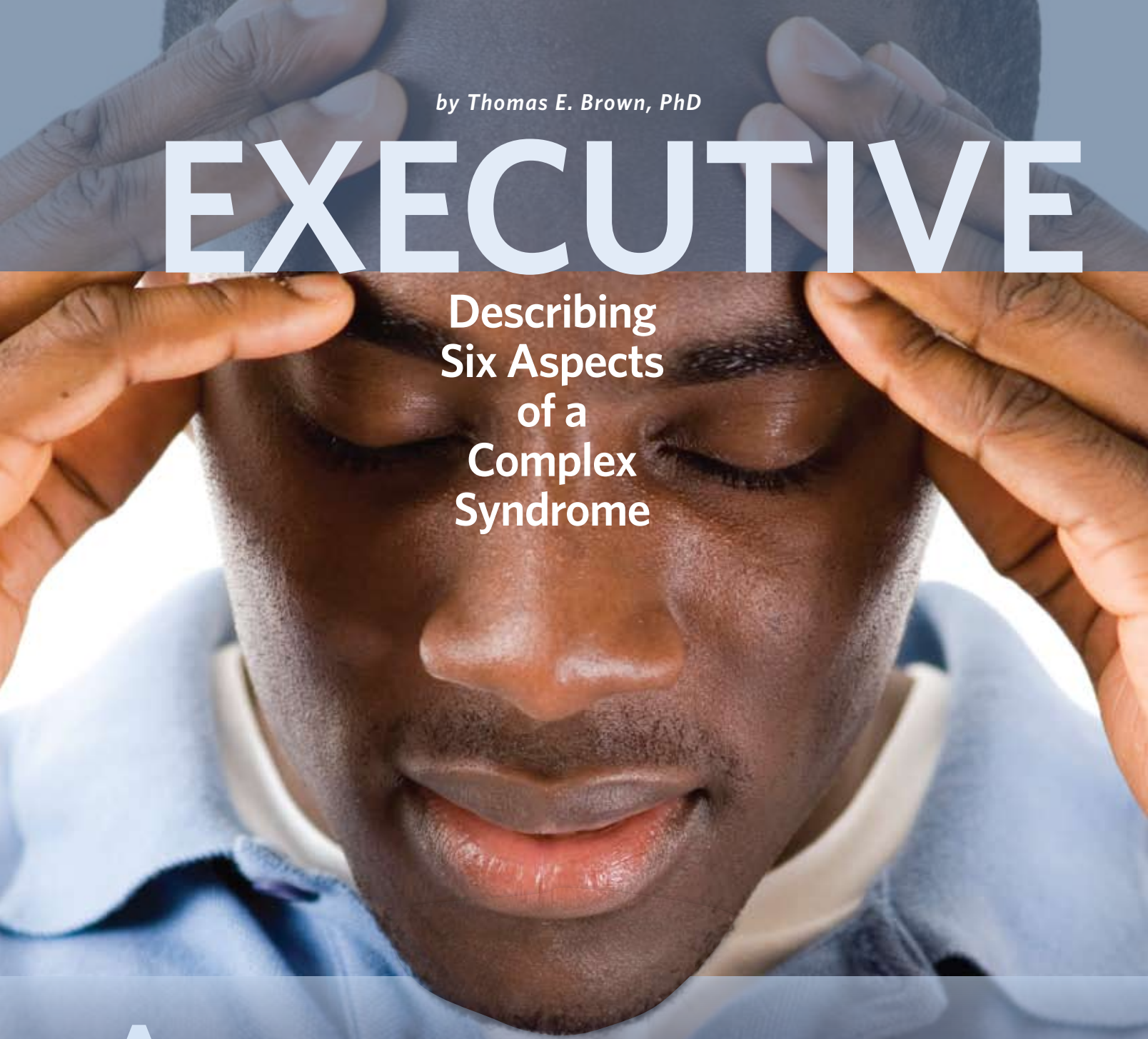


by Thomas E. Brown, PhD

EXECUTIVE

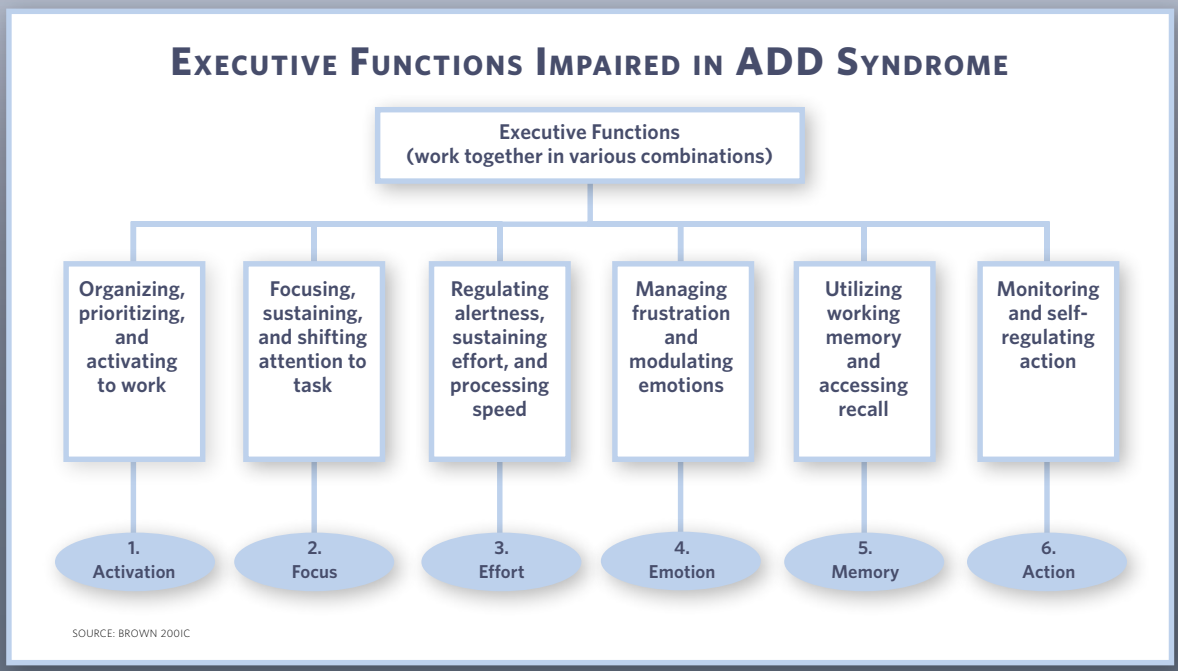
Describing Six Aspects of a Complex Syndrome

ATTENTION IS AN INCREDIBLY COMPLEX, MULTIFACETED FUNCTION of the mind. It plays a crucial role in what we perceive, remember, think, feel, and do. And it is not just one isolated activity of the brain. The continuous process of attention involves organizing and setting priorities, focusing and shifting focus, regulating alertness, sustaining effort, and regulating the mind's processing speed and output. It also involves managing frustration and other emotions, recalling facts, using short-term memory, and monitoring and self-regulating action.

Observing the problems that result when attention fails has allowed me to notice the effects of attentional processes on multiple aspects of daily life. Documenting the interconnected improvements that occur when attentional impairments are effectively treated has shown me the subtle but powerful linkages between attention and multiple aspects of the brain's management system. All of these observations have led me to conclude that attention is essentially a name for the integrated operation of the executive functions of the brain.

Each cluster of my model (see chart) encompasses one important aspect of the brain's executive functions. Although each has a one-word label, these clusters are not single qualities like height, weight, or temperature. Each cluster is more like a basket encompassing related cognitive functions that depend on and interact continuously with the others, in ever-shifting ways. Together these clusters describe executive functions, the management system of the brain.

FUNCTIONS



Until we know much more about underlying neural processes, any descriptive model is likely to be a bit arbitrary. But regardless of how the clusters are arranged, these executive functions tend to operate in an integrated way. Most persons diagnosed with ADHD report significant chronic difficulties in at least some aspect of each of these six clusters. Impairments in these clusters of cognitive functions tend to show up together; they appear clinically to be related.

When an individual with ADD is treated with appropriate medication and shows significant improvement in one of these six clusters, some significant improvement is usually seen in aspects of the other five clusters as well.

Since these clusters of symptoms often appear together in persons diagnosed with ADD and often respond together to treatment, it seems reasonable to think of these symptoms of impairment as a "syndrome." Because this syndrome consists primarily, though not exclusively, of symptoms associated with the disorder currently classified as attention-deficit hyperactivity disorder, I refer to it as "ADD syndrome." Taken together, the six clusters in this model describe my understanding of the executive functions of the brain.

