

# New light on executive function and attention deficit hyperactivity disorder

Função executiva e transtorno do déficit de atenção/hiperatividade novos esclarecimentos

Alexandra Prufer de Queiroz Campos Araujo

Universidade Federal do Rio de Janeiro, Professora de Neuropediatria, Rio de Janeiro RJ, Brasil.

## Correspondence:

Alexandra Prufer Queiroz Campos Araujo  
Av Américas, 700 bloco 3 / sala 202  
22640-100 Rio de Janeiro RJ, Brasil  
E-mail: alexprufer@ufrj.br

**Conflict of interest:** There is no conflict of interest to declare.

Received 27 March 2017

Accepted 31 March 2017



**A**ttention deficit hyperactivity disorder (ADHD) a prevalent worldwide disorder has been associated to anatomical and circuits changes involving mainly pre-frontal and parietal cortex, cerebellum and basal ganglia. Executive functions as working memory, inhibition capacity and mental flexibility are important functions related to those brain areas<sup>1</sup>.

Nevertheless, studies looking for treatment effect on those functions have retrieved conflicting results. In this issue of *The Arquivos de Neuropsiquiatria*, Bolfert et al.<sup>2</sup>, assess the executive functions of 23 children with ADHD, before and after 3 months of methylphenidate treatment, comparing them to 30 healthy age and gender matched control school children.

Different activation paths have been observed on functional tests in ADHD subjects compared to healthy controls<sup>3</sup>. Furthermore, although some functions may be improved on drug therapy, they do not occur through the same circuits as in normal subjects<sup>4</sup>. Different drugs as well as motivation and reinforcement improve executive functions, and, although sharing some final effects, in different specific ways, some directed to working memory, while others to inhibition or mental flexibility<sup>5,6,7</sup>.

The catecholamine reuptake inhibitor methylphenidate seems to upregulate the left inferior frontal cortex and enhances fronto-temporo-striatal activation<sup>7</sup>. The study by Bolfert et al highlights the effects after 3 months methylphenidate treatment on digit span backwards and arithmetic, the Taril Making Test part B and on the Stroop Color Test, executive function tests, adding new information on this matter.

## References

1. Barkley RA. Behavioral inhibition, sustained attention, and executive functions: constructing a unifying of ADHD. *Psychol Bull.* 1997;121(1):65-94. <https://doi.org/10.1037/0033-2909.121.1.65>
2. Bolfer C et al Attention-Deficit/Hyperactivity Disorder: the impact of methylphenidate on working memory, inhibition capacity and mental flexibility *Arq Neuropsiquiatr.* 2017;75(4):204-8. <https://doi.org/10.1590/0004-282X20170030>
3. Kobel M, Bechtel N, Weber P, Specht K, Klarhöfer M, Scheffler K, Opwis K, Penner IK. Effects of methylphenidate on working memory functioning in children with attention deficit/hyperactivity disorder. *Eur J Paediatr Neurol.* 2009 Nov;13(6):516-23. doi: 10.1016/j.ejpn.2008.10.008. Epub 2008 Dec 3.
4. Prehn-Kristensen A, Krauel K, Hinrichs H, Fischer J, Malecki U, Schuetze H, Wolff S, Jansen O, Duezel E, Baving L. Methylphenidate does not improve interference control during a working memory task in young patients with attention-deficit hyperactivity disorder. *Brain Res.* 2011 May 4;1388:56-68. doi: 10.1016/j.brainres.2011.02.075. Epub 2011 Mar 5.
5. Strand MT, Hawk LW Jr, Bubnik M, Shiels K, Pelham WE Jr, Waxmonsky JG. Improving working memory in children with attention-deficit/hyperactivity disorder: the separate and combined effects of incentives and stimulant medication. *J Abnorm Child Psychol.* 2012 Oct;40(7):1193-207. doi: 10.1007/s10802-012-9627-6.
6. Rosch KS, Fosco WD, Pelham WE Jr, Waxmonsky JG, Bubnik MG, Hawk LW Jr. Reinforcement and Stimulant Medication Ameliorate Deficient Response Inhibition in Children with Attention-Deficit/Hyperactivity Disorder. *J Abnorm Child Psychol.* 2016 Feb;44(2):309-21. doi: 10.1007/s10802-015-0031-x.
7. Cubillo A, Smith AB, Barrett N, Giampietro V, Brammer M, Simmons A, Rubia K. Drug-specific laterality effects on frontal lobe activation of atomoxetine and methylphenidate in attention deficit hyperactivity disorder boys during working memory. *Psychol Med.* 2014 Feb;44(3):633-46. doi: 10.1017/S0033291713000676. Epub 2013 Apr 19.