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The impairment of the prefrontal cortex due to high levels of dopamine and norepinephrine in relation to ADHD

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Attention- Deficit/ Hyperactivity Disorder (ADHD) affects many people from various backgrounds; however, not much is known about the disorder aside from clinical symptoms. Researchers are just beginning to dissect ADHD and its effects on the brain, specifically in the prefrontal cortex (PFC) region. The PFC controls attention, motivation, planning, and most importantly working memory. Working memory is temporary storage for short-term memory; it is essential for sequencing tasks and assists with internalized language. The working hypothesis implicates increased levels of Dopamine (DA) and Norepinephrine (NE) in the impairment of PFC cells, leading to inhibition of working memory, and the development of disorder. The interaction of pyramidal neurons in the various layers of the PFC is studied in order to discover the impact of the network level plasticity on the disorder. This interdisciplinary research examines the relative impact of DA and NE, and the relevant pathway interactions on affected cells. Relevant neurophysiological experimentation data is used to examine mechanisms of ADHD in rat PFC, and to develop a computational model of the pyramidal neurons located in the six layers of the PFC. An analysis of the cognitive effects of ADHD via computational modeling may predict brain function, uncover emergent properties, and assist in the development of treatment. Reliable computational modeling will help save money and time as well as avoid the frequent use of human trial subjects.