

What Is Executive Functioning?

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In the Introduction, you learned that students with weak executive functioning have trouble negotiating the world of deadlines and paperwork and that they may have difficulty juggling multiple sources of information. In order to proceed in building a working model of executive functioning in the classroom, we'd like to offer a more specific definition of the term.

DEFINITION

There are many different definitions out there, and we have tried to boil them down to their essence.

Executive functioning is an umbrella term for the mental processes that serve a *supervisory role in thinking and behavior*. It incorporates a number of neurologically based operations that work together to *direct and coordinate our efforts to achieve a goal*.

The specific operations that contribute to what is collectively known as executive functioning are referred to as *executive skills* or *executive functions*. These terms are synonymous.

It is executive functioning that allows someone to create a master plan, initiate the steps in a timely manner, react effectively to changes and challenges, and keep the goals in mind over time.

Smooth executive functioning is like riding a bike. You need to have the foundation skills in place (for example, pedaling, steering, braking, and balancing), but no single skill alone accounts for the magic that happens when you put them all together.

An experienced bike rider is fluid and sure as she navigates her path. She makes numerous adjustments to her pedaling, steering, and balance as she rides, dealing with internal challenges (“My back is getting stiff; I need to change body positions”) and external challenges (“That ball is rolling right across my path!”) in what appears to be an effortless manner. In addition to immediate challenges, our bike rider is considering long-term goals, perhaps monitoring the output and timing needed to meet various self-directed targets. (“I need to do a vigorous ride today to stay on my training schedule for next month’s race.” “I have to pick up the pace so that I can complete twenty miles and still be back home in time to shower and be ready to leave for dinner at six.”)

Like bike riding, executive functioning seems misleadingly effortless in students with typical development. As most students mature and their neurological development advances, they are able to rise to the challenges caused by ever-increasing demands for independent academic functioning and long-term planning in school.

Consider for a moment, however, the students who lag behind. Although they used to get their homework in on time when the teacher required everyone to keep everything in a single bright-yellow homework folder, they may have more trouble when faced with multiple binders, rotating classes, frequent classroom and teacher changes, and daily and long-term homework to manage.

Let’s return to the bike metaphor.

Second grader Jessie has always had difficulties with balance and motor coordination, but she loves to ride her bike nonetheless. When her friends started, one by one, to ask their parents to remove the training wheels from their bikes, Jessie wanted to be just like them. So, wobbly as she was, she still wanted to get those training wheels

off. For weeks, she tried to get the hang of balancing without training wheels, keeping her feet just off the ground and trying to stay upright. After falling down over and over, she asked to have the training wheels put back on.

Or consider an older student, John. A competent bike rider, John is racing for the first time. As he focuses on speed, he finds it harder to attend to the environment as it whizzes by. He catches a vision of something rolling across his path, but a child's ball hits his front tire before he thinks about correcting his course. He knows he needs to conserve energy for a final kick at the end of the race, but he waits too long and finds himself at the back of the pack as others speed ahead. He goes all out to catch up, but the effort tires him, and he can't maintain the pace.

Like these bike riders, some kids and teens have delays or inefficient executive skills. Jessie is weak in two of the basic skills required for bike riding, so she falters when she tries to increase the complexity of the riding task. John has a different problem. He has all the foundation skills, but he runs into difficulty when he must fluidly coordinate all the components to meet the higher-level demands of racing.

We count on the fact that with time, targeted instruction, and practice, both of these cyclists will develop the skills they need. However, sometimes we have to simplify the task or offer additional support until the components come together.

CORE EXECUTIVE SKILLS

To understand executive functioning more fully, let's take a closer look at the specific skills involved.

Researchers agree on the overarching concept of executive functioning as the process of engaging in "purposeful,

goal-directed, and future-oriented behavior.”¹ However, there is less agreement on how to break those skills down into component processes.

Our list of core skills (see Table 1.1) draws heavily on the work of Drs. Gerard Gioia, Peter Isquith, Steven Guy, and Lauren Kenworthy and their widely used scale of executive functioning, the Behavioral Rating Inventory of Executive

Table 1.1 Core Executive Skills

Executive Skill	Definition	Impact
Planning and Organization	The ability to impose order on thoughts, tasks, play, and storage spaces	Students with poor planning and organizational skills have difficulty breaking down a task into smaller steps to reach a goal. They also have trouble creating a cognitive schema to organize information. Rather than organizing new information into a hierarchy or categories in their mind, they tend to hold on to a collection of facts. It is as if they have a file cabinet, but they just open the drawers and throw things in rather than creating files and placing information into an appropriate file folder. They may take the same haphazard approach to organizing materials as they do to organizing information in their heads.
Working Memory	Memory in the service of an action;* a dynamic process that involves reviewing new information and retrieving, holding, and manipulating stored information in our minds for the purpose of completing a cognitive task	Students with weak working memory may have difficulty holding on to multiple bits of information long enough to complete a task, such as remembering a short grocery list long enough to buy what they need or completing all the steps in multistep directions. Working memory is also critical for more complex tasks that require students to retrieve information from their own long-term storage, hold the information in mind, manipulate it in their head, and perhaps coordinate it with new input. There is evidence that visual working memory and verbal working memory are not always evenly developed in an individual.

