

A New Approach to

It's not a simple behavior disorder, but rather a complex syndrome of impairments in the management system of the brain.

Thomas E. Brown

As burgeoning numbers of children and adolescents are being diagnosed with attention deficit disorders, parents are increasingly asking teachers, "Do you think my child has ADD or ADHD?" Some insist that their child receive multiple accommodations for presumed ADD/ADHD. Many teachers and school administrators are uncertain about how to respond. They are also unsure about which interventions are appropriate when a student appears to be impaired by attention disorders but the parents are skeptical or refuse to consider that possibility.

A recent study conducted by the US Centers for Disease Control found that approximately 7.8 percent of US children ages 4-17 are currently diagnosed with Attention Deficit Disorder (ADD) or Attention Deficit Hyperactivity Disorder (ADHD) (*Journal of the American Medical Association*, 2005). This means that most teachers are likely to have at least a couple of students with ADD/ADHD in every class they teach. However, few educators are familiar with major findings from recent scientific studies of

attention deficit disorders or with the implications of these findings for schools.

For decades, most educators, physicians, psychologists, and parents have thought of ADD as a cluster of behavior problems, a label for children who can't sit still, won't stop talking, and often are disruptive in class. Discussion has

centered mainly on controversy over whether children with this diagnosis should be treated with stimulant medication, which, paradoxically, calms down overactive bodies and brains. However, recent research offers a new way of understanding this disorder and a different view of how medication treatment actually works in the brain.

