



BEYOND IQ:

The largely overlooked importance of Executive Functions

“What we really need to harness for our youth to succeed”

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discussing complex concepts, but be nearly incapable of producing an essay, completing a set of problems, or finishing a research paper. Why? It's not because he isn't smart enough, it's because he can't effectively marshal his efforts toward a specific end result.

Child W is a highly gifted adolescent, however, he is also known to have weak executive functions. This adolescent can run circles around you when arguing a point. However, this same adolescent needed to be handheld through high school, his mother quitting her job so she can manage his workload and assist him full-time. This child has no sense of time, grossly underestimating how long assignments may take, as such often playing video games till midnight and then realizing a report was due the next day and its more time consuming than he had imagined. He would let subject upon subject pile up on each other, to the point that he was so far behind he wouldn't do anything at all. He could equally get fixed on a topic and find it hard to shift, as such spending much more time than his peers on topics. Other times he was also found to stay up till the small hours of the morning perfecting a single low-stake assignment, leaving untouched the others that influence his grade far more. W also often had all the information accurately in his head, but lacked a method to get those ideas cohesively in written form resulting in no finished product to submit to his teacher. This gifted student struggled through all of high school. He was ineffective because he couldn't manage his time or prioritize his efforts or organize himself. This highly intelligent child ended up failing out of his first year of university. W was a gifted child with weak Executive Functions. Executive Function (EF) skills have been shown by research to predict academic outcomes. EF have been shown to in fact be better predictors than both intelligence and socioeconomic status.

I suppose it seems like a logical formula strong, IQ = success. We can also conger together the understanding that clearly you need a supportive environment; chances are better if there is financial support and family support as well as living in a decent neighbourhood. These are all factors that will clearly increase success. However, there is a growing understanding that success lies beyond intelligence and academic skills. One area that is often overlooked, at the hand of which many children have faltered, are executive functions. Executive Function allow us to manage our emotions and attention, organize and plan our work and time, work with large amounts of information, and reflect upon and revise our tactics as circumstances change. A person with a high IQ can be capable of understanding or

What are Executive Functions?

Executive functions are understood as the distinct, but related, higher-order neurocognitive processes that control thoughts and behaviors aimed at achieving an objective or goal (Anderson, 2002; Zelazo and Carlson, 2012). Therefore, they regulate behavior and cognitive and emotional activity by means of a set of adaptive capabilities.

Experts in the field usually break down Executive Function into these simple skills:

Inhibitory control (IC)

The ability to override impulses to exercise control over attention, thoughts, and behavior.

Cognitive flexibility (CF)

The capacity to adapt our thinking and behavior, often in response to new information.

Working memory (WM)

The ability to hold information in our minds that is not perceptually present and simultaneously analyze or manipulate it.

These simple skills intertwine and support complex skills, like planning, problem-solving, and reflection. They help us manage multiple pieces of information, filter distractions, and prioritize our actions.

The frontal lobe, often referred to as the brain's "control centre," or "central executive" is considered to house executive functioning. This is also where the anterior cingulate is located, which is often referred to as the "oops centre" because of its role in helping us anticipate risks and keeping us from acting in a way that is detrimental. This structure in the brain has been associated with many executive function skills, including emotional self-control, problem solving, divided attention, recognizing errors or conflicting information, and adaptive behaviour in changing circumstances (Allman, Hakeem,

Erwin, Nimchinsky, & Hof, 2001; Powell & Voeller, 2004). Although the anterior cingulate is not the only part of the brain involved in executive function skills, it does demonstrate that the roots of executive dysfunction lie in the brain, not in character flaws.

Executive Functions vs Intelligence

Studies show that various aspects of child self-regulation accounted for unique variance in the academic outcomes independent of general intelligence and that the inhibitory control aspect of executive function was a prominent correlate of both early math and reading ability (Blair & Razza, 2007). In the K-12 years, EF has been shown to predict math and reading in higher grade levels. A student must be able to successfully avoid distractions, pay attention, remember rules, and manage emotional reactions. The literature provides numerous examples of the importance of executive functions in achieving academic success (see Huizinga et al., 2018; Willoughby et al., 2019). The research by Best et al. (2011), Hall et al. (2015), or Tsubomi and Watanabe (2017) all highlight the importance of executive functions in the early years of primary education and the effects of rapid development of working memory at a young age in achieving stability between the ages of 10 and 12. In Alloway and Alloway's (2010) article, this mnemonic-executive aspect emerges as a better predictor of future performance (in literacy and mathematical reasoning) than the intelligence quotient. Pascual, Munoz & Robres (2019) suggest that an important finding is that it was possible to confirm that, in the last decade, executive functions have replaced the intelligence quotient as the most studied variable with respect to academic performance and that both currently have the same predictive capacity. Given the dilemma of classifying executive functions as a domain-general cognitive variable, the studies reviewed confirm that executive functions can be decomposed into different components (working memory, inhibition, cognitive flexibility and planning) that are distinctly linked to certain types of learning.

