

Lighten Up: Modifying postural state to reduce fall risk in older adults

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Background and Objectives:

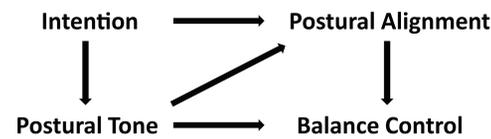
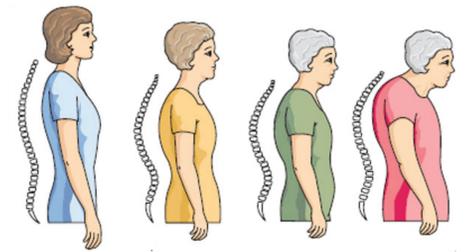
Falls are the leading cause of injury and death in older adults¹. The risk of falls is associated with poor balance and stooped posture², indicating the importance of postural alignment and balance control.

Postural tone, the coordination of limbs and torso into a single, functioning unit, may play an important role in modulating both postural control and alignment³. Insufficient tone may lead to the development of stooped posture and poor control of balance. Excessive tone may lead to higher stiffness and decreased balance control.

Our previous study showed that postural instructions had significant effects on balance-relevant outcomes for adults with Parkinson's disease⁴. Our main objective here was to determine whether intentionally adopting a specific postural state affects outcomes associated with fall risk in healthy older adults.

Hypothesis:

Postural instructions based on maintaining an intention of length while minimizing excessive tension will be associated with reduced neck compression, reduced postural sway and better control in task performance.



Results:

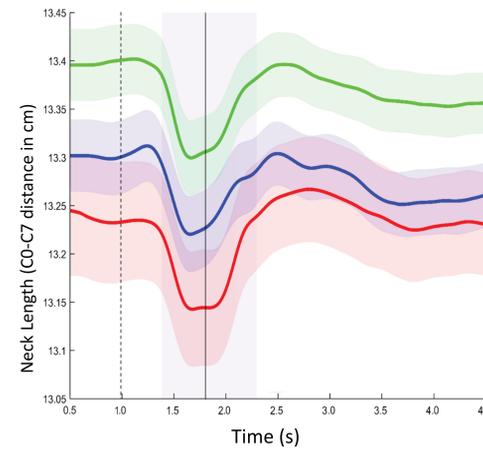


Figure 1: Neck length in discrete foot lifts. Lighten up instructions led to the least amount amount of neck compression (Lighten Up vs. Relaxed $p = .019$).

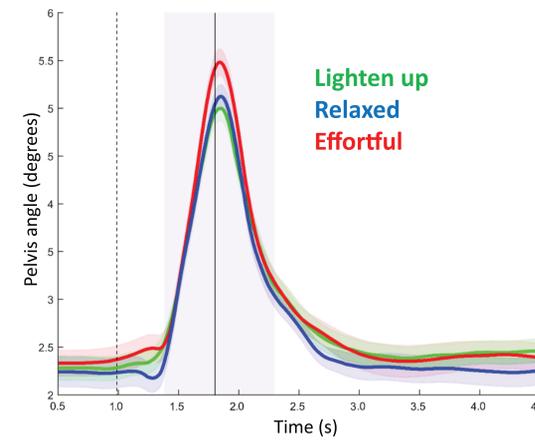


Figure 2: Pelvic tilt in discrete foot lifts. Effortful instructions led to the highest amount of pelvic tilt (Lighten Up vs. Effortful $p = .045$).

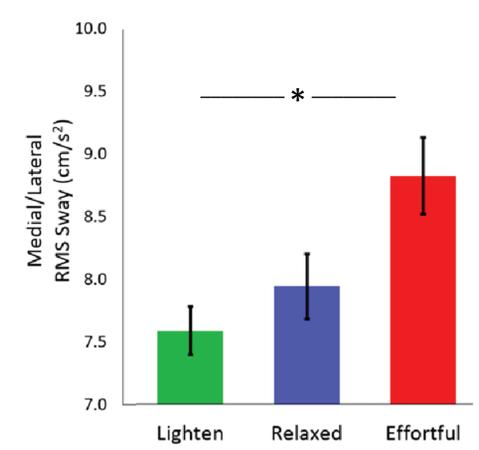


Figure 3: Postural sway in rhythmic arm swings. Lighten up instructions led to the least amount of motion in the medial-lateral axis (Lighten Up vs Effortful, $p = .02$).

Conclusions & Next Steps:

Simple postural instructions had beneficial effects on aspects of motor behavior associated with aging and falls. These results imply that how one thinks about postural uprightness has a significant effect on how one stands and moves, and that this influence can be utilized for training and rehabilitative purposes.



Previous work showed that lessons in the Alexander Technique, based on similar principles, led to lasting improvement in back pain⁵. We plan to conduct clinical trials to determine whether longer-term training provides lasting benefits for postural tone, alignment and balance. We will also include EMG recordings of muscles used in stabilizing movements during the different postural instruction conditions.

Methods:

Participants:

20 healthy older adults, 68 ± 6 years of age.

Design:

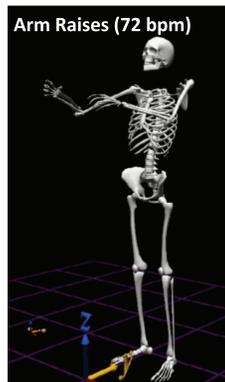
Within-subjects, counter-balanced design

Tasks:

- * Discrete right foot raises
- * Rhythmic forward arm swings with a metronome (72 beats per minute)

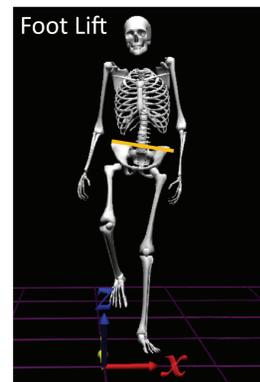
Measures

- * Neck length (Atlanto-occipital joint to C7)
- * Lateral pelvic tilt
- * Postural sway (motion in medial-lateral axis)



Equipment:

Vicon Nexus, The Motion Monitor (Innovative Sports), Opals (APDM)



Postural Instructions:

A. Lighten Up - "Allow your bones to send you up; let your head float on top of your spine".

B. Relaxed - "Stand as if you are feeling tired and heavy, it is the end of a long day and nobody is watching".

C. Effortful - "Use muscular effort to pull yourself up to your greatest height; feel your core muscles activating".

References:

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Acknowledgments:

Funding was provided by the **University of Idaho**: Seed Grant, **College of Letters, Arts, and Social Sciences**: Kurt O. Olsson Early Career Research Fellowship Grant, and **Mountain West Consortium**: Clinical & Translational Research Infrastructure Network Pilot Award.

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