between 2% and 6% of the adult population, assuming that one- to two-thirds of cases persist into adulthood. ADHD in adults always occurs as a continuum of the childhood condition. Adult-onset symptoms are likely to be due to other factors. Diagnosing adult ADHD can be a difficult problem since hyperactivity typically wanes as children get older, while attention and organizational problems may develop in older people. Some experts believe, then, that the number of adults with ADHD is underestimated.

A rating scale using four factors has been developed that may prove to be useful in identifying adults with ADHD:

- Inattention and memory problems. (Examples: losing or forgetting things, being absent-minded, not finishing things, misjudging time, depending on others for order, having trouble getting started, changing jobs or projects in the middle.)
- Hyperactivity and restlessness. (Examples: always being on the go, fidgety, easily bored, taking risks, liking active and fast paced jobs and activities, such as being a sales representative or stockbroker.)
- Impulsivity and emotional instability. (Examples: saying things without thinking first, interrupting others, being annoying to others, easily frustrated, easily angered, having unpredictable moods, driving recklessly, having high relationship and job turnover.)
- Problems with self worth. (Examples: Avoids new challenges, appears confident to others but not to oneself.)

Physicians can use adult reports of their childhood behaviors and experiences when searching for clues for a diagnosis. Interestingly, the disorder seems to be distributed equally between women and men in adulthood, with women having twice the reported incidence in young adulthood. Such findings suggest that ADHD may be underestimated in girls.

How Serious Is Attention Deficit Disorder in Adults?

Accompanying Emotional, Personality, and Learning Disorders. Between 19% and 37% of adults with ADHD have depression or bipolar disorder and between 25% and 50% have anxiety disorder. Bipolar disorder plus ADHD, in fact, may be very difficult to differentiate from ADHD alone in adults.

Accompanying Learning Disorders. About 20% of adults with ADHD have learning disorders, usually dyslexia and auditory processing problems. These problems should be considered in any treatment plan.

Effect on Work. Compared to adults without ADHD, those with the condition tend to reach lower educational levels and to be fired more often. In fact, one article reported that by the time they are in their 30s, about 35% of ADHD adults are self-employed.

Substance Abuse and Risky Behavior. According to a 2003 study, the incidence in ADHD is five to 10 times higher among alcoholics than in the general public. Other studies have reported that between 32% and 53% of adults with ADHD abuse alcohol and between 8% and 32% smoke marijuana or take cocaine. Self-medication with nicotine and coffee is also common. Notably, deficiencies in the brain chemical dopamine may create a more intense need for "reward" seeking. Substance abuse, then, is a way of self-medicating. Nicotine, in particular, may act as a medication that improves ADHD symptoms. An important 2003 study suggested that young people and adults with the highest risk for substance abuse were those whose ADHD symptoms during childhood were primarily inattention and those with conduct disorders. Adults with ADHD

also take more sexual risks and have a higher risk for sexually transmitted disease.

Accidents and Driving. Of concern is a significantly higher risk for injury-producing automobile accidents in older adolescents and adult drivers. The major factors contributing to this higher risk were higher rates of drunken driving, street racing, and traffic violations. Those with more severe ADHD symptoms were more likely to be in danger. Whether ADHD traits, such as inattentiveness or hyperactivity, were involved with the risk is not known.

Sleep Disorders. Sleep disorders, especially restless legs syndrome and sleep apnea, are common in adults, as they are in children, with ADHD. Sleep apnea is a disorder in which a person stops breathing during the night, perhaps hundreds of times. In most cases the person is unaware of it, although sometimes they awaken and gasp for breath. It is usually accompanied by snoring. One report suggested that treating sleep apnea in adults with both conditions may help reduce ADHD symptoms. [See *Well-Connected* Report # 65 *Sleep Apnea.*]

How Is Adult Attention Deficit Disorder Treated?

Atomoxetine (Strattera). Atomoxetine (Strattera) is the first agent approved for adults with ADHD. It is not a stimulant but acts on the neurotransmitters dopamine and norepinephrine. In two well-conducted 2003 studies, atomoxetine significantly reduced symptoms of inattention, hyperactivity, and impulsivity in adult patients. Side effects were mild. The drug does not appear to pose a risk for abuse.

Antidepressants. Specific antidepressants, such as bupropion (Wellbutrin) and venlafaxine (Effexor), may be useful for adults with ADHD. Studies to date report response rates with these agents of 50% to 78%. Bupropion may be a particularly good choice for certain ADHD adults, including those who also have bipolar disorder or a history of substance abuse. Tricyclic antidepressants, such as desipramine may also be very effective, particularly in adults with both ADHD and depression.

Psychostimulants. The standard psychostimulants, methylphenidate (Ritalin) and Adderall, are also effective in adults. The newer, longer acting forms of methylphenidate (Concerta, Ritalin-LA, Metadate CD) and Adderall (Adderall XR) may offer specific advantages for this group. Some adults, however, might still need a mid-day boost of the medications.

Nicotine Replacement. Nicotine improves ADHD symptoms and appears to have effects in the brain that are similar to those of stimulants. Although such findings should certainly not encourage anyone to smoke, some studies are focusing on benefits of nicotine therapy in adults with ADHD.

Causes

Advanced imaging techniques have detected differences in the brains of ADHD children compared to those of non-ADHD children.

Brain Structures. Increasingly, research using imaging techniques reports differences in volume in certain parts of the brain between ADHD children and those without the syndrome. The areas affected include the following:

- The prefrontal cortex. The prefrontal cortex, which is located in the front of the brain, is thought to be the brain's command center; it regulates the brain's ability to inhibit responses. A number of imaging studies has indicated that the prefrontal cortex of the brain in ADHD may be underactive in comparison with those without ADHD.
- The caudate nucleus and the globus pallidus. The caudate nucleus and globus pallidus, located near the center of the brain, speed up or stop orders coming from the prefrontal cortex. A major 2002 study reported that it was smaller than average in young children with ADHD but tended to normalize as children got older. Abnormalities in these areas may impair a person's ability to brake actions, resulting in the impulsivity typical of people with ADHD.
- The cerebellum (the area above the brain stem). This area helps control muscle tone and balance and synchronizes muscle activity. An important 2002 study reported that on average this area is smaller in

children with ADHD compared to those without the condition.

It is important to note that such abnormalities are not progressive and are not related to intelligence.

Brain Chemicals. Abnormal activity of certain brain chemicals in the prefrontal cortex may contribute to ADHD. Dopamine and norepinephrine are of special interest. These chemical messengers, called *neurotransmitters*, affect both mental and emotional functioning. They are also important in the "reward" response, in which a person experiences pleasure in response to certain stimuli (such as food or love). Studies now suggest that increased levels of other brain chemicals (glutamate, glutamine, and GABA), collectively called Glx, interact with the pathways that transport dopamine and norepinephrine.

Nerve Pathways. Another area of interest is a network of nerves called the basal-ganglia thalamocortical pathways. Abnormalities along this neural route have been associated with ADHD, Tourette's syndrome, and obsessive-compulsive disorders, which all share certain symptoms.

Genetic Factors

Genetic factors may play the most important role in ADHD. The relatives of ADHD children (both boys and girls) have much higher rates of ADHD, antisocial, mood, anxiety, and substance abuse disorders than the families of non-ADHD children. In a twin study, 90% of children with a full diagnosis of ADHD shared it with their twin. Most likely more than one gene is responsible for inherited cases. This is not surprising, since there is no consensus that ADHD is even a single disorder.

Genetic Factors Regulating Dopamine and Advantages in Early Man. Most of the research on the underlying genetic mechanisms targets the neurotransmitter dopamine. Variations in genes that regulate specific dopamine receptor have been identified in a high proportion of people with addictions and ADHD. Such genes have been associated with novelty seeking and extroversion. Some experts theorize that the genetic variants may have first appeared thousands of years ago and affect as many as half of ADHD children. Furthermore, the genetic variations may have offered some benefits to their early carriers. In such people, a genetic predilection for novelty-seeking and risk-taking may have supplied an advantage in reproduction, mating, hunting, and achieving dominance.

