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WHAT IS EXECUTIVE FUNCTION?

Executive Function consists of high-level cognitive skills that allow us to organize our behavior over time and override immediate demands in favor of long term goals. They are a collection of processes that are responsible for guiding, directing, and managing cognitive (thinking), emotional, and behavioral functions, particularly during active, novel problem solving. These behaviors are responsible for purposeful, goal-directed, problem solving behavior.

What is the purpose of Executive Function skills?

Use of these skills allows us to plan and organize activities, sustain attention, and persist to complete a task. They help us regulate our behavior.

How do we develop these skills?

We see beginnings in the infant and toddler and more in five year olds. Skills begin in infancy and continue to develop through adolescence. There is parallel development between the brain and the development of a child's ability to act, think, and feel.

Where is this in the brain?

Researchers agree that the frontal brain systems (the frontal/prefrontal cortex, along with connections to adjacent areas) make up the neurological base for executive skills. The frontal lobes are like the conductor of the orchestra, and although there are other areas of the brain involved, the frontal lobes have a preeminent role in the relationship between brain structures and executive function.

What do the frontal lobes do?

The prefrontal brain systems are among the last to fully develop in the brain in late adolescence and are the final, common pathway for managing information and behavior from other brain regions.

What are the critical functions of the frontal lobes?

- The frontal lobes decide what is worth attending to and what is worth doing
- The frontal lobes provide continuity and coherence to behavior across time
- The frontal lobes modulate behavior so that actions can be completed within constraints
- The frontal lobes monitor, evaluate, and adjust

What are the two different ways that we develop these skills?

- First, the child is *directed with limits and rules*. We act as the frontal lobes for children, but guiding their behaviors. We prompt and teach and then step back as the child's executive skills emerge.
- Second, we *structure the environment* to compensate for underdeveloped skills.

Why is it important to assess executive function skills?

The frontal brain regions are also regions for other human behaviors and a *variety of different factors* may affect executive functions. The question may be whether other factors such as depression, fatigue, situational stress, or an attention disorder affects performance or is there an inherent weakness in one or more executive skills. Intervention can differ widely depending on the source of the weakness. It is also important to look at strengths and weaknesses to be more specific in intervention techniques.

Why is it difficult to assess executive functions during formal psychological evaluations?

Many of the factors that demand the use of executive functions are removed during a formal evaluation. Here are some examples:

- Two important EF skills (initiation and sustained attention) are not assessed during a formal evaluation when the examiner tells the child when to start and stop and tasks are often brief so there is no demand for sustained attention
- With an examiner present, the child does not have to monitor his or her own performance
- In this highly structured situation, there is no need for planning and organization
- The need to complete complex, open-ended tasks requiring problem solving and creative or unique solutions is not required when tests are usually scored with answers that are straight forward, right or wrong.
- Complex tasks presented in testing are less complex than real world demands and there is no way to determine if the results of testing translate to the real world situations.
- Even good performance on “tests” of executive function doesn’t mean that the child can apply good planning ability in daily performance at home or at school.

How do we evaluate these skills?

There are some Neuropsychological tests, but it is difficult to standardize behaviors because they can be specific to the situation. *Behavioral checklists* such as the *Behavior Rating Inventory of Executive Function* can assess at least observed behaviors related to these skills in specific situations at home and at school. As part of the Auditory Processing Evaluations, parents and teachers are asked to complete inventories.

What are some examples of Executive Function Skills?

As measured by the *Behavior Rating Inventory of Executive Function*, measured skills are grouped into

- *Behavior Regulation* which includes the ability to inhibit unwanted behavior, shift attention from one task to another, and maintain emotional control
- *Metacognitive ((Self-Directed) Thinking Skills* including the ability to initiate tasks, hold information in memory, plan and organize tasks, organize materials needed for tasks, and monitor behavior.

What can we do about EF problems?

We can plan specific environmental modifications, and specific interventions to improve and develop these skills.

What are the three categories of EF Weakness?

- *EF Weakness in the absence of a recognized disorder.* Everyone has strengths and weaknesses, and what is a problem in one classroom may not be a problem in another.
- *Children with complicated educational issues, of which EF skills may be one aspect*
- *Disorders that impact EF*
 - *Acquired brain injury* (head trauma, stroke, oxygen deprivation, infection)
 - *Autism Spectrum Disorders* (There is no specific pattern of EF weakness, but children with Asperger syndrome and nonverbal learning disabilities often demonstrate problems with self-regulation, self-directed thinking strategies, and flexibility)
 - *Attention Deficit/Hyperactivity Disorder* (EF deficits are CENTRAL in ADHD) Typical goal directed persistence is deficient in individuals with ADHD as well as weakness in self-regulation.
 - *Sleep Disorders and Sleep Deprivation* (The prefrontal cortex helps regulate sleep, arousal, and attention) Sleep deprived children have difficulty with complex tasks that require planning or goal directed persistence, particularly when the goals are abstract and rewards are delayed. Surveys indicate that 60% of children under 18 years complain of daytime sleepiness and 15% report falling asleep in class.

Sources of information:

- **Executive Skills in Children and Adolescents** by Dawson and Guare available from the Guilford Press at www.guilford.com
A practical guide to assessment and intervention.
- **Behavior Rating Inventory of Executive Function** by Gioia, Isquith, Guy, and Kenworthy available from Psychological assessment Resources, Inc. at www.parinc.com
- **The Executive Brain: Frontal Lobes and the Civilized Mind** by Goldberg available from Oxford University Press



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Behavior Rating Inventory of Executive Function (BRIEF)

This is a questionnaire for parents and teachers, inquiring about Executive Function behaviors in the home and school environments. The executive functions are a collection of processes that are responsible for guiding, directing, and managing cognitive (thinking), emotional, and behavioral functions, particularly during active, novel problem solving. Executive function is a collection of interrelated behaviors, which are responsible for purposeful, goal-directed, problem solving behavior and weaknesses in these functions often co-exist with auditory processing, attention, and learning problems.

