

Vestibular And Proprioceptive Alteration Influence Postural Instability During Dual Tasks In Adults Diagnosed With HIV

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Abstract

Background & Purpose: People diagnosed with HIV can exhibit impaired postural control as a consequence of infection or from secondary effects of medication. Therefore, the purpose of this study is to assess postural control during four single and four dual tasks to evaluate the role of the vestibular and proprioceptive system during these balance activities. We hypothesize that postural stability will decrease with the increase of task complexity. **Number of Subjects** : 24 **Materials/Methods** : The study was conducted in San Juan, Puerto Rico at La Perla de Gran Precio Rehabilitation Clinic for HIV. 24 subjects (13 male and 11 female) participated in the study. Age range was 59.2± 1.7 years old. Participants had to be diagnosed with HIV and have a CD4 count >200 cells/uL to enroll in the study. After signing the informed consent and collecting demographic data, a member of the research team placed a lumbar accelerometer on each subject. Each participant was instructed to stand in a static bi-pedal posture on a firm surface or a thick foam pad . Each task took 15 seconds to be performed, multiply per nine balance tasks (18x15=3 minutes and 10 seconds), plus the 2 minutes of rest between every two tasks (2x6 minutes=12). The eight remaining balance tasks will be performed with a thick balance foam mat and further divided into two parts, four single and four dual cognitive tasks (subjects counting backward 3 numbers at a time). **Results** : Postural control was measured with Body-worn accelerometers (ACC). The two variables of interest in this study were jerk sway acceleration in an anterior-posterior (A-P) and mediolateral direction (M-L), m²/s⁵. A MANOVA analysis was used to evaluate Jerk of sway acceleration in both directions, between baseline (BL) (firm surface eyes open) and single/double tasks. Postural control was significantly altered during single (ACC BL 0.020 ± .01 m²/s⁵ versus ACC single task 0.20 ± 0.02 m²/s⁵ P< 0.005) and dual tasks (ACC BL 0.020 ± .01 m²/s⁵ versus ACC dual task 0.23 ± 0.03 m²/s⁵ P< 0.005) when visual input was canceled, and vestibular system was altered in an A-P direction. Thus ACC sway acceleration was increased in an anterior-posterior direction when the Ve and Pro system was challenged at the same time during the Vi system where canceled. **Conclusions** : Single and dual tasks showed similar challenge and results regarding increased acceleration and instability. It appears that the vestibular and proprioceptive systems could be impaired in HIV diagnosed people. Because there is no fall history among the participants of this study and these findings, it seems that patients with HIV rely on the visual system to a higher degree to attain postural control. **Clinical Relevance** : Identify balance disturbance in early stages to reduce the risk of fall.

Participants

Characteristics	Study Participants (n=24)
Age	M= 59.2± 1.7
Gender	Male: n=13; Female: n=11
CD4	m= 612.25
BMI	m= 25.1± 5.7
5X Sit-to-Stand	m= 12.58
ABC Scale	m= 72.4 ± 1383

Table 1. Characteristics of the study of subjects

Statistics:

- The data collected by this system was analyzed with the software of the Body-Worn Accelerometers (ACC)
- A statistical analysis of MANOVA in the SPSS program for all the variables of interest was performed.

*HUD- head up and down movements, using a metronome 2/4 60 BPM

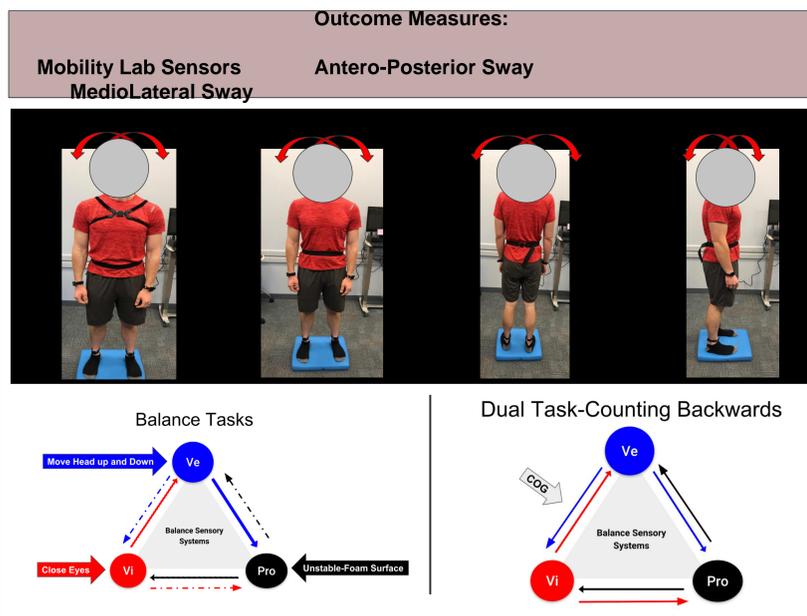
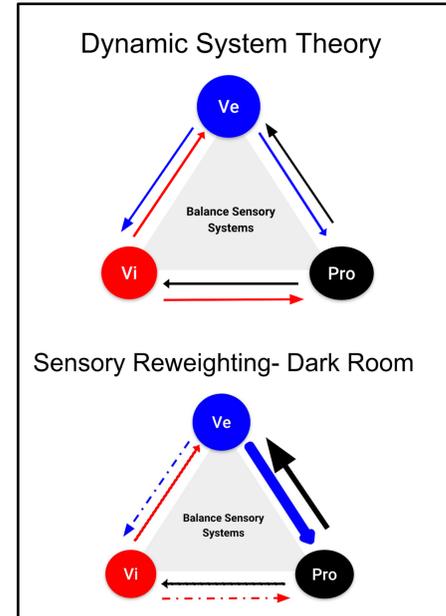
**Cog- cognitive, counting backwards by 3s.

