

## Attention Deficit Disorder

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# Attention Deficit Disorder

*The Unfocused Mind in Children and Adults*

**Thomas E. Brown, Ph.D.**

Yale University Press New Haven & London

The information and suggestions contained in this book are not intended to replace the services of your physician or caregiver. Because each person and each medical situation is unique, you should consult your own physician to get answers to your personal questions, to evaluate any symptoms you may have, or to receive suggestions on appropriate medications.

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*To my wife, Bobbie, with continuing love and gratitude for all you are,  
all you give, and all we share together*



As physicians strive to gather more data, to see more, to be more objective, to be more scientific, they are often experienced by their patients as not listening. . . . Listening is central to learning about and coming to understand a sufferer. . . . The healer learns about the sufferer in direct proportion to the quantity and quality of his listening.

—Stanley W. Jackson, M.D., “The Listening Healer in the History of Psychological Healing” (1992)

The untangling of the complexity has barely begun. . . . But even at its early stages, the whole business of the matter of the mind requires a global view if we are to get anywhere.

—Gerald M. Edelman, M.D., Ph.D., *Bright Air, Brilliant Fire: On the Matter of the Mind* (1992)

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## Preface

**Over the** past decade hundreds of thousands of children, adolescents, and adults have been diagnosed and treated for attention deficit disorder (ADD) or attention-deficit hyperactivity disorder (ADHD). Advocacy groups for individuals and families affected with ADD/ADHD are burgeoning not only in the United States and Canada, but also in the United Kingdom, Germany, Australia, Mexico, Norway, Spain, Japan, and many other diverse cultures around the world.

Despite this popular groundswell and a tremendous amount of scientific evidence supporting the validity of the ADHD diagnosis and the safety and effectiveness of available treatments, a large segment of those in the popular media and many individuals remain skeptical; they consider ADD a trivial problem that is often overdiagnosed and overtreated. Most of this skepticism is based on simple ignorance about the complex nature of the disorder, its often devastating effects on individuals and families, and the safe, effective benefits obtained by the vast majority of those who receive appropriate treatment.

Over the past twenty years I have assessed and helped to provide treatment for thousands of children, adolescents, and adults who suffer from attention deficit disorders. I have studied and participated in relevant scientific research. I have traveled throughout the United States and in twenty-

five other countries to consult with professionals and laypersons about ADHD and to offer lectures and professional education workshops. These experiences have convinced me that there is a continuing and widespread need for a clear, scientifically based explanation of what ADD/ADHD is, what it isn't, and how it can effectively be recognized and treated.

Thirty-six years ago, when I began studying psychology at Yale, we did not have the powerful imaging tools that now make it possible to look within the living human brain and observe moment to moment changes in its neural networks. We were, however, taught another way to learn about problems of brain function: to listen carefully to the way patients describe their experiences.

I have written *Attention Deficit Disorder* to describe what I've learned from conversations with thousands of children, adolescents, and adults who have ADHD. I hope it will be of interest to a wide range of readers in the general public: those who encounter these problems in themselves, family, or friends, and those who simply want to gain a fresh perspective on the fascinating complexity of the human brain. I hope it will also be useful for psychologists, educators, psychiatrists, pediatricians, family practice physicians, internists, social workers, human resource managers, counselors, and other professionals who want to better provide understanding and appropriate support to individuals who suffer from the difficulties described here.

The path to writing this book began one day as I listened to a very bright high school student describe frustrations that interfered daily with his schoolwork. He complained that he could read fluently, but moments later could not recall what he had just read. He said that his mind repeatedly took long excursions in almost every class. Often he was unable to stay focused enough to catch more than snippets of the lecture or class discussion. He explained that despite good intentions to prepare homework and write papers, he ended up procrastinating on assignments and got the inevitable poor results. Something about his description of these persistent struggles made them sound more like problems of "can't" than problems of "won't."

The boy's descriptions led me to suspect he had an attention deficit disorder that had remained undiagnosed because he was bright and not

hyperactive or disruptive. A trial of stimulant medication brought sudden and dramatic improvements in virtually all of his attentional impairments.

That experience ignited my curiosity. How could someone with so much ability, such an intense desire for success, be chronically impaired in so many ways and then overcome these difficulties almost overnight using just a few small daily doses of a short-acting medication?

The following pages are filled with many real-life examples obtained from children, adolescents, and adults suffering from ADHD. These are intertwined with explanations of current research in neuroscience, psychology, and psychiatry that I find helpful in understanding the complex problems of how this disorder can be recognized and effectively treated.

The first chapter poses the perplexing question of ADHD: How can apparently normal persons have chronic difficulty “maintaining focus” for tasks they see as important, while they are able to pay attention very well to less important tasks that interest them? Is this just a simple problem of “willpower?” I argue that, despite appearances, the core problem in ADHD is not lack of willpower, but chronic, often lifelong impairment of the “executive” or management functions of the brain.

In Chapter 2 I use everyday examples to describe six clusters of cognitive problems reported by most persons with ADD. Some of these symptoms are included in the diagnostic criteria for ADHD in *DSM-IV*, the psychiatric diagnostic manual; some are not. These include chronic difficulties with (1) organizing, prioritizing, and getting started, (2) focusing, sustaining, and shifting attention, (3) regulating alertness, sustaining effort, and determining processing speed, (4) managing frustration and modulating emotions, (5) utilizing working memory and accessing recall, and (6) monitoring and self-regulating action. These cognitive functions interact to serve as the management system of the mind. Chronic impairments of these functions constitute what I call “ADD syndrome.”

