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Executive Functions and the Brain

by Valorie Salimpoor

The frontal lobes of the brain are home to a complex group of mental processes known as executive functions that are responsible for our ability to plan ahead and organize our behaviour in order to accomplish future goals. We use these skills every day when we think about what we have to do, organize our thoughts, control impulses, come up with ideas, solve problems and integrate feedback from our environment. Deficits in executive functioning can negatively affect many aspects of our daily lives. In children, difficulty with these functions can severely impact social, cognitive, emotional and behavioural development and interfere with learning and academic achievement. These underrated mental processes are common to numerous developmental disabilities such as Autism Spectrum Disorder (ASD), Attention Deficit/Hyperactivity Disorder and learning disabilities.

Children with executive function deficits often show difficulty with planning ahead and organizing their thoughts or behaviour. They also show poor reasoning and judgment, have trouble coming up with and applying strategies, find it difficult to imagine abstract or multiple solutions to a problem, get stuck on one way of solving a problem, can be impulsive, have a hard time controlling their emotions and have difficulty monitoring or regulating their behaviour. At school, difficulty with any of these skills can pose a serious impediment to learning and academic achievement. No matter how good a student's knowledge might be in a particular subject, their performance can be negatively affected if they have trouble with executive skills. For example, in the classroom, students who are not able to concentrate, inhibit distractions and focus attention will have trouble following the teacher and processing information. While solving a math problem, children may know their facts well, but still not be able to come up with a solution if they have difficulty organizing their ideas, have trouble coming up with a strategy, and find it difficult to mentally integrate information to solve the problem. Some children may be unable to come up with solutions spontaneously or may get stuck on one method of solving a problem. Children with executive deficits also tend to show socially inappropriate behaviour and poor interpersonal skills. It is not surprising that problems with various aspects of adaptive behaviour such as communication, play and social relationships have been associated with executive dysfunction (Gilotty, Kenworthy, Sirian, Black, & Wagner, 2002). In summary, difficulties with executive function extend to the home and other environments, affecting not only academic but everyday functioning as well. Moreover, due to the covert nature of executive impairments, they are often missed or overlooked, or mistaken for lack of motivation, laziness or impulsivity.

Although there have been studies to look at executive dysfunction and autism, few studies have formally tested executive skills in children with Asperger's Syndrome (AS). Numerous symptoms of executive function deficits are reminiscent of the typical features of AS such as the need for sameness, lack of planning, impulsivity and circumscribed interests. Since executive function is important for and related to virtually all other domains of cognition—learning, memory, higher-order information processing, manipulating information, organizing behaviour, language and visual processing—their impact on learning and academic functioning can have severe consequences for those affected. Thus it is important to recognize these deficits early and apply appropriate training.

Once executive dysfunctions have been identified, intervention programs can be designed that specifically target each aspect of the executive deficits. For example, children may be taught problem solving strategies, metacognitive skills, use of mnemonic devices, study skills, self-regulation training, visual imagery for memory enhancement, task-specific routines, self-talk and self-monitoring and other methods for compensation. To help compensate for executive deficits, external supports may be used such as master calendars, cues, prompts, picture-assists, checklists, to-do lists, written instructions and signs. Furthermore, external devices can be used such as electronic organizers, alarms, tape recorders, watches and timers to assist with organization, planning and time management. Children's environment can also be used to supply external structure to facilitate these skills. For example, modifications can be made in the classroom to incorporate well-planned activities and eliminate distractions. Additionally, teachers and parents should make every attempt to apply consistent routines and rules, present instructions clearly, and explicitly identify assignment goals and sub-goals. Such modifications in the child's home and school environment can facilitate more independent executive functioning.

The first step to remediation of executive dysfunction is accurate assessment. The

Valorie Salimpoor is a research student at York University, Toronto.

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We are currently recruiting children between the ages of 6 to 18 who have been diagnosed with Asperger's Syndrome. If you are interested in participating, or want to find out more about the results of our study please contact Valorie Salimpoor at valorie@yorku.ca. Participation in this study takes about two hours and participants are compensated for their time.

purpose of our study taking place at York University in collaboration with Dr. Mary Desrocher and Dr. James Bebko, is to look at how executive dysfunction affects children with AS. Once the specific executive impairments have been identified, appropriate intervention can be applied to improve learning skills and academic performance. Such difficulties can be compensated for by carefully structured educational and remediation programs. It is important for structured educational programs to begin early in life in order to increase learning opportunities and minimize problems in learning due to difficulty with executive skills. Providing specific intervention programs that target executive dysfunction is feasible and can significantly decrease problems in virtually all subjects at school.

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