A Soft, Flexible Skin-Mounted Sensor for Monitoring Balance Deficits in People with Multiple Sclerosis

Ruopeng Sun¹, Yaejin Moon¹, Ryan S. McGinnis², Kirsten Seagers³, Robert W. Motl⁴, Nirav Sheth³, John A. Wright³, Roozbeh Ghaffari³, Jacob J.Sosnoff¹

1. Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign; 2. Department of Electrical and Biomedical Engineering, University of Vermont; 3. MC10, Inc.; 4. Department of Physical Therapy, University of Alabama at Birmingham

BACKGROUND

- Impaired balance affects 75% of MS patients during the progression of the disease[1].
- Degradation in balance increases the risk of falls[2].
- Clinical balance rating scales (i.e. Berg Balance Test) often lack precision and depend on clinician’s expertise.
- Force platform-based balance assessment is immobile and expensive.
- The BioStampRC® sensor is a soft, flexible wireless inertial sensor that can be attached to skin with minimal preparation.

Objective: Investigate the validity of BioStampRC® sensor to assess the balance performance of individuals with MS (and without a history of falling) and healthy control subjects.

METHODS

- Participants: 40 MS participants + 12 Healthy Controls

RESULTS

- The balance assessment consisted of two 30-second standing trials in three conditions:
  - Eyes Open/Firm Surface (EO)
  - Eyes Closed/Firm Surface (EC)
  - Eyes Open/Foam Surface (FEO)

  - Postural sway was measured with a BioStampRC® sensor placed on the lower back (L5), as well as by a force plate placed under the feet.

Measure abbreviations are presented in the Table below. *significant difference between HC and MS Recurrent Faller, + significant difference between HC and MS Non-Faller (p<0.017).

• CEA and TP sway metrics (derived from force plate and BioStampRC®) can differentiate MS Recurrent Faller from HC in all test conditions.
• Force plate based metrics (CEA,SP,MV,TP) and SP metric from BioStampRC® can additionally differentiate MS Non-Faller from HC in EC condition.
• Sway JERK, a unique metric for accelerometry measure, can differentiate MS Recurrent Faller from HC in EC/FEO conditions.

Moderate to strong correlation (rho >0.66) between BioStampRC® and force plate based sway metrics.

• BioStampRC® based sway metrics were as effective for differentiating individuals with poor balance as the force plate sway metrics.

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REFERENCES