Understanding this syndrome requires at least a minimal grasp of how the brain operates. In Chapter 3 I offer basic explanations of how the brain works to manage daily life: how it uses short-term memory to get things done; how it selects moment by moment what things are most important to pay attention to; and how it regulates itself to be alert and

“open for business” when needed. The chapter includes information about how two specific chemicals manufactured in the brain regulate these functions, and what happens when those chemicals do not work adequately.

Problems of ADD syndrome are different at different ages. In Chapter 4 I describe how parents and teachers build a supportive environment, or “scaffolding,” to help young children gradually develop self-management skills to behave carefully, to cooperate with others, to communicate, and to work to learn to read and write. I also explain how, despite scaffolding, these tasks are much more difficult for children with ADD syndrome.

Chapter 5 explains how that scaffolding is gradually withdrawn as teenagers are required to take more responsibility for managing their time and homework, dealing with their emerging sexuality and developing relationships, working for money and driving a car, and, eventually, leaving home to function more independently. I describe impairments of adolescents with ADD syndrome as they encounter these tasks.

Some adults have less difficulty with ADD syndrome once they get out of school. Others experience increasing difficulty as they struggle to find and hold a job, advance careers, develop relationships, manage households and finances, and negotiate partnerships and childcare. I describe the effects of ADD syndrome on these tasks in Chapter 6.

All the problems of ADD syndrome are experienced by everybody sometimes. Chapter 7 raises the question of how clinicians can differentiate the impairments of ADD syndrome from normal problems of inattention. Here, too, I challenge the validity of popular but overly simplistic efforts to evaluate the impairments of ADD.

Research has established that persons diagnosed with ADHD are as much as six times more likely than others to suffer from one or more other psychiatric or learning disorders at some time during their life. In Chapter 8 I describe a variety of disorders of learning, emotion, or behavior that often overlap with ADD syndrome. I propose that executive function impairments of ADD syndrome are an integral part of many different psychiatric and learning disorders, and I suggest some possible helpful changes to current diagnostic models.

In Chapter 9, I explain options to alleviate ADD syndrome impairments with treatment. The first step in any treatment program is to provide accurate information to the patient and family about the nature and course of ADD impairments. Since ADD syndrome is biochemically based, the most effective treatment is usually medication. Recently, new medications and new delivery systems for older medications have been developed. I outline what is now known about safety, effectiveness, side effects, and practical aspects of these medication treatments. The usefulness and limitations of behavioral treatments, accommodations, and other supports for ADD syndrome are also described. I emphasize that it is important to design for each patient a personalized treatment plan.

In Chapter 10, I provide examples of how untreated ADD syndrome tends to erode hope, and how it can cause severe suffering to individuals and families. This chapter also describes fears, prejudices, and other factors that are barriers to seeking, obtaining, and sustaining adequate treatment. I contrast strategies that offer “unrealistic hope” with interventions that nurture “realistic hope” in the daily lives of individuals and families suffering from ADD syndrome.

Many children, adolescents, and adults whom I have treated over the past twenty years have contributed to what is written here. Their names and identifying data have been removed, but I remain very grateful for their comments and stories, which have infused my understanding and these pages with essential details of real life. I also appreciate deeply the encouragement of patients, parents, and professional colleagues as I worked to write and publish these materials; their enthusiasm has sustained me during the long process of turning ideas and images into sentences and paragraphs.

For helpful comments on earlier versions of the manuscript I am indebted to Dr. Jay Giedd, Dr. Anthony Rostain, Dr. Rosemary Tannock, and Dr. Margaret Weiss. Wendy Hill is the medical illustrator who provided the excellent drawings that illustrate the text. Our son, Dave Brown, helpfully challenged my hesitations about trying to write for a wider audience and our daughter, Liza Somilleda, contributed perceptive comments on

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## Introduction

**Often** people think of “focus” as holding a camera still and adjusting the lens for a clear picture of an unmoving object. That is not the meaning of focus in the title of this book. Rather, focus refers here to a complex, dynamic process of selecting and engaging what is important to notice, to do, to remember, moment to moment. Much as a careful driver focuses on the task of driving a car in heavy traffic by actively looking ahead while also checking mirrors, observing road signs, braking, and so on (all while monitoring dashboard gauges, keeping in mind the speed limit and destination, and ignoring the temptation to look too long at interesting sights), a person employs this very active, rapidly shifting, repeatedly readjusted deployment of attention and memory as the “focus” needed to plan and control ongoing activity. Such focus is extremely difficult for the 7 to 10 percent of the world’s population who suffer from a syndrome of cognitive impairments currently known as attention deficit disorder (ADD) or attention-deficit hyperactivity disorder (ADHD).

“Syndrome” is a term that describes a cluster of symptoms that tend to appear together. For example, nasal congestion, sore throat, headache, fatigue, and fever often appear together as a syndrome commonly referred to as a “cold.” One single cause or a variety of different causes might lead to one common syndrome.

In this book, the term “ADD syndrome” is used to refer to a cluster of impairments in the management system of the mind. The *DSM-IV*, the diagnostic manual of the American Psychiatric Association, describes currently accepted diagnostic criteria for attention-deficit hyperactivity disorder (ADHD). The concept of ADD syndrome introduced in this book is not intended to be a new diagnosis, replacing existing diagnostic categories. I am simply proposing a new way of looking at these impairments, of which many, but not all, are encompassed in current diagnostic criteria for ADHD. Other labels have been proposed for this cluster of impairments: “Attention Deficit Disorder,” “Executive Dysfunction,” “Minimal Brain Dysfunction,” “Regulatory Control Disorder,” and “Dysexecutive Syndrome,” to name a few. The concept of ADD syndrome described here includes many impairments described by these various labels, impairments that often appear together and tend to respond to similar treatments.

