Executive Functioning:

What it is, Why it is Important, and How to Enhance Skills

Lebo P.R.I.D.E. – April 30, 2019

Heather S. Doyle, Ph.D., NCSP
hdoyle@mtlsd.net

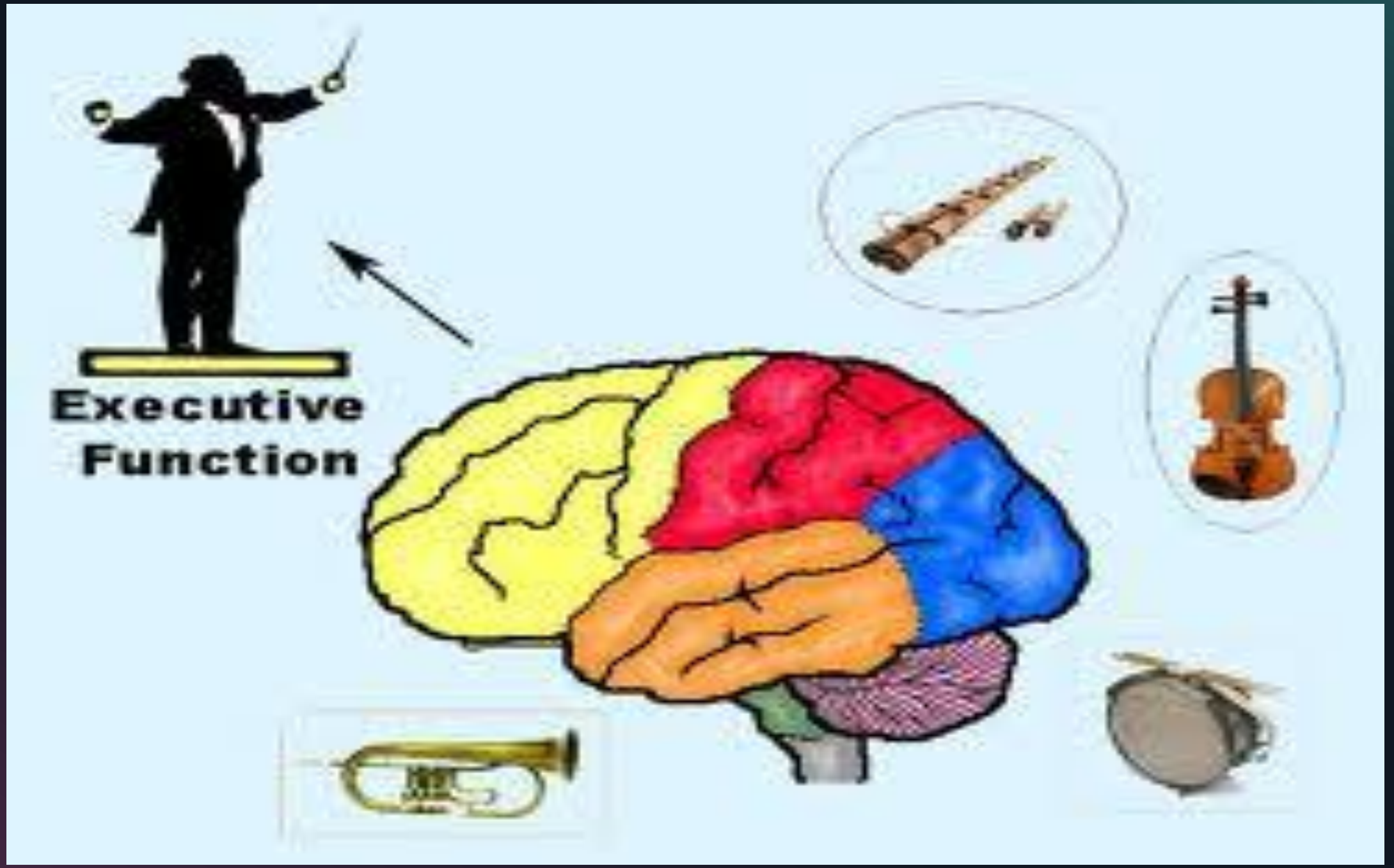
Advance Organizer

- Defining Executive Functioning (EF)
- Why is EF Important?
- Executive Functions and Processes
- Development of EF
- Intervention

What is Executive Functioning?