- **Explanation of Scales**

These scales measure the extent to which the parent and/or teacher reports problems with different types of behavior related to eight domains of executive functioning. This is a judgment of various behaviors, and scores indicate if these executive function behaviors are *not significantly different* or *significantly different* compared to children of the same age, and aid in understanding behaviors as well as planning management interventions. **Raw scores are converted to T-scores and scores of 65 or greater are considered to be elevated and clinically significant.**

- **Description Scales**

Behavioral Control:

Inhibit: Ability to stop one's own behavior at the appropriate time.

Shift: Ability to move freely from one situation, activity, or aspect of a problem to another as the circumstances demand.

Emotional Control: Ability to modulate emotional responses.

Self-Directed Thinking Strategies:

Initiate: Ability to begin a task or activity, as well as independent generate ideas, responses, and develop problem-solving strategies

Working Memory: Capacity to hold information in mind for the purpose of completing a task.

Plan/Organize: Ability to manage current and future-oriented task demands.

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

Monitor: Ability to check own performance during or shortly after finishing a task to ensure appropriate attainment of a goal

Comparison of BRIEF Working Memory and Inhibit Scales to ADHD Groups according to computer analysis

- This profile is *not similar* to that seen in children clinically diagnosed with ADHD
- This profile *is similar* to children exhibiting some problems of inattention, but not to the level of a specific diagnosis of ADHD
- This profile is similar to that seen in children clinically diagnosed with:
 - Attention Deficit Hyperactivity Disorder
 - Attention Deficit Hyperactivity Disorder, Inattentive Type
 - Attention Deficit Hyperactivity Disorder, Combined Type (Inattention and Hyperactivity)
- This profile is similar to that seen in children clinically diagnosed with ADHD, although the subtype is unclear given the moderate elevation on the Inhibit scale.
- This profile indicates characteristics of executive dysfunction that are often seen in children diagnosed with ADHD. It is important to appreciate; however, that some children with similar elevations do not meet criteria for ADHD.

The BRIEF is published by Psychological Assessment Resources, Inc. at 800-331-8378 www.parinc.com



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Behavior Rating Inventory of Executive Function (BRIEF)-Self Report

This is a self-questionnaire to assess Executive Function behaviors. The executive functions are a collection of processes that are responsible for guiding, directing, and managing cognitive (thinking), emotional, and behavioral functions, particularly during active, novel problem solving. Executive function is a collection of interrelated behaviors, which are responsible for purposeful, goal-directed, problem solving behavior and weaknesses in these functions often co-exist with auditory processing, attention, and learning problems.

- **Explanation of Scales**

These scales measure the extent to which the individual reports problems with different types of behavior related to eight domains of executive functioning. This is a judgment of various behaviors, and scores indicate if these executive function behaviors are *not significantly different* or *significantly different* compared to individuals of the same age, and aid in understanding behaviors as well as planning management interventions. **Raw scores are converted to T-scores and scores of 65 or greater are considered to be elevated and clinically significant.**

- **Description Scales**

Behavioral Control:

Inhibit: Ability to stop one's own behavior at the appropriate time.

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Emotional Control: Ability to modulate emotional responses.

Monitor: Ability to check own performance during or shortly after finishing a task to ensure appropriate attainment of a goal

Self-Directed Thinking Strategies:

Working Memory: Capacity to hold information in mind for the purpose of completing a task.

Plan/Organize: Ability to manage current and future-oriented task demands.

Organization of Materials: Orderliness of work and storage spaces.

Task Completion: Ability to finish or complete tasks appropriately in a timely manner

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Executive Function

Books

- The Executive Brain Frontal Lobes and The Civilized Mind by Elkhonon Goldberg available from Oxford University Press
- Executive Function in Education from Theory to Practice edited by Lynn Meltzer available from The Guildford Press www.guilford.com
- The Dysfunctionality of Executive Function by Miriam Cherkes-Julkowski available from Surviving Education Guides www.surviving-education-guides.com
- Attention, Memory, and Executive Function by Lyon and Krasnegor available from the Paul Brooks Publishing Company www.brookespublishing.com

Assessment

- The Behavior Rating of Executive Function available from Psychological Corporation www.parinc.com
Scoring Software also available

Intervention

- A Metacognitive Program for Treating Auditory Processing Disorders by Hamagushi available from Pro-Ed at www.proedinc.com (Ages 6 years and older)
- It's Time to Listen-Second Edition: Metacognitive Activities for Improving Auditory Processing in the Classroom by Patricia Hamaguchi available from Pro-Ed at www.proedinc.com (Grades 2-6, but can be adapted for younger or older students)
- Executive Skills in Children and Adolescents by Dawson and Guare available from the Guilford Press at www.guilford.com (Also has Intervention strategies)
- How to Help Your Child with Homework by Schumm available from Free Spirit Publishing at (612) 338-2068 or www.freespirit.com.
- The Source for Development of Executive Functions by Richard and Fahy available from Linguisystems www.lynguisystems.com

Commercial Programs

- Play Attention Biofeedback Instrument to improve ability to sustain attention www.playattention.com
- Brain Cogs Software to improve organizing, remembering, prioritizing, and checking skills. www.fablevision.com
- Attention Processing Training Improves sustained attention www.lapublishing.com
- Thinking Reader builds reading comprehension skills. www.tomsnyder.com