EXECUTIVE FUNCTIONS

Synthesis

How important is it?

Executive functions are the cognitive abilities needed to control and regulate our thoughts, emotions and actions. A distinction is sometimes made between the “cool” component of executive functions which strictly involves cognitive skills (e.g., the ability to do mental arithmetic), and the “hot” component, which reflects the ability to regulate emotions (e.g., being able to control anger).

Executive functions can be divided into three broad categories of skills:

- Self-control: The ability to resist doing something tempting in order to do the proper thing. This ability helps children pay attention, act less impulsively and stay focused on their work.
- Working memory: The ability to keep information in mind where it can be manipulated. This skill is necessary to perform cognitive tasks such as relate topics to one another, mental calculation, and decide what needs to get done in order of priority.
- Cognitive flexibility: This involves creative thinking and flexible adjustments to changing requests. This ability assists children in using their imagination and creativity to solve problems.

Executive function abilities are critically important for development as illustrated by the fact that early differences in executive functions longitudinally predict important developmental outcomes, including academic achievement, health behaviours and social adjustment.

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What do we know?

Executive functions take time to develop to their full potential, and this is partly explained by the slow maturation of *prefrontal cortex*. Changes in executive functions are apparent when children become able to remind themselves what the important goals are (e.g., finish one's homework rather than watch television). Improvements in executive functions are also seen when children develop the ability to analyze their environment to decide what is the appropriate plan of action (e.g., studying tonight is crucial for success in tomorrow's exam). Underdeveloped executive functions may explain why young children often appear hard-headed when refusing to follow logical instructions such as putting on a hat in the winter. Children from poor economic background are particularly at risk for experiencing executive function difficulties.

Given the long maturation process of executive function skills, children are acutely sensitive to early experiences that can either hinder or boost their abilities. Stress, for instance, can be so damaging to a young child's executive functions that it can lead to a misdiagnosis of ADHD. On the other hand, enhancing experiences, such as a positive parent-child relationship, can protect children against the negative effect of stressful circumstances, such as living in poor economic conditions, and consequently improve executive functioning. Children of responsive parents who use gentle rather than harsh discipline and who are supportive of their child's autonomy also tend to have better executive function skills.

High executive functioning is linked to several positive outcomes such as competency in the social, emotional and academic domains. In fact, they predict early school success better than intelligence, early numeracy and literacy. Executive function skills appear to enable children to navigate their constantly changing environment, which may be especially key for children developing in high-risk environments. Executive function efficiency predicts health, economic prosperity and few criminal acts in later life. Specific components of executive functions are also responsible for children's ability to understand other people's minds. For instance, response conflict-executive functioning (RC-EF) is strongly predictive of children's false belief understanding, the notion that others can have beliefs about the world that are different than one's own, which is a required skill for successful social interactions.

While there are several benefits to strong executive function abilities, poor executive functioning is characteristic of a number of disorders such as ADHD, behaviour problems, learning difficulties, autism and depression. Early problems with executive functions are also likely to

persist throughout childhood and adolescence.

What can be done?

There are several benefits to helping preschool children improve their executive function skills. Intervention programs focusing on executive function training are efficient at enhancing children's school success and socio-emotional skills, and can lead to changes in brain circuitry. Early intervention may also attenuate the rate and the difficulties associated with disorders such as ADHD and behaviour problems. Executive function training is inexpensive and can be implemented in the regular classroom with children as young as 4 or 5 years of age. Modifications to existing early childhood curricula should include enjoyable and challenging activities that focus on self-regulation. Yoga, music, aerobics, dancing, meditation, story-telling, martial arts are all examples of activities that can help improve core executive function abilities. In the classroom, children should engage in more active learning and small-group activities, and spend less time in large group activities. Children with better executive functions require less negative interventions from teachers, which helps create a stress-free environment that further nurtures the development of executive functions. Young children should also be encouraged to participate in elaborate forms of play, such as social pretend play where they learn to take on roles and adapt to ever-changing plot.

It is also essential to understand that executive function skills are acquired gradually through the years and that even a highly motivated child can struggle with instructions such as not eating a cookie before supper, or concentrating for a long period of time.

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