Brown (2003) describes Executive Function (EF)as the **management system** of the brain's cognitive functions. The conductor of a symphony orchestra.

Each musician has the potential to play his instrument very well, but it is the conductor's ability to synchronize the different parts into a perfect whole, that makes the music great.


Executive
Function

Executive Functioning: Definition

Executive Functioning Skills are a set of eight inter-related cognitive operations, mediated by the frontal lobes, that are responsible for goal directed, problem solving behavior.

Executive Functioning (EF)

Executive functioning is an umbrella term for a set of high-level mental processes that control and regulate other abilities and behaviors.

They include the ability to initiate and stop actions, to monitor and change behavior as needed, and to plan future behavior when faced with novel asks and situations.

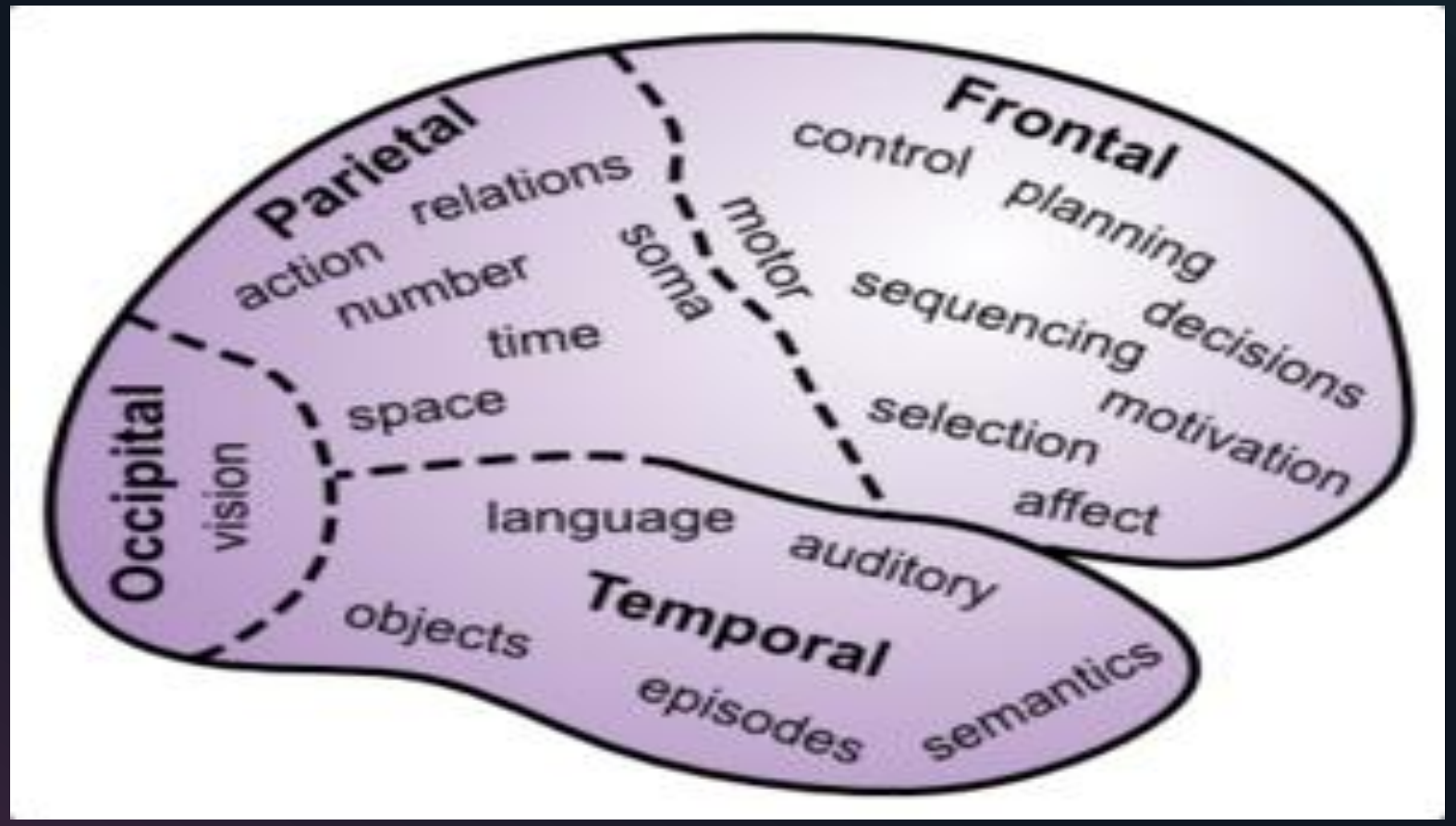
Executive functions allow us to anticipate outcomes and adapt to changing situations

