EXECUTIVE FUNCTIONS: WHAT ARE THEY EXACTLY, AND WHAT CAN WE DO TO HELP?

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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.

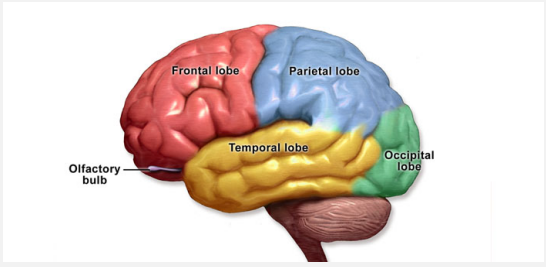
EF DEFINED

- Inhibition: the capacity to inhibit or resist an impulse.
- Shift: to shift freely from one activity or mental set to another.
- Emotional Control: ability to regulate emotional responses.
- Initiate: the capacity to initiate or begin a task or activity.
- Working Memory: to hold information in mind for the purpose of completing a task.
- Plan/Organize: to manage current and future oriented task demands.
- Organize: to keep track of one's possessions.
- Monitor: to watch one's own performance or to pay attention to the effect of one's behavior on others.

EF ASSESSMENT

- Inhibition: NEPSY or Stroop Procedure
- Shift: Wisconsin Card Sorting Test
- Working Memory: Most Cognitive Assessments
- Plan/Organize: NEPSY or D/K Tower Test.
- Organize: Rey Complex Figure
- Monitor: Continuous Performance Test
- Overall Ratings:
  - Behavior Rating Inventory of Executive Functions (BRIEF)
  - Comprehensive Executive Functioning Inventory (CEFI)

THE BRAIN REGIONS



13 oz in infancy → 3 lbs in adolescence

FRONTAL LOBES

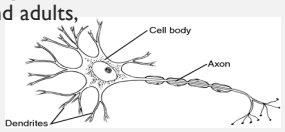
- Evolutionarily the frontal lobes are the most recent addition to the human brain – we have just started being social.
- Frontal lobes comprise about 33% of the entire cerebral cortex for humans (about 15% for monkeys, 8% for dogs).
- Studies have shown that in mammals, the higher and more complex degree of social living, the more frontal lobe architecture there will be.
- The function of the frontal lobes is often compared to the function of an orchestra conductor.

FRONTAL LOBES (CONTINUED)

- The Frontal Lobes are the last part of the brain to fully mature, about 18-20 (maybe even longer) years of age.
- However, because of neuroplasticity, the brain never ceases to stop developing and building upon itself.

NEUROPLASTICITY: BRAIN GROWTH 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.
- The structure and functioning of the brain changes, in children and adults, due to ***experience***.



NEUROPLASTICITY

- These repeated firings are accompanied by changes in actual brain function, mental experience (feelings and emotional balance), and physical responses to stress.
- The associations between neurons that are developed through repeated neural firing = LEARNING

NEUROPLASTICITY (CONTINUED)

- Therefore, skills that you have not learned, you learn through repetition, sustained attention and effort in mastering the skill.
- Scaffolding: refers to using a variety of instructional techniques to move students progressively toward stronger understanding and, ultimately, greater independence in the **learning** process.

EMOTIONAL CONTROL

- Mirror neurons are important to our social brain in that they help us perceive the intentional, goal directed actions of others,
- then link this perception to the priming of the motor systems needed to engage in the same action.
- In other words, what we see, we become ready to do or to feel.

EMOTIONAL CONTROL

- Young children learn to regulate their emotions through empathically based interactions with parents and other caregivers.
  - These interactions set up the neural pathways in the brain.
- The ability to regulate emotions derives in part from early attachment experiences with caregivers where emotions were consistently recognized, validated, and empathized with.

EMOTIONAL CONTROL

- Studies have shown that children born into a family where parents do not respond to the child's affective experience have deficits in brain functioning as early as 1 year of age.
- The EF skill of emotion regulation in children and teens involves the ability to be aware of, tolerate, put into words, and use emotions adaptively to regulate distress.

EF SKILLS AND ATTENTION

- Sustained Attention is a foundational skill that is important to several domains of EF. Sustained Attention refers to the ability to direct and maintain a focused attention on a specific stimulus.
- Selective Attention refers to the ability to attend selectively to stimuli in the environment.

ATTENTION

- Sustained Attention and Selective Attention are requirements for basic information processing.
- The brain learns mainly from what the mind attends to.
- Vacuum & Spotlight

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.

INTERVENTION

- BASICALLY….
  - Set up the environment and act as a surrogate frontal lobe for the student/child…
  - Teach/repeat/teach/repeat…
  - Neuroplacticity = Learning

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.

