Locomotor Adaptability, Brain Integrity, and Mobility of Older Adults

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Motivation

Restrictions in community mobility, the ability to move outside of one's home, are common in older adults and contribute to disability, institutionalization, and poor quality of life.

Successful community mobility requires the brain to quickly use information from the environment (e.g. surface quality, distances) to appropriately adapt gait to the current situation (locomotor adaptation).

Context

Locomotor adaptation can be induced in the laboratory by having an individual walk on a split belt treadmill on which each leg is moving at a different speed. Repeated exposure to split belt walking improves the rate of adaptation to the new situation.

The brain mechanisms of this adaptation are unknown in healthy older individuals. The impact of locomotor adaptability on mobility and fall risk are also unknown.

Project Deliverables

We plan to submit 1-2 manuscripts and an NIH R01 grant as a result of this preliminary study.

The R01 will be aimed at understanding how the proposed training for locomotor adaptability could improve brain control of walking, community mobility, and fall risk of older adults.

We anticipate finishing data collection by midterm and to have all data processed and analyzed with manuscript and grant drafts in progress by the end of the funding.

University of Pittsburgh

Does brain aging affect community mobility and fall risk in older adults through changes in walking adaptability?

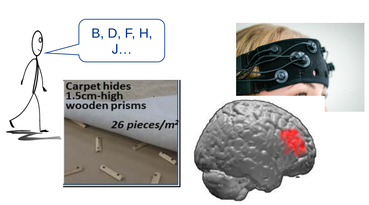
Project Description

Our central hypothesis is that the ability to improve locomotor adaptability with repeated exposure to split belt walking is greater in those with better brain integrity, specifically the integrity of subcortical-prefrontal connections that contribute to the brain control of walking (gait automaticity).

We will test whether:

1. Brain integrity is related to locomotor adaptability
2. Better brain integrity predicts greater improvements in locomotor adaptability with repeated exposures
3. Improvements in locomotor adaptability are related to clinical measures of mobility and fall risk.

Our primary measures will be defined by:
Locomotor adaptation: Rate at which individuals adapt to a new walking situation when placed on a split belt treadmill and changes in adaptation rate after repeated exposure
Brain integrity (gait automaticity): The extent to which an individual relies on the prefrontal cortex rather than subcortical structures to walk under challenging conditions
Brain integrity (cognitive function): Neuropsychological battery to assess prefrontal-subcortical function



Potential Impact

Exposure to split-belt walking improves locomotor adaptation in older adults, but the underlying mechanisms and relevance to mobility and fall risk of these improvements are unknown. Gait automaticity and prefrontal-subcortical function may be important neural mechanisms of locomotor adaptability.

These results will identify novel contributors to loss of community mobility in older adults and could identify novel therapeutic targets for interventions that improve locomotor adaptation to prevent falls and enhance independence.