Executive Functions: Functional Definition

- Self-awareness of strengths and limitations (what's hard to do; what's easy to do)
- Goal setting
- Planning/organizing
- Initiating
- Inhibiting
- Self-monitoring and evaluating
- Strategic thinking
- Flexible shifting, adjusting, benefiting from feedback

(Feeney, 2005)

Locations of Brain Function



Why is Executive Functioning Important?

- Allows us to account for short-term & long-term consequences of actions and plan for results.
- EF deficits in every neuropsychiatric condition.
- EFs are good predictors of achievement and are more evident in production than skill acquisition.

How Can Executive Functioning Affect Learning?

- Trouble initiating and completing tasks in a timely manner.
- Difficulty generating ideas independently.
- Difficulty retaining information that is required to complete a task.
- Difficulty in communicating details in an organized, sequential manner (i.e., orally and/or in writing).
- Struggles to understand the planning that is needed to complete a project.

Why Focus on Executive Functioning?

- Executive functioning skills have become a main focus for psychologists, neuroscientists, and educators.
- Executive functions help you manage life tasks of all types. For example, executive functions let you organize a trip, a research project, a paper for school, and how to get dressed in the morning.
- *Most importantly*, EF skills are essential to academic and social success.

Executive Functions and Education

Brain-based responses:

- Attention
- Memory
- Planning
- Organising/Priorizing
- Shifting
- Initiating
- Inhibiting /control
- Timing

EF Skills are Life Skills

Goal setting
- Steps in achieving desired outcome

Planning
- Time Management

Initiating
- Organizing and prioritizing information

Shifting from one concept to the next
- Transitioning from one activity to the next

Self monitor
- Own progress
- Attention and Focus

Executive Functioning Difficulties

- Planning
- Organizing Materials and Space
- Time Management
- Working Memory
- Initiating Tasks

- Difficulties can be seen at any age but tend to be increasingly apparent during the elementary grades as the demands of school work increase.

Executive Function Skill Clusters

- Self Regulation Clusters
  - Attention
  - Engagement (initiating, inhibiting, flexible)
  - Optimization (monitoring, correcting)
  - Efficiency (pacing, using routines)
  - Memory (holding/working, storing/retrieving)
  - Inquiry (anticipating, analyzing)
  - Solution (organizing, planning, deciding)

- Higher Level EFs - tend to develop later, lower correlation with self regulation
  - Self Realization - sense of self and others, metacognition, theory of mind, self-awareness
  - Self-Determination - goal setting and long-term planning

EF Component	Associated EDF Area of Weakness
Response Inhibition	Difficulty inhibiting responses; May blurt out answers; May seem to act without thinking
Cognitive Flexibility	Perseveration on thoughts, concepts, or tasks; Difficulty shifting tasks; Difficulty multitasking
Setting and Achieving Goals	Difficulty setting appropriate goals and maintaining course; Difficulty generating individuals strategies for problem solving
Task Initiation	Reduction in self-generated behaviors; Procrastination
Planning, Organization, and Time Management	Poor planning/ organizational skills; Inefficient use of time
Abstract Reasoning/ Concept Formation	Use of concrete thinking; Difficulty understanding consequences and cause-effect relationships
Working Memory	Difficulties accessing knowledge; Forgetfulness
Attentional Control	Poor attention; Distractibility
Controlling Emotions and Social Behaviors	Emotional lability; Poor frustration tolerance; A tendency to blame others
Self-Monitoring and Regulation/ Metacognition	Poor self-control; Reduced insight; Difficulty learning from past experiences

