

The effects of simulated vision impairment on the postural stability of older adults as measured by the Nintendo Wii balance board

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Background

In assessing balance, clinicians have begun using the Wii Balance Board (WBB) as a practical and cost-effective alternative to force plates¹. It is well established that the visual system has an important role in balance, but this has not been examined in an older population with simulated visual impairment.

The aim of the study was to establish baseline centre of pressure characteristics in older adults prior to the onset of visual impairment by comparing older adults with and without simulated visual impairments.

It is **hypothesized** that participants will perform worse on balance measures with simulated visual impairment compared to their normal correction.

Method

Participants over the age of 50 were recruited from a community event geared to their age group.

The **Activities-specific Balance Confidence (ABC) Scale²** was used to measure balance confidence and fear of falling.

The **Timed Up-and-Go (TUG)³** was used to measure global balance objectively.

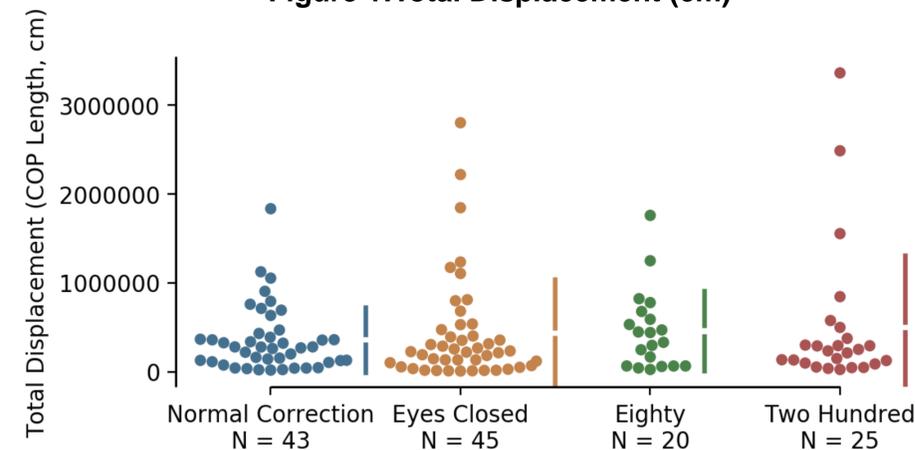
Postural control was measured using the **Nintendo Wii Balance Board (WBB)¹**.

Fork In The Road Low Vision Simulators were used to simulate visual impairments of 20/80 and 20/200 in the **TUG** and **WBB** tasks.



Results

Figure 1: Total Displacement (cm)



• Total displacement data was obtainable for 45 participants.

◦20/80 Group: N=20 (*M*: 456026, *SD*: 446011)

◦20/200 Group: N=25 (*M*: 499866, *SD*: 808349)

• Total displacement (cm) was higher in both the 20/80 and 20/200 ($W = 19.0, p = 0.208, d = -0.213$) conditions (Figure 1), but this was only significant in the 20/80 condition ($t = -2.854, p = 0.011, d = -0.655$).

• Anterior-posterior amplitude (cm) data was obtainable for 45 participants.

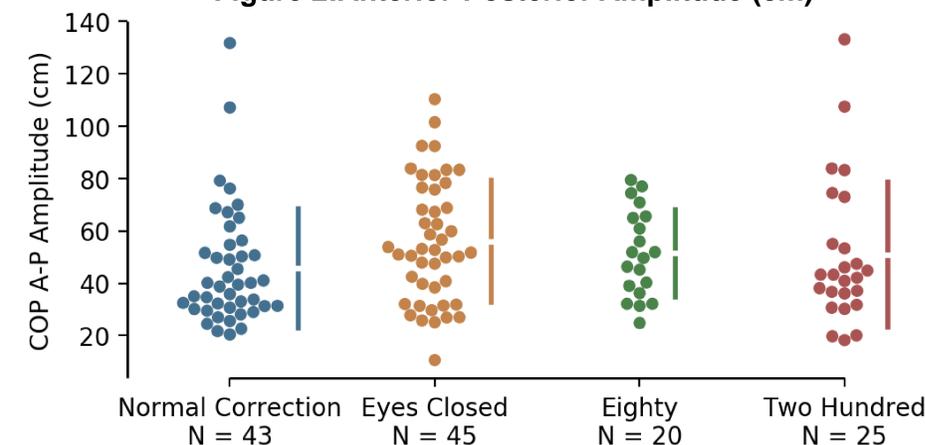
◦20/80 Group: N=20 (*M*: 51.5, *SD*: 16.7)

◦20/200 Group: N=25 (*M*: 50.8, *SD*: 27.8)

• Anterior-posterior amplitude (cm) was lower in the 20/200 condition ($W = 157.0, p = 0.208, d = 0.065$) which was non-significant (Figure 2).

• Anterior-posterior amplitude (cm) was significantly higher in the 20/80 condition ($t = -3.241, p = 0.005, d = -0.744$).

Figure 2: Anterior-Posterior Amplitude (cm)



• A total of 45 participants (38 female, 7 male) participated in this study.

• They ranged in age from 51 to 90 years (*M*: 68.3, *SD*: 10.0)

• Participants reported falling between 0 and 3 times in the last year (*M*: 0.689, *SD*: 0.925).

• Participants reported an average overall balance confidence between 21.9 and 100 (*M*: 88.2, *SD*: 15.0)

• Participants in both the 20/80 and 20/200 conditions performed worse on the TUG, with significantly slower times, compared to their normal correction

◦20/80 Group: $t = -5.05, p < .001, d = -1.129$

◦20/200 Group: $W = 24.00, p < .001, d = -0.615$

Conclusions

Preliminary results show significant differences in global balance (TUG) between normal correction and simulated vision impairment in both conditions, demonstrating the importance of vision in balance.

Significant differences in anterior-posterior amplitude between the normal correction and 20/80 impairment indicate an increased risk of falls. No significant difference was found in the 20/200 condition. This could indicate that a simulated visual impairment of 20/200 is sufficient to increase anxiety levels in a population that is generally confident of their balance abilities, causing participants to adopt a stiffening strategy and lower their average anterior-posterior amplitude below the normal correction condition.

Further analyses using data collected from the Nintendo Wii Balance Board will examine postural stability and identify the contribution of vision to postural control. In addition, these results will be compared to those of younger adults and older adults with actual vision impairments.

References

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