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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 A practical guide to assessment and intervention by Dawson and Guare available from the Guilford Press at www.guilford.com

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.

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.

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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Behavior Rating Inventory of Executive Function-Preschool

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 functions are a collection of interrelated behaviors responsible for purposeful, goal-directed, problem solving behavior and weaknesses in these functions often co-exist with a (Central) Auditory Processing Disorder. These scales measure the extent to which the informant reports problems with different types of behavior related to the eight domains of executive functioning. This is an objective assessment of various behaviors, and scores indicate if these executive function behaviors are significantly different compared to children of the same age, and aid in understanding behaviors as well as planning management interventions.

Description of Scales

- **Inhibit:** Assesses the ability to stop one's own behavior at the appropriate time.
- **Shift:** Assesses the ability to move freely from one situation, activity, or aspect of a problem to another as the circumstances demand.
- **Emotional Control:** Addresses the ability to modulate emotional responses.
- **Working Memory:** Measures the capacity to hold information in mind for the purpose of completing a task.
- **Plan/Organize:** Measures the ability to manage current and future-oriented task demands.

Indexes

- **Inhibitory Self-Control Index (ISCI):** Represents a child's ability to modulate actions, responses, emotions, and behavior via appropriate inhibitory control. Appropriate flexibility and inhibitory self-control are fundamental to emerging metacognitive (self-directed) problem solving.
- **Flexibility Index (FI):** Represents a child's ability to move flexibly among actions, responses, emotions, and behavior. This is an important component of behavioral regulation as indicated by the child's ability to modulate behavioral and emotional reactions according to different response contingencies and environmental demands.
- **Emergent Metacognition Index (EMI):** Represents the child's developing ability to initiate, plan, organize, implement, and sustain future-oriented problem solving. It is interpreted as the child's ability to cognitively self-manage tasks and to use information from working memory to guide performance or behavior. It related directed to the ability to actively solve problems and to implement behavioral plans in a variety of contexts.

Validity

- **Inconsistency:** *This score indicates the extent to which the informant answers similar items in an inconsistent manner. For examples, answering "never" in response to one item and "often" in response to a similar item. A raw score is obtained and is classified as "Acceptable," "Questionable," or "Inconsistent."*
- **Negativity:** This score measures the extent to which the informant answers selected items in an unusually negative manner. Scores can reflect either an excessively negative perception of the child or that the child may have substantial executive dysfunction. The score is classified as "Acceptable," "Elevated," or "Highly Elevated"

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Executive Function

Books

- **No Mind Left Behind** by Dr. Adam Cox
Understanding and fostering executive control-the eight essential brain skills every child needs to thrive. Available from www.amazon.com
- **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)
- **The Source for Development of Executive Functions** by Richard and Fahy available from Linguisticsystems www.lynguisystems.com

Problem Solving

- **Easy Stories for Problem-Solving** (Ages 4-8 years)
Children learn to use language to solve common everyday problems with the activities in this book. Item #49954-RF20 at \$29.00 from *Academic Communication Associates* at 1-888-758-9558 www.academ.com
- **Solve the Problem** (Ages 5-11 years)
Stories and picture cards to help develop children think of appropriate solutions for each of the problems. Item #49947-SP06 at \$36 from *Academic Communication Associates* at 1-888-758-9558 www.academ.com
- **Tasks of Problem Solving-Elementary** (Ages 6-12, Grades 1-7)
Problem solving tasks addressing the skills of general information, identifying problems, determining causes, making inferences, sequencing, negative questions, predicting, problems solving, and justifying opinions. Item #6-0612-9P6 at \$39.95 from *Linguisticsystems 1- 800-776-4332* www.linguisticsystems.com
- **Tasks of Problem Solving-Elementary** (Ages 12-18, Grades 7-12)
Kit providing real-life language and thinking practice with realistic newsletter articles and real-life situations for discussing starters. Item #NO5-5P6 at \$59.95 from *Linguisticsystems 1- 800-776-4332* www.linguisticsystems.com

ADHD

- **The Survival Guide for Kids with ADD or ADHD** by John Taylor from www.amazon.com

Organizational Skills

- **Get Organized Without Losing It** by Janet Fox from www.amazon.com
- **The Organized Student** by Donna Goldberg from www.amazon.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