Genetic Resistance to Thyroid Hormone. About 50% of adults and 70% of children with a genetic resistance to thyroid hormone, essential for normal brain development, have ADHD. People who have this condition appear to have a more severe form of ADHD. The thyroid disorder is not a common cause of ADHD, however, and only those with a family history of thyroid disease are at risk.

Problems Surrounding Pregnancy

ADHD is often associated with problem pregnancies and with difficult deliveries. Maternal smoking during pregnancy is also associated with a higher risk for ADHD in genetically susceptible children. One study indicated that an increased risk also existed in children of women who were exposed during pregnancy to environmental toxins, including dioxins and polychlorinated biphenyls (PCBs).

Dietary Factors

Infant malnutrition is a strong risk factor of ADHD. Even if children receive enough food later on, infants who suffer from malnutrition may develop behavior problems, the most prevalent being attention-deficit disorder.

A number of dietary factors have been researched in ADHD, including sensitivities to certain food chemicals, deficiencies in fatty acids and zinc, and sensitivity to sugar. No clear evidence has emerged that implicates any of these nutritional factors in ADHD.

Deficiencies in Zinc and Essential Fatty Acids. Some studies have found an association between deficiencies in certain fatty acids (compounds that make up fats and oils) and ADHD. Related to these findings are studies

reporting an association between zinc deficiencies and ADHD. (Zinc is important in the metabolism of fatty acids, which in turn affects dopamine, the neurotransmitter likely to be involved with ADHD.)

Diagnosis

In 2000, the American Academy of Pediatrics issued its first guidelines for diagnosing attention-deficit hyperactivity disorder (ADHD) in children. They include the following:

- Children between ages six and 12 should first be evaluated for ADHD if they show symptoms of inattention, hyperactivity, impulsivity, academic underachievement, or behavior problems in at least two settings. Such behaviors should have been harmful for the child academically or socially for at least six months.
- The child should meet the official symptom guidelines.
- A diagnosis requires detailed reports by parents or caregivers. It should be noted that a mother's description of her child's behavior is a very accurate and reliable guide for diagnosing ADHD. Parents should not be shy about insisting on further evaluation if their experience does not match a doctor's single observation of their child. This is particularly important now, because the cost of pursuing a diagnosis under managed care is not always covered.
- Guidelines for primary care physicians emphasize the importance of obtaining direct evidence from the classroom teacher or other school-based professionals about the child's symptoms and their duration, and evidence of functional impairment in the school setting.
- The child should be assessed for accompanying conditions (such as learning difficulties).

Difficulties in Identifying Children with ADHD

At this time no laboratory or imaging tests can indicate reliably whether a child does or does not have ADHD. A diagnosis relies only on behavioral symptoms and ruling out other disorders. Many experts believe that the disorder is both over- and underdiagnosed, depending on a variety of factors. Diagnosis of attention-deficit hyperactivity disorder is difficult for some of the following reasons:

Arguments that ADHD is Overdiagnosed in Some Children.

- The popularity methylphenidate (Ritalin) has encouraged some parents and teachers to pressure physicians into prescribing this standard ADHD drug for children, usually Caucasian boys, who are simply aggressive or who have poor grades. In one study of fifth graders in two different cities, 18% and 20% of Caucasian boys were being treated with medications. In one center, after careful testing, ADHD was the actual diagnosis in only 11% of children referred for ADHD and 18% had no disability. Others were simply poorer learners or had no problems at all.
- In one study, children more likely to receive medication were young for their grade, indicating they may have been socially and intellectually immature, rather than behaviorally impaired.
- Being poor and growing up in a single parent household contribute to emotional and behavioral problems. The significant increase in these problems has also paralleled an increase in the diagnosis of ADHD children, who may simply be responding to social and economic problems.

Arguments that ADHD is Underdiagnosed in Some Children.

- Some evidence suggests that many girls with ADHD may go underdiagnosed. Research indicates that girls with ADHD are often inattentive but not hyperactive or impulsive. In fact, older girls with ADHD tend to have social problems due to withdrawal and internalized emotions, showing symptoms of anxiety and depression. The inattentive subtype, in any case, may first show up in older children and adolescents. However, according to the criteria, ADHD is not diagnosed in people whose symptoms appear after age seven.
- Physicians may fail to diagnose children with ADHD because they often behave normally in the quiet physician's office where there are no distractions to trigger symptoms.
- In spite of the fact that there seems to be no differences in response to treatment among population groups, African-American, Hispanic, and Asian children with ADHD are half as likely to be diagnosed and

treated as Caucasian children. By high school, the racial disparity increases to the level that the medication rate for blacks is one-fifth of that for whites.

- ADHD may also be underdiagnosed in adults. Some experts, in fact, believe that ADHD may be the most common chronic undiagnosed psychiatric disorder in adults.

History of Behavior

The physician will first require a detailed history of the child's behavior. Physicians will match this against a standardized checklist to define the disorder.

The parents should describe the following:

- Specific problems beginning as early as possible they have encountered during the child's development. (School reports are very helpful.)
- Sibling relationships.
- Recent life changes.
- A family history of ADHD.
- Eating habits.
- Sleep patterns.
- Speech and language development.
- Any problems during the mother's pregnancy or during delivery.
- Any history of medical or physical problems, particularly allergies, chronic ear infections, and hearing difficulties.

The health professional will want to know how the parents handle different situations and may want to observe them interacting with the child.

Physical Examination

The child should also be given a general physical examination to determine if any medical causes are present. The child should be given a hearing test to rule out hearing abnormalities as a source of behavioral problems.

Screening Tests

Continuous Performance Test. A test called the Continuous Performance Test is sometimes helpful in evaluating sustained attention and impulsivity. The child sits in front of a computer screen and is asked to press or not press certain keys in response to images on the screen.

Other Screening Tests. Other tests are available to test neurologic, intellectual, and emotional development problems. Most involve learning and problem solving tasks that help define the particular areas that are most disabling.

Investigative Objective Tests

To date, there are no objective physical tests for diagnosing ADHD. Blood or other laboratory tests are currently recommended only if the physician suspects lead toxicity or other medical problems. Some, however, are being investigated for diagnosing ADHD using recent knowledge of specific brain abnormalities.

Optical Tracking and Attention Test. OPTax (Optical tracking and attention test) uses two approaches:

- A test that measures the child's ability to be on task. According to a small study, untreated children with ADHD score 41.6% on average and children without ADHD score 82.4%. (Children who had been treated raised their scores to 75.4%.)
- A videotape that shows the child's head movements. Children with ADHD typically have movement characteristics that differ from children without ADHD.

Such a test offers a possible simple and objective way to determine a diagnosis.

QEEG Test. The quantitative electroencephalographic procedure (QEEG) assesses the electrical activity in a part of the brain called the prefrontal cortex. Evidence suggests that ADHD is associated with low activity in this region. Studies are reporting that it may be highly accurate in both diagnosing and ruling out ADHD in patients.

Imaging Techniques. Brain scans using imaging techniques, including magnetic resonance imaging (MRI) or single photon emission computed tomography (SPECT) may eventually help confirm a diagnosis. At this time, however, they are used only for research.

Drug Trials

Although it is fairly common to use a trial of a psychostimulant (usually Ritalin) to facilitate diagnosis, experts strongly recommend against this method of diagnosis, because it is not always accurate. An improvement in symptoms is considered suggestive of ADHD, while in non-ADHD children the stimulant often increases agitation and hyperactivity. Many children and adults without the disorder have a similar response, and such a diagnostic trial may lead to unnecessary prescriptions of this drug.

Other Disorders Associated with ADHD

A number of disorders may mimic or accompany attention-deficit disorder. ADHD exists alone in only about one-third of children. Many professionals object to the use of the single term “attention-deficit hyperactivity disorder” to encompass such a wide spectrum of behaviors, which they believe should be categorized into subgroups. Many of these problems require other modes of treatment and should be diagnosed separately, even if they accompany ADHD.

Attention-Deficit Disorder without Hyperactivity

Attention-deficit disorder can appear without hyperactivity, in which case the child's primary symptoms are distractibility and an inability to persist in tasks.

Oppositional-Defiant Disorder

About 35% of children diagnosed with ADHD also have oppositional-defiant disorder (ODD). The most common symptom for this disorder is a pattern of negative, defiant, and hostile behavior toward authority figures that lasts more than six months. In addition to displaying inattentive and impulsive behavior, these children demonstrate aggression, have frequent temper tantrums, and display antisocial behavior. Up to 25% of children with ODD have phobias and other anxiety disorders, which should be treated separately.

