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Kathlyn Tipton, Psy.D.

Understanding Executive Functions

Preview Chapter

*"You can get all A's and still flunk life."
Walker Percy*

Introduction

Executive functions comprise the command center of the brain. They are controlled by the prefrontal cortex, housed in the frontal lobes of the brain (the parts just behind your forehead). These are the functions that allow us to regulate our emotions and behavior, and to use our intellectual and cognitive abilities effectively and efficiently. Just like a CEO works to make her organization run effectively and efficiently, so do our executive functions work for us. When the CEO is ineffective, his organization becomes unproductive or even dysfunctional.

Here is another way of looking at it: intellectual and cognitive abilities are the car. Executive functions are the driver. A good driver can get a lot out of an old jalopy, while a bad driver can trash a Ferrari. People who struggle with executive functions can be very intelligent, but cannot seem to get organized, manage affairs, or keep things together.

The frontal lobes are the last parts of the brain to fully develop. Executive functions are not working at full capacity until an individual is in her mid to upper twenties. As you read further, you will probably realize how much this explains typical adolescent behavior (especially when you add in raging hormones). Do not expect too much too soon.

Executive functions are often split into two divisions: those that control behavioral regulation, and those that control metacognitive functions. Behavioral regulation includes controlling behavior and emotions. Self-monitoring, impulse control, delayed gratification, flexibility, and emotional control are among these skills. Metacognitive functioning is controlling the use of cognitive abilities. These functions include such abilities as working memory, organization, flexibility, planning, and time management.

Understanding Executive Functions

Few people have deficits in all functions, but rarely does a deficit in any one executive function occur in isolation. They interact with and support each other, and impairment in one function will impact other functions (not necessarily all). Impairments in executive functions often accompany other mental disorders, such as ADHD, bipolar disorder, autism, and schizophrenia. They are also common among students with learning disabilities.

What are the primary executive functions?

Behavioral regulation functions:

Inhibition: Impulse control, delayed gratification, and the ability to stop when appropriate.

Flexibility (switching): The ability to switch gears, adjust when the rules change, find alternative approaches to solving problems, or move freely from one task to another when appropriate.

Monitoring: Self-monitoring, including work-checking habits, sizing up situations to recognize what should be done, and keeping track of the effects of own behavior on others.

Emotional Regulation: The ability to manage frustration and modulate emotional responses.

Metacognitive functions:

Cognitive Fluency: The speed of recalling information from long-term memory, forming concepts, and making decisions. It is important for all academic tasks, reading fluency, listening, and talking. It supports working memory.

Working Memory: The ability to remember while doing, or the capacity to hold information in short-term memory, for the purpose of completing a task. It is important for all academic tasks, especially writing, reading comprehension, and multiple-step problem solving. It supports reasoning processes and is strongly impacted by attention problems. Current research is indicating that working memory might be a better predictor of academic achievement than I.Q.

Initiation: The ability to get started on a task promptly.

Planning: The ability to anticipate future events and to form and follow a plan or strategy. It includes setting goals and developing the necessary steps ahead of time to carry out a task.

Understanding Executive Functions

Organizing: The ability to bring order to information and to appreciate main ideas and key points. It includes such skills as prioritizing, preparation, follow-through, and effective use of resources.

Attention: The ability to maintain attention over time (sustained) and with distractions (selective), to be able to attend to more than one stimulus at a time (divided), and to be able to shift attention from one task to another (shifting). This is critical for all academic tasks, and supports cognitive fluency and working memory.

Time Management: Sense of time, promptness, anticipating how long a task will take, using time effectively and efficiently.

Creativity: Building from what is known to generate novel ideas, products, responses, strategies, and use forms of expression in original or imaginative ways; inventiveness.

Organization of Materials: Orderliness of living, play, work, and storage spaces.

When executive functions go wrong

Impairments in executive functions adversely affect all aspects of life, including task management, educational performance, emotional stability, behavior regulation, social interactions, and more. A set of books that provides information and strategies for executive functions uses the title, “Smart but Scattered” (Dawson & Guare). This encapsulates the experience well.

Executive function impairments can have far-reaching consequences. Extensive damage to the frontal lobes via some form of trauma can result in a complete change in personality. People who were mild mannered, productive, effective people may become impulsive, hostile, aggressive, and dysregulated, while others might become passive and ineffective. Yet, there can be no change in I.Q., knowledge, and learned academic or vocational skills if other parts of the brain are not damaged as well. Less significant abnormalities or lesions in the frontal lobes can result in functional impairments ranging from mild to severe in any of the executive functions described above.

