Changes in Gait Balance and Brain Connectivity in Response to Equine-Assisted Activity and Training in Children with Attention Deficit Hyperactivity Disorder.

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Abstract

OBJECTIVES: Equine-assisted activity and training (EAAT) is thought to improve body balance and clinical symptoms in children with attention deficit hyperactivity disorder (ADHD). The study hypotheses were that EAAT would improve the clinical symptoms and gait balance in children with ADHD and that these improvements would be associated with increased brain connectivity within the balance circuit.

METHODS: A total of 12 children with ADHD and 12 age- and sex-matched healthy control children were recruited. EAAT consisted of three training sessions, each 70 minutes long, once a week for 4 weeks. Brain functional connectivity was assessed by using functional magnetic resonance imaging.

RESULTS: After 4 weeks of EAAT, children with ADHD showed improved scores on the Korean ADHD scale (K-ARS), while the K-ARS scores of healthy children did not change. During the 4 weeks, the plantar pressure difference between the left foot and right foot decreased in both the healthy control group and the ADHD group. After 4 weeks of EAAT, healthy controls showed increased brain connectivity from the cerebellum to the left occipital lingual gyrus, fusiform gyrus, right and left thalami, right caudate, right precentral gyrus, and right superior frontal gyrus. However, children with ADHD showed increased brain connectivity from the cerebellum to the right insular cortex, right middle temporal gyrus, left superior temporal gyrus, and right precentral gyrus. In contrast, children with ADHD exhibited decreased brain connectivity from the cerebellum to the left inferior frontal gyrus.

CONCLUSION: EAAT may improve clinical symptoms, gait balance, and brain connectivity, the last of which controls gait balance, in children with ADHD. However, children with ADHD who have deficits in the fronto-cerebellar tract did not exhibit changes in brain connectivity as extensive as those in healthy children in response to EAAT.