Conduct Disorder

Some children with ADHD also have conduct disorder, which describes a complex group of behavioral and emotional disturbances seen in children. It includes aggression towards people and animals, destruction of property, deceitfulness, lying, or stealing, and general violation of rules.

Pervasive Developmental Disorder

Pervasive developmental disorder (PDD) is rare and usually marked by autistic-type behavior, hand-flapping, repetitive statements, slow social development, and speech and motor problems. If a child who has been diagnosed with ADHD does not respond to treatment, the parents might inquire about PDD, which often responds to antidepressants.

Primary Disorder of Vigilance

Primary disorder of vigilance is a term for a syndrome that includes poor attention and concentration as well as difficulties staying awake. The term is not recognized as an official diagnosis by the American Psychiatric Association, but some experts believe it represents a fairly well defined set of behaviors. People with vigilance disorder tend to fidget, yawn and stretch, and appear to be hyperactive in order to remain alert; they typically have kind and affectionate temperaments. The condition appears to be inherited and gets worse with age; it is treatable with stimulants.

Central Auditory Processing Disorder and Hearing Problems

Children with ADHD often have difficulties with tasks that involve listening or hearing. Research is indicating that symptoms of the two disorders often overlap but may actually be two distinct disorders. Hearing problems themselves may cause ADHD symptoms.

Bipolar Disorder (Manic Depression)

One study found that as many as 25% of children diagnosed with attention-deficit disorder may also have bipolar disorder, commonly called manic depression. Indications of this problem include episodes of depression and mania (with symptoms of irritability, rapid speech, and disconnected thoughts), sometimes occurring at the same time. [See *Well-Connected Report #66, Bipolar Disorder.*] Both disorders often cause inattention and distractibility and may be difficult to distinguish, particularly in children. Children with mania and ADHD may have more aggression, behavioral problems, and emotional disorders than those with ADHD alone. In some cases, ADHD in children or adolescents can even be a marker for an emerging bipolar disorder. The primary way to differentiate bipolar disorder from ADHD is by the presence of a manic or hypomanic episode, which occurs in patients with bipolar disorder but not with ADHD. Most children with bipolar will also respond to the drug valproate, which does not typically work for ADHD in children.

Anxiety Disorders

Anxiety disorders commonly accompany ADHD. Obsessive-compulsive disorder is a specific anxiety disorder that shares many characteristics with ADHD and may share a genetic component. Young children who have experienced traumatic events, including sexual or physical abuse or neglect, exhibit characteristics of ADHD, including impulsivity, emotional outbursts, and oppositional behavior.

Sleep Disorders

Sleep disorders or disturbances are very common with ADHD patients. Insomnia is common. In addition, specific sleep disorders--restless legs syndrome and sleep-disordered breathing--have been identified with hyperactivity and conduct disorder.

Restless Legs Syndrome (RLS). RLS and periodic limb movement disorder are thought by some experts to be strongly associated with ADHD in some children. One theory is that the two are linked by a common mechanism. The disorders have much in common, including poor sleep habits, twitching, and the need to get up suddenly and walk about frequently. They may even be genetically linked. For example, both have been associated with lower levels of dopamine in the brain, which is associated with faulty motor control, a common problem in both disorders.

Sleep-Disorder Breathing and Sleep Apnea. Some research has shown an association between mild symptoms of ADHD and sleep-disordered breathing, including snoring and obstructive sleep apnea in children and adults. Treating the sleep-related breathing disorders may improve the attention disorder in some children. (One study indicated that such problems are unlikely to be associated with children with moderate to severe ADHD.) [See *Well-Connected Report # 65 Sleep Apnea.*]

Other Diagnoses

Tourette's Syndrome and Other Genetic Disorders. A number of genetic disorders cause symptoms resembling

ADHD, including fragile X and Tourette's syndrome. About 50% of those with Tourette's syndrome also have ADHD and some of the treatments are similar.

Other Medical Conditions. A number of medical problems, including hyperthyroidism and vision problems, can produce ADHD-like symptoms.

Lead. Children who ingest even low amounts of lead may manifest symptoms similar to those of ADHD; they are easily distractible, disorganized, and have trouble thinking logically. The major cause of lead toxicity is exposure to leaded paint, particularly in homes that are old and in poor repair.

Complications

Emotional Disorders

In addition to a host of other diagnoses that accompany the diagnosis of ADHD, there is also evidence that other emotional difficulties are more common in this group. More than half of children with attention-deficit disorder have accompanying disorders, including anxiety, depression, and conduct disorders. (Children with ADHD who experience anxiety or depression are also more likely to suffer from low self-esteem.) One study found that 25% of children with ADHD have or develop bipolar disorder (commonly called manic depression).

Social Problems

Anti-Social Behavior. Even if these emotional disorders are absent in childhood, the ADHD child's relationship with others is volatile, and he or she is often unhappy from a very young age. Research indicates that any ADHD boy or girl, particularly an aggressive child, has trouble getting along with others and is less liked by his or her peers.

- ADHD children with the inattentive subtype only are more likely to be picked on and to spend time alone.
- Children with the combined subtypes tend to have different problems. A best friend can turn into an enemy overnight when, for example, an ADHD boy does not perceive his friend's fearful response to over-aggressive roughhousing and fails to let up. The next day the ADHD child has forgotten the event; the ex-friend hasn't. This is a classic situation repeated time and again. The ADHD child hurts someone; he either may go into a state of denial because he can't accept his lack of self-control or he may blame himself excessively. As ostracism, fear, and ridicule from peers persist from year to year, the unstable behavior, originally neurologic, becomes emotionally based as well. Unless this cycle is broken, serious adult problems can evolve.
- A 2000 study found that boys with ADHD are less likely than others to empathize with people in difficult circumstances. One speculative explanation is that this is a self-protective reaction to prevent negative feelings, which ADHD children are highly prone to all the time.

Substance Abuse. Studies consistently report that ADHD young people--in particularly those with conduct or mood disorders--have a higher than average risk for substance abuse and that it starts in younger ages. In one study, for example, by age 11 nearly 20% of children with ADHD had tried smoking cigarettes, drinking alcohol, or both. Biologic factors associated with ADHD may make these individuals susceptible to substance abuse. Many of these young people are self-medicating their condition. In fact, according to a major analysis, Ritalin or other stimulants used to treat ADHD may help protect such patients against substance abuse. (Boys with ADHD and conduct disorder, however, still face a high risk for substance abuse. Girls with ADHD and emotional disorders may also still have a higher risk.)

High-Risk Behavior. Impulsivity in ADHD young people can certainly cause them to take chances before thinking them through, putting them in situations where the consequences become clear only after the action has been taken. ADHD children with high levels of aggression are at higher risk for delinquent behavior in adolescents and criminal activity in adulthood. It should be strongly noted that ADHD children who are not aggressive have a lower and even normal risk for dangerous activities. Even in aggressive ADHD children, close parental attention and early treatment can limit the risk considerably.

Learning Problems

Although speech and learning disorders are common in children with ADHD, the disorder does not affect intelligence. People with ADHD span the same IQ range as the general population. One study suggested, however, that 90% of ADHD children were underachievers and that half were held back at least once. Some evidence suggests that inattention may be a major factor in low academic performance in these children. About 20% also have reading difficulties and 60% have serious handwriting problems. Adults with ADHD are also at very high risk for these conditions.

Persistence of ADHD into Adulthood

Some research suggests that ADHD persists in one- to two-thirds of those diagnosed with the condition in childhood. Many experts, in fact, describe the pattern of ADHD as they would a chronic illness, in terms of whether it goes into remission or not. They define this remission in three categories of severity:

- *Syndromatic Remission.* Person has fewer symptoms than fit the full definition of ADHD, but significant functional impairment in social or occupational activities is present.
- *Symptomatic Remission.* Person has few symptoms and some functional impairment.
- *Functional Remission (Full Recovery).* Few symptoms and no functional impairment.

