



MEASURE WHAT MATTERS!

Literacy: What Does Executive Function Have to do with it?

How many times have you read or written something in the past 24 hours? Reading and writing are key skills that we use on a daily basis. In school, in the workplace, and at home, reading serves as a vital tool for acquiring new information. Reading is especially important between 3rd and 4th grade, as this is when children are expected to transition from "learning to read" to "reading to learn." After this point, children rely on their reading ability to learn about new topics in all school subjects.

One report found that children who were not reading at grade-level by the end of 3rd grade were 4 times more likely to drop out of high school. Like reading, writing is also a critical skill that allows us to communicate with others. It is also a proficiency that employers highly value in job candidates. Since reading and writing are essential for academic and life success, it is important to understand how certain brain skills, like executive function (EF), influence literacy.

What are executive function skills?

Executive Function Skills refer to brain-based skills that are used to control one's thoughts and behaviors to accomplish goals. Most experts agree that executive function is made up of 3 different components: working memory, inhibitory control, and cognitive flexibility. Here's a closer look at what these terms mean:

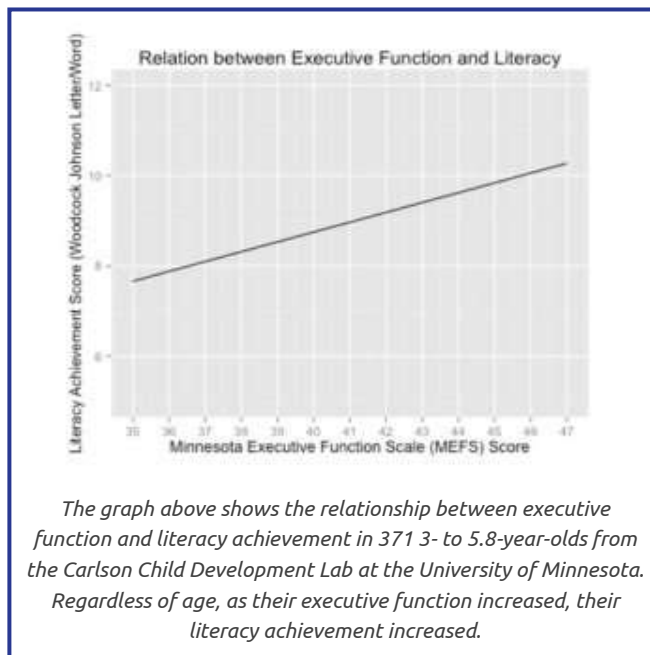
- **Working Memory** refers to the ability to keep information in mind for a short period of time and use that information to reach goals.
- **Inhibitory Control** refers to one's ability to stop automatic or impulsive responses, as well as ignore

distracting, irrelevant information.

- **Cognitive Flexibility** refers to one's ability to be flexible with one's thoughts and actions, think about something in multiple ways, and to switch gears during activities.

What is the relation between executive function skills and literacy?

Research shows that children with better executive function skills perform better on literacy assessments. When children are first learning to read and write, their executive function is related to important pre-literacy skills, such as recognizing letters or learning the sounds that letters make. However, once children have mastered these basic pre-literacy skills, their executive function continues to be related to increasingly complex literacy skills such as reading comprehension.



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There is also evidence that children with difficulties and disorders related to reading and writing, including dyslexia, dysgraphia (trouble with written expression), and specific reading disorders, have deficits in executive function skills compared to children without such disorders. This suggests that executive function skills play an important role in being able to successfully read and write.

How is EF used when reading and writing?

In addition to enabling children to sit still and pay attention while engaging in literacy activities, there are specific ways in which executive function skills play an important role in reading and writing.

Some examples of how EF skills affect Reading:

Working Memory is needed when children comprehend the meaning of a text by keeping in mind what they have already read and updating their understanding of the story as they continue to read. Young children also use working memory when sounding out words because they have to keep in mind all the different letter sounds and then put them together to figure out what the word is.

Inhibitory Control is needed when encountering words with multiple meanings by choosing the correct meaning in the context of the story and ignoring its other meanings. For example, when reading a story about baseball, a child has to use the meaning of the word “bat” to refer to a baseball bat and inhibit its meaning that refers to an animal. It is also useful for ignoring irrelevant information when trying to comprehend a text or when young children need to distinguish between letters that look very similar such as ‘b’ and ‘p.’