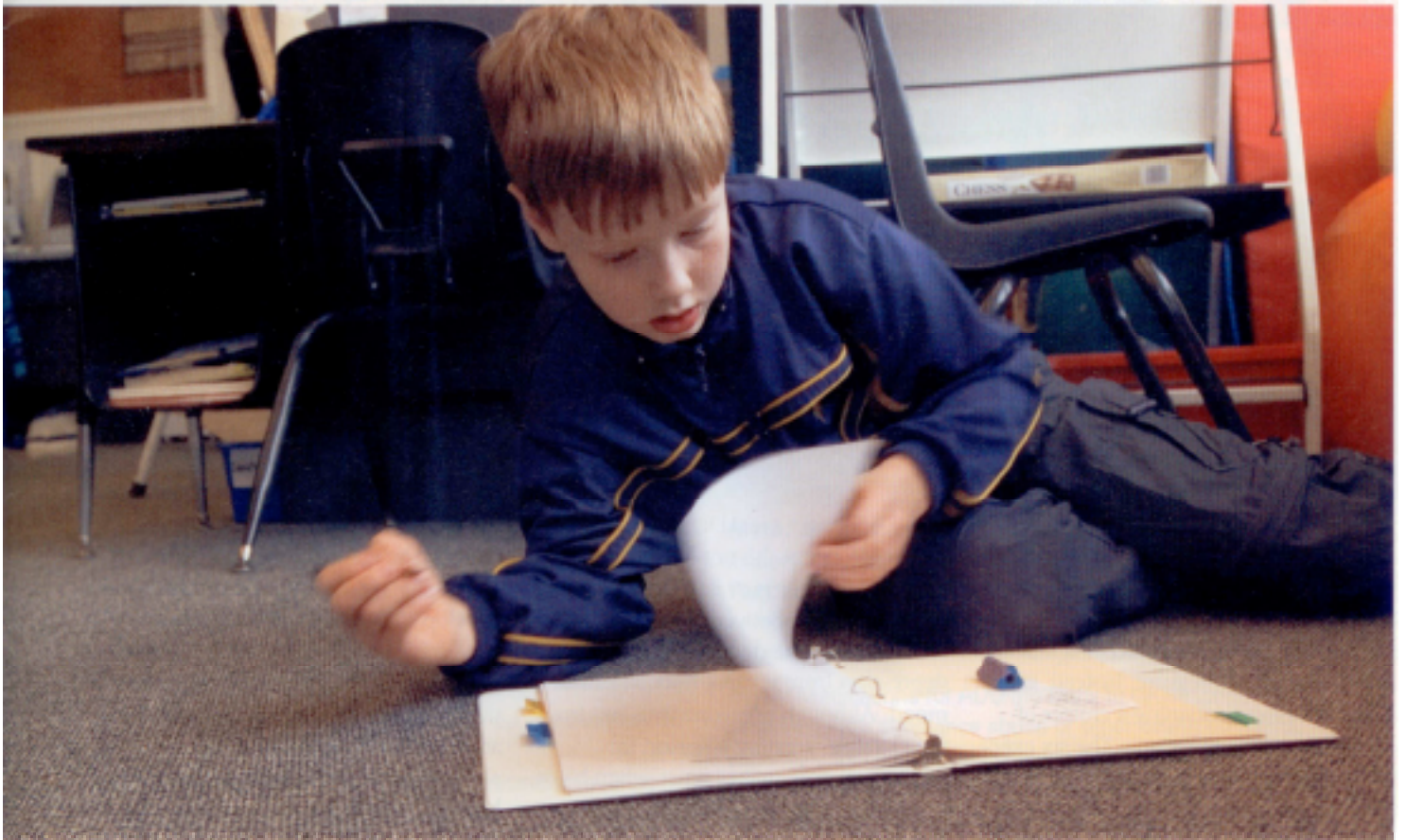


The Symphony of the Brain

Few researchers still think of ADD as a simple behavior disorder. Increasingly, specialists are recognizing that it is a complex syndrome of impairments in development of the brain's cognitive management system, or executive functions. The disorder affects one's ability to

- Organize and get started on tasks.
 - Attend to details and avoid excessive distractibility.
 - Regulate alertness and processing speed.
 - Sustain and, when necessary, shift focus.
 - Use short-term working memory and access recall.
 - Sustain motivation to work.
 - Manage emotions appropriately
- One way to imagine the -

Attention Deficit Disorder



cluster of cognitive functions involved in the new model of ADD is to visualize a symphony orchestra composed of talented musicians. Regardless of their expertise, the musicians need a competent conductor who will select the piece to play, make sure they start at the same time and stay on tempo, fade in the strings and then bring in the brass, and manage them as they interpret the

music. Without an effective conductor, the symphony will not produce good music.

In individuals with ADD, the parts of the brain that correspond to the individual musicians often work quite well. The problem is with the conductor, with those executive functions that, in a healthy individual, work together to accomplish a task. ADD impairs neural

circuits that function as the conductor of the symphony.

Take James, for example. He's a bright 6th grader who enthusiastically participates in class discussions that relate to science or social studies. He often contributes examples from shows he has watched on the Discovery Channel or History Channel or from the many books he has read. However, he rarely

completes homework assignments, can't keep track of his papers or books, and often claims that he can't recall what he has just finished hearing or reading in class.

Julie has her own set of challenges with accomplishing school tasks. A quiet, intelligent 9th grader, she was on the honor roll every year-until she got to high school. Halfway through freshman year, she is in danger of failing most of her major classes because of missing homework and low test grades. Her parents say that although she spends many hours each night doing homework, she loses track of what she needs to hand in for each class. As she works to catch up on overdue work in one course, she falls behind in others. She also studies hard for tests and knows all the answers when others quiz her on the material, but on the following day when she takes the test, she's unable to recall most of the information. Both James and Julie display executive function impairment.

The Six Executive Functions

One model describing the executive functions emerged from my research with children, adolescents, and adults. Although each of the six components of the model has a single-word label, they are not unitary variables like height, weight, or blood pressure. Instead, each is like a basket containing a cluster of related cognitive functions. The six executive functions that work together in various combinations are

- *Activation*: organizing, prioritizing, and activating for work.
- *Focus*: focusing, sustaining, and shifting attention to tasks.
- *Effort*: regulating alertness and sustaining effort and processing speed.
- *Emotion*: managing frustration and modulating emotions.
- *Memory*: using working memory and accessing recall.
- *Action*: monitoring and self-regulating action.

In daily life, these clusters of cognitive functions operate, often without our conscious involvement, in integrated and dynamic ways to accomplish a wide variety of tasks. They do not continually work at peak efficiency for any of us; everyone has difficulty with some of them from time to time. However, those diagnosed with ADD-James and Julie, for example-are substantially more impaired in their ability to use these executive functions than are most other

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people of the same age and developmental level.

We no longer see ADD as an all-or-nothing concept. It's not like pregnancy, where one either is or isn't pregnant, with nothing in between. Diagnosing ADD is more like distinguishing clinical depression from normal fluctuations in mood. Although everyone feels sad from time to time, treating a person for depression only makes sense when he or she is significantly impaired by depressive symptoms over a substantial period of time. Similarly, the diagnosis of ADD/ADHD is not warranted for people who have occasional difficulty with the relevant symptoms but rather for those who are significantly impaired by the cluster of ADD symptoms over a longer period of time.