CLUSTER 1: Organizing, Prioritizing, and Activating for Tasks

Although many people associate ADD with impulsive and hyperactive behavior where affected individuals are too quick to speak or act, difficulties in getting started on tasks are a primary complaint of many individuals with ADD syndrome. Though they may be impulsive in some domains of activity, those with this syndrome often complain that procrastination is a major problem, particularly when they are faced with tasks that are not intrinsically interesting. Often these individuals lament that they keep putting off important tasks until the task has become an emergency. Only when faced with dire consequences in the very immediate future are they able to get themselves motivated enough to begin.

Many persons with ADD report that they often are aware of specific tasks they need, want, and intend to do, but are unable to get themselves to begin the necessary actions. Often these are routine tasks such as completing homework assignments, laundering clothes, or submitting invoices or expense account reports to obtain reimbursement. Or they may be important, less common tasks like completing a thesis for a degree, asking for a raise or promotion, or filing income tax returns on time.

The continuous process of attention involves organizing and setting priorities, focusing and shifting focus, regulating alertness, sustaining effort, and regulating the mind's processing speed and output. It also involves managing frustration and other emotions, recalling facts, using short-term memory, and monitoring and self-regulating action.


SHUTTERSTOCK

Persons with ADD syndrome often complain that they have much more difficulty than most others in sorting out and assigning priorities to various tasks. Many routines of our daily life involve organizing, prioritizing, and sequencing jobs according to their importance, their urgency, and the availability of resources. Usually, but not always, critical variables include time or money, which cause very practical constraints to quickly come into play.

When they describe specifics of their difficulties with organizing themselves, persons with ADD syndrome often indicate a recurrent failure to notice critical details. Often these difficulties involve failures to estimate time properly or to calculate the relationship between expenditures and income. A similar tendency to ignore realistic limitations is often seen in the "to do" lists kept by some persons with ADD syndrome. Though they may be very intelligent about other things, many seem clueless about how many tasks they can actually accomplish within a single day or week. Many create lists with thirty or more items for a single day, some of which are time-consuming projects that no one could actually accomplish in a month. They seem to have great difficulty figuring out how long a task will take and then prioritizing by putting some items ahead of others, deferring some to another day, or simply recognizing some as currently not possible.

CLUSTER 2: Focusing, Sustaining, and Shifting Attention to Tasks

One of the most common complaints of persons with ADD syndrome is that they cannot focus their attention on a task and keep focusing as long as necessary. Sometimes their problem is one of selection. They find it very hard to focus on the particular stimulus that requires attention: the voice on the telephone or the words printed on the page.

Another facet of the problem of not being able to focus on an intended task is excessive distractibility. Even when they have focused on a task, whether reading, listening, or trying to do some other work, persons with ADD syndrome often feel themselves drawn away by distractions. Like anyone else they see and hear things going on around them and they have many thoughts continually going through their head. But unlike most others, who readily block out distractions in order to do what needs to be done, persons with ADD syndrome have chronic and severe difficulty screening out those distracting stimuli. They cannot ignore the myriad thoughts, background noises, and perceptions in the surrounding environment.

This is not simply a problem of immaturity. Children and adolescents have no monopoly on excessive distractibility, and the problem is not limited to students sitting in boring classrooms. Many adults with ADD syndrome report persistence of this problem, which can cause trouble in their jobs, driving, and social relationships.

The same individuals who have chronic difficulty with getting distracted and drifting off task report that they sometimes have the opposite problem: they are unable to stop focusing on one thing and redirect their focus to another when they need to. Some call this "hyperfocus." They describe it as "locking on" to some task, sight, or sound they are interested in while totally ignoring or losing track of everything else, including some things they ought to attend to, like looking ahead while driving the car or answering someone who has directly spoken to them. Many persons with ADD syndrome report that they get stuck in this way while using their computer. Sometimes it occurs in conversation. Some persons with ADD syndrome report similar problems in writing.

Maintaining effective attention requires the ability to select the most important of countless external and internal stimuli—and screen out those that intrude on awareness. Yet it also requires the ability to shift one's focus of attention as needed, to attend to other words, images, sounds, feelings, topics, and matters. People with ADD syndrome often report chronic difficulty in focusing their attention, in sustaining their focus of attention, and in shifting their focus of attention as needed to meet the demands of learning, work, social interactions, and the countless tasks of daily life. As in the other clusters of symptoms described here, these difficulties occur occasionally for everyone. But for persons with ADD syndrome they seem to be more persistent, pervasive, and problematic.