Deficits in executive function have additional implications, beyond the classroom manifestations. For example, studies show that the emotional control measure of the BRIEF (an EF

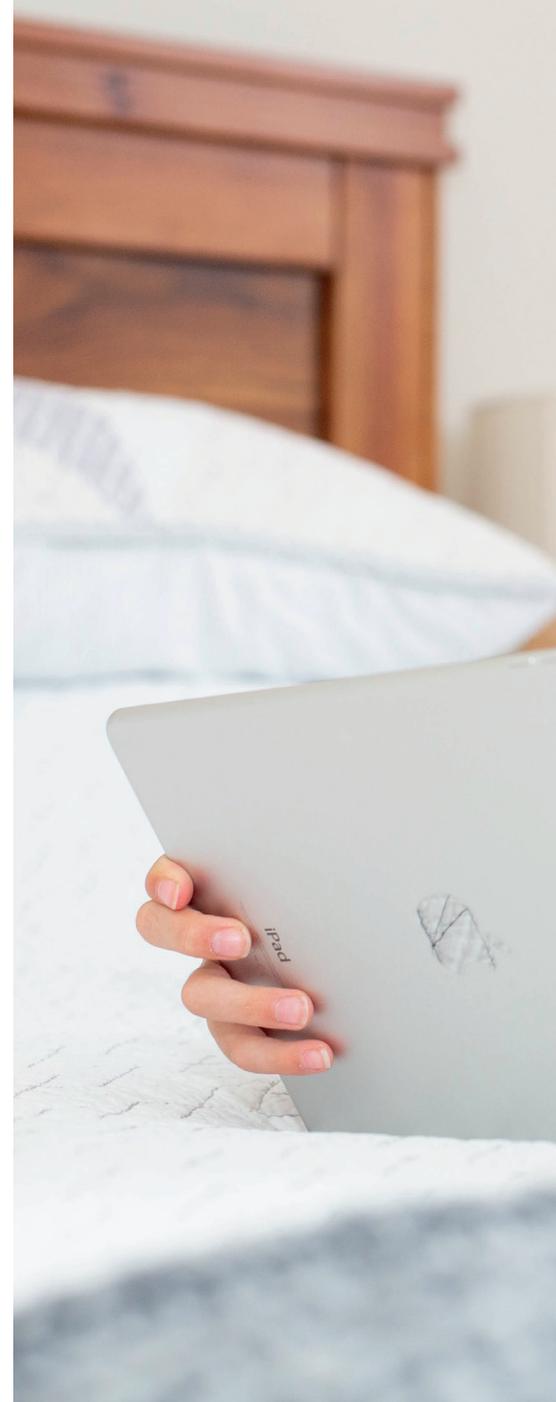
questionnaire) was identified as a significant predictor of being bullied, because a child with weak emotional control is so reactive (as cited in MacReady, 2011). A student with poor inhibitory and emotional control, who doesn't grasp the effect of his or her behaviours on others, will likely have impaired social skills. A student with weaknesses in working memory, organization, and the ability to plan and initiate tasks is likely to have deficits in such academic enablers as study skills, motivation, and/or engagement—which have been linked to academic success (DiPerna & Elliott, 2002).

There are important correlations that deserve our attention. We know that strong EF development in early childhood is associated with positive academic and social outcomes all the way through adulthood. We know that it's possible to improve these skills at any time through direct intervention. We know that the deficits are disproportionately larger for disadvantaged populations. Meta-analysis confirms that the executive functions display greater predictive power at early ages and have a robust, specific capacity for predicting future academic performance. Thus, it is important to detect academic achievement problems as early as possible to initiate intervention programs.

One of the stumbling blocks is, identifying children with weak EF skills. What do these EF deficits look like in a classroom?

Unfortunately, most students don't show up on the first day of school, clutching a pencil in one hand and a full psycho-educational report in the other. And even if they do, and you're lucky enough to find they have been tested for executive functioning, there's a caveat. Many measures test for a well-circumscribed and small subset of executive function skills, so the results cannot be generalized across the whole span of skills.