Table 1.1 Core Executive Skills (*Continued*)

Executive Skill	Definition	Impact
Initiation	The ability to begin a task or activity and to independently generate ideas, responses, or problem-solving strategies	Without a good ability to initiate, a student may seem to procrastinate about starting tasks.
Task Monitoring	The ability to monitor one’s own performance and to measure it against a standard of what is needed for any given task	Task monitoring allows someone to consider his own progress toward a goal and to adjust his plans if he is going off course. In the absence of effective task monitoring, students may not adjust the content or the pace of their work in keeping with changing conditions or feedback from the environment.
Self-Monitoring	The ability to observe one’s own behavior and to determine whether it conforms to explicit behavioral expectations and unwritten social rules	Good self-monitoring allows someone to fluidly adjust her behavior in response to overt environmental feedback and more subtle social cues, such as facial reactions or the modeling of peers. Without good self-monitoring, students will miss the signs that what they are doing is inappropriate or irritating to others, so they are prone to behavioral problems and social isolation.
Inhibition	The ability to “put on the brakes” or to stop behaviors at the appropriate time	Without good ability to inhibit behaviors and thoughts, children are impulsive and unfocused, and they tend to take action before thinking about the consequences.
Emotional Control	The ability to reflect on one’s own feelings and then to use that understanding to guide one’s emotional responses	Individuals with weak emotional control tend to have strong, immediate, poorly controlled emotional reactions.
Shifting	The ability to “change gears,” to move freely from one situation to another, and to think flexibly in order to respond appropriately to a new or unexpected situation	People with weak ability to shift tend to get locked into behaviors or expectations, and they have trouble making transitions from one activity or pattern of thought to another.

*Barkley, R. A., “ADHD, Self-Regulation and Executive Functioning: Implications for Management and Life-Course Outcomes,” presentation, Rockville, MD, September 23, 2011.

Function (BRIEF).² We also take into account here their later research, which identified a slightly different breakdown of skills than the original formulation.³

It is important to remember that these core executive skills work together to bring about smooth and efficient functioning. As an example, can you imagine a long-term project that requires planning and organization but does not require task monitoring?

Students with EF delays vary in the pattern and intensity of strengths and weaknesses in their executive profile. This book will primarily address executive skills that govern thinking, but behavioral and emotional regulation can never be fully erased from the picture, so we will offer some tips for building those skills, too.



Brain Alert!

Executive skills are sometimes broken down into two broad categories: “cool” skills are those that govern *thinking* (such as planning and organization, working memory, and task monitoring); “hot” executive skills are those governing *behavior and emotion* (such as inhibiting, emotional control, and self-monitoring). The distinction between hot and cool executive functions is useful because it helps us characterize individual profiles and thus think about a person’s specific needs. However, several researchers have pointed out that in real life, the hot and cool functions can never be fully separated, so the difference between hot and cool is always a matter of degree.* Barkley further explains how the neural networks involved in the two categories of executive skills work together: “The supposedly ‘cool’ EF brain networks, such as working memory, planning, problem-solving, and foresight, may provide for the ‘what, where, and when’ of goal-directed action, but it is the ‘hot’ EF brain network (Castellanos et al., 2006; Nigg & Casey,

2005) that provides the ‘why’ or basis for choosing to pursue that goal in the first place and the motivation that will be needed to get there.”**

*For a review, see Hongwanishkul, D., Happaney, K. R., Lee, W.S.C., and Zelazo, P. D. “Assessment of Hot and Cool Executive Function in Young Children: Age-Related Changes and Individual Differences.” *Developmental Neuropsychology*, 2005, 28(2), 617–644.

**Barkley, R. A. *The Executive Functions: What They Are, How They Work, and Why They Evolved*. New York: Guilford Press, 2012, p. 26.

HOW DO EXECUTIVE SKILLS DEVELOP?

To understand what happens when development veers off course, it is important to know about typical development of executive skills. Our biking metaphor provides a model of how the skills unfold.

From Big Wheels to the Tour de France: The Developmental Arc of Executive Functioning

Even toddlers can get in on the riding toys! Before their small feet ever touch a pedal, they may start on a simpler riding machine. They sit on wheeled toys and push themselves along, relying on their feet as brakes when they get going too fast.

Soon these little ones progress to their first riding machines with pedals, perhaps one of those exciting Big Wheels. Hugging the ground, they learn to propel themselves with pedals. Downhill they go, learning about speed and steering as they roll. If there are busy streets nearby, it is a supervised sport. The child cannot yet be counted on to attend to obstacles or traffic or other safety concerns. Like our youngest riders, young students need help with classroom organization and routines as they develop the basic skills to support school success.

