What are the possible neurological sources of motor difficulties for children with ADHD?

childhood disability LINK

Summary

Using neuro-imaging techniques (which take images of the brain), numerous studies have identified structural and functional abnormalities in children with Attention Deficit Hyperactivity Disorder (ADHD). This study explored three different hypotheses about the neurological sources of this disorder: cortical activation dysregulation, delayed white matter maturation, and cerebellar dysfunction.

Cortical Activation Dysregulation: The region of the brain commonly known as "grey matter" is mainly responsible for processing information, but also plays an important role in motor function. It is hypothesized that there is an abnormality in how the brain controls the activation of this area that could affect one's attention and motor skills. As an example, children with ADHD had more trouble walking backwards compared to a control group.

Delayed White Matter Maturation: Researchers hypothesize that some motor skill impairments such as overflow movements (which is a movement that goes beyond the intended movement like faking to kick a person but failing to stop the movement at the right time) are caused by an inefficient connection between the left and right brain due to a delay in white matter maturation. So far no links were found between overflow movements and neuroimaging findings.

Cerebellar Dysfunction: The cerebellum is one of the most important regions of the brain for motor control and co-ordination and therefore it is likely that any motor impairment would have the cerebellum for origin. However, in a study cited by the authors, no correlation was found between motor difficulties and cerebellar volume.

About the study

This paper was a review of four separate studies that were chosen according to the three following criteria: the population of interest were children or adolescents with ADHD, motor performance or skills were measured as one of the outcomes of interest, and neuroimaging findings were correlated to motor performance.

What families should know

- There are several possible neurological sources for ADHD. An inefficient connection between the left and right brain (delayed white matter maturation) or differences in cerebellar volume (cerebellar dysfunction).
- Due to the complexity of the brain, there is no direct evidence of the relationship between brain structure and motor difficulties.

What practitioners should know

- In reference to the cortical and sub-cortical activation dysregulation, preliminary evidence suggests that the use of methylphenidate has a positive effect on the motor performance of children with ADHD.
- The four studies cited by the authors are inconclusive about the neurological differences between children with ADHD and those without neurobehavioral disabilities.
- Further research is needed on the relationship between brain structure and motor function limitations. The authors also recommend that future studies relate brain imaging findings with motor difficulties.

Reference

Marie Brossard-Racine, Annette Majnemer, Michael I. Shevell (2011). Exploring the Neural Mechanisms that underlie motor difficulties in children with Attention Deficit Hyperactivity Disorder Vol. 14, No. 2 , Pages 101-111. Developmental Neurorehabilitation (doi:10.3109/17518423.2010.547545).