An intelligent student with poor executive functions is probably going to underachieve, struggle with basic tasks, fail to meet expectations, and receive negative feedback from adults and peers. They are often seen as students who are just not trying hard enough, lazy, careless, or willfully disruptive. They are at high risk for giving up on themselves and their potential due to frustration and discouragement, as well as the self-fulfilling prophecy triggered when the negative messages of others are internalized.

Eventually such a student might decide that it is better to not try and have an excuse for failing, than to try, fail, and feel stupid. Lack of motivation or the desire to not achieve is abnormal in children or adolescents. A healthy young person will want to do well and work as best she can when given appropriate instruction, support, and encouragement, even when challenged by obstacles. When parents or teachers start using the words “lazy,” “unmotivated,” or “does not care,” there is something wrong that very well might not be within the student’s control.

What can we do about it?

Assessment

An expert in executive functions assessment, such as a neuropsychologist, school neuropsychologist, appropriately trained school psychologist, or licensed educational psychologist (California) can provide such an evaluation. It is important to make sure any evaluator has a solid understanding of executive functions, as well as training and experience in assessment. Such professionals with experience in the school setting and educational intervention planning are best equipped to turn the assessment results into applications that are meaningful in the classroom.

Assessment usually starts with parent and teacher rating scales. Self-report scales are important for adolescents. If the scales suggest significant problems, then there should be follow-up with direct testing. While it is generally apparent that the individual is experiencing executive functioning problems without an assessment, an assessment serves to pinpoint the specific deficits, and to establish necessary understanding for effective, individualized intervention. The student is also more likely to gain access to specialized services with test results that substantiate the impairment.

Intervention

Intervening when there is a problem in executive functions essentially requires that the parents and teacher become the student’s frontal lobes. This includes:

- Structuring the environment to guide and support regulatory behaviors and the targeted skills. This includes deliberately working to provide a positive climate and reduce negative reactions or teasing from peers.
- Directly training the young person in the executive skills he needs to develop.
- Monitoring his behavior and progress to respond quickly and consistently when problems occur.
- Positive reinforcement for appropriate behaviors when they occur and as they progress over time.

Understanding Executive Functions

The younger the child the more external structure required. Older children and adolescents are more likely to respond to behavior training with more of an orientation toward self-direction. The earlier the intervention starts the better. Learning new skills is much easier before the dysfunction has become embedded in the child's patterns of learning and behavior. Early intervention also capitalizes on open windows of opportunity that occur with rapid brain development. The brain is also more sensitive or reactive to damage during early stages of development, with the potential patterns of dysfunction becoming hard-wired over time.

Motivation is critical – retraining the brain takes a tremendous amount of time and effort. The student is working against her neurology, and the new processes are hard to grasp and feel very unnatural. Because of this, she needs continuous support, positive feedback, encouragement, and reinforcement in order to succeed.

Positive reinforcement is very important for training and motivation, but personal understanding and buy-in are just as important. Until he has the ability to understand the need and embrace the process for himself, the focus of intervention is on providing a highly structured environment that regulates executive processes for the child. This will help improve habitual patterns and shape behavior over time, countering the effects of repetitive dysfunction. Once buy-in is established and the young person can take on more direction and responsibility in his own learning, direct training becomes much more effective.

There are entire books written on interventions for executive functioning problems. Such a presentation is beyond the scope of this chapter. Caretaker education along with structured positive behavior support both at home and at school are crucial. Behavior coaching for the young person by a specialist can be an important part of the process, especially after buy-in is established.

In most instances, a list of strategies is not sufficient to appropriately guide the process, although such a list can provide a helpful launchpad and framework for environmental support and informal intervention. The professional who assesses the child should be able to provide both individualized intervention strategies and coaching. School and behavior specialists are trained in positive behavior support. Discussions of specific strategies can also be found in the following books (this is not a comprehensive list):

School-based

Executive Function in the Classroom: Practical Strategies for Improving Performance and Enhancing Skills for All Students (Kaufman, 2010)

Executive Skills in Children and Adolescents: A Practical Guide to Assessment and Intervention, Second Edition (Dawson and Guare, 2010)

70 Play Activities for Better Thinking, Self-Regulation, Learning & Behavior (Kenney and Comizio, 2016) – children and adolescents

Home-based

Smart but Scattered (Dawson and Guare, 2009) – children

Late, Lost, and Unprepared: A Parents' Guide to Helping Children with Executive Functioning (Cooper-Kahn and Dietzel, 2008) – children and adolescents

