

Lack Direction? Evaluate Your Brain's C.E.O.

By RICHARD C. SALTUS

You can be truly smart and still struggle in life if you lack the ability to plan, organize time and space, initiate projects and see them through to completion, and you cannot resist immediate temptations in favor of later better rewards.

When those capacities are damaged or underdeveloped, even people with intelligence and talent may flounder. They are often misunderstood as being willfully disorganized or lazy, possessing a bad attitude or, from a parental viewpoint, "doing this on purpose to drive me crazy."

More and more, however, neuroscientists are saying such puzzling underachievers may suffer from neurological abnormalities affecting "the brain's C.E.O." This control center, really an array of "executive functions," orchestrates resources like memory, language and attention to achieve a goal, be it a fraction of a second or five years from now.

Executive functions "enable you to maintain a mental image of destination," said Dr. Anthony Bashir, a specialist in communications disorders at Emerson College in Boston. A person lacking the functions, another researcher said, behaves in a way that is considered "future-blind."

Until recently, the terms executive function and dysfunction were mainly confined to textbooks and used by neuropsychologists. But now parents and educators are seeing them in evaluations of underperforming children with learning disabilities and conditions like attention deficit hyperactivity disorder. The functions may, in addition, be a part of the problem in people of any age who are markedly disorganized and inefficient and failing in their careers.

Executive dysfunction has in fact become something of a "disability du jour," said Christopher Murphy, an official at Landmark School in Prides Crossing, Mass., which focuses on children who have language-based learning disorders as their primary diagnosis. Not an actual medical diagnosis, the term is freely used like the once-popular "minimal brain dysfunction" or like A.D.H.D.

Executive dysfunction is real, even if the term is sometimes used loosely.

Dr. Martha Bridge Denckla, a neurologist at the Kennedy Krieger Institute at the Johns Hopkins School of Medicine, treats sons and daughters of professional and official workers in the Washington metropolitan region who have executive dysfunction, usually — but not always — in combination with learning disabilities.

"What fascinates me is kids who attend good schools, go off to college with perfect SAT's and then flunk out in their first year because there is too little structure for their scattered minds," Dr. Denckla said. "'On your own' is a death knell for these kids."

Such is the sweep of the brain's "C.E.O." that it encompasses day-to-day housekeeping functions like getting from here to there, managing the constant torrent of thoughts and sensory inputs and memories, as well as loftier human processes like reflection and making moral judgments.

Researchers do not entirely agree on definitions of the executive functions and where they are in the brain. The researchers are using methods like PET scans and M.R.I.'s to map their locations. But clearly much of the action is in the highly developed frontal lobes, the area that makes up one-third of the cerebral cortex in humans, and other structures with links to it.

The cat, by contrast, gets by with frontal lobes amounting to just 3.5 percent of its cortex, said Dr. Kirk Daffner, a neurologist at Brigham and Women's Hospital in Boston. That may not come as a total shock to cat owners, watching their pets meander aimlessly from chair to food bowl to sunny spot.

The frontal lobes are, unfortunately, extremely vulnerable to injury or disease. Car accidents and other head injuries are major causes of executive losses in younger people, and executive functions are among the first to be eroded by Alzheimer's disease.

Genetic factors probably have a role. The disorder can run in families.

Dr. Russell A. Barkley, a psychologist at the Medical University of South Carolina in Charleston, who is an A.D.H.D. researcher, said he believed that attention disorders and impaired executive function stemmed from a developmental flaw in the self-regulation mechanism of the brain. Because the nerve pathways in the frontal lobes are the last in the brain to mature, executive functioning is not fully developed until people are in their 30's.

No single test measures the strength of executive functions. Instead, neuropsychologists use batteries of tests to evaluate performance in a number of areas.

One area is inhibition, a basic and vital function that enables someone to delay automatic responses to stimuli, thoughts and changes in the environment. It allows an instant to consider consequences before acting, avoiding mistakes and bad decisions. For example, the Stroop Test displays lists of color names printed in colors that do not match the names. Directed to reel off the actual colors, most people mistakenly say the written word, unless they inhibit that automatic response.

Another field for testing is shifting, maintaining attention to a task, but smoothly switching, if necessary. Such transitions are difficult for people with executive

dysfunction, and so are tolerating changes in environment and thinking flexibly in solving problems.

A third area is initiating activities or tasks or generating ideas independently. Those operations can be a huge challenge for many people with weak executive functioning. Dr. Deborah Waber, a learning disabilities specialist at Children's Hospital in Boston, says some young students can be "reactive to what's there," as opposed to stepping back and thinking it through. Mentally, she adds, they "take the path of least resistance and exhibit a superficial stimulus-driven approach to the world."

"Working," or "scratch pad," memory, is temporarily holding onto information while doing something with it like the next step in a mathematics problem or dialing a telephone number that has just been looked up. Information vanishes from working memory faster in people with deficits in executive function, frustrating efforts to carry out complex tasks.

Planning and organization require mental categories for filing information, as well as the ability to divide tasks into steps in the proper sequence. When the mental C.E.O. is defective, the person approaches large projects haphazardly and without all the needed materials. The person is easily overwhelmed by details while missing the big picture.

A task like writing a term paper places heavy demands on executive functions. Coming up with a subject and doing the research can be daunting. The actual writing — in fact, any writing — may be even harder.

Dr. Bashir of Emerson College and Dr. Bonnie Singer, a speech-language pathologist in Newton, Mass., have devised a therapeutic strategy that involves a step-by-step approach and visual organizational aids for children.

"They don't know how to tell a story sequentially," Dr. Singer said. "They just pick up a pencil and start writing. They write slowly, without rich detail, and they stop writing early. They have trouble monitoring their work, because it involves more than one thing at a time."

Some parents say subtle executive function problems do not receive enough attention in the schoolroom. Stephen Darby, 12, attended elementary schools in Marblehead, Mass., where, his parents say, his learning problems were not regarded as serious because he tested in the upper third of his class in I.Q. and reading.

But "the child in the classroom was a different child from the one on the tests," his mother, Julie, said. "He had a terrible time reading. He seemed to understand a lot, but he couldn't write a coherent sentence. He could tell you everything that happens in every scene of 'Star Wars,' but he could not tell you the plot."

With the help of outside evaluations, Stephen was given a diagnosis of a language-based learning disability, A.D.H.D. and deficient executive functioning. He transferred to

Landmark School, where, his mother says, he performs much better in that structured environment, with small classes and heavy emphasis on organizational tools and repetition.

Neuropsychologists look for a treatable medical cause. They may include sleep disorders, depression, anxiety, thyroid disease or mild strokes. As with A.D.H.D., stimulant medications may help.

But most help involves external cues and supports, to teach the stronger parts of the brain strategies to compensate. Often, Dr. Denckla said, adults with executive deficits can be relatively successful, "as long as there is another human being — a co-author, a teacher, a wife — who acts as an auxiliary frontal lobe to keep them on track."

There is no shortage of strategies and devices to improve organization. Parents can hire tutors or academic "coaches" to strengthen study skills. Some children use aids like time organizers, computers or watches with alarms.

Executive abilities range across a continuum even in unimpaired people. Some seem born to the boardroom. Others are perfectly happy working for someone else.

"I think this is really just the normal and wonderful variation in human nature," Dr. Waber said.

In today's information overload, she added, no one is exempt from organizational lapses, saying, "We're just requiring a lot more executive functioning of people than ever before."