As children mature, their riding machines morph into bikes with higher seats, lower handlebars, and gears to accommodate varied riding conditions. They grow in their physical abilities and motor coordination, but they also grow in their ability to simultaneously attend to the environment. They learn to monitor what is going on around them and adjust their own actions in a fluid and consistent manner. As students, they are becoming more independent as well. They can plan assignments, monitor due dates, and manage their own homework, albeit with some prompting and supervision by parents and teachers.

In time, some of these developing cyclists may take on new challenges, such as doing tricks on ramps or racing, that add a very different level of complexity to the action. The newbie brings experience and strong skills, but these must be applied in new ways.

For example, the new racer must learn how to coordinate with team members and to train in order to peak at the right time. New levels of endurance and strength are needed, too, and each person must monitor his or her own and others' performance toward the goal of winning the race. In school, planning and goal-directed thinking are taken to a new level now. The added complexity requires better ability to hold goals in mind over longer periods of time, as well as the ability to juggle and prioritize multiple projects. Further, as the number and complexity of demands increase, so too must the student's efficiency.

Like bike riding or other arenas of development, executive skills emerge in a relatively predictable fashion as our brains mature and as we learn from experiences. Academic demands are designed to keep pace with these emergent skills.

Although a full discussion of the neurological underpinnings of executive functioning is outside the scope of this book, we offer just a bit of information in the next section to

support your understanding of executive functioning when working with students.

The Brain and Executive Functioning

Although executive functioning has historically been linked most directly to the development of the prefrontal cortex (an area of the frontal lobes of the brain), it is now clear to researchers that this is an oversimplification. The frontal lobes are central in executive functioning, but these processes depend on many different brain regions that are interconnected. Problems within a specific region or in the connections between regions can lead to functional difficulties with executive skills.



Brain Alert!

As brain imaging technology advances, exciting new details on the working brain are emerging. Researchers are now able to see how the various parts of the brain operate together to complete executive tasks. Further, it is clear that different executive functions depend on different brain circuits. There is much more to learn, and fascinating new information is sure to come out of this phase of research. In a review that summarizes the state of the research, Suchy notes that “virtually all EF components require the integrity of circuits involving portions of the prefrontal cortex, the basal ganglia, the thalamus, and the cerebellum, as well as cortical areas outside of the frontal lobes . . . Suffice it to say that individual aspects of EF should *not* be viewed as easily localized.”*

*Suchy, Y. “Executive Functioning: Overview, Assessment, and Research Issues for Non-Neuropsychologists.” *Annals of Behavioral Medicine*, 2009, 37(2), 106–116.

It is the natural unfolding of brain development, in combination with instruction and opportunities for practice, that leads to the behaviors we know collectively as executive functioning.

Practice and repetition set pathways in the brain, building those critical circuits responsible for executive processes. We know that these systems are late to develop, not reaching full maturity until early adulthood. The components can be seen early on, and they build on one another over time. In late adolescence and early adulthood, the thrust of development is toward greater efficiency of functioning rather than building skills.

For some students, however, delays in development of the prefrontal cortex and its support systems lead to corresponding delays in executive functioning. When this happens, the student's development will be out of sync with his or her peers and with academic demands.



To Sum Up

- The term *executive functioning* refers to the process of supervising one's own thinking and behavior to achieve a goal.
- Effective executive functioning allows people to operate with intent, including creating a master plan, initiating the steps in a timely manner, and reacting well to changes and challenges, all while keeping the goal in mind over time.
- Good executive functioning relies on a collection of specific operations that are referred to as *executive functions* or *executive skills*. These terms are synonymous.
- There are a variety of different lists and approaches to defining the specific executive skills. We identify the following core executive skills (building on the work of Gioia, Isquith, Guy, and Kenworthy, noted earlier in the chapter): planning and organization, working memory, initiation, task monitoring, self-monitoring, inhibition, emotional control, and shifting.
- The core executive skills work together to bring about smooth and efficient functioning.
- It is the natural unfolding of brain development, in combination with instruction and opportunities for practice, that leads to good executive functioning.
- Early development is focused on building the components of executive functioning. Later development brings higher-level skills as well as better coordination between them, so students can perform more complex tasks and operate with greater efficiency.



Time to Reflect

1. What aspects of executive functioning did you already understand well? Did you have any misunderstandings? What new understanding would you like to focus on as you move forward?

2. Which element(s) of executive functioning are already addressed well in your classroom? Which pose the greatest problems daily for your students or for one student in particular?

3. What changes in executive functioning do you typically see in your students over the course of a school year? How do your classroom expectations and routines change to accommodate this growth?

4. Try to name one “burning question” you have right now that must be answered in order to solve an important EF problem in your classroom.

5. Note any other key takeaways from this chapter.