CLUSTER 3: Regulating Alertness, Sustaining Effort, and Processing Speed

Many with ADD syndrome report that they frequently become very drowsy—to the point where they can hardly keep their eyes open—when they have to sit still and be quiet. Some describe themselves as "borderline narcoleptic." Usually this is not a problem when they are physically active or actively engaged in conversation. But it can pose serious difficulties when they are trying to listen to a lecture or proceedings of a meeting. Getting drowsy is especially problematic when they try to read, particularly if what they are reading is not especially interesting to them. Similar difficulties occur for many when they sit down to write an essay or report. Some report the same drowsiness when they are driving long distances on a highway, without the stimulation of having to negotiate heavy traffic or the possibility of observing many people.

From clinical descriptions, it appears that this problem of drowsiness when sitting still and being quiet is related not to being overtired, but rather to chronic difficulties in sustaining alertness. It is as though individuals with ADD syndrome cannot stay alert unless they are engaged actively in a behavior that provides steady motoric, social, or cognitive feedback.

Though the problem of daytime drowsiness afflicts many with ADD syndrome even when they are not tired, heavy eyelids sometimes appear for a different reason. Many with ADD syndrome report that they are often tired during the day because they have chronic and severe difficulties in settling into sleep, even when they are very tired and want to fall asleep. This is the opposite pole of the same problem: difficulty in regulating alertness.

Even when they do expend significant effort, many persons with ADD syndrome report that they require an extraordinarily long time to complete certain types of tasks because of a tediously slow processing speed. They often complain that it takes them a particularly long time to read and write. Sometimes slow processing time in reading results from the need to reread repeatedly. In writing, the problem of excessive slowness may be due to the getting-stuck problem (also known as "sticky perseveration"). But for many with ADD syndrome, there is a chronic problem with slow processing speed that is different from these earlier described difficulties. Mel Levine (2003) has described this output problem in written expression; he laments that many with such difficulties are seen as lazy, when they actually are impaired in their ability to coordinate and integrate the multiple skills required for writing.

Although individuals with ADHD often have a slow processing speed for certain tasks, in other situations many have trouble slowing themselves down enough to minimize errors. Boys with ADHD studied by Virginia Douglas (1999) were both too slow and too fast. Their reaction times for some cognitive tasks were too slow, but on other, more demanding tasks they had difficulty slowing themselves down enough to perform carefully. They were unable to regulate their processing speed appropriately for changing task demands.

CLUSTER 4: Managing Frustration and Modulating Emotion

The diagnostic criteria for attention-deficit hyperactivity disorder in the DSM-IV do not include any items referring to emotions. Yet many clinicians report that patients with ADHD struggle with managing their emotions. My own clinical research on children, adolescents, and adults has led to similar conclusions. ADD symptom rating scales I have developed from studying each of these age groups include a cluster of symptoms related to managing frustration and modulating emotions. In analyzing reports from patients with ADHD, I have found that their problems with emotions seem to fall into two closely related types: a very low threshold for frustration, and chronic difficulty in regulating subjective emotional experience and expression.

Most persons diagnosed with ADHD report
significant chronic difficulties in at least some aspect of each of these six clusters.
Impairments in these clusters of cognitive functions tend to show up together;
they appear clinically to be related.

Many with ADD syndrome report disproportionate emotional reactions to frustration: a short fuse, a low threshold for irritability. Many with ADD syndrome describe the following aspect of emotional experience: a feeling that an emotion floods one's mind, taking up all available space. This overwhelming intensity of feeling then can cause one to lose perspective and become, for a few moments or much longer, so preoccupied with that particular feeling that other relevant thoughts and feelings are displaced, ignored, or overlooked. The immediacy of the emotion then can have too much influence on thought and action, causing one to speak or act in ways that don't adequately take account of other feelings, ideas, or information that may also be important.

Many with ADD syndrome describe themselves as "overly sensitive" and reacting too intensely to even minor slights or criticism. Some others report that they often have difficulty modulating feelings of sadness, discouragement, or depression.