In one study using these criteria, 60% of ADHD Caucasian boys were in syndromatic remission four years after the onset of the study and 10% were fully recovered (in functional remission). In other words, nearly all boys experienced fewer symptoms, although most still had significant social problems. Older individuals were more likely to retain symptoms of inattentiveness than those of impulsivity and hyperactivity. Because inattentiveness affects organizational skills, this could be a significant problem in adulthood. It should be noted, however, that the study lasted only four years and stopped between ages 18 and 20. (The study did not include girls or boys in other ethnic groups, so it is not known if these results are generally applicable.)

Effect on Family

The time and attention needed to deal with the ADHD child can change internal family relationships and have devastating effects on parents and siblings.

Effect on Parents. Studies increasingly suggest that any intervention for an ADHD child must include the parents as well. Parents who are responsive to their child in a positive way can help reduce the chances for oppositional behaviors. But it can be very difficult. The ADHD child is wonderful one day and terrible the next for no apparent reason. The parent can feel betrayed and hurt, and believe they have no control over their child. Parents must protect themselves and their child by establishing tough but kind rules about where their space ends and the child's begins. The effects on parents are multiple:

- Mothers generally get the brunt of the emotional and physical abuse that an ADHD child can produce, which is sadly ironic because the ADHD child tends to love the mother intensely and feel safe with her.
- Parents may have to give up on the idea of an immaculate house and a hot meal every night. (One advantage of an ADHD child in the family is that the parents learn that they are not perfect, nor do they have to be. In fact, striving for perfection is among the most counterproductive goals to pursue in raising an ADHD, or any, child.)
- Parents must face the hostility and anger of other parents and see their own child rejected. It is very easy to fall into an emotional black hole, and feel alone, inadequate, and helpless.
- Marriages are often stressed to the breaking point because of exhaustion and disagreements between the husband and wife on how to raise the ADHD child.

Effect on Siblings. Siblings of ADHD children have particular difficulties, and are also at risk for psychologic impairment, depression, drug abuse, and language disorders. The non-ADHD sibling does not have the control a parent does in the management of the ADHD child's behavior and is very likely to feel alienated and alone. Non-ADHD children are often victimized by ADHD siblings who may be demanding or bullying.

A sibling who is not given attention in his or her own right may begin to imitate undesirable behaviors or to act out negatively in other ways. It is very important to make the brothers and sisters equally vital to the family's functioning. It should be strongly emphasized, however, that their value in the family should *never* be as fellow-caregivers of the ADHD sibling.

Treatment

A combination of a psychostimulant, most commonly methylphenidate (Ritalin), and cognitive-behavioral therapy is proving to be the best option for treatment of children with ADHD.

In 1999, a large study compared medication, behavior therapy, a combination of both, and standard community care. While all four groups improved, medication, when carefully monitored, was more effective than behavior therapy alone, and its effects were similar to combination therapy. The combined approach, however, allowed lower doses of medication and also improved academic performance and family relations. In addition, it was more helpful for children who also had mood disorders (such as depression or anxiety) or oppositional-defiant disorder.

A 2001 study further suggested that 80% of adolescents with ADHD who were treated with a combined approach showed an improvement in academic performance.

Developing a Treatment Approach. The following guidelines may be useful in determining a treatment approach for children with ADHD:

- Behavioral techniques, possibly including dietary changes, should be tried first, if possible.
- If the symptoms are severe or do not respond, then a trial using medication (usually psychostimulants), in conjunction with behavior modification therapy, is advisable.

Unfortunately, most children do not have access to behavioral therapies, either because of lack of time or available resources. A 2000 study reported, in fact, that during office visits when children received psychostimulants less than half of these visits included *any* psychologic intervention. In addition, there was no follow-up at all after 21% of these visits. One study suggested that a simple eight-week program conducted in the primary care physician's office may be of some help. Children in the study received either a combination of drugs with the program or drugs alone. They had no complicating problems, such as anxiety or conduct disorder. Children who received the combination approach had improved functioning at home that persisted for at least six months, although teachers observed no differences in two groups.

Specific Patient Populations. Unfortunately, such guidelines do not address the following specific patient groups:

- There are no authoritative treatment guidelines for treating adolescents and adults with ADHD. Increasingly, evidence suggests that psychostimulants are a reasonable choice for adults with a confirmed diagnosis of ADHD.
- There are no definite guidelines for treating preschool children with severe ADHD. Some parents have reported very good long-term results with behavioral interventions at this age.
- There are no reliable guidelines on how to treat the inattentive subtype of ADHD, which might be more common in girls.
- Finally, there are no defined treatments for ADHD patients with accompanying conditions, including impaired working memory and deficits in language processing.
- There are no defined treatments for children with ADHD and accompanying emotional problems, such as bipolar or anxiety disorders. (There is some evidence, for example, that children with ADHD plus anxiety disorders do *worse* on psychostimulants.)

Arguments For and Against Psychostimulants. Many parents are very disturbed by the idea of putting their children on intensive stimulant drug regimens, possibly for years, particularly given the uncertainties in diagnosis and the negative publicity surrounding the use of these agents. Although the decision to use these drugs should not be made lightly, the negative social and emotional effects of the disorder itself for many

children with ADHD are far more severe and long-lasting than the use of these agents. For some parents and children, medication seems like a miracle and can provide desperate families with a quality of life for which they had almost given up hope.

Still, there are a number of questions, particularly for taking psychostimulants alone without additional behavioral therapy. Of great concern is the dramatic increase in prescriptions for psychostimulants among preschool children, not only in the US but also in some European countries. There is evidence the drugs may be over-prescribed, and parents should discuss the question of medications very carefully with their physicians. ADHD represents a growing market for pharmaceutical companies. Although psychostimulants and alternative agents are proving to be helpful for many families, no one should underestimate the influence of the economic issues involved.

It should be noted that a major study reported that children with ADHD will benefit to some degree from *any* treatment, whether behavioral therapies, medication, or simple mental health intervention. Combinations of behavioral therapy and medications are best, however. Stimulants are not a cure-all, and children should not grow up believing that taking a pill will solve life's problems without their having to make self-efforts.

Help for Families and Teachers

Research increasingly supports the view that interventions for the ADHD child must also include the parents if they are to be successful. Teachers and school officials should also be educated and involved in the process.

Parents who feel they have the most control over their child's situation also experience the least psychological stress and depression. Parents who are responsive in a positive way also help reduce the chances for their child developing oppositional behaviors. But it can be very difficult, particularly for parents who have ADHD themselves. In fact, parents who have severe ADHD symptoms are less likely to respond to parent training programs unless they get help for themselves.

In addition to behavioral therapy for the child, family therapy may help ADHD children and their parents and siblings cope with the emotional conflicts that nearly always arise in the lifelong process of managing the condition. Separate psychological therapies for specific family members might be needed, particularly in light of the high incidence of psychiatric and other emotional problems in families with ADHD children.

Ritalin and Other Psychostimulants for ADHD: Pros and Cons		
	<i>Arguments For Medications</i>	<i>Arguments Against Medications</i>
Effect on ADHD Symptoms	The effectiveness of Ritalin in improving ADHD symptoms has been established by more than 160 controlled studies, the largest amount of evidence on any subject involved with childhood behavioral disorders. They are equally effective in boys and girls with ADHD.	Positive results in many studies are most evident in children with severe symptoms, particularly those who suffer from aggression. The benefits with less severe conditions tend not to be as pronounced.
Effect on Intelligence and Academic Achievement	Some studies suggest that medications raise intelligence test scores, even in children who have accompanying disorders, such as autism, pervasive developmental disorder, and mental retardation.	There is no definite proof that drugs improve academic achievement. Psychostimulants, for example, do not improve a child's ability to memorize facts by rote. In fact, in a major study there was no difference in academic achievement between children taking medications and those being given behavioral therapies. And a 2001 study reported that only low doses improved academic functioning in adolescents. In some young people higher doses was associated with worse performance.
Effect on Social Functioning	A 2000 study reported that medications had some positive effect on self-esteem,	A child may still have social problems after taking psychostimulants.