Several of the EF skills are behavioural in nature, and others are metacognitive. An individual may be weak in some skills and competent or even strong in others. The weaknesses may be "stand-alone" or part of a mix of other difficulties. There is a slew of characteristics that make up EF deficits, some of the more common ones you may notice in the classroom are as follows: Difficulty changing tasks, places, approaches to problems, difficulty tolerating change,



black and white thinking, can't see the grays, can't let go (not won't let go), needs to be told to start a task, even if they're willing to do it, ready to start a task, but doesn't know where to begin (i.e., doesn't know the first step, needs to have the steps broken down), losing track of what they're doing, forgetting the purpose of an errand, frequently failing to stick to an activity (poor sustained attention), underestimating time to complete a task, or level of difficulty, waiting to the last minute to begin a big project, mixes up the steps involved in a project, or in any multi step sequence, failing to understand main points in written or verbal material, losing track of homework assignments, trouble keeping school materials/belongings organized, leaving things at home that should be at school, and vice versa, locker/desk/schoolbag is a mess, frequently



losing things, difficulty assessing their own performance after finishing a task, assessing what works and what doesn't work. These are all EF deficits in set-shifting, initiation, self-monitoring, working memory and planning and organization.

So what are some of the specific strategies that can be employed in the classroom?

Some specific strategies that may be taught to and employed by all students, not just those with executive dysfunction, would include time and work organizers, colour-coded and/or sectioned notebooks, calendars to keep track of deadlines and monitor progress, task analysis checklists, memory aids such as mnemonics. It is also important to understand whether they are strong auditory or visual learners

and use techniques adapted to those styles (audio recording of classes, detailed written instructions of assignments, etcetera). It may also be beneficial to give the opportunity to develop important work habits, such as breaking down problems or projects into manageable "chunks," realistically estimating time demands, generating alternative solutions and selecting the best one, taking time to pause, reflect, and consider options before impulsively acting upon a first thought. These types of strategies have important implications even beyond the academic years. They encourage self-reliance and self-knowledge skills which would benefit any student, and should be applied in all classes, so they may begin to be generalized. Explaining to parents what appears to work best for their child may encourage them

to reinforce these approaches at home when helping with homework or in other activities, again increasing the likelihood that the strategies will be internalized and generalized across environments.

Strategies for teachers can be as simple as changing how they talk to a child. Using what is termed 'metacognitive language' equally develops EF. For example, with a younger student, articulating the challenge could be useful. "I see that you are missing a pencil. You will need a pencil to complete the assignment. Where could you find one in the classroom?" Displaying the steps or questions that students could ask themselves in the classroom will in time with repetition become internally automatized by the student.

It is also important to know that some of these children that seem "explosive",



that have meltdowns are actually suffering with underlying weak executive functions. Meltdowns are manifestations of inflexibility, rather than opposition or bad behaviour. Punishing such behaviour, or even rewarding the cessation of these outbursts, would do nothing to remediate the underlying problem. If these children could behave, they would behave; the problem is that they lack the skills to respond adaptively to the demands being placed on them.

One last nugget that will greatly improve all children's academic ability goes back to the archaic days of rote learning poetry. From a young age in France it is noted that children are asked to arbitrarily memorize lengths of poetry. Although this seems arbitrary and useless to most parents there is a good reason for this neurologically. 'This memorization task encourages the development of verbal memory, long term memory, rhyme, vocabulary, and working

memory. Memory is known to be plastic and very much trainable, improving these neurological connections from a young age increases academic capability. As much as the more modern method of teaching is straying away from mental multiplication facts, these remain important for that exact same reason, expanding the working memory. Children with working memory difficulties are at high risk of academic failure. Studies show working memory is strongly associated with literacy and numeracy skills, and children with poor working memory at school entry are unlikely to reach expected levels of attainment in literacy, maths and science three years later. Working memory deficits can be identified early - even before academic difficulties become obvious. Promising new evidence, suggests that working memory deficits can be improved by training intervention in the early school years.

Knowing these factors would then beg the question: So, why isn't Executive Function a standard element of curriculum design or after-school programs?

Awareness of the importance of executive functions is still in its infancy. Many educators are wrapping their minds around how to teach them. Understanding the power and necessity of explicitly teaching time management, planning and organization from the perspective of the brain takes time to trickle down from research to the hands on approach at school. Research is showing us hands down of the importance of executive functions and how it rivals IQ for academic success. Our growing understanding of the neurological basis for executive dysfunction will lead to effective classroom interventions to help these students (and indeed even neurologically typical students) reach their academic and personal potential.

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