

“The Boss is Out!”

Impact of Executive Function Deficits in Children with ADHD and Related Learning Disabilities.

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Researchers have identified a combination of critical brain processes known as executive functions that influence a student’s ability to succeed in school, if not life. Executive functions act as the management system of the brain. The following is one way executive functioning can be described: Picture a symphony orchestra whose members are excellent musicians. Despite the fact that the musicians are superb, if there is no conductor, who can organize and integrate the efforts of the individual musicians in the same piece, at the same time, the overall performance will suffer.

Students with executive function deficits (EFD) have difficulty managing themselves consistent with same age peers.

Parents and educators must be aware to the danger of attributing negative EFD outcomes to lack of motivation or poor attitude. A particularly damaging assumption is reflected in the often-heard statement that the student “should be able to do this by now,” “he’s just hard headed,” and s/he “needs to take more responsibility for their actions.”

Certainly, students with executive function deficits must learn to take responsibility for their behaviors, but this learning must occur in the context of their own developmental timetables. This means discipline is imposed in a very different manner than with children who willfully misbehave. If students cannot appropriately self-direct their behavior/organization in school to ensure success, then IDEA and Section 504 mandate the provision of supports and accommodations for eligible students.

Although executive function may improve with age, the student’s delays at the middle and high school levels are often too profound to overcome without help, encouragement, support, and understanding from teachers and parents. Age and grade level expectations for students such as self-directing routines of daily living, working independently, following through on tasks with minimal supervision, organizing assignments and materials, and “acting their age,” are unrealistic for students with EFD. These students are

functioning at their best, but their outcomes are not consistent with same age peers. They require assurance and appreciation for their effort over outcomes.

Educators expect most teenage students to remember assignments, complete homework, turn it in a timely manner, and manage long-term projects without frequent monitoring. Unfortunately, students with EFD experience poor development in the skills necessary to perform these tasks in a timely manner despite immense effort.

It is estimated that middle school and high school students with EFD are delayed by about 2-3 years from their contemporaries to manage critical academic and social/behavioral tasks.

While these teen students can look and seem mature in some areas, their ability to organize, remember details, manage time, act responsibly, use self-care skills, use appropriate social skills and be self-aware typically are not as well-developed as they are in aged-matched peers. Therefore, parents and educators must provide more supervision and support that is commensurate with the student’s developmental age rather than the student’s chronological age. Unfortunately, teens tend to thwart environmentally imposed structure, consistency, and routine.

The following are definitions of specific areas of Executive Functions and their behavioral, social, and educational impact.

WORKING MEMORY is the ability to maintain two or more bits of information in immediate memory and use that information simultaneously, to purposefully generate novel solutions or behaviors. Working memory allows an individual to ‘think ahead’ and self-direct behavior to complete goals.

Results of working memory tasks are often variable, which suggests intact working memory capacity, but poor expression of the skill set secondary to inattention and/or distractibility. Intact but inconsistently expressed working memory skills suggest a child can think ahead to factor consequences into behavioral decisions and maintain ‘future memory’ to plan and

meet goals, but often do not. Unfortunately, the variable expression of working memory skills often undermines appropriate goal completion despite intact capacity, and it can lead to poor behavioral decisions. It also can lead to the child being misperceived as oppositional or malicious when they are not.

INHIBITION is the ability to withhold responding to stimuli that should not be responded to. As working memory allows an individual to direct behavior, a lack of working memory will result in poorly self-directed (impulsive/dysinhibited and stimulus bound) behavior. As well, one can have large working memory capacity and quite poor inhibition, which in turn undermines working memory.

An impulse control deficit is characteristic of ADHD. A child's impulsive responding has the potential to make them appear willful and defiant when, in fact, the impairment causes them to act before they think. Impulsivity also has the potential to undermine academic performance as the child frequently responds without thinking, toxifies performance, and requires additional time to correct inadvertent mistakes.

PLANNING and ORGANIZING is ability is the direct result of a functioning working memory and inhibition system.

A child may have intact ability to plan and organize for problem solving; however, their abilities are frequently undermined by inattention and impulsivity. Inattention and distractibility can result in the failure of information to get encoded into working memory. Impulsivity causes one to act before they are using working memory. In each scenario, working memory is undermined and planning and organization for problem solving becomes inefficient. Therefore, when a child must self-direct behavior for planning and organization for problem solving, they sometimes have difficulty making the best behavioral and social decisions. For example, this may be the child who continues a joke when everyone else is done with it. The negative outcome may lead to learned helplessness if the child frequently experiences impulsive failures despite much effort and good intent, as they are unaware of their impulsivity. This also causes the child to blame others for their poor behavioral outcomes. Imposing structure around problem solving approaches likely will improve the expression of planning and organization for problem solving efficiency.

