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Towards grasping the underlying neuronal processes in ADHD using a visual search task: a computational modelling approach.

Eirini Mavritsaki; Amy Cook; Glyn Humphreys

## Abstract

Attention is essential for our everyday life. The role of attention is to identify the most relevant information in our environment to be processed. Deficits in attention processes have been linked to attention deficit hyperactivity disorder (ADHD). ADHD is a disorder with an onset in childhood and is characterised by inattentiveness, hyperactivity and impulsivity. In the present study we investigate the link between ADHD and visual attention. ADHD is linked with a reduction in arousal levels, which is related to norepinephrine and dopamine function. It is difficult to investigate the role of these two neurotransmitters in ADHD without using interventions. An attractive approach is to use computational modelling, as there is no need for interventions, if the appropriate model is used. In the present study, we extended a neural-level model, the spiking Search over Time and Space (sSoTS) model which was developed to simulate visual search [1]. The important characteristics of sSoTS that qualifies it as an appropriate tool is the incorporated top-down processes and the neuronal details of the system. We will present the outcomes of the first step of our study; using neurotransmitter changes to simulate ADHD behavioural results in a visual search experiment. Importantly the combination of simulated dopamine and norepinephrine function in the model allowed us to be able to stimulate the ADHD behavioural results. The next step in this work is to identify the mechanism(s) responsible for the deficit of attentional function in children with ADHD.

REFERENCES [1] Mavritsaki, et al. (2011) Psychological Review, 118(1): p.3-41.