EF ASSESSMENT AREAS

Link to Academic issues

Reading

reading decoding,, rapid auto/ naming, comprehension

Writing, graphomotor control automaticity, retrieval cueing , poor generation cueing, self regulation

Math

poor cueing and monitoring,
poor ability to organize manipulate and retrieve,
poor ability to execute

Source: Avirett, Mortimer, Maricle and Miller

Executive Function Processes

- Brain-based (higher cortical function)
- Education-based (higher order thinking skills)
- Environmental influences
  - Excessive stress causes ‘flight or fight’ reaction – alarm system always on

Executive Function Processes

EF as overseer

- Provides infrastructure

- Highly interactive with other cognitive domains
  - E.g. Inhibitory control, a sub domain of EF is a related to Attention Deficit and Hyperactivity Disorder (ADHD)

Emotional Control

- Relational experiences throughout life promote the development of self regulation in the brain, specifically, the pre-frontal regions.
- This insight – that neural pathways develop in response to interpersonal relationships – has generated the research in the new field of interpersonal neurobiology.

Executive Functioning Skills and Attention

- Sustained Attention and Selective Attention are requirements for basic information processing and they are skills mediated by the right dorso-lateral cortex of the frontal lobe.
- The function of attention has been compared to the combined effects of a spotlight and a vacuum cleaner and it is the primary way neural structures develop.
- That is, the brain learns mainly from what the mind attends to.

Monitoring

- Good readers also have the metacognitive ability to monitor their performance. This means that a successful reader pays attention to comprehension and quickly becomes aware if the material has not been understood.

- In contrast, poor readers will decode large sections of the text before they become aware of comprehension deficits.

Executive Function and Behavior

- Child has poor executive functioning skills and poor fine motor skills which results in poor hand writing skills.
- She has become frustrated over time by the disparity between what she knows and her inability to express this in writing.
- She loses focus in class and misses important details which accounts for her being left behind in assignments .
- More than self will!

Brown (2003)quotes a client:

"If it is not interesting to me, if it doesn't turn me on, then usually I can't make myself pay attention, even when I recognize that it would be important for me to do so."