Differences in Development

As teachers know, a student's capacity to exercise these various self-management

functions develops slowly from early childhood through late adolescence or early adulthood. We hold different expectations for 8-year-olds than for 5-year-olds in their capacity to sustain attention, follow directions, remember information, and so on. We also know that within any given age group, some children develop these abilities more quickly and in more refined ways than others do. A diagnosis of ADD/ADHD is appropriate only when the individual's impairment is significantly greater than that of most other children of the same age and developmental level.

Scientific evidence has now demonstrated that although some basic elements of executive functions emerge during early childhood, these complex self-management networks are not fully developed until the late teens or early twenties (Brown, 2005). Accordingly, most governments will not allow their citizens to drive a motor vehicle until they are at least 16 years old. This is not because the drivers' legs are too short for their feet to reach the pedals; rather, it is because the crucial executive functions of the brain that enable an individual to manage the complexities and high-stakes responsibilities of driving a car do not develop sufficiently until middle or late adolescence.

Because normal development of executive functions is not complete until late adolescence or early adulthood, it is not always possible to identify, during childhood, students with impairments in these functions. For some students, ADD impairments become obvious during preschool. These students may be wildly hyperactive or unable to sit still or follow even the most basic directions. Other students may learn and behave quite well during elementary school, showing signs of ADD impairments only when middle school challenges their self-management abilities as they leave behind a classroom in which a single teacher has helped guide their executive functions.

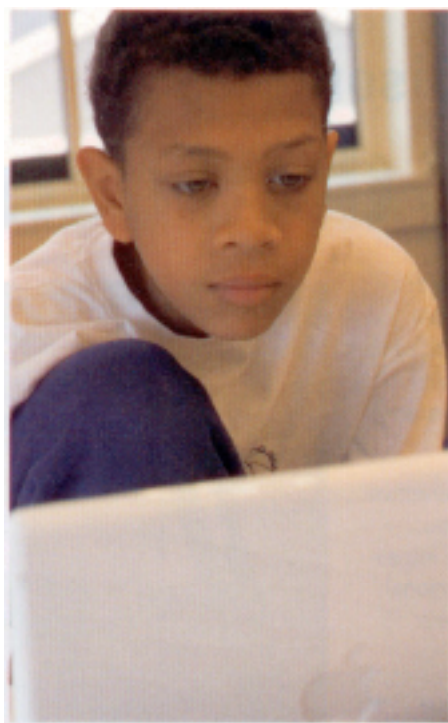
Some students do not manifest their ADD impairments in noticeable ways until they encounter the more demanding world of high school, where they may be unable to cope with the ongoing conflicts and demands of study, classroom performance, homework in several subjects, and family and social interactions. Other students with ADD do not have noticeable symptoms until even later. Their parents may have built such successful compensatory scaffolding around them that their ADD impairments do not become apparent until the scaffolding is suddenly removed—as when the student moves away from home to attend a college or university:

Why Here and Not There?

The most perplexing aspect of an ADD diagnosis is the situational specificity of the symptoms. Every child, adolescent, and adult with ADD whom I have ever seen has a few types of activity in which they effectively exercise cognitive functions that are quite impaired in almost every other circumstance.

Take Larry, for example, a high school junior who was the goaltender for his ice hockey team. His parents brought him in for evaluation the day after the team won the state championship. As they described his performance, it was clear that he was an extraordinary goalie who kept careful track of the puck throughout each game. He was bright; his IQ was in the very superior range. However, he was always in trouble with his teachers. They reported that although he occasionally made impressively perceptive comments in class, most of the time he was distracted and "out to lunch," unable to follow the class discussion. "If you can pay attention so well when you're playing hockey," they would ask him, "then why can't you pay attention in class?"

Not all individuals with ADD focus best in sports; some get intensely



involved in such activities as playing video games, drawing, building with Legos, or completing mechanical tasks. All seem to have a few specific activities in which they can focus well and for long periods of time. Yet they have difficulty focusing on many other tasks that they recognize are important and that they want to do well, such as completing an essay or preparing for a major exam. People often see ADD as a problem of willpower: "You can do it here," they say: "Why can't you do it there?" ADD is *not* a problem of willpower, however. It is a chronic impairment in the chemistry of the management system of the brain.

A Word About Medications Evidence now shows that ADD is a highly heritable disorder, with impairments related to problems in the release and reloading of two crucial neurotransmitter chemicals made in the brain: dopamine and norepinephrine. These chemicals play a crucial role in facilitating communication within neural networks that orchestrate cognition. A

massive body of evidence indicates that 8 of 10 individuals with the disorder experience significant improvement in their functioning when treated with appropriately fine-tuned medications. These treatments can compensate for inefficient release and reloading of essential neurotransmitters at countless synaptic connections in the brain.

