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Exploring the cortical dynamics of walking using mobile EEG in real-world environment

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The neural control of walking in humans remains poorly understood, with much of the existing knowledge derived from animal studies. Early neuroimaging studies using functional magnetic resonance imaging (fMRI), single photon emission computed tomography (SPECT), and positron emission tomography (PET) have identified brain regions involved in walking, but these approaches require participants to imagine they are walking (Hamacher et al., 2015). Mobile electroencephalography (EEG) offers direct measurement of cortical activity with high temporal resolution during dynamic tasks such as walking. Recent advancements in mobile EEG technology now make it possible to investigate brain activity in naturalistic and ecologically valid environments. However, most existing research has focused on treadmill walking within laboratory settings, providing limited insights into how the brain responds to the complexities of real-world walking (Richer et al., 2024). I will explore cortical activation patterns using mobile EEG in healthy adults during treadmill, indoor overground, and outdoor real-world walking, with the aim of understanding how brain networks adapts to increasing environmental complexity. In particular, the frontoparietal and dorsal attention networks will be examined (Lo et al., 2017). These neuroimaging findings will contribute to a deeper understanding of the cortical control of walking in real-world environments. These insights are particularly relevant for informing rehabilitation strategies and developing targeted interventions for individuals with impaired walking due to neurological injury or illness.

This presentation aims to explain how brain networks are analysed using mobile EEG, focusing on interactions between different cortical regions and highlighting advancements in EEG for understanding brain networks during walking in natural environments.

Keywords
cortical activation, walking, brain networks, mobile EEG, real-world environment

References

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