Compared to others of the same age and developmental level, persons with ADD syndrome tend often to have an “unfocused mind” not only for driving, but also for many other important tasks of daily life. This does not mean that persons with ADD syndrome are never able to focus adequately. Nor does it mean that those without ADD syndrome are always well focused. ADD syndrome is not like pregnancy, an all-or-nothing status with no in-between. It is more like depression. Every person feels sad sometimes, but a person is not diagnosed and treated for depression simply because he feels unhappy for a few days or even a few weeks. It is only when depressive symptoms are persistent and significantly impairing that the diagnosis of depression is appropriately made. Similarly, persons with ADD syndrome are not constantly unfocused, but they are much more persistently and pervasively impaired in these cognitive functions than most other people.

My purpose in writing this book is to describe more adequately the complex ADD syndrome as it occurs in children, adolescents, and adults. My understanding of ADD syndrome is not universally accepted. Some researchers prefer less cognitive, more behavioral models to describe this disorder. In these pages the reader will find a new, somewhat controver-

sial understanding of ADD syndrome, including how it can be recognized and how it can be treated effectively.

Sometimes an effective treatment for a disorder is discovered by accident, before there is a full understanding of what is being treated or why the treatment works. An effective treatment for ADD syndrome was accidentally discovered in 1937 by Charles Bradley, a Rhode Island physician who was seeking a medication to alleviate severe post-spinal-tap headaches in behavior-disordered children he was studying. The amphetamine compound he tried was not helpful for the headaches, but teachers reported dramatic, though short-lived, improvement in the children's learning, motivation, and behavior while they were on this medication. Gradually this treatment gained wider use for hyperactive children with disruptive behavior problems.

Our understanding of what would later be called ADD syndrome expanded significantly during the 1970s when researchers noticed that hyperactive children tend also to have chronic problems with inattention that, like problems with hyperactivity, improve in response to stimulant treatment. In 1980 the American Psychiatric Association first used the term "attention deficit disorder" as an official diagnosis. At that time they recognized chronic impairment of attention, with or without hyperactive behavior problems, as a psychiatric disorder. The 1980 version of the diagnostic manual also noted that although this disorder usually originates during childhood, impairments to attention sometimes persist into adulthood. A 1987 revision of the manual changed the name of this condition to Attention-Deficit/Hyperactivity Disorder; since that time the official name has continued to bind inattention to hyperactive behavior problems, largely neglecting the independent importance of the syndrome's cognitive impairments.

Over the past decade, specific medicines have proven safe and very useful to many children, adolescents, and adults throughout the world who suffer from ADD syndrome. Yet very little has been published to explain in understandable terms the complex nature of attention and the wide variety of these chronic cognitive problems associated with ADHD.

In this book, I emphasize the crippling effects of chronic inattention problems on development and functioning throughout the lifespan. I also suggest that the current diagnosis of ADHD encompasses only part of a much wider range of cognitive impairments that are often responsive to medication treatment. And I propose that a cluster of cognitive impairments associated with ADHD, here called ADD syndrome, affects not only those diagnosed with ADHD, but also many people with a wide variety of other conditions, some of whom might benefit from treatments used for ADHD.

Like most clinicians of my generation and, unfortunately, many of the current generation, I learned very little about impairments to attention during my professional training. We were taught to recognize little children, mostly boys, who were extremely hyperactive and often responded to treatment with stimulant medications. And we were told that these hyperactive children often had difficulty paying attention to their teachers and parents. But our education about attention problems generally stopped there.

In the ensuing thirty years of clinical work, I have learned much more about the complex nature of attention. The impetus for most of this learning came from my patients: children, adolescents, and adults struggling with learning, working, social relationships, and family life. As they described to me the wide variety of their chronic problems with inattention, I began to appreciate the complexity of attention and its crucial importance in everyday life. Indeed, by describing the wide range of cognitive functions that improve when treatment is effective, these patients have helped me see the interconnectedness of the attentional networks of the mind.

Although this book is built on a clinical understanding of patients with problems of inattention, it also incorporates information from current research in psychology, psychiatry, and neuroscience. By integrating recent findings in these rapidly changing fields with the clinical study of how inattention affects patients day by day, we can better understand previously mysterious processes within the brain—and better support patients with symptoms of ADHD.

Many people of all ages continue to suffer needlessly from chronic impairments of attentional functions. I hope through this book to share my

understanding, acquired over years of clinical experience and research, that many of these complex impairments are treatable. I want to challenge common misunderstandings of ADD syndrome and to advocate for those who suffer from the disorder. In addressing ADD syndrome, we have an important opportunity both to relieve widespread suffering and to learn more about the vast, fascinating complexities of the human brain's attention and management systems.



## Chapter 1 Misconceptions about Focus and Willpower

**MYTH:** ADD is just a lack of willpower. Persons with ADD focus well on things that interest them; they could focus on any other tasks if they really wanted to.

**FACT:** ADD looks very much like a willpower problem, but it isn't. It's essentially a chemical problem in the management systems of the brain.

**Most** individuals who suffer chronically from an impaired ability to pay attention are able to focus their attention very well on activities that interest them. So why can't they pay attention during other activities that they recognize as important? To answer this riddle, we have to look more carefully at the many aspects of attention, recognizing that processes of attention in the human brain are more complex and subtle than we might have imagined. One way to understand the complexity of attention is to listen carefully to patients with ADHD as they describe their struggles with inattention. Meet a patient of mine, a teenaged hockey player whom I'll call Larry:

Larry, a sturdy, sandy-haired high school junior, was sitting in my office with his parents as we began our first session together. While introducing the family, the parents mentioned that Larry's hockey team had just won the state championship. Proudly they told of how well he had played. As goalie he had successfully blocked thirty-four shots in the championship game and led his team to victory. Larry smiled modestly, but with obvious and well-deserved pleasure.