However, ADD is not like a strep infection, where you can take a course of antibiotics and knock out the infection. It's more like a vision problem: Appropriately prescribed eyeglasses can improve impaired vision, but not cure it. Similarly, medications for ADD may help alleviate symptoms, but only for those hours of the day when the medication is active in the brain. During these times, some students under treatment can perform most self-management tasks quite well. For others, medication alone is not sufficient.

Approximately 50 percent of students with ADD have one or more specific learning disorders. If students with concurrent ADD and learning disabilities do not receive adequate treatment for their ADD impairments, it is unlikely that they will benefit from special education instruction because they will not be in a state that makes them available to learn. But medication alone will not alleviate their learning disability problems. Students with both ADD and learning disabilities often require accommodations or special education services.

The Difficulties of Diagnosis

When we considered ADD/ADHD a simple behavior disorder, it was easy to diagnose. Teachers could readily spot students who were chronically inattentive, restless, and impulsive in the classroom and on the playground. However, the new model of ADD—as a developmental impairment of executive functions—requires a different kind of evaluation, an approach that can pick up more subtle cognitive impairments.

These may or may not be accompanied by hyperactivity or other readily observable symptoms. For example, a student may appear to be paying attention in class when he is actually drifting off and thinking of unrelated things. Another student may diligently read her assignment but then be unable to recall what she's just read.

To begin with, the most important assessment element is an individual clinical interview to query the student about a variety of daily cognitive functions. This requires a clinician who is well trained to recognize ADD and differentiate it from other learning, emotional, and behavioral problems. The evaluating clinician also needs to gather information from parents and teachers that describes the student's strengths and impairments as he or she encounters such tasks as keeping track of assignments, doing homework, reading for understanding, organizing thoughts for writing projects, and socially interacting both in and out of school. Rating scales—such as the Conners Rating Scale, Behavior Assessment System for Children (BASC), or Brown ADD Scales—can be helpful in gathering data for evaluation, but none is sufficient in itself for making or ruling out a diagnosis of ADD.

Nor can standard IQ scores or achievement test scores help an evaluator diagnose ADD. However, IQ index scores on the Wechsler Intelligence Scale for Children (WISC-IV) or Wechsler Adult Intelligence Scale (WAIS-III) can suggest ADD impairments if the student's score for the Working Memory and/or Processing Speed Index is one standard deviation or more below that student's index score for Verbal Comprehension or Perceptual Organization. Any student who underachieves in school and displays such discrepancies between basic cognitive abilities and indices of executive functions should be carefully evaluated for possible ADD.

Three specific groups of students with ADD tend to be overlooked: bright students, female students, and students under stress. Adults often think that very bright students who underachieve are lazy, the assumption being that one cannot be bright and, at the same time, have significant ADD impairments. In fact, individuals with ADD are found at all IQ levels. Female students with ADD may be difficult to spot because they generally don't call attention to themselves with dramatic, disruptive

ADD impairs the neural circuits that function as the conductor of the symphony of the brain.

behavior. Finally, adults often explain away the achievement problems of students coming from families with multiple social stressors, such as divorce, unemployment, poverty, and multiple relocations. Teachers may assume that poor achievement is just the student's reaction to these difficulties. They may not realize that ADD is more common in families under psychosocial stress.

Importance of Early Identification

When a student with or without hyperactivity or behavior problems chronically underachieves, educators should consider evaluating the student for ADD/ADHD. To start the process, school staff should systematically gather relevant information from teachers and the school psychologist about specific impairments observed in the student's

academic work, classroom performance, or social interactions. They should present this information to parents with suggestions about how the parents can arrange for an appropriate evaluation to identify causes of the student's chronic difficulties and possible options for intervention.

Before school staff can adequately assist parents in identifying students for a possible ADD/ADHD evaluation, however, teachers, school psychologists, and administrators need to develop a solid understanding of the new model for attention deficit disorders. Resources are available online at <http://help4ADHD.org>, a Web site funded by the U.S. Centers for Disease Control, or in the *CHADD Educator's Manual* available at <http://chadd.org>.

Early identification of students with ADD is important because appropriate interventions can prevent a student from becoming demoralized by repeated experiences of frustration and failure. With appropriate intervention, most students with ADD/ADHD can achieve at the level of their abilities. III

I use the terms ADD and ADHD interchangeably in this article.

References

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