What are Executive Functions?

> ... the mental processes that enable us to plan, focus attention, remember instructions, and juggle multiple tasks successfully.

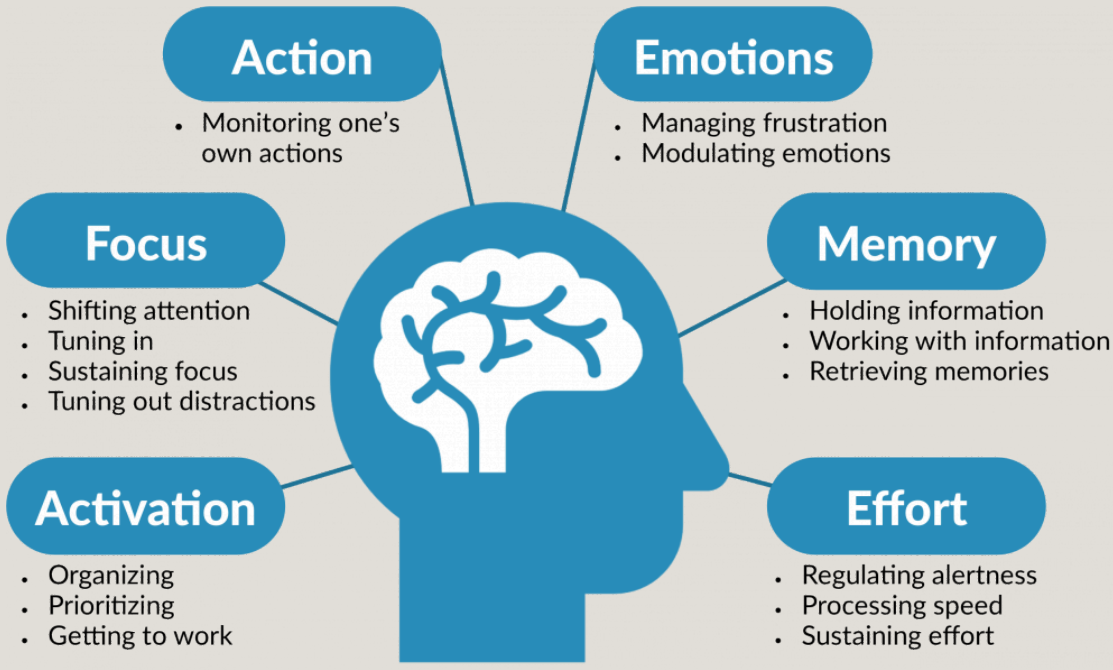
(Executive Function & Self-regulation 2020)

EFs as Air Traffic Control for the Brain

"Just as an air traffic control system at a busy airport safely manages the arrivals and departures of many aircraft on multiple runways, the brain needs [executive functions] to filter distractions, prioritize tasks, set and achieve goals, and control impulses."

(Executive Function & Self-regulation 2020)

Some Common Behaviors Associated with EFs



Executive functions (EFs) are difficult to define because they overlap and present differently in each individual's learning process.

However, these are some of the behaviors related to or governed by EFs (Brown, 2005):

1. Activation
2. Focus
3. Action
4. Emotions
5. Memory
6. Effort

Brown, T.E. (2005). Attention deficit disorder: The unfocused mind in children and adults. Yale University Press.

Executive Function & Self-regulation. Center on the Developing Child at Harvard University. (2020, March 24). Retrieved December 14, 2022.

Center for the Enhancement of Learning & Teaching

Why Are Students Suddenly Struggling with EFs?

Some students are more prone to exhibit difficulties with executive functions than others, including students with ADHD, dyslexia, processing disorders, traumatic brain injuries, and students on the autism spectrum. However, problems with EFs can also emerge as a result of outside forces like stress, anxiety, trauma, and even stereotype threat.

The excessive levels of stress, trauma, and anxiety that we all experienced as a result of COVID-19 have caused many people (including our students and ourselves) to struggle with things like time-management, focus, organization, prioritizing, and monitoring our own progress. In fact, many people who didn't previously have difficulties with EFs are experiencing EF problems now.

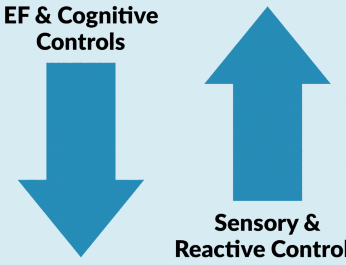
How Does Stress Affect Executive Functions?

Stress has long been known to impact EFs, but the current literature is less clear on exactly how stress affects EF. In a 2016 meta-analysis, Shields et al. sought to determine the mechanisms by which stress affects EF. This meta-analysis examined three main theories:

1

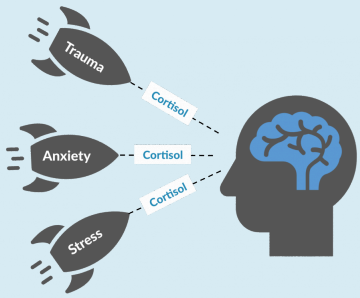
Stress causes cognitive resources to be shifted to the thing causing the stress.

2



Stress shifts cognition from top-down control (higher-level cognitive controls like EF) to bottom-up controls (sensory and reactive controls).