Some with ADD syndrome also meet full criteria for another disorder that more directly reflects problems with managing one or more emotions, for example, an anxiety, depressive, or bipolar mood disorder. At issue with these various examples is simply that persons with ADD syndrome, with or without any additional psychiatric disorder, tend to suffer from chronic problems in managing frustration and other emotions. These chronic problems appear to be an integral aspect of ADD syndrome and not just overlap with other disorders. In addition, like other symptoms of ADD syndrome, they often respond to treatment with stimulants.

CLUSTER 5: Utilizing Working Memory and Accessing Recall

Chronic difficulties with memory appear to be a core problem in ADD syndrome, but the impairments are not generally with long-term storage memory; instead they involve "working memory," a term that has been used in many different ways, most of which are unrelated to the older term "short-term memory." Working memory has several functions. An important one is to hold one bit of information active while working with another. One patient described his impairment of this essential function as lacking a "hold" button in his memory.

Working memory is like a very active computational unit that not only holds information, but also actively processes this current information in connection with the vast files of longer-term memory. In other words, working memory might be compared to the RAM of a computer combined with its file manager and search engine.

Impairments of working memory can interfere with both receptive and expressive aspects of communication between individuals and within groups. Maintaining reciprocal communication is difficult when working memory function is impaired, and is a common complaint among persons with ADD syndrome.

Another aspect of working memory involves the retrieval of information from the files of longer-term memory. Defective retrieval of learned information is a distinct type of memory problem. Persons with ADD syndrome often complain that they have chronic difficulty pulling up from the files of longer-term memory the information needed to do a task at hand. Sometimes the problem is recalling the name of someone whose face has just been recognized as familiar. Sometimes the problem lies in retrieving information or procedures needed to answer a question or solve a problem.

Many aspects of academic work depend heavily on the effective functioning of working memory. When reading, one needs to hold in mind the sounds symbolized by the first part of a word while decoding the sound of later syllables to recognize the word as a whole. One then has to retrieve from memory the meanings associated with that word and hold those in mind while linking them to meanings of other words to get the full meaning and context of the entire sentence. This process happens automatically for fluent readers as they rapidly link up and absorb layers of meaning built on words, sentences, paragraphs, chapters, and so on. Persons whose working memory is significantly impaired, however, may experience great difficulty in understanding an entire text, even if they are quite competent in decoding each word. Reading comprehension is built on the effective functioning of working memory in conjunction with an active, sustained attention to the text.

Working memory is also essential for doing math, even simple arithmetic. If one cannot keep in mind what quantities have been borrowed or need to be carried from one column to another in calculations, one's answers are not likely to be correct. And if one cannot keep in mind the sequence of operations, then much of algebra, geometry, and higher math becomes incomprehensible. Written expression also places strong demands on working memory. There has not been much research on students who have problems with written expression, but preliminary studies indicate that persons with ADHD demonstrate a disproportionately high incidence of impairment in this respect.

Working memory is involved not only in academic tasks, but also in countless aspects of everyday life, as one holds briefly in mind the continuing flow of perceptions of current external events—sounds just heard, images just observed, impressions just formed. Problems with integrating internal and external information can have a substantial influence on one's ability to link new information being acquired with other information already in mind.

The difference between problems of working memory and problems of insufficient attention has been a matter of debate among researchers. Neuroscientists studying memory functions have argued that what is currently referred to as working memory is not simply a memory unit of the mind, but a complex system that involves both "working attention" and "working memory" serving together to manage the continuous flow of information in the mind. Chronic impairments in this complex system are an important aspect of the ADD syndrome.

THE EXTRACTS IN THIS ADAPTATION were used with permission from Thomas Brown's book, *Attention Deficit Disorder: The Unfocused Mind in Children and Adults* (Yale University Press, 2005). *Attention* retains the style used in the book, i.e., ADD and ADHD, rather than house style, which is AD/HD.

CLUSTER 6: Monitoring and Self-Regulating Action

Most descriptions of the disorder now known as ADHD emphasize problems with hyperactive and impulsive behavior. Many persons identified with this disorder tend to act without sufficient forethought, or are chronically restless and hyperactive, finding it very difficult to slow down and accurately control their actions. Children with ADHD have often been seen as wild, restless, and impulsive, unable sufficiently to control their words and bodies and so needing much more supervision from teachers and parents than others of the same age.