EO- Eyes Open

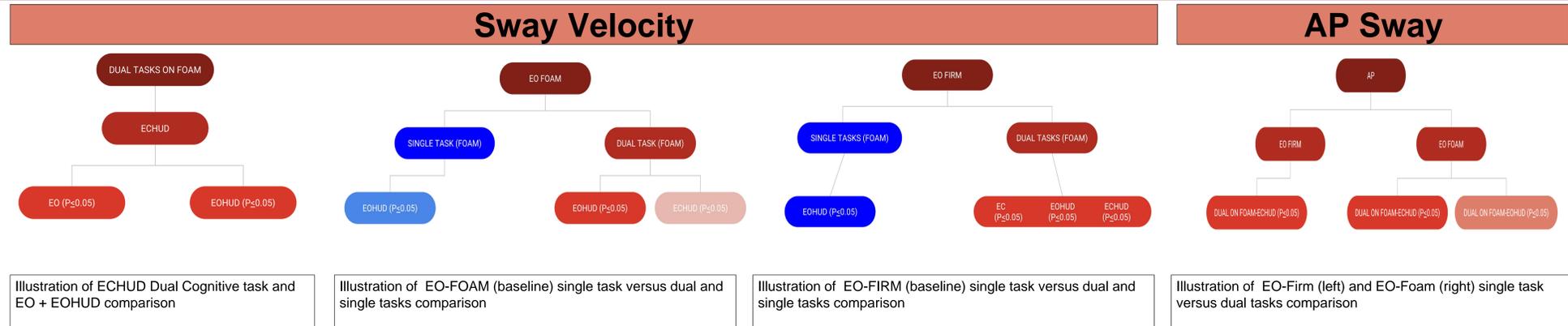
EC- Eyes Closed

Foam- Thick (Blue) unsteady surface

Methods



Results



Introduction

- People diagnosed with HIV can exhibit impaired postural control as a consequence of infection or from secondary effects of medication.
- How HIV affects the postural control and which sensory system (visual, vestibular, somatosensory) is the most affected, possibly vestibular and somatosensory.

Purpose

Assess postural control during single and dual tasks

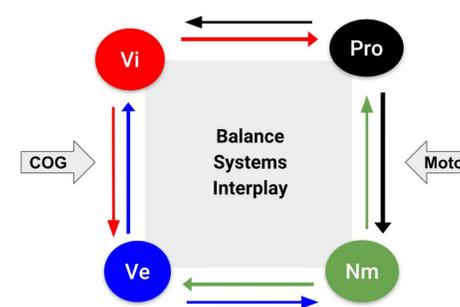
Characterize the role of the vestibular and proprioceptive system during these balance activities

Conclusion

- Dual tasks showed to be a challenge regarding increased acceleration and instability
- It appears that the vestibular and proprioceptive systems could be altered in HIV diagnosed people
- It seems that patients with HIV rely on the visual system to a higher degree to attain postural control before history of falls.

Future Directions

Dual Task: Sensory-Motor Balance Systems



Assess static postural control dual tasks with sensory balance test and lower extremities EMG

Clinical Relevance

Clinicians should assess balance in early stages to reduce the risk of fall in asymptomatic, normal cd4 levels, undetectable viral load HIV diagnosed individuals.

Reference

Bauer LLO, Ceballos NA, Shanley JJD, Wolfson LIL, Ceballosa N, Shanley JJD, et al. Sensorimotor dysfunction in HIV/AIDS: effects of antiretroviral treatment and comorbid psychiatric disorders. *AIDS*. 2005;19(5):495-502. doi: 10.1097/01.aids.0000162338.66180.0b.

Richert L, Dehail P, Mercie P, Dauchy F, Bruyand M, Greib C, et al. High frequency of poor locomotor performance in HIV-infected patients. *AIDS*. 2011;25(6):797-805. doi: 10.1097/QAD.0b013e3283455df.

Dorsey SG, Morton PG. HIV peripheral neuropathy: pathophysiology and clinical implications. *AACN Clin Issues*. 2006;17(1):30-36. doi: 10.1097/00044067-200601000-00004.

Ruiz M, Reske T, Cefalu C, Estrada J. Falls in HIV-infected patients: a geriatric syndrome in a susceptible population. *J Int Assoc Provid AIDS Care*. 2013;12(4):266-269. doi: 10.1177/2325957413488204