Then Larry's father stated their dilemma. "When he is playing hockey, Larry is amazing in how he pays attention to all the action. He knows where that puck is every second. He protects the goal and at the same time he watches what the other guys are doing and helps keep his team organized and motivated. He is always totally involved and on top of his game."

"But at school," his father continued, "it's an entirely different story. We know that Larry is very bright. His IQ test scores show he's in the superior range, in the top 3 percent. Usually he scores high on semester exams and he did very well on the PSAT, but his day-to-day work and his report card grades are always up and down, from A+ to almost failing."

"We know Larry wants to get good grades. He's always talking about how he wants to become a doctor and how he needs to get his grades up so he'll get into a good college and then medical school. But for years he has been totally inconsistent in his schoolwork. Once in a while we see him burning the midnight oil to do some reading or write a paper, but most of the time he procrastinates and avoids his schoolwork. We're constantly getting complaints from his teachers, the same frustrations every year."

"They say that once in a while Larry will make some comment in class that shows how smart he is, how well he understands whatever they are working on. Once in a while he'll write an excellent paper or do an amazing job on an assignment. But most of the time, the teachers are complaining that Larry is uninvolved and out to lunch. He's not a behavior problem, but he is gazing out the window or staring at the ceiling. They say that in class discussions he often doesn't even know what page they are on. And we're always getting reports that his homework is late or just not done."

"How can Larry be so amazingly good at paying attention to his hockey, and yet be so amazingly poor at paying attention to his schoolwork?"

Larry had been staring at the carpet as his father spoke, but then he raised his head. His eyes were moist as he quietly said to his parents, “I don’t know why it keeps happening. I’m just as frustrated and even more worried about this than you are. When I saw my last report card, I went to my room and cried.”

“I know what I have to do and I really want to do it because I know how important it is for all the rest of my life. I try to get into it like I’m into hockey. Sometimes I can get into it for a while, for this assignment or that class. But mostly I just can’t make it happen.”

“I really want to, and I know I should be able to do it; I just can’t. I just can’t make myself pay steady attention to my work for school anywhere near the way I pay attention when I’m playing hockey.”

A very similar dilemma was experienced by Monica, a shy girl in fifth grade who hung her head as her mother angrily described to me her problems in school.

Her teachers say she can’t pay attention for more than three minutes at a time. I know that’s not true! I’ve watched her play Nintendo. She can play those video games for three hours at a time without moving. And the teacher says she’s “easily distracted.” That’s nonsense! When she’s playing those video games she’s locked onto that screen like a laser. When she’s into those games the only way you can get her attention is to jump in her face or just turn off the TV.

I’ve done everything I can think of to get her to shape up in school. I’ve gotten daily reports from school and praised her when she did well. I’ve tried to bribe her with rewards for good work. I’ve tried punishing her, taking away her Nintendo or making her do long time-outs in her room. None of it works. I know she can pay attention when she really wants to. I don’t know what else I can do. She’s not a dumb kid and she’s not a bad kid, but if she doesn’t start paying attention to her schoolwork pretty

soon, she's never going to do any better in school than I did. I never finished high school and I really regret it. I want something better for her. If only I could get her to pay attention to her schoolwork the way she pays attention to those video games.

Everyone I've ever evaluated for chronic problems with inattention has some domains of activity where they can pay attention without any difficulty. Some are artistic; they intently sketch and draw. Others are childhood engineers constructing marvels with Lego blocks and, in later years, repairing car engines or designing computer networks. Some others are musicians who push themselves for hours to learn chords for a new song or to compose a new piece of music.

### **Attention and "Willpower"**

The examples of Larry and Monica bring us back to the central riddle of chronic inattention: How can someone who is very good at paying attention for some activities be unable to pay enough attention to other tasks that they know are important and really want to accomplish? When I have asked this question of patients with ADHD, most answer with something like: "It's easy! If it's something I'm really interested in, I can pay attention. If it's not interesting to me, I can't pay attention, regardless of how much I might want to."

Most people respond to this answer with skepticism. "That's true for anyone," they say. "Anybody's going to pay attention better for something they're interested in than for something they're not."

But for some individuals there is an important difference. When faced with something boring that they know they have to do, that's important to them, most people can make themselves focus on the task at hand. Yet some lack this ability unless the consequences of not paying attention are very immediate and severe. One middle-aged businessman, Henry, whom I had diagnosed with attention deficit disorder, once reported:

I've got a sexual example for what it is like to have ADD. It's like having impotence of the mind. If the task you are trying to do is something that turns you on, you're "up" for it and you can per-

form. But if the task you are trying to do is not intrinsically interesting, if it doesn't turn you on, then you can't "get it up." You can't make it happen. It's just not a willpower kind of thing.

### **Facets of Attention**

What do we mean by "paying attention"? Over one hundred years ago, William James wrote:

Everyone knows what attention is. It is the taking of possession by the mind, in clear and vivid form, of one out of what seem several possible objects or trains of thought. Focalization, concentration of consciousness [is] its essence. It implies withdrawal from some things in order to deal effectively with others, and it is a condition which has a real opposite in the confused, dazed, scatter-brained state which . . . is called distraction. (1890, vol. 1, pp. 403–404)

James held what I call "the spotlight theory" of attention: the notion that attention is a solitary, powerful beam focused by the mind on some "objects or trains of thought" (in James's words) selected from the many other perceptions and ideas that might otherwise be attended to in that same moment.