Researchers have identified "impaired ability to inhibit" as a core problem in these hyperactive and impulsive symptoms of ADHD. Russell Barkley (1997) has argued that impairment of the ability to inhibit is the primary problem of persons with ADHD, and, of all the executive functions impaired in the disorder, is the one on which the development and effective functioning of all other executive functions depends.

Yet to overemphasize inhibition as the central problem of ADHD is to ignore the essential connection between holding back actions and engaging in actions. It is to overlook the need to "go," which is as important as the need to hold back or stop. Certainly it is important for a person to be able to stop at the curb rather than impulsively running across a busy street. But it is also important for that person to be able to monitor the traffic on the street, to determine when it is safe to cross, and then to actually cross. Indeed, most behaviors require the ability to act, to "do it," as well as the ability to inhibit, to refrain from acting. And essential to one's success in this regard is the ability to monitor the context of action, in this case, the traffic, so that one can decide when to wait and when to cross the street.

Social situations are often among the most challenging for those with difficulties monitoring and self-regulating their actions. In those circumstances, one must quickly assess the expectations and perceptions of other persons in order to behave appropriately. When is it okay to tell this joke, or to complain about an injustice, or to confront one's boss, teacher, coworker, customer, parent, spouse, child, or friend? Because persons with ADD syndrome find it harder to monitor effectively the context in which they are operating, they report that they tend to be too random in what they notice, attending too much to some details and too little to others that may be equally or more important. Especially difficult for these persons are those situations where one has to monitor and gauge the emotions and intentions of other people with whom one is interacting. Indeed, often persons with ADD syndrome complain that they have gotten into trouble because they have failed to notice how others were reacting to them, or have been insufficiently aware of how they themselves were coming across to others. This monitoring is made even more difficult when one is simultaneously holding in check one's own reactions while interacting with others.

Some other persons with ADD syndrome have a different problem. They tend to be excessively focused on how others are reacting and are excessively self-conscious. They tend to be too constricted, too shy, too inhibited in their social actions. These persons often cannot bring themselves to act effectively in a group.

Although there are a variety of ways in which individuals experience difficulty in monitoring and regulating their actions, most with ADD syndrome report chronic difficulties in one or more aspects of inhibiting action, monitoring one's self, monitoring one's context, and taking action in an appropriate way. This cluster of ADD-related impairments extends far beyond simple excesses of hyperactive or impulsive behavior: these problems hamper one's ability to perform well in a wide variety of everyday tasks. Ⓐ

Thomas E. Brown, PhD, *is assistant clinical professor of psychiatry at the Yale University School of Medicine and associate director of the Yale Clinic for Attention and Related Disorders. He is a former member of CHADD's professional advisory board.*

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Brown Attention-Deficit Disorder Scales for Children

Narrative and Graphical Report

Child's Name: Matthew Thompson **ID:** _____

Sex: Male **Date of Birth:** 03/08/1997 **Report Date:** 07/13/2004

This report for Matthew presents *T* Scores derived from raters using the Brown Attention-Deficit Disorder Scales for Children. The Brown Scales indicate how much difficulty a child is reported as having on a wide variety of cognitive functions that are associated with Attention-Deficit/Hyperactivity Disorder (AD/HD). These scores alone cannot determine whether a child does or does not have AD/HD, but they can indicate what problems are prominent and whether the reports suggest AD/HD is likely, so that a comprehensive evaluation for AD/HD and other possible learning, emotional or behavioral problems should be done. Raters included in this report are listed below along with the type of form completed, the date the form was completed, and the age of the child at the time that each rater form was completed.

Completed By	Form Type	Date Completed	Child's Age at Completion Date
George Wilson	Teacher Form-Age (3-7)	7/13/2004	7
Sue Thompson	Parent Form-Age (3-7)	7/13/2004	7

Total Scores

The *T* Scores reported for Matthew by each rater include two total scores that provide an overview of the cluster scores. The ADD Inattention Total Score combines the first five clusters together for an assessment of Matthew's difficulties with inattention aspects of AD/HD. The ADD Combined Total Score combines all six cluster scores, including the Monitoring and Self-Regulating Action cluster score to reflect any reported difficulties Matthew may have with both inattention and hyperactivity aspects of AD/HD.