	<p>which was greatest in highest doses. (Presumably, then, children with the most severe symptoms felt the greatest improvement in self-confidence.)</p> <p>One of the few long-term studies on ADHD children reported that patients who were effectively treated and responded well were more likely to be living independently as adults, to be either married or to be engaged. They had higher IQs and were less likely to have substance abuse problems or have attempted suicide. (Patients who were closely monitored for treatments as children, however, may also have had more positive parenting, which could also account for the better outcome.)</p>	<p>Medication alone rarely helps aggressive children with ADHD. And a major study found no difference in oppositional behavior or relationships with peers between children taking psychostimulants and those being given behavioral therapies.</p>
Side Effects	<p>Most young people report mild side effects, most often loss of appetite.</p>	<p>Some children report distressing side effects that include a "zombie" like effect, tics, and moodiness. Weight loss may be a problem for some children. Even in young people who abuse Ritalin, however, less than 1% experience severe side effects (rapid heart rate, hypertension).</p>
Effect on Bone Loss and Growth	<p>The agents do not cause bone loss, as some people have feared.</p>	<p>These agents may affect growth, although most studies suggest the impact is not significant and that children catch up later on.</p>
Effect on the Brain	<p>There is some recent evidence to suggest that medication may enhance growth of brain white matter—which consists of insulated nerve fibers that make up the core of the cerebral hemispheres.</p>	<p>No major studies have been conducted on the long-term effects of stimulant use in preschool children. Studies on animals being given such drugs during equivalent developmental periods report negative effects on memory, on important neurotransmitters, and other adverse effects.</p>
Risk for Addiction	<p>Studies on both animals and humans suggest that Ritalin lacks the properties that create addiction, particularly in doses used for treating ADHD. Furthermore, a major 2003 analysis of six studies suggested that the use of stimulants may protect against drug abuse in ADHD young people.</p>	<p>An emerging and serious problem is the sale of stimulants to non-ADHD peers, who are in danger of over-use and severe side effects. It should be noted that crushing the pills and inhaling them nasally <i>can</i> also provide a euphoric state.</p>
Choosing Candidates for Drug Treatment	<p>When used correctly, questionnaires and other screening tests for ADHD symptoms are proving to be very accurate for determining the best candidates for drug treatments.</p>	<p>There are no objective tests for diagnosing ADHD, so it is not clear if the appropriate people are being treated or not treated.</p>

Medications

Psychostimulants to date are the primary drugs used to treat ADHD; they are effective for both children and adults with severe ADHD. These drugs have been intensively studied for decades and there is little evidence for any serious concern with long-term use.

A nonstimulant, atomoxetine (Strattera), is now approved for ADHD in children and the first treatment approved for adult ADHD.

Such agents, however, may not be effective or appropriate in all patients. Some children also suffer from other disorders (e.g., anxiety disorders) that reduce the effectiveness of stimulants. Other children cannot tolerate some of the side effects (tics, insomnia, loss of appetite).

Other agents used for ADHD include certain antidepressants (e.g., tricyclic antidepressants, bupropion) and drugs called alpha agonists (clonidine). A 2002 study reported that children with ADHD are increasingly being treated with combinations of psychostimulants and some of these other agents. Experts warn that there is little evidence that such combinations add any benefits and their long-term safety is unknown. Nevertheless, combinations may be warranted in certain severe cases, such as in children who are also suffering from an accompanying emotional disorder, such as bipolar or anxiety disorder.

Determining a Correct Regimen

Physicians still have a difficult time predicting which medications will produce beneficial results, so treatment is individualized and performed on a trial and error basis, which requires close observation and cooperation between all participants. In developing an effective medication plan, the following steps may be helpful:

- Before any drug is administered, a child should be given a thorough examination for any medical problems to be sure there are no medical conditions that interfere with the medication.
- Both the physician and the parents should be very clear about the specific behaviors they hope the medication will target.
- The goal is to use the lowest possible dosage that produces improved behavior.
- If an initial regimen doesn't work, changing the dosage, adding another drug, or changing to a different medication often brings improvement. Some experts recommend trying a second psychostimulant if a first one fails. If the child still doesn't respond, antidepressants or other second-line drugs may be beneficial.
- Frequent follow-up visits should be scheduled to assess the response and to detect possible side effects.

Medications in Older Children. As children enter adolescence, the social stigma associated with ADHD often makes them reluctant to continue drug treatment. If the drug has proven to be effective, it is very important to keep the young person on the regimen during this critical period.

Medications for Adults. One report suggested that two-thirds of adults with ADHD may also be successfully treated with stimulants and psychotherapy. Certain antidepressants may also be effective treatments in adults.

Methylphenidate (Ritalin) and Similar Agents

Methylphenidate (Ritalin, Metadate, Concerta) is the most commonly used psychostimulant for ADHD. Its positive benefits for improving ADHD symptoms appear to be due to its actions in increasing dopamine, a neurotransmitter important for motor control. This agent is effective in both children and adults. A similar agent dexamethylphenidate (Focalin) has been approved. It is similar to methylphenidate in effectiveness and side effects.

Regimen. The older form of Ritalin is short acting, and needs to be taken several times a day, including during school hours. As it wears off, a rebound effect can occur and ADHD symptoms intensify. Longer-acting forms (Concerta, Ritalin LA, Ritalin SR, Metadate) are now available.

Concerta is now the most commonly prescribed agent for ADHD and uses a special pump action that releases the medication gradually into the body and can be effective for 12 hours. Ritalin LA and Metadate also only need to be taken once during the entire school day. (Ritalin SR can still wear off by early afternoon.) A patch form of methylphenidate (MethylPatch) is awaiting approval. A four-week trial in 2002 reported that it was very effective in improving attention and improving behavior.

A 2003 study of Concerta indicated that depending on the ADHD subtype, children may require different doses. In the study, children with the inattentive type responded to lower doses than those with the combined type.

Side Effects. All stimulants have a number of side effects:

- The most common side effects of any stimulant are nervousness and sleeplessness, although some parents have reported *improved* sleep patterns in their children after taking stimulants.
- Children may lose weight.
- Tics or jerky, disordered movements occur in about 9% of children. Some studies indicate they are not caused by standard doses of Ritalin. In any case, low doses are often effective in controlling impulsivity without causing tics, even in some children who also have mild to moderate Tourette's syndrome.
- Other side effects include irritability, withdrawal, stomach pain, headache, depression, hallucinations, hair loss, and lack of spontaneity.

Of note, taking Ritalin with a high-fat breakfast may delay its effects.

Symptoms of Overdose. Symptoms of overdose include changes in heart rhythm and rate, hypertension, confusion, breathing difficulties, sweating, vomiting, and muscle twitches. If they occur, parents should call the doctor immediately. Even among young people who abuse Ritalin, however, less than 1% experience severe side effects (rapid heart rate, hypertension) and outcomes are generally good. (Side effects may very severe, however, if Ritalin is overused and taken with other drugs.)

Long-Term Complications. Many people have taken Ritalin for years without experiencing adverse effects or loss of effectiveness. Few long-term complications have been reported, but the following warrant some caution or additional research:

- Early research had suggested that growth may be retarded during long-term treatment. Recent studies, however, have found little evidence for any significant growth suppression in boys or girls. In addition, a 2003 study found no significant effect on onset of puberty in girls.
- A 2001 study on animals suggested that there may be some long-term effects from methylphenidate that may change brain cell structure or function. Heavy abuse of other stimulants (cocaine, amphetamines) has been associated with worsening in motor skills and attention. However, more research is needed to determine if such changes occur with long-term use of Ritalin. In fact some evidence suggests that Ritalin may help increase white matter (the primary substance that makes up the core of the brain's hemispheres).

Concerns for Abuse. Studies on both animals and humans suggest that that Ritalin lacks the properties that create addiction, particularly in doses used for treating ADHD. Although methylphenidates have properties similar to amphetamines, their drug levels rise very slowly in the brain at the oral doses given for ADHD. This slow rise prevents a so-called "high" and subsequent addiction to the drug.

A major analysis in 2003, in fact, indicated that methylphenidate treatment may even protect young people with ADHD from abusing alcohol or other drugs. In such cases, methylphenidates may reduce the need to self-medicate ADHD symptoms using nicotine, alcohol, or illegal agents. (Ritalin does not protect against substance abuse in young people with ADHD and conduct disorder, however.)

