Arm-trunk control in young and healthy older adults using the Stationary Hand Task

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Introduction

Stroke arises due to a disturbance in the blood supply to the brain and can lead to impairments in an individual's ability to coordinate his or her arm and trunk during a reaching movement.

The **aim** of this study is to characterize deficits in arm-trunk coordination post-stroke.

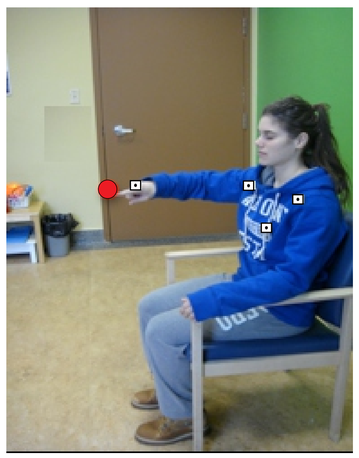
Through the use of the **Calibration Task** and the **Stationary Hand Task**, arm-trunk functionality will be determined on an individual basis.

Performance of participants post stroke (aged 40 - 75 years) will be compared to healthy older adults (aged 40 - 75 years) and young participants (18 - 30 years).

Methods

To determine the compensatory actions of arm-trunk control, participants will perform:
1. A calibration task: used to determine the maximum change in arm displacement when trunk motion is conveyed to the arm
2. A stationary hand task: in which participants are to maintain a stable hand positure while bending forward at the trunk

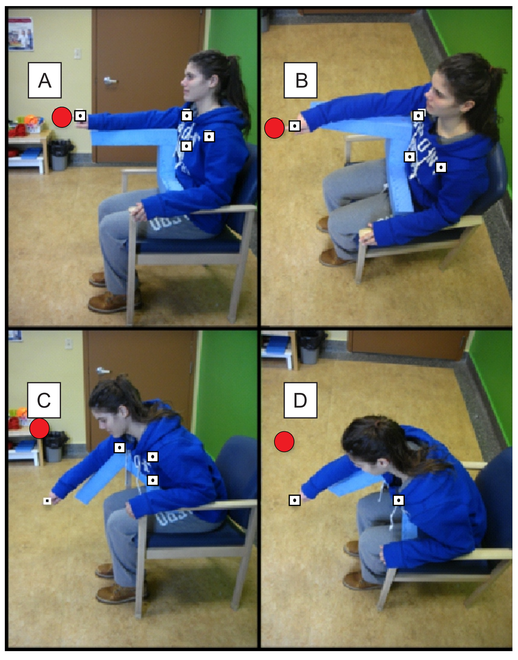
Experimental Set-Up



Target Reciever

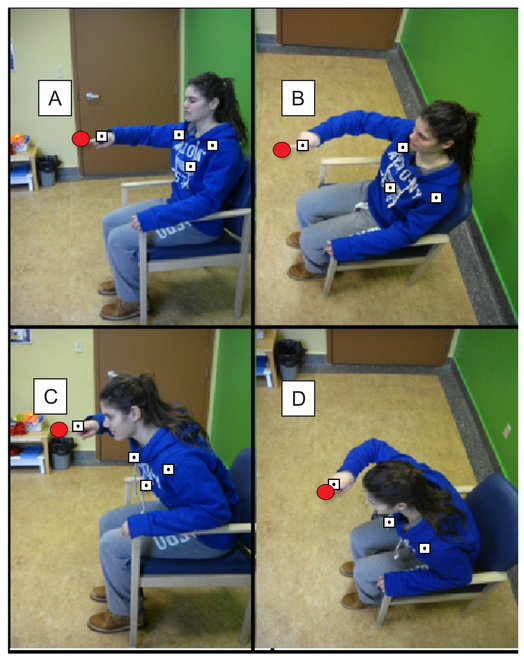
Motor Tasks

1. Calibration Task



Methods

2. Stationary Hand Task



Analyses

From results achieved in both tasks, a gain score is calculated for each participant for each trial in the stationary hand task according to the following equation:

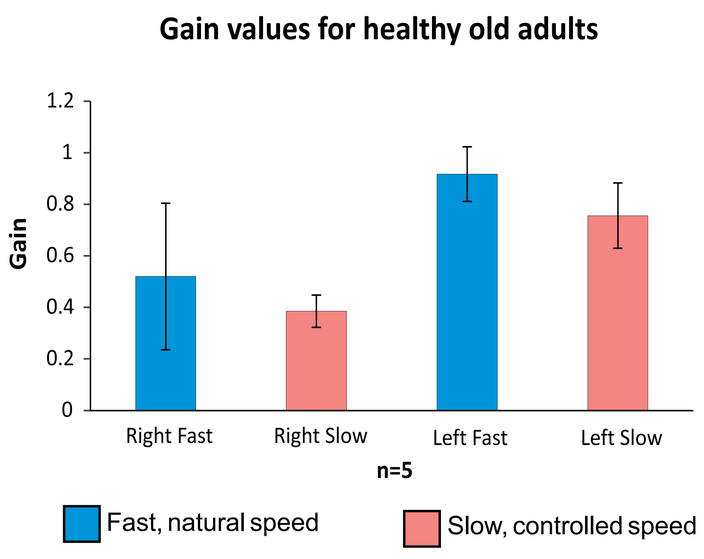
$$g=1-h/hm$$

h = The deviation of the finger in the Stationary Hand Task (the hand was to remain stationary)

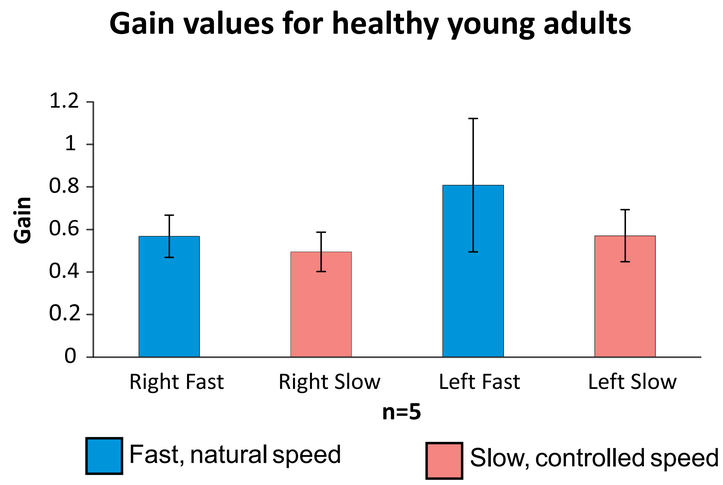
hm = The deviation of the finger representing no compensation as determined in the calibration trials

g = 1 reflects compensation by the arm for trunk motion
g = 0 reflects no compensation by the arm for trunk motion

Results



Results



Discussion

To date, data has been collected from 11 young individuals and 11 old individuals. The data shown represents average results attained across 5 young and 5 healthy older adults.

All participants were able to complete the tasks with minimal discomfort.

Results indicate that young and older participants performed in a similar manner, such that larger gain values were achieved with the the left hand (demonstrating compensatory arm-trunk motion) compared to the right hand and larger gain values were achieved when participants were moving at a faster speed.

Data is currently being collected with all three participant groups, including stroke individuals, who are expected to reach with a slower reaching speed compared to healthy control participants.

The long term goal of this study is to determine if this measure can characterize arm-trunk coordination deficits post stroke and thus can be used to guide individualized rehabilitation programs.

References

Cirstea, M.C. & Levin, M.F. (2000). Compensatory strategies for reaching in stroke. *Brain,* 123, 940-953.

Levin, M.F., Kleim, J.A., & Wolf, S.L. (2009). What do motor "recovery" and "compensation"mean in patients following stroke? *Neurorehabilitation and Neural Repair,* 23, 313-319.

Sibindi, T.M., Krasovsky, T., Feldman, A.G., Dannenbaum, E., Zeitouni, A., & Levin, M.F. (2013). Arm-trunk coordination as a measure of vestibulospinal efficiency. *Journal of Vestibular Research,* 23, 237-247.

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