



Relative efficacy of various strategies for visual feedback in standing balance activities

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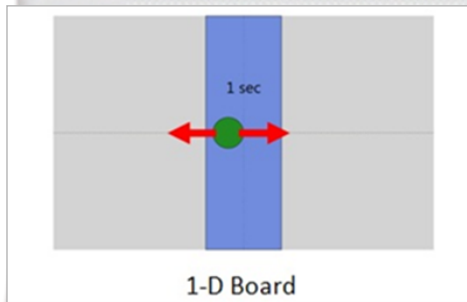


Background

- Visual feedback (VFB) is a common form of biofeedback known to improve the efficacy of balance therapy and training.
- Mechanisms of biofeedback influence on rehabilitation are not yet fully understood.
- The objective is to identify the optimal form of VFB for balance therapy and training.

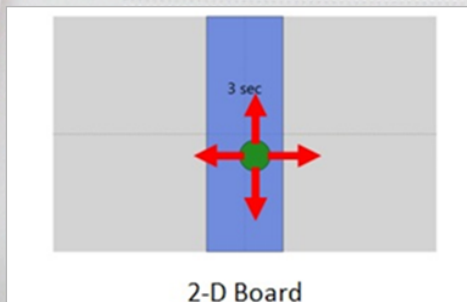
Methods

- 4 VFB strategies for lateral balance activities



1-D Board

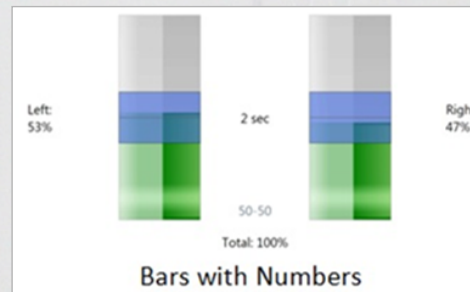
Direct Center of Pressure (CoP) – lateral only



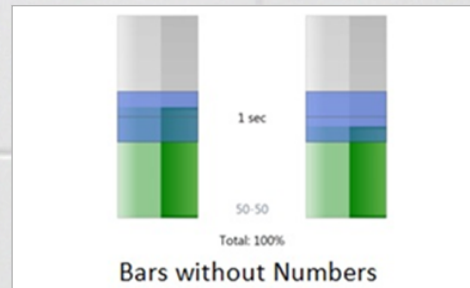
2-D Board

Direct CoP – lateral and sagittal

Methods, cont.



Lateral weight distribution – with numbers



Lateral weight distribution – without numbers

- Data collection
 - 79 healthy subjects (ages 17-21; 39 M and 40 F)
 - Data collected using WeHab system¹ (40 min avg.)
 - 3 repetitions of static, symmetric stance task
 - 2 repetitions of dynamic weight-shifting task
- Data analysis
 - Static task
 - Center of Pressure (CoP) data: muscular dynamics
 - Center of Gravity (CoG) data: balance kinematics
 - Difference (CoP-CoG): postural control
 - Dynamic task: Time to target

Results

- Static balance
 - Board feedback reduces sway compared to Bars for muscular dynamics ($p=0.0002$), balance kinematics ($p=0.0001$), and postural control ($p=0.001$).
 - Numbers feedback reduces sway for muscular dynamics ($p=0.0385$) and postural control ($p=0.0105$).
 - Dimensionality has no significant effect on sway.
- Dynamic weight-shifting balance
 - Board feedback results in faster weight shifts compared to Bars feedback ($p<0.0001$).
 - Numeric feedback has no significant effect on dynamic weight shifting.
 - For offset targets, 2-D feedback results in faster weight shifts ($p=0.0411$).

Conclusions & Future Work

- Potential clinical applications
 - Initial balance therapy (maximal assistance)
 - Static: Board
 - Weight shifting: 2-D Board
 - Advanced balance therapy (reduced assistance)
 - Static: Bars without numbers
 - Weight shifting: Bars
- Optimization of VFB for clinical population
 - Evaluate feedback arrangement (Board vs. Bars)
 - Assess effects of variation in balance deficits on optimal feedback strategy

1. Kennedy, et al. (2011) Enhanced feedback in balance rehabilitation using the Nintendo Wii Balance Board. *HealthCom 2011*.