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The developmental dynamics of gait maturation with a focus on spatiotemporal measures

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HIGHLIGHTS

- Studies of gait maturation provide insight into brain function
- We review the neural processes contributing to and regulating gait in children
- Independent sub-components of gait may follow unique developmental trajectories
- Higher-order cognitive processes are important for gait development
- A dynamic approach to gait maturation may be needed to understand pathological gait

Abstract

Gait analysis is recognised as a powerful clinical tool for studying relationships between motor control and brain function. By drawing on the literature investigating gait in individuals with neurological disorders, this review provides insight into the neural processes that contribute to and regulate specific spatiotemporal sub-components of gait and how they may mature across early to late childhood. This review also discusses the roles of changing anthropomorphic characteristics, and maturing sensory and higher-order cognitive processes in differentiating the developmental trajectories of the sub-components of gait. Importantly, although studies have shown that cognitive-gait interference is larger in children compared to adults, the contributing neurocognitive mechanisms may vary across age groups who have different types of attentional or cognitive vulnerabilities. These findings have implications for current models of gait maturation by highlighting the need for a dynamic model that focuses on the integration of various factors that contribute to gait through experience and practice. This is essential to elucidating why gait and other motor deficits are often contiguous with cognitive neurodevelopmental disorders.

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