This "spotlight theory" is too simple. It describes only certain types of attention—visual attention, for example, in which one looks steadily at one point rather than flitting around aimlessly to see many different points, or simple auditory attention, in which one listens to one sound, or a series of sounds, while ignoring others. But when we look carefully at the descriptions of Larry and Monica, for example, we notice that they do many things at once. They are not only watching and listening to what is happening on the screen or on the ice, but also engaging in complex actions that may occur simultaneously or in rapid-fire sequence. As Monica plays her video games, she is not simply staring at the TV, but also actively monitoring rapid movements of many objects on the screen, deciding which ones might enrich or destroy her icon. She responds quickly by pressing control buttons and guiding her icon with adept movements of the controls. Mon-

ica keeps track of her score and her levels in the game, all while recalling and engaging strategies useful in earlier games. She also contains her alternating feelings of frustration and triumph so that she can attend to the game without overreacting to its ever-changing ups and downs.

Likewise, Larry's success on the hockey rink depends on multifaceted and simultaneously implemented aspects of attention. He not only tracks the puck in its quick movements around the ice, but also monitors his teammates and opposing players, trying to anticipate moves and to alert his defensemen to dangers and opportunities. Simultaneously, he keeps track of the passage of time—how many minutes or seconds are left in the period, or how soon a player will be released from the penalty box.

Larry also notices subtle cues of flagging effort in his teammates and calls out to encourage and challenge them. He stops himself from thinking too much about a goal he just blocked or one that just got by him into the net. He keeps in mind and tries to follow tips given by his coach in practice last week or during the momentary time out. And he tries to ignore provocative actions and comments from opposing players or spectators. All this and much more is included in Larry's paying attention while he is playing hockey.

Larry's father suggested even broader meanings of attention when he spoke of how Larry exercised year round in the gym to stay in shape for hockey and how he pushed himself hard to build strength, endurance, and skills during team practices. He elaborated on how Larry planned his daily schedule to be on time to every practice. And he told of how carefully Larry managed his equipment, keeping his skates sharp and his pads and uniform in good repair. He related how this boy attended special training clinics and studied plays of college and professional goalies so he could use their strategies to improve his moves on the ice. From this description it was clear that Larry gave intense and continuing attention to hockey in a wide variety of complex ways.

### **The Many Components of Inattention**

If "attention" is more than just a simple "beam of focus," we can reason that "inattention" is multifaceted as well. When teachers and parents

complained about Larry and Monica's poor attention to their schoolwork, they were not using a simple "focus the spotlight" concept of attention—that is, they were not complaining simply about these students not listening to the class discussion or not watching what was being written on the blackboard. They were talking about a much broader, more complex range of attentional functions.

Larry's problems with lack of attention to schoolwork included a chronic failure to engage himself with the various tasks of school. He reported not only excessive distractibility, but also chronic difficulty in getting started on assigned work; he would intend to do it, but procrastinate until it was too late. He told of poor planning, losing track of what readings were assigned or what math problems were to be done. This boy who was so careful with his skates and hockey equipment often lost his textbooks and couldn't find the notes he needed to do his homework. He told of how he often would start an assignment and then lose interest in it, setting aside the task to do something else and frequently not returning to it.

Larry also complained about his memory for schoolwork. Although he had become a virtual encyclopedia of statistics and other detailed information about many hockey players, he reported chronic forgetfulness about directions given by the teacher or the content of readings he had done for class. Often he was unable to recall for an exam information he had studied carefully and seemed to have mastered just the day before.

Larry said he often felt drowsy in class and while he was trying to read texts assigned for homework. He described how he had to struggle to stay awake in those situations, even when he had slept well the night before and was not overtired. This sluggishness was in sharp contrast to the heightened alertness he felt anytime he was thinking about or engaged in tasks related to hockey.

### **Inattention as a Disorder**

When we look carefully at the details of Larry's chronic academic difficulties, it is clear that this boy's inattention is broad-based and complex. It includes problems of excessive distractibility, procrastination, difficulties in organizing his work, avoidance of tasks requiring sustained mental

effort, insufficient attention to details, losing track of belongings, failure to finish assigned tasks, and excessive forgetfulness in daily activities.

What do all of these problems have in common? They are all impairments in facets of “attention”—impairments that are elements of what I describe in Chapter 2 as “ADD syndrome.” And all of these chronic difficulties are listed among the inattention symptoms of the disorder ADHD in *DSM-IV*, the fourth edition of the diagnostic manual published by the American Psychiatric Association (2001). “Inattention” as it is described in *DSM-IV* is a broad term. Under its umbrella are a wide variety of cognitive impairments recognized as chronic, but not necessarily constant. The diagnostic manual notes: “Signs of the disorder may be minimal or absent when the person is under very strict control, is in a novel setting, is engaged in especially interesting activities, is in a one-to-one situation . . . or while the person experiences frequent rewards for appropriate behavior” (p. 79).

Everyone experiences difficulty in exercising these various aspects of attention from time to time. But those who legitimately are diagnosed as having ADHD by *DSM-IV* criteria are persons who manifest ADHD symptoms “to a degree that is maladaptive and inconsistent with developmental level” (p. 83). In other words, they must have these symptoms to a degree that makes consistent trouble for them in ways that most persons of the same age and developmental level do not often experience. Moreover, the ADHD symptoms must produce “clear evidence of clinically significant impairment in social, academic or occupational functioning” (p. 84). That is, the ADHD must disrupt significantly the individual’s schoolwork, employment, and/or relationships with other people.

ADHD is not like pregnancy, where one either does or does not have the characteristics, where there is no “almost” or “a little bit.” ADHD is more like depression, which occurs along a continuum of severity. Everyone occasionally has symptoms of a depressed mood. But being unhappy for a few days does not qualify one for the diagnosis of depression. It is only when symptoms of depression significantly interfere with an individual’s activities over a longer time that he or she is eligible for such a diagnosis.

