

research snapshot

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What Can Neuroimaging Tools Tell Us About the Motor Skills of Children With ADHD?

What is this research about?

Impaired motor skills are a concern for many children with attention deficit hyperactivity disorder (ADHD), some of which meet the criteria for Developmental Coordination Disorder (DCD). DCD involves impaired motor skills that cannot be explained through other medical conditions. Clinicians deal with ADHD and DCD separately, as they are thought to involve different neurobiological processes. Neuroimaging tools can document abnormal brain structures and functions. However, current research has not, for the most part, used these tools to focus on the mechanisms that underlie motor impairments for children with ADHD.

What did the researchers do?

The researchers focused specifically on motor impairments for children with ADHD. They reviewed studies on ADHD that used neuroimaging findings. Keywords were used to find research database articles on studies with imaging devices like: Magnetic Resonance Imaging (MRI), functional MRI (fMRI), and Transcranial Magnetic Stimulation (TMS).

They narrowed their results by research published in English, with participants 18 years or younger. They focused on:

- Participants that were diagnosed with ADHD;
- Voluntary movements to measure motor skills as an outcome;

What you need to know:

More research needs to use neuroimaging tools to observe the results of clinical motor skill tasks. This will help to measure brain disturbances and the relationship between motor skills and neurobiological functions in children with ADHD.

- Neuroimaging findings that were related to the motor skills.

In total, 4 articles remained for review. These 4 studies used small sample sizes, and compared groups of children with and without ADHD who were males.

What did the researchers find?

All 4 studies showed minimal focus on the associations between neuroimaging findings and motor skills in children with ADHD. The researchers suggested 3 theories that future research can address:

Cortical and sub-cortical impairment:

The frontal lobe of the brain showed contradicting results in brain activity during response inhibition tasks. Inhibition affects children with ADHD and their impulsive behaviour or poor motor timing. Thus, inhibition is one area that may reveal a meaningful relationship with motor impairments.

The brain's basal ganglia work to gain knowledge and use sensorimotor and behavioural skills. However, an impairment may exist in the neurotransmitters that link the basal ganglia to these processes for children with ADHD. Further research can address these links.

The studies also differed on results from a sequential finger tapping (SFT) test for children with ADHD. While some research reported lower activity in the temporal and parietal cortex of the brain, others showed no difference between children with and without ADHD. What are the neural structures that play into motor deficits?

Delayed white matter maturation:

Some studies suggested that children with ADHD experience more brain activity in the motor cortex. This may be related to a delay of maturing white matter in the brain. But specific studies do not address these issues with neuroimaging tools. In particular, diffusion tensor imaging could be used to explore this relationship.

Cerebellar dysfunction:

Further research can explore the effect of the brain's cerebellum on children with ADHD. While the cerebellum affects motor coordination, there is a lack of research that uses neuroimaging tools to focus on this relationship. This would also help to observe if DCD is also occurring separately or with ADHD.

How can you use this research?

This study may inform policymakers seeking to fund health research that uses neuroimaging tools to address ADHD needs. The knowledge potential from such research might inform future interventions and practices for children with ADHD by clinicians, service providers, and families.

Clinicians may also find this research useful. It highlights the value of measuring motor skills as a potential challenge in the everyday life of children with ADHD.

About the Researchers

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Citation

Brossard-Racine, M., Majnemer, A., and Shevell, M., 2011. Exploring the Neural Mechanisms That Underlie Motor Difficulties in Children with Attention Deficit Hyperactivity Disorder. *Developmental Neurorehabilitation*, 14 (2), pp. 101-111.

Available online at bit.ly/S0y92C

Keywords

Attention deficit hyperactivity disorder, Motor performance, Neuroimaging tools

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