Suggested ranges for clinical interpretation of all of the *T* scores are as follows:

If *T Score* ≥70	Markedly atypical, very significant problem
If *T Score* ≥60 and <70	Moderately atypical, significant problem
If *T Score* ≥55 and <60	Somewhat atypical, probably significant problem
If *T Score* ≥45 and <55	Average Range, possibly significant concern

Child's Name: Matthew Thompson **ID:** _____

Sex: Male **Date of Birth:** 03/08/1997 **Report Date:** 07/13/2004

Cluster Scores

This report includes Cluster *T* Scores for each rater form selected. Difficulties reflected by each of the Cluster *T* Scores are described below.

Cluster 1 ***Organizing, Prioritizing and Activating to Work***: Items in this cluster tap for excessive difficulties in getting organized and getting started on work-like tasks, activities not usually chosen for pleasure. For younger children these tasks include mainly following directions and completing daily routines such as getting dressed, picking up toys, etc. For older children items ask about difficulties in organizing homework and getting started on assignments. For older children, items inquire about excessive procrastination, difficulty in prioritizing and completing assignments, etc. along with undue problems in waking up and self-activating for daily routines.

Cluster 2 ***Focusing, Sustaining and Shifting Attention to Tasks***: These items query for chronic problems in sustaining attention and focus for tasks, or in shifting attention as needed from one focus to another. For younger children items ask about excessive need for adults to ask the child to stop and listen, problems in listening to stories when being read to, and difficulties in making transitions from one activity to another. For older children problems include excessive distractibility and difficulty in grasping the main idea when trying to read. Older children are queried about excessive daydreaming, and need to re-read texts in order to understand required readings.

Cluster 3 ***Regulating Alertness, Sustaining Effort and Processing Speed***: This cluster assesses problems in staying alert and in sustaining sufficient effort for work-related tasks. It also asks about slow processing of information, inadequate task completion, and inconsistent performance. For younger children this includes need for excessive prodding to eat meals, get ready for bed, etc. and giving up too quickly when trying to learn a new task. For older children items include difficulty in completing tasks within allotted time, and needing reminders to complete assignments. Older children are asked about problems with daytime drowsiness, not completing assignments on time, and chronic underachievement.

Cluster 4 ***Managing Frustration and Modulating Emotions***: Items in this cluster assess difficulties with regulating emotional reactions so that frustrations, worries, anger, hurt feelings, sadness, etc. do not take over too much of what the individual is thinking or doing. Children in each group are evaluated for chronic problems, relative to others of the same age, in reacting to frustrations with excessive irritability, having feelings hurt too easily, having work disrupted by excessive worries, or getting overly discouraged and depressed.

Cluster 5 ***Utilizing Working Memory and Accessing Recall***: These items inquire about forgetfulness in daily routines and problems in recall of learned material. For younger children, items assess difficulties in remembering directions, in remembering daily routines, and problems in recalling basic learning. Older children are asked about difficulties following through on intended actions, losing track of belongings, and problems in memorizing vocabulary or math facts. They are also asked about problems in keeping track of assignments, and chronic difficulty in recalling learned material.