Dependence has not been reported in children who have taken this drug for long periods in appropriate dosages. It should be noted, however, that crushing the pills and inhaling them nasally *can* provide a euphoric state. The primary danger for drug abuse from stimulants appears to occur in non-ADHD young people who purchase these agents illegally. In one study, for instance, 16% of ADHD children reported pressure from their fellow students to sell or give them their medication.

Adderall

Adderall combines four kinds of amphetamine salts. It is inexpensive and can be taken once or twice a day. (Adderall XR is designed to be taken once a day.) Adderall may also be effective for adults. In studies comparing standard forms of Adderall and Ritalin, both drugs are beneficial and the effect on behavior was

similar in children. In one major 2002 analysis of comparison studies, parents and physicians reported that Adderall was superior to standard Ritalin, but teachers found no superiority of one agent over the others. Side effects include stomach problems and mood changes, including sadness, anxiety, and irritability. Studies are needed to determine long-term risks.

Other Central Nervous System Stimulants

Pemoline. Pemoline (Cylert) is an effective stimulant in children who do not respond to other drugs. It has shown promise for adults with ADHD but has not been approved for this population. The agent takes longer (sometimes weeks) to produce improvement than the other drugs, but it allows once-daily administration. Of major concern is a risk of liver damage, particularly when taken in combination with other medications or alcohol. Although the risk is small, it can be life-threatening in rare cases. Physicians should monitor liver function every two weeks in children taking the agent. Parents or patients should watch for any symptoms of liver toxicity, including tenderness of the abdomen, yellow skin or eyes, vomiting, weight loss, or malaise. The drug was withdrawn in Canada in 1999.

Dextroamphetamine. Dextroamphetamine (Dexedrine) is similar to Ritalin. Although it is commonly believed that it is both less effective and less safe than Ritalin, there is no evidence of this, and one study reported a slightly better response with dextroamphetamine. Side effects are similar. The arguments against dextroamphetamine mainly rest on widespread abuse of this drug in earlier decades. Some experts believe it may be a useful alternative for people who do not respond to Ritalin.

Atomoxetine

Atomoxetine (Strattera) is the first non-stimulant to be approved for ADHD in children and the first treatment approved for adult ADHD. The drug appears to work by increasing levels of both norepinephrine and dopamine, which are generally lower than normal in ADHD. A number of studies have now reported that atomoxetine is effective and safe. It is proving to reduce ADHD symptoms, improve well being, and even reduce problem behaviors. It appears to be as effective as methylphenidate and is well tolerated. The most common side effect to date is decreased appetite. Long-term effects, such as any impact on growth, are still unknown.

Antidepressants

Specific antidepressants are proving to be helpful under certain conditions and some may be reasonable alternatives to psychostimulants for some people with ADHD.

Designer Antidepressants. Bupropion (Wellbutrin), reboxetine (Edronax) and venlafaxine (Effexor) are unique antidepressants, sometimes referred to as designer antidepressants. Such agents affect one or more neurotransmitters that are not targeted by older antidepressants. These agents may be particularly helpful for treating patients with ADHD and accompanying disorders, including depression or conduct disorder. Most studies to date have focused on bupropion and have reported good results in both children and adults.

Tricyclics. Antidepressants known as tricyclics, which include desipramine (Norpramin, Pertofrane), or imipramine (Janimine, Tofranil), have been prescribed for children who do not respond to stimulants or who have accompanying problems, such as tics, anxiety, or depression. Desipramine appears to have the best results of the tricyclics and may even help control impulsivity. Tricyclics can have distressing side effects however, including dry mouth, sleepiness, and constipation. They have mild effects on blood pressure and heart rate, but such effects do not appear to be harmful in people without existing heart disease. Reports of sudden death of a few children taking tricyclics, however, have caused alarm, although these occurrences are extremely rare and the role tricyclics may have played is not clear. Reports of delirium and increased heart rate have occurred in adolescents who take tricyclics and smoke marijuana. Careful monitoring is important.

SSRIs. The antidepressant drugs known as selective serotonin reuptake inhibitors (SSRIs), which include fluoxetine (Prozac), sertraline (Zoloft), citalopram (Celexa), and paroxetine (Paxil), are sometimes recommended for treating depression in ADHD patients with both conditions. They have little effect on ADHD and in fact they may increase the risk for impulsive behavior. The effects of long-term use of SSRIs in young

people are not clear. There have been case reports of myoclonus (uncontrolled muscle jerks) with long-term use. In addition, there is some concern that SSRIs may limit growth in children. Although there have been reports of a greater risk for suicide in young people taking Paxil, the evidence supporting such reports is weak. Intensive research is underway to determine if SSRIs pose a risk for suicide in anyone.

Alpha-2 Agonists (Clonidine)

Alpha-2 agonists stimulate the neurotransmitter norepinephrine, which appears to be important for concentration. They include clonidine (Catapres) and guanfacine (Tenex). They are used for Tourette's syndrome and may be beneficial when other drugs have failed for ADHD children with tics or those whose primary symptoms are severe impulsivity and aggression.

These agents have a number of side effects. (Guanfacine may have fewer than clonidine.) Sedation is the most common. A clonidine skin patch, which gradually releases the medication, helps reduce the sedative effect. Because clonidine slows the heart down, it can have adverse effects in some children. Going off too quickly or missing doses can cause rapid heartbeats and other symptoms that may lead to severe problems.

Studies in general report that the agent is safe, including in combination with stimulants. Of concern, however, were reports of five deaths in children taking clonidine with other medications. Experts strongly recommend that no child be given this medication without a preliminary examination for heart problems, and no child with existing heart, kidney, or circulatory problems should take it.

Other Medications Investigated for ADHD

Anticholinesterases. Drugs known as central anticholinesterases, including tacrine (Cognex) and donepezil (Aricept), are used to treat symptoms of Alzheimer's disease. Currently, they are also being investigated for ADHD. Some early studies suggest that such an agent may be effective in the same way as psychostimulants and may also have additional benefits, including improving executive functions, such as organizational capacity. All these drugs have gastrointestinal side effects, including nausea. In high doses, they can also cause liver damage.

Selegiline. Selegiline (Eldepryl, Movergan, Zelepar), also known as deprenyl, metabolizes into compounds found in methamphetamine and blocks monoamine oxidase B (MAO-B), an enzyme that degrades dopamine. A well-conducted study in 2003 suggested that it may be as effective as Ritalin with fewer side effects. Note: Selegiline can cause hypertension if combined with agents that increase serotonin levels--such agents include nearly every major antidepressant.

Modafinil. Modafinil promotes wakefulness and is used to treat patients with narcolepsy. It is being investigated for adults and children with ADHD, but studies have been mixed on its benefits.

Behavioral Management

Behavioral techniques for managing the child with ADHD are not intuitive for most parents and teachers. To learn them, caregivers may need help from qualified health care professionals or from ADHD support groups. At first, the idea of changing the behavior of a highly energetic, obstinate child is daunting. It is futile and damaging to try to force an ADHD child to be like most children. It is possible, however, to limit destructive behavior and to instill a sense of self-worth that will help overcome negativity toward life, which is one of the great dangers of the disorder.

Behavioral Techniques at Home

Bringing up an ADHD child, like bringing up any child, is a process. No single point is ever reached where the parent can sit back and say, "That's it. My child is now OK, and I don't have to do anything more." The child's self-worth will evolve with an increasing ability to step back and consider the consequences of an action and then to control that action before taking it. But this does not happen overnight. A growing ADHD child is different

from other children in very specific ways and he or she presents challenges at every age.

Setting Priorities for the Parent. Parents must first establish their own levels of tolerance. Some parents are easygoing and can accept a wide range of behaviors, while others cannot. To help a child achieve self-discipline requires empathy, patience, affection, energy, and toughness. Some tips to help the parent are as follows:

- Parents should prepare a list giving priority to those behaviors they think are the most negative, such as fighting with other children or refusing to get up in the morning. The least negative behaviors on the bottom of the list should be ignored temporarily or even permanently (e.g., refusing to wear anything but red T-shirts).
- Certain odd behaviors that are not hurtful to the child or to others may be an indication of creative or humorous attempts to adapt (e.g., making up silly songs or drawing violent pictures). These should be accepted as part of the child's unique and positive development, even if they seem peculiar to the parent.
- It is important to keep in mind that no one is a saint. Loving parents who occasionally lose their tempers will not damage their children forever. In fact, non-abusive open disapproval or dismay is far less destructive to both parent and child than harboring resentment beneath a false calm.