3



Stress causes a spike in cortisol, a stress hormone, which floods the pre-frontal cortex (PFC) causing disruptions to EF.

Findings from this meta-analysis of 51 studies point to the first theory as being the most likely mechanism by which stress affects EF, which suggests that stress causes cognitive resources to be reallocated to the most salient information, the stressor (Shields, 2016).

Shields, G.S., Sazma, M.A., & Yonelinas, A.P. (2016). The effects of acute stress on core executive functions: A meta-analysis and comparison with cortisol. Neuroscience and Behavioral Reviews, 68, 651-668.

How Can I Support Students' Executive Functioning?

When students experience challenges with EFs and managing their learning it can present in different ways, including an apparent lack of motivation or engagement. Of course, we can't get inside the brains of our students and make them have better executive functioning skills, but we can use teaching and design strategies that help support the development of their EF skills. On the previous page, we introduced some common behaviors which are related to or governed by executive functions, but that list includes all areas of a person's life. For the remainder of this resource, we will concentrate on some of the more salient behaviors associated with EFs in an academic setting: focus, activation, and memory.

Some academic EF tasks you may notice students struggling with:

Focus

- Shifting tasks quickly
- Changing gears
- Transferring skills
- Tuning out distractions
- Being "present"
- Paying attention
- Adjusting when off-task
- Taking notes

Activation

- Planning study time
- Organizing notes
- Gathering materials
- Meeting deadlines
- Prioritizing tasks
- Following multi-step directions
- Planning ahead for long-term projects or papers

Memory

- Holding info in short-term memory when taking notes
- Difficulty recalling information
- Remembering things you want to remember
- Processing spoken information or directions
- Answering questions with little to no processing time

Strategies to Support Students' EFs

Focus & Activation

If students are struggling with...	Try these strategies to support focus:
Shifting tasks quickly & changing gears	• Provide an agenda or plan for the day. This gives students a heads up on transitions that could otherwise disrupt the flow of their learning.
Tuning out distractions & paying attention	• Intersperse periods of passive listening with active learning breaks (1-minute reflections, turn & talk, small group discussion). • If a class is longer than 60 minutes, give students a 5-minute break in the middle of the time. Use a visual countdown timer (easily found on YouTube) to make sure you stick to the 5 minute break time.
Being "present"	• Build in one or two short (<3 min.) phone/social media breaks into your class time. If students know this time is coming up, you can ask them to wait to check their phones until those times.
Adjusting when off-task	• Ask students to metacognitively reflect on their own time-on-task during your class. "Did you notice yourself tuning out today? When? What was happening? What can you do differently next time when you realize you're tuning out?"
Taking notes	• Provide students with a simple outline or graphic organizer that will help them take notes more effectively. • Use a clear structure in your slide deck to indicate new categories, topics, or sections of information.

Activation

If students are struggling with...	Try these strategies to support activation:
Planning study time	• Provide a quick summary at the end of your instruction that helps students see the main points and critical features. This will help them know which things are most important, and therefore, which things to focus on in study time. • Explicitly tell students how you would spend your time studying for the exam if you were a student taking this class.
Organizing notes	• Provide them with very simple graphic organizers so they have a designated place to take notes for each part of your lecture. • Provide students with a sparse outline that matches the structure of your lecture slides.
Meeting deadlines	• Sending weekly reminders of due dates and upcoming assignments. • Enter all due dates in Canvas so students can utilize the "To do" list feature to keep track of all their classes at once.
Prioritizing tasks	• Provide a quick summary at the end of your instruction that helps students see the main points and critical features. This will help them know which things are most important, and therefore, which things to focus on in study time.
Following multi-step directions	• Lay out directions in a checklist with blank boxes or lines to check off. • Can you streamline the directions? Remember: the fewer words you use, the more likely students are to actually read them!
Planning for long-term projects or papers	• Break long-term projects into multiple smaller, milestone assignments. • Build in a 2-minute reflection where students submit responses to a survey (e.g., Google form) about where they are in their project and what they need help on.

Memory

If students are struggling with...	Try these strategies to support memory:
Holding info in short-term memory when taking notes	• Some students have difficulty writing down information presented on slides, while also trying to write down spoken information. You can provide students with the slide deck ahead of time so they only have to fill in the spoken information instead of trying to jot down information from two sources at the same time. • Build some intentional pauses into your lectures so students can catch up on notes. • Give students access to a digital version of the slides so they can refer back to previous slides in case they missed something.
Difficulty recalling information	• Recall of information from our stored (or long-term) memory only improves with practice. Provide students with low-stakes or no-stakes quizzes to build their recall capacity. • Encourage students to use digital or paper flash cards to practice recalling information.
Remembering things you want to remember	• Use the technology on your phone or device to help you remember. Set an alarm, set a reminder, or send yourself an email.
Processing spoken information or directions	• Provide both spoken and text-based (i.e. written) information, especially with directions.
Answering questions with little to no processing time	• Build in a 1-minute buffer between the time you ask a question and when you accept answers to allow students to process information before they respond. • Think-ink-pair-share: When you ask students a question you want them to respond thoughtfully to, first ask them to think about their answer, then jot down their answer (ink), then give them an opportunity to share with a partner before sharing with the large group.