Linking ADHD to the Neural Circuitry of Attention

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Attention deficit hyperactivity disorder (ADHD) is a complex condition with a heterogeneous presentation. Current diagnosis is primarily based on subjective experience and observer reports of behavioral symptoms – an approach that has significant limitations. Many studies show that individuals with ADHD exhibit poorer performance on cognitive tasks than neurotypical controls, and at least seven main functional domains appear to be implicated in ADHD. We discuss the underlying neural mechanisms of cognitive functions associated with ADHD, with emphasis on the neural basis of selective attention, demonstrating the feasibility of basic research approaches for further understanding cognitive-behavioral processes as they relate to human psychopathology. The study of circuit-level mechanisms underlying executive functions in nonhuman primates holds promise for advancing our understanding, and ultimately the treatment, of ADHD.

Trends

Deficits in many different cognitive domains are associated with ADHD. Cognitive batteries that assess the performance of individuals within these different cognitive domains show that the disorder is very heterogeneous.

ADHD medication that improves performance in one cognitive measure does not necessarily improve it in others.

Studies in human and nonhuman primates have revealed much about the underlying mechanisms of endogenous, exogenous, and spatial- and feature-based selective attention.

The regions of the brain and the neuromodulators that influence selective attention and other cognitive domains implicated in ADHD are non-overlapping.