to 0.32 for Hb) irrespective of the methods used. In addition, intraclass correlations suggested excellent reliability across methods and task conditions (HbO2 range=0.982 to 0.996; Hb range=0.883 to 0.984). These findings support fNIRS as a robust approach for measuring prefrontal activity in older adults during walking and emphasize the importance for establishing explicit guidelines/principles for fNIRS processing.

PATTERNS OF PREFRONTAL ACTIVATION AND PERFORMANCE DURING WALKING TASKS AMONG OLDER ADULTS

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Differences in prefrontal cortex (PFC) control of walking in older age likely arise from changes in neural capacity and compensation. PFC activation by changes in oxygenated hemoglobin from functional near infra-red spectroscopy was examined in 29 older adults (mean age=76). Tasks included standing with cognitive challenge and walking with and without cognitive challenge on even and uneven surfaces. Three PFC activation-performance patterns were identified using K-means clustering: 1) low activation during walking tasks and high activation during standing cognitive task, with the best performance in terms of walking speed and cognitive performance (n=10); 2) low activation on all tasks, with the lowest performance (n=15); 3) high activation during walking and low activation during cognitive, with intermediate performance (n=5). Associations of patterns with cognitive function and structural neuroimaging were explored, with results informing interpretation of functional changes of PFC during aging process, including compensatory mechanisms for primary network impairment.

USING FNIRS TO CAPTURE CEREBRAL OXYGENATION IN OLDER ADULTS NAVIGATING STAIRS

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Navigating stairs is a complex motor activity and while it provides health benefits it can also increase the risk of falls in older adults (OA). The prefrontal cortex (PFC) contributions to stairclimbing (with or without a cognitive task) remain unknown. Using functional near infra-red spectroscopy (fNIRS) and wireless insoles, this study evaluated cerebral oxygenation changes (ΔHbO2) in the PFC, gait parameters (speed) and cognitive performance (reaction time(RT)/accuracy) during stair ascent and descent in single (SMup/SMdown) and dual task (DTup/DTdown) conditions. OAs navigated stairs with or without a simple reaction time task. Participants had longer RTs in DTup ($p < .001$) and DTdown ($p < .001$) in comparison to standing, with no significant differences in accuracy or walk speed. ΔHbO2 was significantly different ($p = .003$) between SMdown and DTdown. Findings suggest that despite the simplicity of the cognitive task, dual-tasking on stairs resulted in increased cerebral oxygenation and slowed cognitive responses.

OVERLAP, COMMONALITY, DISPARITY, AND VARIABILITY OF FRONTAL LOBE ACTIVATION IN AGING AND NEURODEGENERATION

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Recent work suggests that the prefrontal cortex is recruited during complex walking as a form of cognitive compensation to maintain performance in aging and neurodegenerative diseases. Evidence from fNIRS studies is accumulating on different patient groups demonstrating the utility of this method and its sensitivity to neural dysfunction. However a direct comparison that explores the specificity of prefrontal activation patterns has not been conducted. This process is essential towards implementing the use of fNIRS at the individual level. Data collected from four different cohorts; young adults, older adults, PD patients at different stages of the disease, and patients with Multiple-Sclerosis during challenging tasks will be presented. Overlap, commonality, disparity and variability between groups and conditions will be presented and modifiers and moderators that can affect individual performance will be discussed. Understanding individual differences in fNIRS response will enhance data interpretation and promote translation of this technology to clinical care applications.

FNIRS OUTCOMES FOR A PILOT CLINICAL TRIAL COMBINING FRONTAL TDCS WITH WALKING REHABILITATION IN OLDER ADULTS

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This pilot study assessed a novel intervention to enhance both walking and executive function in older adults. The primary hypothesis was that eighteen sessions of frontal lobe tDCS combined with walking rehabilitation would be feasible, safe, and show preliminary efficacy. Eighteen participants were randomized to one of three intervention groups: active tDCS and rehabilitation with complex walking tasks (Active/Complex); sham tDCS and rehabilitation with complex walking tasks (Sham/Complex); or sham tDCS and rehabilitation with typical walking (Sham/Typical). Outcome measures included multiple tests of walking function, executive function, and prefrontal activity during walking as measured by functional near infrared spectroscopy (fNIRS).