70 Play Activities for Better Thinking, Self-Regulation, Learning & Behavior (Kenney and Comizio, 2016) – children and adolescents

Smart but Scattered Teens (Guare, Dawson, and Guare, 2013) – adolescents

Train Your Brain for Success: A Teenager's Guide to Executive Functions (Kulman, 2012) – adolescent self-help

Understand Your Brain, Get More Done: The ADHD Executive Functions Workbook (Tuckman, 2012) – adult self-help

Developmental Executive Function Activities

Preschool (about 2 to 4)

- Following first-then commands
- Working for a reward
- Completing age-appropriate chores (e.g., sorting laundry, putting clothes away)
- Playing age-appropriate games that involve turn taking and winning/losing
- Following routines
- Doing a simple household chore routinely
- Listening to stories
- Exploratory art and music/rhythm activities
- Active, social, constructive, and puzzle play
- Learning to identify problems

Early childhood (about 5 to 7)

- Waiting until later in the day for a reward or preferred activity
- Following multiple-step commands
- Helping plan activities

Understanding Executive Functions

- Talking about weekend plans
- Staying on a schedule
- Following a to-do list for chores and other routines or tasks, including checking off items once completed
- Telling stories
- Acting out stories
- Cleaning his room routinely
- Finishing what he starts
- Expressing emotions with “I” statements
- Learning to describe problems
- Learning the difference between accidental and intentional, especially in social conflicts
- Dramatic and creative play – let the child use his imagination freely in play instead of reproducing or being restricted to unnecessary rules

Middle childhood (about 7 to 9)

- Mental math
- Writing imaginative stories
- With assistance, planning the steps (including timeline) to complete extended tasks and upcoming events that are not too complex
- Following a recipe
- Initiating less desired activities promptly
- Adding another age-appropriate household chore to her routine
- Choosing potential solution options from a selection
- Learning that others can react to emotion-triggers differently than she does
- Writing stories
- Checking and editing class work and homework once completed
- Reading for 20 minutes per day
- Independent study skills
- Obtaining a small monthly allowance if household chores are completed routinely and acceptably (developmentally appropriate); learning how much things cost, and planning how to save or spend the money (with substantial guidance)

Upper childhood (about 9 to 11)

- Solving multiple-step logic puzzles and math problems mentally
- Strategy games
- Helping plan more complex and extended activities

Understanding Executive Functions

- Summarizing stories she has read or heard in her own words
- Perspective-taking and empathy
- Monitoring the verbal and nonverbal reactions of others to her behavior
- Outlining writing assignments before writing
- Helping fix things
- Learn about and practicing money transactions
- Maintaining a planner for assignments and activities
- Journaling
- Defining problems brainstorming solutions to attempt, and then describing the outcomes
- Competitive sports
- Learning anger management skills
- Organized creative activities and hobby development (e.g., art lessons, music)

Preadolescence (about 11-14)

- Planning the week's schedule
- Maintaining a calendar and to-do list
- Watching documentaries
- Learning a systematic approach to solving problems, including practice; here is a standard:
 - Identify and define the problem, including known triggers or causes.
 - Brainstorm solutions – free flow of ideas, even if they seem ridiculous or inappropriate.
 - Select the most reasonable ideas to evaluate, and then consider potential outcomes for each (positive and negative consequences).
 - Choose the best solution.
 - Attempt the solution, monitoring the process and effects.
 - Evaluate the outcomes.
 - Try again if necessary.
- Talking through social problems, cause and effect, outcomes, and alternatives
- Writing and illustrating social stories for younger children to teach a social skill or about a social challenge
- Discussing moral dilemmas
- Helping plan the week's grocery shopping, including budget and grocery needs
- Learning and practicing money and time management
- Maintaining a personal savings account, with a defined savings plan for desired items
- Keeping school materials organized
- Setting short and long-term goals

Understanding Executive Functions

- Exploring career options
- Peer tutoring
- Taking notes during lectures
- Evaluating problem-solving outcomes and determining alternatives when an attempted solution did not work

Adolescence (about 14 and up)

- Planning a career path
- Maintaining a savings account
- Participating in organized debates
- Writing poetry
- Researching special interests and current events
- Learning to stop and think before acting, considering possible consequences
- Creating and following a timeline for long-term assignments
- Attending to homework for 45 minutes at a time
- Paraphrasing text
- Resolving strong emotions through discussion and problem solving
- Volunteer work for community nonprofit charity or service organizations
- Babysitting, assisting elderly neighbors with domestic tasks or yardwork
- Maintaining a budget and personal checking account, including monthly reconciling and tracking expenses by categories