Moreover, for inattention impairments to be considered a disorder, they not only have to be chronic and impairing, but also have to be present in a cluster. These multiple aspects of inattention constitute a *syndrome*, a grouping of symptoms that often occur together and characterize a specific disorder. Put another way, the impairments described in the examples of Larry and Monica are like a string of Christmas tree lights, each of which may appear separate when viewed from a distance, but are actually linked. And as with Christmas tree lights—certainly the older, less reliable versions—when one flickers or fails, the others usually do the same.

This example of Christmas tree lights is not perfect. Cognitive functions of attention are not wired in series like the old light strings. And they are not simple or discrete as are the separate bulbs. Each attentional function I've described is, in fact, itself a cluster of complex functions. Yet despite the limitations of this metaphor, chronic symptoms of inattention do appear as a syndrome and patients can be successfully diagnosed on the basis of these symptoms. In fact, individuals diagnosed with ADHD, by definition, have chronic impairments in not just a few, but in at least six of the nine inattention symptoms listed in *DSM-IV* and often some of the hyperactive-impulsive symptoms as well. I discuss components of the ADD syndrome in more detail in Chapter 2.

### **ADD Syndrome and Impaired Executive Functions**

For decades the syndrome now known as ADHD was seen simply as a childhood behavior disorder characterized by chronic restlessness, excessive impulsivity, and an inability to sit still. Late in the 1970s it was recognized that these hyperactive children also had significant and chronic problems paying attention to tasks or listening to their teachers. This discovery paved the way for changing the name of the disorder in 1980 from “hyperkinetic disorder” to “attention deficit disorder” and to recognizing that some children suffer from chronic problems of inattention without any significant hyperactivity. That change from an exclusive focus on hyperactivity and impulsive behavior to a primary focus on inattention as the principal problem of the disorder was the first major paradigm shift in understanding this syndrome.

In recent years another major shift in understanding ADHD has been developing. Increasingly researchers are recognizing that the syndrome of ADHD symptoms overlaps with impairments in what neuropsychologists call “executive functions.” F. Xavier Castellanos (1999) pointed this out:

ADHD is not merely a deficit of attention, an excess of locomotor activity or their simple conjunction. . . . The unifying abstraction that best encompasses the faculties principally affected in ADHD has been termed executive function (EF), which is an evolving concept . . . there is now impressive empirical support for its importance in ADHD. (p. 179)

The concept of executive functions refers not to corporate activities of business executives, but to facets of the cognitive management functions of the brain. Although there is not yet an established consensus definition of executive functions, most researchers agree that the term should be used to refer to brain circuits that prioritize, integrate, and regulate other cognitive functions. Executive functions, then, manage the brain’s cognitive functions; they provide the mechanism for “self-regulation” (Vohs and Baumeister 2004).

### **A Metaphor for Executive Functions**

Imagine a symphony orchestra in which each musician plays his or her instrument very well. If there is no conductor to organize the orchestra and start the players together, to signal the introduction of the woodwinds or the fading out of the strings, or to convey an overall interpretation of the music to all players, the orchestra will not produce good music.

Symptoms of ADD can be compared to impairments not in the individual musicians, but in the orchestra’s conductor. As is clear in the cases of Larry and Monica, persons diagnosed with ADD usually are able to pay attention, to start and stop their actions, to keep up their alertness and effort, and to utilize their short-term memory effectively when engaged in certain favorite activities. This successful functioning of persons with ADD in preferred activities indicates that these people are not totally unable to exercise attention, alertness, or effort. They can play their instru-

ments very well—sometimes. The problem of persons with ADD lies in their chronic inability to activate and manage these functions in the right way at the right time. Impairment lies not at the level of the individual musicians (those functions work perfectly well under certain circumstances), but at the level of the conductor, who has to start and guide all of the individual players.

This notion that the core attentional problems in ADD are impairments of executive functions is quite different from William James's "spotlight" concept of attention. The new paradigm describes the complex and rapidly shifting integration of multiple aspects of attention to achieve multiple tasks. Yet this notion does resonate with James's description of attention as "withdrawal from some things in order to deal effectively with others." The concept of executive functions is a way of describing how the brain's various cognitive functions are managed—by being continually shifted and reconfigured—to "deal effectively" with the moment-by-moment demands of life.

One way to consider this broader view of attention as executive functions is to observe situations where tasks are not dealt with effectively. Martha Bridge Denckla (1996) has written about patients with high intelligence and no specific learning disabilities who have chronic difficulties in dealing effectively with tasks. She compares these persons to a disorganized cook trying to get a meal on the table.

Imagine a cook who sets out to cook a certain dish, who has a well-equipped kitchen, including shelves stocked with all the necessary ingredients, and who can even read the recipe in the cookbook. Now imagine, however, that this individual does not take from the shelves all the ingredients relevant to the recipe, does not turn on the oven in a timely fashion so as to have it at the proper heat when called for in the recipe, and has not defrosted the central ingredient. This individual can be observed dashing to the shelves, searching for the spice next mentioned in the recipe, hurrying to defrost the meat and heat the oven out of sequence. Despite possession of all equipment, ingredients

and recipe, this motivated but disheveled cook is unlikely to get dinner on the table at the appointed hour. (p. 264)

The “motivated but disheveled cook” sounds very much like a person with severe ADD who tries to accomplish a task, but is unable to “get it together.” Individuals with ADD often describe themselves as intensely wanting to accomplish various duties for which they are unable to activate, deploy, and sustain the needed executive functions.

### **Executive Functions and Intelligence**

Denckla introduced her tale of the disorganized cook as an example of impairment seen in some patients who have “excellent intelligence” (p. 264). This comment is important because it indicates that such disorganization can be independent of general intelligence. It is quite possible for an individual to be extremely bright on standard measures of intelligence and still have severe impairments of executive functions such as those often seen in ADD.