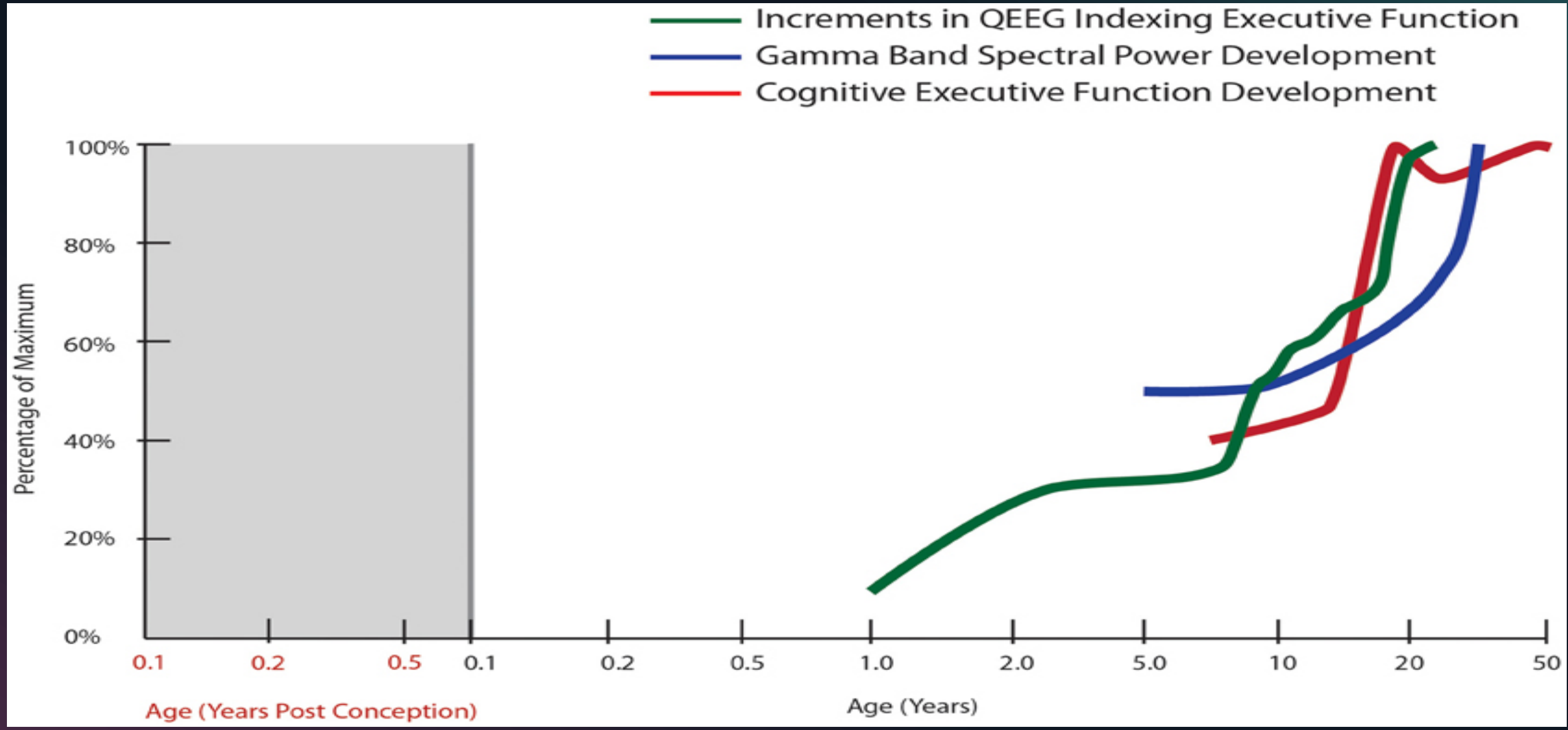
Development of Executive Functioning Skills

- Executive functioning is slow to fully develop.
- It emerges in late infancy, goes through marked changes during the ages of 2 through 6, and does not peak until around age 25.
- Therefore, it is important for children to be provided with strategies and adult support in order to help them acquire these skills.

Neuroplasticity

- Refers to the discovery by neuroscientists that the structure and functioning of the brain changes, in children and adults, due to *experience*.
- *Experience* for the nervous system involves the activation of neural firing in response to a stimulus. When neurons become active, their connections to each other grow and supportive cells proliferate. This is how experience shapes neural structure.

Normal Developmental Trajectory of Cognitive EF



Development of EF Demands

- Demands usually increase in middle school, high school, and the first 2 years of college when individuals are faced with the widest range of demands to organize and direct themselves in the broadest range of cognitive and social activities.
    - Also parents and other adults are expected to decrease their management efforts when the child reaches early and middle adolescence.
- Executive function becomes progressively more necessary and complex as an individual gets older.
- Denckla (1996) suggests that growing up is essentially the development of competence in executive function.
- Dealing with multiple teachers, driving a car, managing finances, and parenting children place strong demands on executive function.

Intervention

Executive Function Processing

- Effective Intervention Strategies:
  - Structured systematic approach
    - Graphics, thinking maps, use of organisers (colour-coded)
  - Explicit instruction for:
    - note taking, doing home work, studying, resources needed etc.
  - Metacognitive strategies
    - reflect on how students learn, what works
  - Positive reinforcement to motivate

Tools for Children and Adolescents with EF Difficulties

- clipboard
- post-it notes
- To do lists
- post-it tape pop-ups
- 3-hole punch
- super-large, 3 ring notebook with colored dividers
- lightweight mechanic pencils and fine-tipped pens

Study Tools for Children and Adolescents with EF Difficulties (cont.)