Cognitive Flexibility helps children engage in, coordinate, and switch between multiple mental processes during reading. This includes interpreting what words sound like and what words mean, as well as being flexible in interpreting phrases as literal or figurative depending on the context of the story. For example, when children encounter the phrase, “The man had a heart of stone,” they have to be flexible enough to interpret this beyond the literal meaning to understand that it refers to someone who is cold and unsympathetic.

Some examples of how EF skills affect Writing:

Working Memory helps a child to keep the topic or goal of a paper in mind while writing, versus going off



on a tangent. It also helps in remembering spelling and grammar rules.

Inhibitory Control is needed during the brainstorming/planning process of writing. This is going to help children inhibit ideas they have already covered, allowing them to think of new ideas. It is also important during the revision process for inhibiting the original way something was written in favor of a more effective way.

Cognitive Flexibility is important for thinking of alternative ways of saying something or to change the organization of an essay. It is also needed to take on multiple perspectives in fiction writing or to imagine both sides in a comparative essay.

Executive function skills are important during the period when children are learning to read and write. Understanding this relationship and noticing the ways in which children use their executive function skills during this time can help you to better understand and better support your children’s literacy development.

Resources:

For information from **LDA America** on how EF impacts reading: <https://ldaamerica.org/the-reading-brain-executive-function-hard-at-work/>

For information from **Learning Works for Kid** on suggestions for improving writing and EF: <http://learningworksforkids.com/2013/10/strategies-to-improve-writing-skills-executive-functioning/>

For information from **Understood.org** on EF difficulties: <https://www.understood.org/en/learning-attention-issues/child-learning-disabilities/executive-functioning-issues/understanding-executive-functioning-issues>

What Do Executive Function Impairments Look Like in the Classroom?

Executive function impairments in the classroom can manifest in a number of ways.

Commonly, children who struggle with self-regulation will act out. Other low executive functioning students may go undetected — rather than causing trouble, they quietly struggle. How can parents provide support?

Dr. Stephanie Carlson, Reflection Sciences' Co-founder and Chief Science Officer, participated in an interview with Sucheta Kamath, Founder and CEO of Cerebral Matters. Sucheta's podcast series, **Full Prefrontal**, hosts researchers, neuroscientists, educators, learning experts, and thought leaders. Together, Sucheta and the experts discuss the importance of the **prefrontal cortex** (see below) in impacting a child's focus, attention, planning, problem-solving, emotion regulation, and independence.

In this episode, Sucheta and Dr. Carlson discuss how executive functions develop and how addressing early executive function impairments or delays can promote success in a school setting.

The **Prefrontal Cortex** is located in the front of the brain.



Listen to the Podcast here:

<http://cerebralmatters.com/podcast/podcast/episode-23/>

For ideas on how you can help prepare your child for school, try some of these activities at home!

For Toddlers:

- **Try adding rules to sorting games for more of a challenge.**
After sorting things by item (teddy bears vs. puppies), have your toddler sort items by color, like putting green play food on a red plate and red play food on a green plate. This will help engage their attention span, working memory, and ability to stay on task.



- **Talk to your child about thoughts and emotions.**
Use a variety of words that describe emotional states (e.g. excited, worried, jealous) and what goes on inside people's heads (e.g. thinking, wanting). Talk both about what your child is feeling and what other people around them are feeling. When your child has the words to talk about their internal world, they are better able to express and regulate themselves, and they also learn more empathy for others!
- **Be consistent in the limits you set for your child.**
First, make sure your expectations are realistic given your child's age. For example, younger children simply can't remember as many rules as older children. Then, when you make a rule, try to enforce the rule every time it comes up. Having clear limits helps children know what they can and can't do, and therefore control their own behavior to meet those expectations.

For Preschoolers:

- **Play games that require children to follow rules and control their body.**
These games, such as Red Light Green Light or the B-I-N-G-O song, require the child to pay close attention and also inhibit impulsive movement, which is great for learning self-control!
- **Teach your child explicit strategies to use when they are upset.**
Naming the emotion they are feeling is a good start. Calming strategies like 10 deep breaths or walking away from the situation and coming back are also useful. When children have strategies to deal with intense emotions they feel more in control and are able to work through emotions more successfully!