I have evaluated persons with a wide range of intellectual abilities. Some of my patients diagnosed with ADD are extremely bright, employed as university professors, research scientists, physicians, attorneys, and senior executives in business. The intellectual abilities of others are distributed across the high-average, average, and low-average ranges of IQ. An individual’s overall level of “smarts” as measured by standard IQ tests appears to have very little to do with whether they meet the diagnostic criteria for ADD.

### **Executive Functions and Awareness**

A forty-three-year-old man came to my office with his wife to be evaluated for attentional problems. Both of the couple’s children had recently been diagnosed with ADD and had benefited from treatment. When I explained that most children diagnosed with ADD have a parent or other close relative with ADD, both parents laughingly announced, “Those apples haven’t fallen far from the tree.” All agreed that the father had more ADD symptoms than either of the children. Here’s how the wife described her husband:

Most of the time he's totally spaced out. Last Saturday he set out to fix a screen upstairs. He went to the basement to get some nails. Downstairs he saw that the workbench was a mess so he started organizing the workbench. Then he decided he needed some pegboard to hang up the tools. So he jumped into the car and went to buy the pegboard. At the lumberyard he saw a sale on spray paint, so he bought a can to paint the porch railing and came home totally unaware that he hadn't gotten the pegboard, that he had never finished sorting out the workbench, and that he had started out to fix the broken screen that we really needed fixed. What he needs is a lot more awareness of what he is doing. Maybe that medicine our kids are taking can give him that.

From this wife's description one might conclude that the central problem of ADD is essentially a lack of sufficient self-awareness. She seems to believe that if only her husband were more steadily aware of what he is doing, he would not be so disorganized, jumping from one task to another without completing any single one. But most people do not require constant self-awareness to complete routine tasks. For most people, most of the time, operations of executive functions occur automatically, outside the realm of conscious awareness. For example, while driving a car to the local supermarket, experienced drivers do not usually talk themselves through each step of the process. They do not have to say to themselves: "Now I put the key in the ignition, now I put my foot on the brake, now I turn on the engine, now I check my mirrors and prepare to back out of my driveway," and so on. Most experienced drivers move effortlessly through the steps involved in starting the car, negotiating traffic, navigating the route, observing traffic regulations, finding a parking place, and parking the car. In fact, while they do these complex tasks they may be tuning their radio, listening to the news, thinking about what they intend to fix for supper, and carrying on a conversation with a passenger. Effective execution of multiple and concurrent tasks involved in driving to the supermarket requires extensive use of executive functions, most of which operate without any conscious effort. Many other routine tasks of daily life—for example, preparing a meal, shopping for groceries, doing homework, or par-

icipating in a meeting—involve similar self-management in order to plan, sequence, monitor, and execute the complex sequences of behavior required. Yet for most actions, most of the time, this self-management operates without full awareness or deliberate choice. The problem of the “unaware” husband is not that he fails to think enough about what he is doing. The problem is that the cognitive mechanisms that should help him stay on task, without constantly and consciously weighing alternatives, are not working effectively.

Gerald Edelman and Giulio Tononi (2000) have described how much of our cognitive life

is the product of highly automated routines. When it comes to talking, listening, reading, writing or remembering, we are all like accomplished pianists. When we read, all kinds of neural processes are going on that allow us to recognize letters irrespective of the font and size, to parse them into words, to enable lexical access and to take care of syntactic structure. There was certainly a time in which we had consciously to learn about letters and words in a laborious way, but afterward these processes become effortless and automatic. . . .

This pervasive automatization in our adult lives suggests that conscious control is exerted only at critical junctures, when a definite choice or a plan has to be made. In between, unconscious routines are continuously triggered and executed so that consciousness can float free of all these details and proceed to plan and make sense of the grand scheme of things . . . only the last levels of control or of analysis are available to consciousness, while everything else proceeds automatically. (pp. 57–58)

Even the simpler example of keyboarding on a computer illustrates the point. If one can type fluently without stopping to consciously select and press each individual key, one’s mind is left free to formulate ideas and to convert these into words, sentences, and paragraphs that can convey ideas to a reader. Interrupting one’s writing to focus on and press keys one at a time costs too much time and effort; it cannot be done very often

if one is to write productively. Grainne Fitzsimons and John Bargh (Fitzsimmons and Bargh 2004, Bargh 2005) have summarized research showing that progress on many complex tasks rests on one's ability to carry out most of the task using such "automatic self-regulation."

### **Executive Functions and the Brain's Signaling System**

Recognition of the amazing fact that executive functions generally operate without conscious awareness offers an important caveat to my use of the orchestra conductor as a metaphor for executive functions. Some might take my metaphor literally and assume that there is a special consciousness in the brain that coordinates other cognitive functions. One might picture a little man, a homunculus, a central executive somewhere behind one's forehead, exercising conscious control over cognition like a miniature Wizard of Oz. Thus, if there is a problem with the orchestra's playing, one might attempt to speak to the conductor, requesting or demanding needed improvements in performance.

Indeed, this presumed "conductor" or controlling consciousness is often the target of encouragement, pleas, and demands by parents, teachers, and others as they attempt to help those who suffer from ADD. "You just need to make yourself focus and pay attention to your schoolwork the way you focus on those video games you love to play!" they say. "You've got to wake up and put the same effort and energy into your studies that you put into playing hockey!"

