



Executive functions in autism: updates and future directions

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Executive functions refer to different cognitive abilities that allow us to plan and monitor our behaviors in order to reach a goal. They include functions such as working memory, inhibition control (interrupting an automatic response, managing distractions), planning and organization skills, mental flexibility, generativity (ability to produce new behaviors and ideas) and self-control. In practice, these abilities allow us to organize our thoughts and regulate our behavior in order to efficiently attain an objective. For example, not letting oneself get distracted by ambient noise in class, following the teacher's instructions, inhibiting inappropriate responses, refraining from impulsive actions, solving a math problem etc.

According to the scientific literature, difficulties with executive functions are common in autistic people. It has also been suggested that these difficulties could contribute to many differences observed in autism, such as repetitive and restricted behaviors, and difficulties with social skills. Until recently, it was thought that cognitive flexibility and planning and organization skills were the most impacted executive functions in autism.

However, two recent **meta-analyses** (Demetriou et al., 2018; Lai et al., 2017) suggest that there may not

be just one or certain executive functions which are significantly more affected than others. What we effectively notice is a huge variability in strength and weakness profiles across executive functions in autistic people. When looking at results from an autistic group, we see that their overall performance appears slightly lower than that of a neurotypical group. However, not all autistic people have executive function difficulties, and profiles vary tremendously from one person to another. Some have severe difficulties across executive functions, whilst others have none or very few. Furthermore, weakened executive functions may look different from one person to another (e.g. one autistic child may present with difficulties in inhibition but not in cognitive flexibility, whilst another child may present in the opposite way). This variability across individuals suggests that personalized approaches are necessary when assessing cognitive functions and selecting interventions.

Many other autism-specific factors should be considered when measuring executive functions. Firstly, the results from the meta-analysis conducted by Lai et al. (2017) show that choice of measurement tool plays a crucial role. Indeed, we see performance gaps in tools meant to measure the same function, with autistic people performing best when tasks do not rely

Autistic people performing best when tasks do not rely on language.

Meta-analysis:

a study which combines results from all research undertaken on a specific topic in order to analyze results more closely and draw general conclusions.

Original paper:


Demetriou, E. A., Lampit, A., Quintana, D. S., Naismith, S. L., Song, Y. J. C., Pye, J. E., ... Guastella, A. J. (2018). Autism spectrum disorders: a meta-analysis of executive function. *Molecular Psychiatry*, 23, 1198-1204. doi: 10.1038/mp.2017.75

Lai, C. L. E., Lau, Z., Lui, S. S. Y., Lok, E., Tam, V., Chan, Q., ... Cheung, E. F. C. (2017). Meta-analysis of neuropsychological measures of executive functioning in children and adolescents with high-functioning autism spectrum disorder. *Autism Research*, 10(5), 911-939.

on language. Greater deficits are also reported when executive functions are assessed through daily behaviors linked to executive functions (e.g. BRIEF questionnaire filled by a parent or teacher), rather than through performance on formal executive function tasks. It is also of great importance to consider other factors involved in assessing cognitive functions, such as general intellectual functioning and language level. For example, reported differences between autistic and neurotypical groups on formal tasks tend to fade when the groups have similar intellectual levels, and even more so when IQ is high and participants older. As a matter of fact, age is an important aspect to consider since executive functions appear to develop differently in autism. Due to delayed maturity and/or compensation strategies, difficulties with executive functions usually improve in adulthood in autistic people. Lastly, executive function research rarely considers the impact of anxiety, which many autistic people experience, and can have a significant impact on performance.

Secondly, we must remember that around half of autistic people also present with Attention Deficit and Hyperactivity Disorder (ADHD), which affects executive

functions and therefore makes it difficult to determine whether difficulties are linked to ADHD or autism. For example, the impulsivity found in ADHD could lead to difficulties with self-monitoring, and vice versa. Lai et al. (2017) also found that autistic groups without ADHD presented with less inhibition and planning deficits than those with associated ADHD, whilst weaknesses in working memory, flexibility and generativity were similar across autistic people with and without comorbid ADHD.

Interventions targeting executive functions could help to prevent and decrease psychological comorbidities, problem behaviours, emotional difficulties, promote social skills and, most significantly, improve quality of life for autistic people. Interventions targeting early development may be the best way to improve executive functions in autistic people. Interventional pilot studies in school and family settings have obtained encouraging results, and demonstrated that interventions targeting executive functions show potential in autistic people with and without ADHD. Further research is still needed to draw firm conclusions on the efficacy of such interventions. 



Sylvie Lauzon
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Research in healing

Though research may at times seem abstract to us, it has consistently managed to answer questions which seemed impossible just moments before. Research ultimately leads to better care, and sometimes cure. This knowledge allows the scientific and medical community to develop new treatments, new therapies and new tools. For example, thanks to research, the vast majority of children with leukemia recover, whereas just over 50 years ago, more than half of them would die.

The Petits Trésors Foundation is very proud to support the publication of Sur le Spectre magazine. The magazine discusses current projects and trends in autism research, but above all it makes this accessible. Valérie Courchesne and her team turn their research into fascinating stories!

Over the years, the Montreal Cognitive Neuroscience of Autism Research Group, which Valérie is a part of, has developed an approach that focuses on developing the strengths of autistic children and adolescents. This difference in perspective and new understanding of how the brain works is very positive because it allows us, parents of young people with autism, to see beyond the barriers inherent in autism. We contemplate possibilities rather than walls.

Of course, walls we have encountered and walls there will be more of. But to better understand the minds of our autistic children, focussing not only what is difficult, but what can be developed, makes all the difference.

This difference feels like a breath of fresh air during difficult moments.

Wishing you all the best with this new issue!