Establishing Consistent Rules for the Child. Parents must be as consistent as possible in their approach to the child, which should reward good behavior and discourage destructive behavior. Rules should be well defined but flexible enough to incorporate harmless idiosyncrasies. It is very important to understand that ADHD children have much more difficulty adapting to change than do children without the condition. (For example, the child should do homework every day but might choose to start it after a TV show or computer game.)

Managing Aggression. Some useful tips for managing aggression include the following:

- Parents should try to give little attention to mildly disruptive behaviors that allow this energetic child to let off some harmless steam. The parent will also be wasting energy that will be needed when the negative behavior becomes destructive, abusive, or intentional.
- The use of "time-out," isolating the child immediately for a short period of time, is an effective measure for allowing both the caregiver and the child to cool down. The child should immediately (and without emotion) be removed from a situation in which he or she is endangered or is endangering others. The child should view time out as a way of cooling off and getting a distance on their behavior, not as isolation from others.
- To channel physical aggression and impulsivity in the ADHD toddler, the parents must teach them to use verbal responses. (A parent may need to allow verbal responses that would be unacceptable in another child.)
- When the ADHD child becomes older and if the verbal responses become intentionally abusive and socially undesirable, then the parent must redirect this form of aggression into more acceptable activities, such as competitive one-on-one sports, energetic music, video games, or big colorful paintings. Competitive video games, such sports games, may also be an option. (Some studies, including one in 2001, suggest that reducing watching of TV or playing video games will reduce aggressive behavior in all children. The 2001 study, however, did not explore the nature of the content and did not study ADHD children specifically. Parents should gauge for themselves what activities will reduce aggressive behavior.)
- Sometimes a parent can anticipate situations when an ADHD child is likely to misbehave, but all too often the child explodes for no apparent reason. If the blow-up occurs in public, the parents should complete their activities and leave as quickly as possible.

Establishing a Reward System. Children with ADHD respond particularly well to reward systems. One study reported that they performed equally well when encouraged either by a direct reward for a correct response or with the use of a system called response-cost. With this system, the child is given the reward first and allowed to keep it if their behavior remains appropriate.

Some suggested tips for rewarding the ADHD child are as follows:

- Create charts with points or stars for good behavior or for completed tasks. It is important to give points for even simple positive behaviors, which may be taken for granted in other children (e.g., responding

- happily to a change in plans, changing an obscenity to a more acceptable expletive).
- Rewards for any child can include playing a favorite game with the child, extending bedtime by an hour, or allowing an extra half-hour of TV.
 - Rewards of food or gifts should be used infrequently, if at all. They can create other problems, such as being overweight, having a bad diet, or making continuous demands for objects.
 - A reward system should rotate different types of rewards, because such children are easily bored.
 - ADHD children respond better with small rewards promised in the short-term than large rewards offered in the future. One approach that employs both short- and long-term rewards uses a system that gives the child points for specific positive behaviors. As the children accumulate points, they can use them for larger tangible rewards, such as a favorite video game or CD.
 - Rewards should be promised only when caregivers are fairly certain they can follow through. ADHD children respond with much greater frustration than non-ADHD children to disappointment, and are likely to have a strong (and noisy) negative reaction. A parent must remember that this response is part of the ADHD child's make-up and not necessarily in their control.

Improving Concentration and Attention. In one study, children were given training twice a week using visual and auditory tasks on two different levels of attention. Lower level attention included being able to focus and sustain attention over time, and higher attention involved the ability to allocate attention among tasks. At the end of the 18-week program, children with ADHD were able to perform as well as non-ADHD children. More research is needed to confirm these results.

Research indicates that ADHD children perform significantly better when their interest is engaged. Parents should be on the lookout for activities that hold the child's concentration. Some options that may help an ADHD child to focus are as follows:

- One very interesting experiment reported that when children with ADHD performed verbal word puzzles while watching themselves in the mirror, they did as well as non-ADHD children. The intent of the experiment was to focus attention back to the self and so avoid external stimuli.
- Many ADHD children are particularly lured by the computer, which is a very promising tool. A number of non-violent computer games are available that offer problem-solving techniques using characters, narrative, and humor.
- A 2001 study reported that children with ADHD had better attention and functioning when they spent time in a natural setting.
- Swimming, tennis, and other sports that focus attention and limit peripheral stimuli are often appealing. ADHD children often do not do well with team sports, although they are interested. Children with ADHD are less likely to become distracted in sports that require constant alertness, such as football or basketball. In baseball, positions such as pitching or catching are preferable to the outfield, where attention easily wanders. Finding a coach that understands the child's difficulties is very helpful.
- Some experts are enthusiastic about martial arts, such as Tae Kwon Do, which can offer an appropriate and controlled emotional outlet, help to focus attention, and teach self-restraint, self-discipline, and tolerance. Care should be taken to select an instructor who makes such goals a priority.
- Learning an instrument may be one of the best ways for an ADHD child to develop a more rhythmic and balanced sense of self. Music, even simply listening to it, is often very important for these children. (Parents may have to tolerate music that does not please them.)

Management at School

Even if a parent is successful in managing the child at home, difficulties often arise at school. The ultimate goal for any educational process should be the happy and healthy social integration of the ADHD child with his or her peers.

Preparing the Teacher. Although teachers can expect that at least one student in every classroom will have ADHD, there is currently little training that prepares them for managing these children. The teacher should be prepared for the certain behaviors in the ADHD child:

- ADHD students are often demanding, talkative, and highly visible.
- Inattention is a major factor in low academic performance. It causes them to frequently forget homework or miss assignments. Children with ADHD often require frequent reminders of or visual cues (such as

posters) for rules and regulations. Having the child sit in the front of the classroom may be helpful for both increasing attention and reducing noisy activity.

- Lack of fine motor control makes taking notes very difficult, and handwriting is often poor. Using a typewriter or computer can compensate for this. One useful skill that has helped some ADHD children is learning to type at an early age, around the third or fourth grade.
- Rote memorization and math computation, which require following a set of ordered steps, are often difficult. (ADHD children may do better with math *concepts*.)
- Many ADHD children respond well to school tasks that are rapid, intense, novel, or of short duration (such as spelling bees or competitive educational games), but they almost always have problems with long-term projects where there is no direct supervision.

The Role of the Parent in the School Setting. The parent can help the child by talking to the teacher before the school year starts about their child's situation:

- The first priority for the parent is to develop a positive, not adversarial, relationship with the child's teacher.
- The parent must acknowledge the teacher's situation, for he or she must deal not only with the ADHD child's behavior but also with the needs of all the other children.
- Frequent brief and sympathetic conversations with the teacher can be helpful and can lead to coordination of efforts, particularly if they provide reciprocal information about progress or setbacks.
- Finding a tutor to help after school may be helpful. It is not clear, however, if tutoring offers significant benefits for children whose academic problems stem from inattention unless it is structured specifically to address this problem.

Special Education Programs. The Individuals with Disabilities Education Act (IDEA) requires the school to identify and evaluate children who may need help and to provide special services. Of note, however, parents sometimes report pressure by the school to put their children on medication or force them into special classrooms without clear educational justification. The schools, in these cases, may be acting illegally.

High-quality special education can be extremely helpful in improving learning and developing a child's sense of self worth. Many families, however, may not have appropriate programs available for them. Programs vary widely in their ability to provide quality education. Parents must be aware of certain limitations and problems with special education:

- Special education programs within the normal school setting often increase the child's feelings of social alienation.
- If the educational strategy focuses only on abnormal behavior, it will fail to take advantage of the creative, competitive, and dynamic energy that often accompanies ADHD behavior.
- There is no federally funded special education category specifically targeted to ADHD.

If, in fact, ADHD is as common as studies are indicating, the best approach may be to treat the syndrome as a variant of the norm and train teachers to manage these children within the context of a normal classroom.

Special programs are also required under the Rehabilitation Act and by the Americans with Disabilities Act (ADA) for students at institutions of higher learning. It is the student's responsibility, however, to inform the administration at their college or university that they need such services. Unfortunately, many college students are reluctant to do this, although such programs can provide important and beneficial assistance in improving their academic performance.