FOCUS EXECUTION is the ability to blend a novel trait or behavior with a habituated behavior or skill. For example, going from training wheels to a two-wheeled bicycle is a focus execution adaptation. Focus execution requires reasoning flexibility, consolidation of basic skill sets, and procedural memory. Focus execution is learning.

If a child performs in a manner that is negative for a focus execution deficit they tend to show an innate disorder of learning. It is not uncommon that a math learning disability

(dyscalculia) and orthographic dyslexia (*aka* surface dyslexia) are likely to exist. As well, the child with such learning disabilities tends to express behavior that is somewhat socially out of step. They may be mis-diagnosed with Asperger's Syndrome or so called Nonverbal Learning Disability. These children are figuring out things as they go as opposed to showing habituation of skill sets. Part of the problem has to do with cerebellar functioning that consolidates procedural memory. Focus execution can be intact, but the outcome can become variably expressed due to inattention and impulsivity. Children with this problem must put forth more effort to complete tasks than same age peers as learning is slow and cumbersome, and the child requires considerable repetition and additional practice to habituate new skills.

COGNITIVE SHIFT is the ability to incorporate feedback from one's environment (via attention) to form and adjust concepts for problem solving. Therefore, one must be sensitive to the information their environment is providing. If a child responds well to an environment characterized by a high degree of imposed structure, they tend to perform well. If, in the face of such structure, the child does not shift and adjust, they likely have the deficit. When considered in contrast to the unstructured tasks where the child has to self-direct problem solving, performance on shift tasks should drastically improve with the provision of environmentally imposed structure and feedback. In other words, the environmental provision of routine, structure, and feedback both at home and at school help to prevent children from making attention-based and impulsive mistakes.

SUSTAINING ATTENTION is concentration directed/allocated by the frontal lobes, but otherwise produced in other regions of the brain. One must prioritize attention.

Children are generally unaware of when they are being inattentive and impulsive. This causes them immense difficulty trying to remediate the problem on their own or based on natural or imposed consequences. As well, attention and impulsivity are '*have/have not*' skill sets. This means that if one is a *have* for attention and inhibition they can sustain the skill sets and inhibit behavior for as long as they want and whenever they want. If they are a *have not*, it does not mean the absence of attention and inhibition; it means the incomplete or inconsistent expression of the skill sets. In this way, children who are inattentive and impulsive are often described as lazy, hard headed, or willful because they are sometimes witnessed paying attention and inhibiting behavior. The problem is the child cannot sustain or inhibit reliably.

A further difficulty with attentional and inhibition system problems is that the individual is largely unaware of when they are expressing the problem. Therefore, if an individual does not know when they are being inattentive or impulsive, they cannot be completely expected to change the behavior on their own, based on imposed consequences, or repeated discussion.

Change for individuals with these problems tends to be slower, causing them to appear concrete and emotionally less mature than same age peers.

ENCODING is how one places information into memory for later recall. Encoding requires working memory, inhibition, planning and organization, and intact language abilities.

In the absence of brain injury, disease sequela, or seizure disorder; encoding and recall deficits are rare. The key is that the child must sustain attention to that which is to be encoded. If the child cannot sustain attention, then they may show a 'Swiss cheese' manner of recall since much information was not encoded in the first place. Sometimes children may seem forgetful, but this is due to intermittent attention paid to information they were supposed to encode, but missed. Even when a child puts forth maximum effort, they still may be unable to consistently sustain attention to information meant for encoding. Learning efficiency may be compromised since the child requires repeated exposure to information for encoding. They may benefit from repetition of information to be encoded as it may allow them to 'fill in the gaps' left by attentional drift.

There is good news for students with EFD; something can be done. The human brain has the ability to reshape and rewire itself. This is called neuroplasticity. Also referred to as brain plasticity or cortical re-mapping; neuroplasticity is the brain's ability to re-network, creating new connections between neurons, as well as establishing new neurological pathways in the brain. EFD can be positively impacted by using a combination of evidence-based cognitive training techniques that aim to create a neurological change in the brain resulting in improved working memory, attention, and learning aptitude.

For further information on Executive Functions, ADHD, and related Learning Disabilities and effective interventions contact the following below.

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