- colorful, stick-on dots
- audio recording, video, pictures
- colorful highlighting markers
- index cards in a variety of colors
- large, brightly colored paper clips
- personal organizational planners
- wall calendar at home

Strategies To Teach Planning and Organization

Homework Time Sheet		
Assignment	Estimated Time	Actual Time

Self Monitoring Chart

Tasks	Monday	Tuesday	Wednesday	Thursday	Friday
	Yes/No	Yes/No	Yes/ No	Yes/No	Yes /No
I raised my hand to speak					
I completed my class work					

Other strategies

1. Color-coded organizers/folders

2. Checklists leaving for school and home

3. Thinking maps for studying

Teaching EF Skills

- In general, children who have executive functioning issues require structure in their daily lives, clear and simple directions on how to accomplish tasks, clear expectations, and lots of praise when they display even the smallest EF skills.

- Remember to create an environment that functions as a surrogate frontal lobe.

Teaching EF Skills

- Stated another way, when teaching executive functioning skills, it is important to create an environment that functions as an executive function. Through repetition, modeling, and engagement with the specific intervention, neural pathways develop in the student that are then used for both behavioral regulation and meta-cognitive skills.

Teaching EF Skills

- Overlearned tasks are less likely to overwhelm a student's existing capacity for EF skills. For example, learning to drive a stick shift at first takes all of your attention. When shifting becomes automatic, one can simultaneously drive and think about other tasks.
- Explicitly demonstrate problem solving strategies that the student will need in class. This helps with the EF skills of initiating and monitoring.

Teaching EF Skills

Reading: requires attention, impulse control, cognitive flexibility, working memory, and self monitoring.

Math: requires attention, self monitoring, planning and organizing, working memory, and impulse control.

Writing: requires working memory, self monitoring skills, and the capacity to initiate a task or activity, and the integration of information from several brain centers.

Strategies for Working Memory

- Repeat orally presented information.
- Simplify the language in directions.
- Chunk/break down multi-step directions.
- Use of mnemonics or other strategies to help remember a series or other information.
- Use visualization strategies to enhance recall.

Strategies for Planning/Organization

- The use of checklists is highly effective in increasing organizational skills.
- The use of a calendar for upcoming activities and/or assignments.
- Color coding books/folders by subject area.
- Breakdown long-term assignments into smaller components and set deadlines accordingly.
- Designate a quiet and clean space for your child to complete their homework or other tasks.

Improving Adult EF

- Mindfulness meditation: There are over 1000 peer reviewed journal articles in psychology on the mental health benefits of mindfulness meditation. Mindfulness has been shown to improve cortical functioning in the right dorsal lateral prefrontal cortex and it has been shown to prevent the adverse effects of aging on the capacity for attention. Mindfulness has also been shown to increase left prefrontal lobe and immune system functioning.

- Exercise: Increases cognitive abilities and the EF skill of memory. Exercise is associated with neurogenesis in the hippocampus - part of the limbic system that is important to memory. Exercise has also been shown to have several mental health benefits.

Resources

Smart but Scattered

By Peg Dawson, Ed.D. and Richard Guare, Ph.D.

Center on the Developing Child: Harvard University-Activities Guide: Enhancing and Practicing EF Skills with Children from Infancy to Adolescence

https://developingchild.harvard.edu/resources/activities-guide-enhancing-and-practicing-executive-function-skills-with-children-from-infancy-to-adolescence/

Child Mind Institute: Metacognition-How Thinking About Thinking Can Help Kids

https://childmind.org/article/how-metacognition-can-help-kids/

Children's Hospital of Philadelphia: EF Interventions for the Home

https://www.chop.edu/centers-programs/executive-function-consultation-education-and-skills-excel-clinic/interventions

Late, Lost, and Unprepared: A Parents' Guide to Helping Children with Executive Functioning

By Joyce Cooper-Kahn & Laurie Dietzel

Questions?