

# Quantifying Balance using Videogame: a Pilot Study

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## BACKGROUND

Videogames with balance boards (VG) provide several balance tests to evaluate the player's stability. However, the parameters used to provide the score for these tests – as well as the possibility of correlating these findings with clinical practice – are not reported in literature.

## OBJECTIVE

The purpose of this study was to correlate the scores registered by the VG balance board tests to the kinetic variables registered by a force platform – both measured simultaneously.

## METHODS

Two stroke patients participated on this pilot study. COP was captured by two AMTI force platforms with an acquisition frequency (AF) of 1.000 Hz. A Nintendo Wii Fit Plus® videogame integrated to a balance board (BB) was placed upon an AMTI force platform for simultaneous collection of data (Fig. 1). The kinetic variables analysed on this study were: area, speed of displacement and mean square of CoP displacement for noth medial-lateral (RMSx) and antero-posterior (RMSy) directions. Kinetic variables were processed by Matlab 7.0® software and correlated to the score provided by VG console (Balance tests: *Single-leg test* –SL- e *Steadiness test* –ST-) (Fig. 2) using Pearson's coefficient ( $p < 0,05$ ).

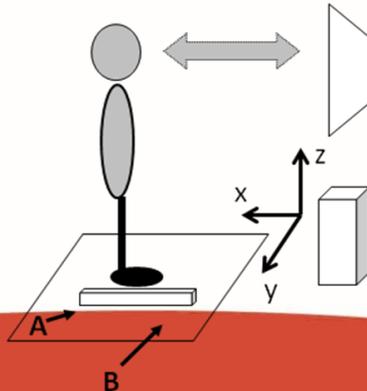


Fig. 1: Positioning of volunteer according to the reference system of the Laboratory of Movement (x, y, z). A: VG platform balance. B: AMTI force platform.

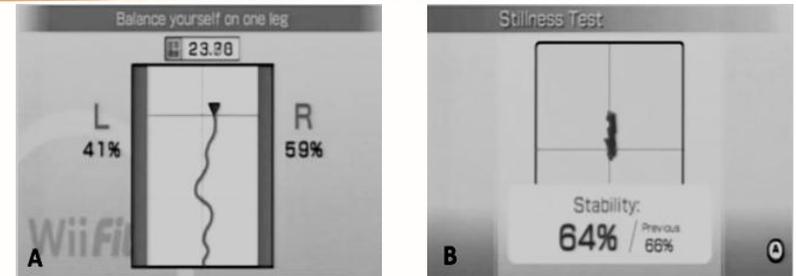


Fig. 2: (A) *Single-leg test* –SL- ; (B) *Steadiness test* –ST-

## RESULTS

The results showed significant, although moderate ( $r=0,5839$ ), correlation only for SL and RMSy. When comparing ST score to the variables Ar ( $r=0,8164$ ), RMSx ( $r=-0,6418$ ) and RMSy ( $r=-0,8094$ ) we found a moderate to strong correlation (Table 1).

Table 1: Results of correlation tests

| R              | Área     | VMx    | VMy    | RMSx     | RMSy     |
|----------------|----------|--------|--------|----------|----------|
| punctuation SL | -0,4545  | 0,3135 | 0,0979 | -0,4056  | -0,5839* |
| punctuation ST | -0,8164* | 0,157  | 0,3229 | -0,6418* | -0,8094* |

SL: *single-leg test*; ST: *steadiness test*, \* Significant Results  $p < 0,05$ .

## DISCUSSIONS / CONCLUSION

No correlation to any of the VG console tests was found when compared to the speed of displacement of the centre of pressure measured by the force platform. Therefore, we conclude that VG scores showed significant correlation to kinetic variables. The RMS had higher correlation to be related to the effectiveness of the postural control system [1,2]. However, this method is not very practical to be used for clinical assessment.

## REFERENCES

1. Mezzarane R.A., Kohn A.F. Postural control during kneeling. Exp. Brain Res. 2008;187(3):395-405.
2. MEZZARANE R.A., KOHN A.F. Postural control during kneeling. Exp. Brain Res. V. 187, n. 3, p. 395-405. 2008.