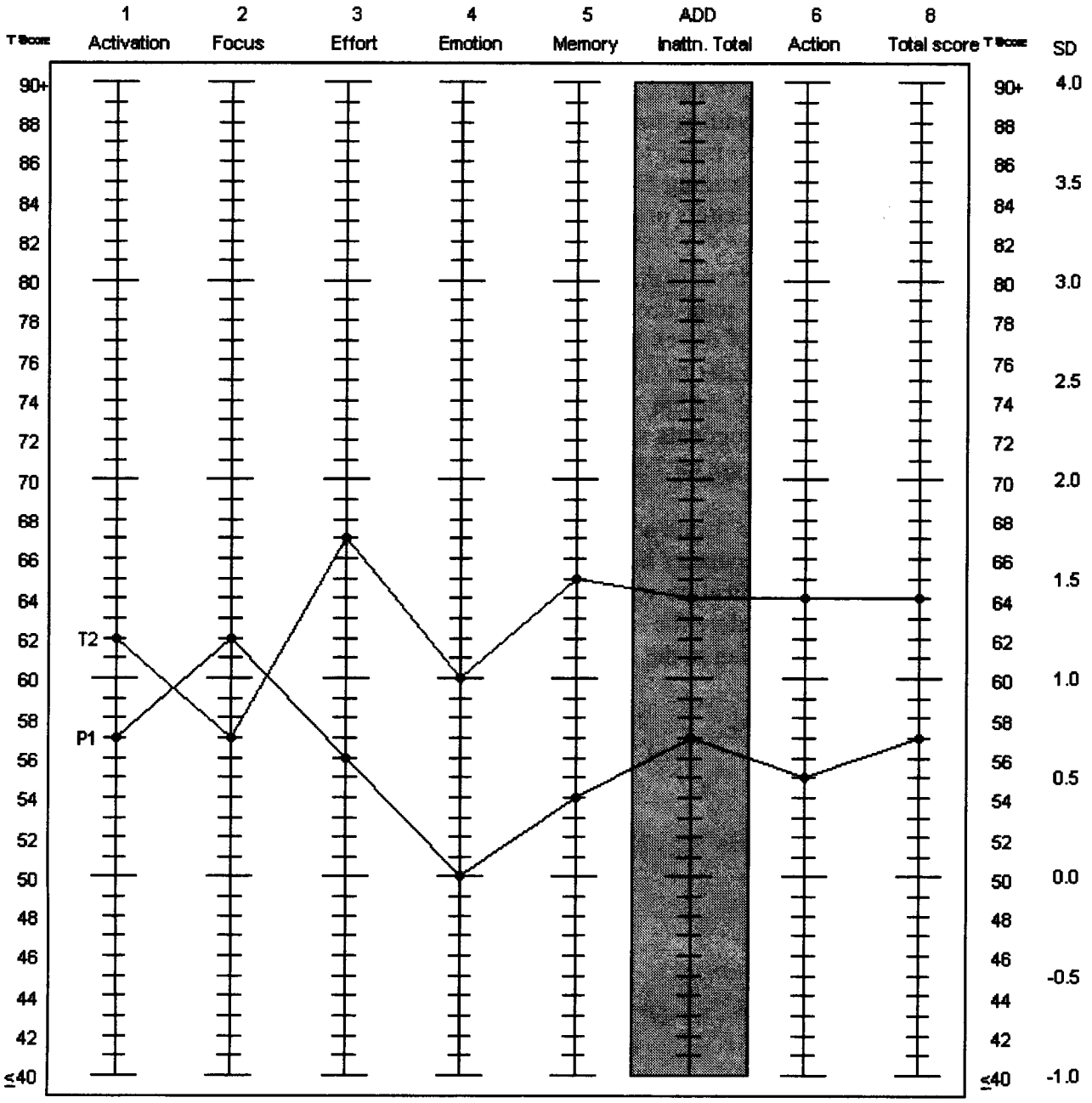
Cluster 6 ***Monitoring and Self-Regulating Action***: Items in this cluster inquire about problems in sizing up situations to recognize what should be done and in self-regulating actions to do what is appropriate. For younger children this includes butting in or interrupting others and having much more difficulty in waiting for things than do most others of the same age. Older children are asked about doing too much teasing or arguing after being asked to stop, grabbing things or starting actions without waiting for permission or directions, and doing things too fast, not slowing down enough to write letters or numbers carefully.

If more than one type of rater form is displayed in this report, the graphical display will allow the clinician to view cluster and total scores from different perspectives simultaneously (i.e.: Parent, Teacher, and Self Report if the child is 8 years of age or more). Notice whether ratings from different perspectives are similar to or discrepant from each other. For example, do parents and teacher ratings follow a similar pattern of elevation or are different clusters elevated for each? Also, are ratings by different respondents similar (within 10 points of each other), or discrepant (more than 10 points apart)? Also, are all *T* Scores ≥ 55?

If this report displays multiple forms administered to one respondent at different times, you may look at similarities and discrepancies in that respondents ratings at different points in time. If Matthew is in treatment or on medication you would hope to see *T*-Scores obtained more recently to be lower than those obtained before the onset of treatment. Note that data in this report should be interpreted by a qualified clinician in the context of all other relevant information.

Child's Name: Matthew Thompson **ID:** _____

Sex: Male **Date of Birth:** 03/08/1997 **Report Date:** 07/13/2004



CLUSTER and TOTAL SCORES

	Person Completing this Form	Form	Date of Administration	1	2	3	4	5	Inattn	6	Combined
T2	George Wilson	Teacher	07/13/2004	62	57	67	60	65	64	64	64
P1	Sue Thompson	Parent	07/13/2004	57	62	56	50	54	57	55	57

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