TEACHING EF SKILLS

- Skills Development
  - Teach the EF skill directly.
  - Guide the student in using this skill over and over.
  - Systematically fade the prompts used to remind student to use the skill.
  - Reinforce its use with incentives/contingencies to motivate continued use

TEACHING EF SKILLS

- 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

- Benefits of overlearning/mastery:
- Overlearned tasks are less likely to overwhelm a student's existing capacity for EF skills.
  - E.g., driving stick shift
- Explicitly demonstrate problem solving strategies that the student will need in class. This helps with the EF skills of initiating and monitoring.

EDUCATIONAL INTERVENTIONS

- Task Initiation-slow/unable to begin a new task, activity, or assignment
  - Start with easiest task (behavioral momentum);
  - provide written and oral directions;
  - check that directions are clear;
  - begin work with mentor peer;
  - segment the work into small initial steps;
  - fold student's paper in halves, quarters, etc, and ask them to work on just the first part

EDUCATIONAL INTERVENTIONS

- Regulation of Affect
  - Reduce classroom stimulation;
  - Maximize predictability;
  - Emotional previewing ("this is a tough worksheet, what can you do if you get frustrated?");
  - Model calm affect;
  - Intervene early in cycle of escalation;
  - Teach positive self-statements

EDUCATIONAL INTERVENTIONS

- Disorganized - poor time management skills; inability to plan ahead; difficulty with sequencing; messy desk/locker; failure to turn-in work although it is complete; misplaces books/materials; written work appears messy and lacks coherence.
  - external organizers (calendars, watch with alarm);
  - instructional chart with sequence of steps articulated;
  - instruction chart posted on desk top on index cards or stickies;
  - daily schedule, routines, rituals;
  - study buddy;

EDUCATIONAL INTERVENTIONS

- Distractible - not responding when called upon; poor task completion; difficulty distinguishing important information/ main idea from less important; skipping from one activity to the next.
  - preferential seating;
  - instruction on appropriate academic level;
  - hands-on learning, based on interests and strength;
  - reducing the number of items per assignment;
  - permitting students to work problems in an unusual order (bottom to top);
  - using external non-verbal cues to prompt student to return to task;
  - increasing the amount of immediate feedback

EDUCATIONAL INTERVENTIONS

- Hyperactive - difficulty staying in chair; high level of gross-motor activity (younger children); restlessness (adolescents); seeks sensory stimulation (chewing, tapping, leg swinging).
  - providing acceptable opportunities for movement rather than attempting to restrict activity;
  - providing a specific number of walking passes (e.g., sharpening pencil, drinks of water, access to books, wall charts);
  - providing small manipulables to channel activity from gross to fine motor (e.g., clay, stress balls);
  - restating rules before the opportunity for rule infraction;
  - increasing proprioceptive feedback (consult with OT or PT);
  - instructional strategies that use tactile materials

EDUCATIONAL INTERVENTIONS

- Impulsive - shouts out answers without being called upon; exhibits risk taking behaviors; does not think about consequences of behavior; difficulty following rules; difficulty taking turns.
  - teaching self-monitoring skills;
  - teaching self-regulating skills;
  - directly teaching the behavior you want to see;
  - giving positive feedback 5 to 8 times more frequently than negative ones;
  - teaching student verbal or motor response to use while waiting (e.g., holding up a "HELP" card, writing note to self so he will remember)

EDUCATIONAL INTERVENTIONS

- Memory - inconsistent and/ or poor recall of previously learned information; reduced reading comprehension with long and/or complex sentences; forgetting assignments, social commitments.
  - segment study time into smaller units;
  - structured breaks;
  - alternating subject matter;
  - establish lesson context and links to prior knowledge;
  - highlight most important features (color coding, shapes, size emphasis);
  - provide opportunity for novel repetitions until student achieves automaticity of basic skills/facts

EDUCATIONAL INTERVENTIONS

- Self-Monitoring and Evaluation - lacks "internal voice," the internal dialogue to self-coach and/or guide thinking and behavior; unaware that his/her behavior is inappropriate, annoying to others; difficulty checking work once completed;
  - role model by thinking out loud;
  - provide non-judgmental feedback to establish sequence and causality of events;
  - provide rubric on desktop for correcting work and provide structured practice in using it

EDUCATIONAL INTERVENTIONS

- Transition - difficulty transitioning between activities, subjects, classes; repeats same idea, question after receiving a response; repeats same error even when told it is incorrect
  - provide three-part transition cues (stopping, moving to, and starting);
  - develop transition rituals;
  - create transition songs, games, activities (primary grades)

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