

Postural Instructions Affect Static and Dynamic Balance in Healthy Older Adults

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Background

- ❖ Our previous research found that quality of attention to postural state affects balance, postural alignment, and tone in older adults with Parkinson's disease.
- ❖ Were the previous results dependent on the exaggerated postural deficits in Parkinson's disease, or will we see similar effects in healthy older adults?

Objectives

- ❖ To assess changes in static and dynamic balance in older adults given three types of postural instruction.

Procedure

- ❖ Participants learned and practiced three postural conditions:
 - **Relax:** Stand relaxed and heavy; let everything settle downward.
 - **Effortful:** Pull yourself up to your greatest height, using muscular effort.
 - **Light:** Allow your bones to send you up; let your head float on top of your neck.
- ❖ They then performed two tasks in each condition (in counterbalanced order): 3-sec foot lift and 30-sec quiet stance on an Airex® foam mat.
- ❖ Motion capture cameras and inertial sensors gathered kinematic data. Electromyography (EMG) quantified activity for tensor fasciae latae, gluteus medius, and external oblique muscles, as well as longissimus and iliocostalis at the level of the 3rd lumbar vertebra.

Participants

- ❖ 7 men and 12 women between 60 and 80 years old (mean age= 69 years)
- ❖ Qualification:
 - Able to hear and understand instructions
 - Able to stand independently for 20 minutes without major discomfort
- ❖ Participants self-reported a mean of 5.7 hours per day of sitting and 40 minutes per day of exercise.

Task 1: Foot Lift (Dynamic Balance)

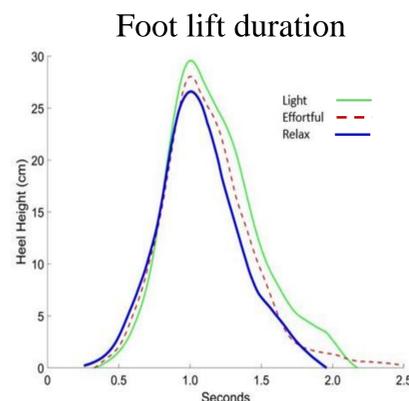


A. Postural Changes

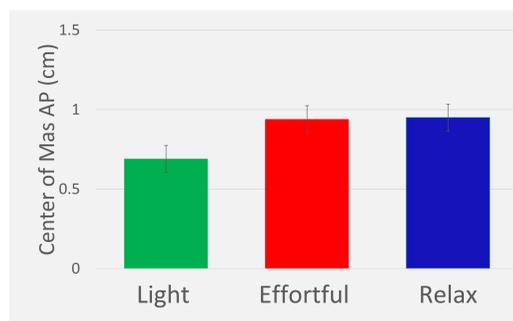


- ❖ Relax condition led to most forward head position relative to neck (p=0.01).

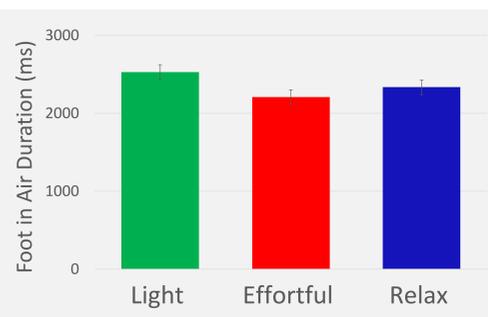
B. Balance-related Changes



CoM Variability

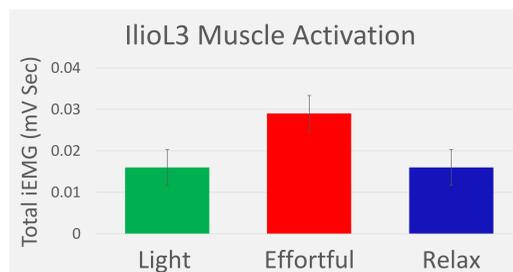
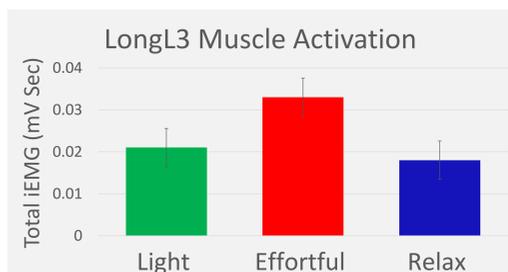


- ❖ Light condition led to smallest CoM anteroposterior variability (p=0.01).



- ❖ Light condition led to 321 ms longer foot-in-air duration than Effortful condition (p=0.04).

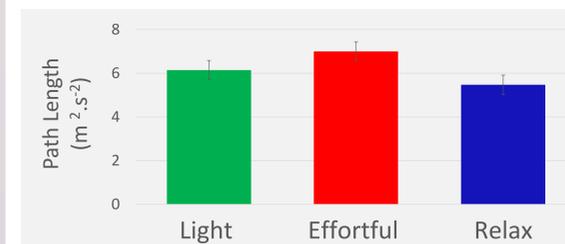
C. Changes in Muscle Activity



- ❖ Effortful instructions led to the highest total activity (integrated EMG), for longissimus and iliocostalis muscles at the L3 level (p=0.03; p=0.004).

Task 2: Postural Sway (Static Balance)

A. Path Length



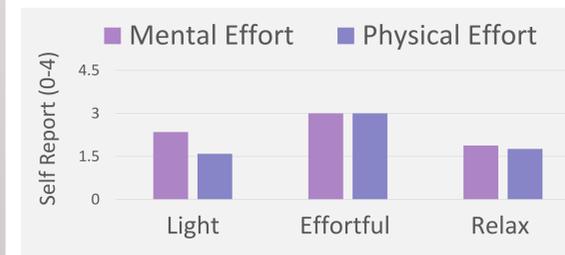
- ❖ Mediolateral path length was highest in the Effortful condition (p=0.0003).

B. Jerk



- ❖ Mediolateral jerk was 33% higher in the Effortful condition than in Light or Relax conditions (p=.03).

Self-Assessment



- ❖ Participants rated the Effortful condition as requiring the most mental (p=0.003) and physical (p=0.00007) effort.

Limitations

- ❖ Long term retention is not demonstrated here, although other studies suggest that Alexander technique (from which the Light instructions were derived) has lasting benefits for musculoskeletal pain and regulation of postural tone.
- ❖ Scripted instructions may not be as potent as individualized instruction from a trained Alexander teacher.

Conclusions

- ❖ Postural instructions have global effects via kinematic chain throughout the body, likely due to changes in postural tone.
- ❖ Instructions that encourage effortless upwards intention can improve balance in healthy older adults.
- ❖ The results have implication for instruction in rehabilitation programs.

Acknowledgments

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