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*Title: Movement variability and sensorimotor cortical activation during forward and backward walking*
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Previous research has used functional near-infrared spectroscopy (fNIRS) to show that motor areas of the cortex are activated more while walking backward compared to walking forward. It is also known that head movement creates motion artifacts in fNIRS data. The aim of this study was to expand on previous findings by examining cortical activation during forward and backward walking, while also measuring head movement. We hypothesized that greater activation in motor areas while walking backward would be concurrent with increased head movement.

Participants (N=8) performed forward and backward walking on a treadmill. Participants wore motion capture markers on their head to quantify head movement and pressure sensors on their feet to calculate stride time. fNIRS was placed over motor areas of the cortex to measure cortical activation. Measurements were compared for forward and backward walking conditions.

Stride time was significantly shorter during backward walking, but not significantly more variable. There were no significant differences in activation for motor areas of the cortex when outliers were removed. However, when stride time variability during forward walking increased, there was increased activation in the primary motor cortex. Greater head movement during backward walking was due to slow drift, which would not influence fNIRS results. Consistent with previous findings, the positive correlation between motor cortex activation and stride time variability suggests that forward walking variability may be represented in the primary motor cortex.