

The Selection Problem

In consideration of the complexity of interconnectivity circuitry profiles and their relationship with ADHD, summarizing posterior regions of the neocortex as exquisite sensory processors and anterior neocortical regions as elegant motor programmers seems grossly simplistic. It is because of the operations of these complex brain networks that human beings can perceive the world and develop and execute specialized motor programs like no other species. This higher-order and flexible range of adaptation generates enormous, complex behavioral possibilities, which almost constantly confronts the individual with the need to select that to which to attend and the behavior in which to engage.

In other words, the price we pay for our highly developed neocortex and the advanced cognitive and behavioral possibilities it confers is the demand to contend with the overwhelming selection problem it generates [157, 158]. No one can attend to everything at one time. However, this selection problem is not unique to humans and it existed well before the significant expansion of neocortex [159]. All animals, and specifically vertebrates, are constantly confronted with stimuli that present opportunities for cognitive/behavioral decisions to be made in the service of the best interest of the organism as a whole [160]. These decisions define executive function. Interactions between the cortex, which primarily functions according to principles of excitation, and the basal ganglia, which serve as a massive inhibitory system, represent the vertebrate solution to this selection problem [157, 161]. Balancing excitatory with inhibitory processes allows appropriate perceptual and action selections to be made. The basal ganglia, in essence, tell *what* regions of cortex to become active and *when* they should become active. This gating function includes the facilitation of “cross talk” between distributed brain networks that ordinarily only need to communicate with each other in order to adapt to changing task demands. In many cases of ADHD, this balance is fundamentally disturbed and the selections made are not adaptive [138, 162].