Other Treatments

Dietary Approaches

A number of diets have been suggested for people with ADHD. Several well-conducted studies have failed to support dietary effects of sugar and food additives on behavior, except possibly in a very small percentage of children. Still various studies have reported behavioral improvement with diets that restrict possible allergens in

the diet. Parents may want to discuss with their physician implementing an elimination diet of certain foods or adding supplements that would not be harmful and that might help.

Feingold Diet and Food Allergies. Evidence suggests that children with behavioral difficulties may be sensitive to certain chemicals in foods. Studies vary widely, however, on how many cases of ADHD may be associated with sensitivities or allergies to food chemicals or additives, with results ranging from 5% to 62%. Among the suspected additives and foods that parents and studies report as inciting behavioral changes are the following:

- Any artificial colorings (particularly yellow, red, or green).
- Other chemical additives. (BHT or BHA is specifically avoided in the Feingold diet.)
- Milk.
- Chocolate.
- Eggs.
- Wheat.
- Foods containing salicylates. Such foods are among those prohibited on the Feingold diet. They include berries (all), chili powder, apples and cider, cloves, grapes, oranges, peaches, peppers (bell & chili), plums, prunes, and tomatoes. (Aspirin is also not permitted.)

In one small study, 62% of children who were given only rice, turkey, pears, and lettuce to eat for two weeks experienced at least a 50% improvement in symptoms. Nevertheless, about a quarter of the children pulled out because they could not stick with diet or they became ill.

The most well known diet for ADHD is the Feingold diet, a salicylate- and additive-free diet, which requires rigorous vigilance over a child's eating habits. Some parents report great success with this diet, although it may be difficult to impose, particularly on an ADHD child. One study that reported its efficacy suggested that it might not provide enough nutritive value, although the diet provides a wide range of healthy foods to select from. It is certainly wise, in any case, to avoid food with artificial colors and flavors and to provide a healthy balance of fresh, natural foods.

It should be noted that allergies themselves have been associated with a higher risk for behavioral problems. Children who respond to allergen-restrictive diets, then, may not have had true ADHD in the first place.

Essential Fatty Acids. Omega-3 fatty acids, found in fatty fish and certain vegetable oils, are important for normal brain function and may have some benefits for people with ADHD. It is not clear if supplements of fatty acid compounds, such as docosahexaenoic acid (DHA) and eicosapentanoic acid (EPA), provide any advantages. A 2001 study of DHA alone reported no reduction in ADHD symptoms.

Zinc. Zinc is important for the metabolism of certain neurotransmitters that play a role in ADHD, and deficiencies have been associated with some cases of ADHD. Long-term use of zinc, however, can cause anemia and other side effects in people without deficiencies and it has no effect on ADHD in these patients. In any case, testing for trace minerals, such as zinc, is not standard procedure when evaluating children suspected to have ADHD.

Sugar. Although parents often blame sugar for causing children to become impulsive or hyperactive, a number of studies now strongly suggest that sugar plays no role in hyperactivity. One study reported, in fact, that ADHD children had fewer problems after a high-carbohydrate breakfast than after a high-protein one. Another reported that children actually moved more slowly after a high-sugar meal, suggesting the carbohydrates may have a sedative effect. (Still, it's probably always wise for any child to cut down on sugar.)

Feedback Approaches

Techniques that use biologic or auditory feedback and proving to be effective tools for increasing children's attention--a primary factor in low academic performance.

Neurofeedback. Neurofeedback is an approach that uses electronic devices to help the child control his or her own brain wave activity. Electrodes are pasted to the child's head and pick up signals from the brain. The child watches images, such as moving graphs, on a computer monitor that reflect the child's brain wave activity. Typically, children are then taught certain high-level mental activities at the point when feedback information on

the screen indicates that they are fully concentrating. Typically children attend forty 50-minute sessions, usually twice a week. Small studies have reported significant improvement in inattention, impulsivity, and response time. In one study IQs increased by an average of 12 points and Ritalin use had dropped from 30% to 6% at the end of training period. To date, however, studies have been very limited and the results could have been due to factors other than neurofeedback. It is also very expensive (\$40 to \$120 per session). More research, however, is certainly warranted.

Interactive Metronome and Musical Therapy. Interactive metronome uses feedback from sound to improve attention, motor control, and certain academic skills. In this technique study, children wear headphones and sensors on their hands and feet. They perform a number of exercises to a rhythmic computer-beat. Training sessions are completed in three to five weeks. Some small studies have reported improvement in attention, motor control, language processing, and behavior. (In support of this, some parents report that learning a musical instrument helped their children significantly.)

Other Alternative Remedies

Procedures and Non-Drug Therapies. A number of alternative approaches may benefit children and adults with mild ADHD symptoms. For example, daily massage therapy helps ADHD adolescents feel happier, fidget less, be less hyperactive, and focus on tasks, according to a study published in 1998. Other alternative approaches that may be helpful include relaxation training, meditation, and music therapy.

Herbal Remedies. A number of parents resort to alternative remedies as an alternative to psychostimulants and other drugs. Small trials have found some agents, such as oral flower essence, ginkgo biloba, panax ginseng, and melatonin may possibly have benefits for ADHD. None, however, can be recommended, particularly for children, where their safety and effectiveness are completely unproven.

Warnings on Alternative and So-Called Natural Remedies

Alternative or natural remedies are not regulated and their quality is not publicly controlled. In addition, any substance that can affect the body's chemistry can, like any drug, produce side effects that may be harmful. Even if studies report positive benefits from herbal remedies, the compounds used in such studies are not, in most cases, what are being marketed to the public.

There have been a number of reported cases of serious and even lethal side effects from herbal products. In addition, some so-called natural remedies were found to contain standard prescription medication. Of specific concern are studies suggesting that up to 30% of herbal patent remedies imported from China having been laced with potent pharmaceuticals such as phenacetin and steroids. Most reported problems occur in herbal remedies imported from Asia, with one study reporting a significant percentage of such remedies containing toxic metals.

The following warnings are of particular importance for people with attention-deficit disorders.

- *Melatonin.* High doses of melatonin have been associated with an increased risk for seizures in children with existing neurologic disorders.
- *Ginkgo.* The risk for side effects from ginkgo appear to be low, but there is an increased risk for bleeding and interaction with anti-clotting medications at high doses.
- *Ginseng.* There have been contaminated forms of imported ginseng. It also has been associated with a hypoglycemia and a higher risk for bleeding. In addition, a great number of ginseng products have been found to contain little or no ginseng.

The following website is building a database of natural remedy brands that it tests and rates. Not all are yet available (www.consumerlab.com )

The Food and Drug Administration has a program called MEDWATCH for people to report adverse reactions to untested substances, such as herbal remedies and vitamins (call 800-332-1088).

Resources

- www.chadd.org -- Children and Adults with Attention-Deficit Disorder (800-233-4050)
- www.add.org -- National Attention-Deficit Disorder Association (847-432-ADDA)
- www.ncgiadd.org -- The National Center for Gender Issues and ADHD (888-238-8588)
- www.nimh.nih.gov -- National Institutes of Mental Health (301-443-4513)
- www.cognitivetherapy.nyc.com -- American Institute for Cognitive Therapy (212-308-2440)
- www.aabt.org -- Association for the Advancement of Behavior Therapy (800-685-AABT)
- www.psych.org -- The American Psychiatric Association (888-357-7924)
- www.dotcomsense.com -- The American Psychological Association (202-783-2077)
- www.socialworkers.org -- The National Association of Social Workers (202-408-8600)
- www.apna.org -- The American Psychiatric Nurses Association (202-367-1133)
- www.aacap.org -- American Academy of Child and Adolescent Psychiatry (202-966-7300)
- www.addwarehouse.com -- A.D.D. Warehouse (800-233-9273)
- www.feingold.org -- Feingold Association of the United States (800-321-3287)
- www.nichcy.org -- The National Information Center for Children and Youth with Disabilities (800-695-0285)
- www.attention.com -- Offers recent studies, advice on attention-deficit disorder and includes an online newsletter
- www.interactivemetronome.com -- Interactive Metronome
- www.mhs.com/jad -- Journal of Attention Disorders
- www.ldanatl.org -- Learning Disabilities Association of America

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