Executive Function

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Outline

- The development of executive functions (EF)
- The neurobiology of impaired EF
- How impaired EF manifests in dyslexic students
- How to address these deficits when working to remediate reading and writing in a dyslexic student

Executive Function

- What comes to mind when you hear the term Executive Function (EF)?
  - Planning
  - Organization
  - Attention
  - Self-regulation

What is Executive Function?

- A ***set*** of cognitive abilities that ***control and regulate other abilities and behaviors***.
- Executive functions include the ability to:
  - initiate behaviors (***task initiation***)
  - delay or prevent inappropriate responses (***inhibition***)
  - monitor, change or stop behaviors (***regulation***)
  - manage interference (***cognitive flexibility***)
  - plan future behavior when faced with novel tasks and situation (***reconstitution***)
- These skills occur on a ***continuum***.

Set of Executive Functions

- **Response Inhibition** – capacity to think before you act; also called impulse control
- **Working Memory** – ability to hold information in memory while performing complex tasks (e.g. mental math)
- **Emotional Control** – ability to manage emotions to achieve goals, complete tasks, or control and direct behavior
- **Sustained Attention** – capacity to keep paying attention to a situation or task in spite of distractibility, fatigue, or boredom

Set of Executive Functions

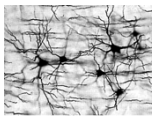
- **Task Initiation** – ability to begin projects without undue procrastination in an efficient or timely fashion
- **Planning/Prioritization** – ability to create a roadmap to reach a goal or to complete a task
- **Organization** – ability to create and maintain systems to keep track of information or materials
- **Time Management** – capacity to estimate how much time one has, how to allocate it, and how to stay within time limits and deadlines

Set of Executive Functions

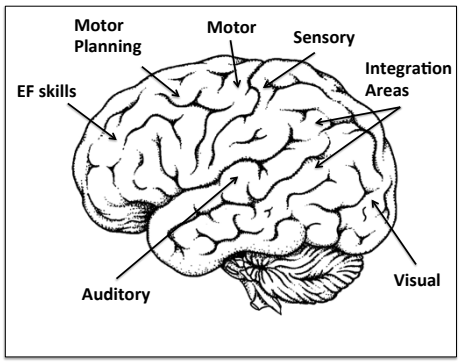
- **Goal-directed Persistence** – capacity to have a goal, follow through to the completion of the goal and not be put off or distracted by competing interests
- **Cognitive Flexibility** – ability to revise plans in the face of obstacles, setbacks, new information, or mistakes
- **Metacognition** – ability to stand back and take a bird's-eye view of yourself in a situation, to observe how you problem solve; thinking about thinking

Learning

- Learning by experience
  - Use it or Lose it
- Neural networks
- Multi-sensory instruction
  - Tactile/sensory
  - Kinesthetic/motor
  - Auditory
  - Visual



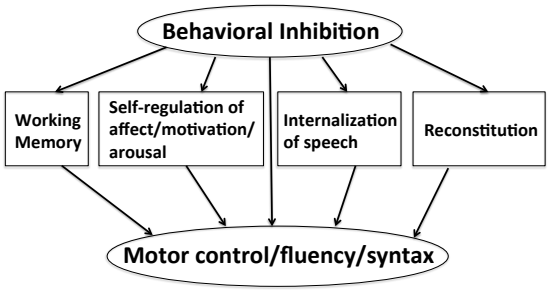
Brain Areas



Foundational Functions

- Inhibition
- Working Memory
- Shifting/ Cognitive Flexibility

Barkley's Hybrid Model



Home Observations

- Plans events ahead of time?
- Able to start and stop conversations?
- Able to adjust voice, topic of conversation, comments when needed?
- Able to initiate activities and be on time?
- Expresses emotions appropriately?
- Has future plans/goals?
- Are room and belongings organized?

Classroom Observations

- Has materials ready at the beginning of lesson?
- Begins and stops working when others do?
- Switches easily between tasks?
- Recognizes and respectful of others' feelings?
- Difficulty with writing, math, reading?

General Accommodations

- Take step-by-step approaches to work; rely on visual organizational aids.
- Use tools like time organizers, computers, or watches/ phones with alarms.
- Prepare visual schedules and review them several times a day.
- Ask for written directions with oral instructions whenever possible.
- Plan and structure transition times and shifts in activities.

http://www.ldonline.org/article/What_Is_Executive_Functioning%3F

Executive Function and Dyslexia

Internal Language

- Also called “self-talk”
- Impaired in students with poor phonological processing/working memory
- Deficit results in “islands of knowledge”
- Required for:
  - following multi-step directions (recipe)
  - learning new motor tasks (tying a shoe, swimming)
  - copying visuo-motor input (letters; sign language)
  - establishing neural networks of activation (domino effect, e.g. NYC, right triangle)

Creating Internal Language

- Increase phonological working memory
- Practice verbalizing externally
- Move from external to internal language using six steps:
  - I say, I do (modeling)
  - We say, we do
  - I say, you do (with verbalizing; say before doing)
  - You say, I do (follow instructions exactly)
  - You say, you do (external)
  - You say, you do (internal)

Using Internal Language

- Practice with physical tasks (e.g. shoe tying)
- Practice imagery tasks (getting ready in the a.m.)
- Drawing on paper
- Use with other modalities to store information (language, pictures, gestures, concepts)
- Problem-solving
- Encoding new information

Applying Internal Language

- Home environment
- Academic Subjects
  - Math
  - Science
  - Social Studies
- Reading/Spelling: Structured Word Inquiry
- Long-term papers/projects

Home Environment

- Identify skill to be improved/task to be done
- Use concrete cues (lists, charts, signs/gestures)
- Always repeat/verbalize instructions/information
- Abstract yourself out of the process
- ***Reward the behavior you want***

Math Example

- subtraction → sub + **tract** + ion
- *trahere* = to pull, draw
- subtract = to take away, draw from below
- Whole vs. Parts
  - Start with the whole
  - Take away the part (encode with sign/gesture)
  - Result = part taken away, amount that is left
- draw picture
- solve example problem
- verbalize steps

Science Example

- atmosphere → **atm** + o + **sphere**
- *atmos* = vapor, steam; *sphaira* = globe, ball
- analyze new vocabulary
  - troposphere → **trop** + o + **sphere**
  - tropopause → **trop** + o + **pause**
  - stratosphere → **strat** + o + **sphere**
  - stratopause → **strat** + o + **pause,** etc.
- draw picture(s)/diagram(s)
- encode with signs/gestures
- verbalize

After 9 months of intervention (age 13):
"I told myself I was going to do my homework assignment when I got home from baseball practice, but then I forgot when I got home."

After 12 months of intervention (age 11):
"this is a little off topic, but…"

Resources

Smart But Scattered
Peg Dawson, EdD, and Richard Guare, PhD

Executive Skills in Children and Adolescents
Peg Dawson, EdD, and Richard Guare, PhD

Promoting Executive Function in the Classroom
Lynn Meltzer

www.LDOnline.org