Those who care about persons with ADD and witness their poor performance in important tasks routinely prod them to deal with their "impotence" in the face of those tasks by insisting: "Just make yourself do it! We can all see that you have the ability. It's just a matter of realizing what is really important and exercising willpower!" Alternatively, they may impose punishments on the person with ADD or shame them for their failure to "make themselves" do consistently what they ought to do. These critics seem to assume that the person with ADD needs only to speak emphatically to the "conductor" of their own mental operations to get the desired results.

But in reality there is no conscious conductor within the human brain. Further, each individual can only use what is made available by his

or her own neural networks. If the person's neural networks for executive functions are impaired, as they are in ADD, then that individual is likely to be proportionally impaired in the management of a wide range of cognitive functions regardless of how much he or she may wish otherwise.

There is now considerable evidence that persons appropriately diagnosed with ADD suffer from significant impairments in executive functions of the brain. These functions are not all localized in a single area of the brain; they are decentralized, with many supported by complex networks within the prefrontal cortex. Some essential components of executive functions are supported by the amygdala and other subcortical structures, while other executive functions depend on the reticular formation and portions of the cerebellum located in the posterior of the brain. Figure 3 in Chapter 3 shows these and other critical regions and structures of the brain.

Complex neuronal networks link the various structures in the brain that sustain executive functions. Rapid-fire messages of input and output travel these networks via low-voltage electrical impulses that can traverse the entire system in much less than a millisecond. The efficient movement of these electrical impulses along the network depends on the rapid release and reuptake of neurotransmitter chemicals, which carry each message across synapses, or the connections between neurons, much as a spark jumps the gap of a sparkplug.

To do this work, each of the 100 billion neurons in the brain depends on one of the fifty or so neurotransmitter chemicals manufactured within the brain. Without the effective release and reuptake of the needed neurotransmitter chemical, that portion of the neural network cannot effectively carry its messages. There is now considerable evidence that executive functions of the brain impaired in ADD depend primarily, though not exclusively, on two particular neurotransmitter chemicals: dopamine and norepinephrine.

The most persuasive evidence for the importance of these two transmitter chemicals in ADD impairments comes from medication treatment studies. Over two hundred well-controlled studies have demonstrated effectiveness of stimulant medications in alleviating symptoms of ADHD. Al-

though these medications are not effective for all persons with ADHD, they work effectively to alleviate ADHD symptoms for 70 to 80 percent of those diagnosed with this disorder. And the medications used to treat ADHD symptoms tend to alleviate many symptoms of ADHD simultaneously.

The primary action of medications used for ADD is to facilitate release and to inhibit reuptake of dopamine and norepinephrine at neural synapses of crucially important executive functions. As Antonio Damasio (1994) emphasized,

Without basic attention and working memory there is no prospect of coherent mental activity. . . . They are necessary for the process of reasoning, during which possible outcomes are compared, ranking of results are established, and inferences are made. (p. 197)

ADD medications help to release dopamine or norepinephrine across the synaptic gap between neurons and to hold it there long enough to pass the message along. Medications that do not act powerfully to facilitate release and to block reuptake of dopamine and norepinephrine tend not to be effective in alleviating ADD symptoms.

Improvement produced by stimulants generally can be seen within thirty to sixty minutes after an effective dose is administered. When the medication has worn off, ADD symptoms generally reappear at their former level. Stimulants thus do not cure ADD symptoms; they only alleviate them while each dose of medication is active. In this sense, taking stimulants is not like taking doses of an antibiotic to wipe out an infection; it is more like wearing eyeglasses that correct one's vision while the glasses are being worn, but do nothing to fix one's impaired eyes. This effect has been demonstrated repeatedly in over two hundred medication treatment studies that were double-blind: that is, neither the doctors nor the patients knew during the study who was being given real stimulant medication and who was being treated with placebos.

Given the often dramatic alleviation of ADD symptoms experienced by 70 to 80 percent of persons diagnosed with ADHD when they take stimulant medications, it is very difficult to sustain the notion that ADHD

impairments are a matter of a lack of willpower. Prior to beginning medication treatment most ADHD patients have made heroic, though often erratic, efforts to improve their situation with willpower alone. Usually such efforts barely work, if at all, and cannot be sustained.

Some argue that improvement in ADD symptoms requires not only willpower, but also intensive behavioral treatments. Results of a major study sponsored by the National Institute of Mental Health (MTA, 1999) challenged this assumption. In the study, 576 children diagnosed with ADHD were randomly assigned to one of four groups, which received either:

- Comprehensive behavioral treatment with no medication,
- Carefully managed medication treatment with no other treatment,
- A combination of comprehensive behavioral treatment with medication management, or
- Community treatment with a pediatrician or another caregiver of the family's choice.

The results of this study were striking. Stimulant medication alone, carefully monitored for each child, was of significantly greater help than the best battery of behavioral supports that could be developed without medication. More surprising, children who received the combined treatment (medication and comprehensive behavioral treatment) showed no better improvement of their core ADHD symptoms than did children treated only with carefully managed medications. Combined treatments were more helpful with some related problems, but nonmedication treatments, even at their best, did not improve the core symptoms of ADHD anywhere near as much as did the carefully monitored medication treatment. This study, described with many others in Chapter 9, stands as powerful evidence that impairments of attention and memory associated with ADHD result primarily from malfunctions in parts of the brain's neural networks that depend on the chemicals dopamine and norepinephrine.

Much more remains to be learned about how the brain's complicated neural networks operate to sustain the broad range of functions encompassed in "attention." Yet it is clear that impairments of executive func-

tions, those brain processes that organize and activate what we generally think of as attention, are not the result of insufficient willpower. So in fact there is an answer to the mystery of inattention illustrated by the experiences of Larry and Monica. Neural chemical impairments of the brain's executive functions cause some individuals who are good at paying attention to specific activities that interest them to have chronic impairment in focusing for many other tasks, despite their wish and intention to do otherwise.