

Executive Functions Fact Sheet

What are executive functions (EFs)?

⇒ EFs refer to a group of skills that help us to carry out a range of mental processes and tasks^{1,2}.

Why are EFs important?

⇒ EFs are utilized in daily activities, with examples such as decision making, self-control, adapting to changes, staying focused and being creative^{1,2}. These skills are essential for cognitive and social development, as well as being related to success in school and in life².

When do EFs start to develop?

⇒ EFs emerge during the first few years of life, while continuing to strengthen into adolescence with more complex skills being developed^{2,3}.

What forms the foundation of EFs?

⇒ Neural connections in the brain form circuits to provide the foundation for behavior and learning^{4,5}. In particular, the myelination process is important as it can possibly serve as a basis for gradual development of prefrontal functions like working memory capacity, a core EF⁶.



How can we build a stronger foundation from a nutrition perspective in early life?

⇒ Various nutrients may support brain myelination and connectivity.

Nutrient	Common food sources	Daily Chinese Dietary Reference Intakes (DRIs) ¹¹
Docosahexaenoic acid (DHA) ⁷	<ul style="list-style-type: none"> Fish and other seafood, especially fatty fish such as salmon, mackerel, tuna and sardines¹² 	< 4 yrs: 100 mg [*]
		4 - 7 yrs: N/A
Phospholipids (including sphingomyelin) ⁸	<ul style="list-style-type: none"> Eggs, lean meat, fish, shellfish and cereal grains¹³ 	N/A
Iron ⁹	<ul style="list-style-type: none"> Iron from animal sources are more bioavailable, including lean beef, oysters, chicken¹⁴ Adding a source of vitamin C will help to increase absorption from good plant sources such as tofu, dark green leafy vegetables, beans and lentils 	< 0.5 yr: 0.3 mg [*]
		0.5 - 1 yr: 10 mg [^]
		1 - 4 yrs: 9 mg [^]
Vitamin B ₁₂ ¹⁰	<ul style="list-style-type: none"> Animal products including fish, meat, poultry, eggs and milk products¹⁵ Vegetarians may have to watch out for vitamin B₁₂ deficiency and supplement as needed 	4 - 7 yrs: 10 mg [^]
		< 0.5 yr: 0.3 μg [*]
		0.5 - 1 yr: 0.6 μg [*]
		1 - 4 yrs: 1.0 μg [^]
		4 - 7 yrs: 1.2 μg [^]

^{*}Adequate Intake (AI); [^]Recommended Nutrient Intake (RNI)

References: 1. Harvard University Center on the Developing Child. Building the brain's "air traffic control" system: how early experiences shape the development of executive function. Working paper 11. 2011. 2. Diamond A. Annu Rev Psychol. 2013;64:135-168. 3. Best JR and Miller PH. Child Dev. 2010;81(6):1641-1660. 4. Harvard University Center on the Developing Child. Brain architecture. Available at: <https://developingchild.harvard.edu/science/key-concepts/brain-architecture/>. Accessed on 20May2020. 5. Yehuda S et al. J Pediatr Gastroenterol Nutr. 2006;43:522-525. 6. Klingberg T et al. Neuroreport. 1999;10(13):2817-2821. 7. Georgieff MK. Am J Clin Nutr. 2007;85(suppl):614S-620S. 8. Hauser J et al. Sphingomyelin in brain and cognitive development: preliminary data. APPSPGHAN Conference proceedings PP-N-03. Bangkok Oct 23-26 2018:152. 9. Georgieff MK. Nutr Rev. 2011;69(suppl 1):S43-S48. 10. Black MM. Food Nutr Bull. 2008;29(suppl 2):S126-S131. 11. Chinese Nutrition Society. Chinese DRIs Handbook. 2013. 12. US National Institutes of Health. Omega-3 fatty acids. Available at: <https://ods.od.nih.gov/factsheets/Omega3FattyAcids-Consumer/>. Accessed on 05Jun2020. 13. Wehrauch JL and Son YS. J Am Oil Chem Soc. 1983;60(12):1971-1978. 14. Academy of Nutrition and Dietetics. Foods to fight iron deficiency. Available at: <https://www.eatright.org/health/wellness/preventing-illness/iron-deficiency>. Accessed on 05Jun2020. 15. US National Institutes of Health. Vitamin B12. Available at: <https://ods.od.nih.gov/factsheets/VitaminB12-HealthProfessional/>. Accessed on 05Jun2020.



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