Gait abnormalities, ADHD, and environmental exposure to nitrous oxide

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Abstract
Papadopoulos et al. (2014) investigated gait profiles of children with attention-deficit hyperactivity disorder-combined type (ADHD-CT) compared to typical developing (TD) controls. The authors reported differences in the gait profile of ADHD-CT in the self-selected fast speed category. Additionally, others have proposed a maturational delay hypothesis in gait, demonstrating that gait variability decreases with age in ADHD children. It has been previously suggested that the cognitive impairment seen in conditions like ADHD may result from chronic, environmental exposure to the air pollutant, nitrous oxide (N2O). Exposure to N2O is thought to exert its antinociceptive properties by stimulating release of dynorphin peptides in the central nervous system which act upon kappa opioid receptors (KOR). Opioid-mediated gait abnormalities in ADHD are supported with evidence that prodynorphin mutations in mice lead to cytotoxic levels of dynorphin A (DYN A) and contribute to abnormal gait profiles and gradual loss of motor coordination. Interestingly, constitutive activity of the KOR receptor in rat brain has been recently shown to undergo maturational alterations, suggesting that while altered gait profiles in ADHD may be a function of the enhanced opioidergic activity attributable to chronic exposure to the environmental air pollutant, N2O, age-attenuated constitutive activity of KOR in brain may explain the normalization of these altered gait profiles in older ADHD subjects.