Neuromuscular Control and Balance

Validity and Reliability of Smartphone Orientation Measurement to Quantify Dynamic Balance Function

A collaboration led by researchers at the University of North Carolina (Greensboro, NC) has developed a novel smartphone-based neuromotor assessment protocol for screening of dynamic balance deficits stemming from head trauma. The reliability and validity of this Android app, called AccWalker, were evaluated in a recent publication (*Kuznetsov et al., 2018*).

The AccWalker orientation detection algorithms were compared to a biomechanics laboratory motion capture system using a pendulum (i.e., non-biological movement) and a human stepping task (i.e., biological movement). The test-retest reliability of a stepping-in-place protocol in three different sensory conditions (eyes open, no-vision, head shake) was also evaluated using temporal and spatial variability metrics extracted from thigh orientation signal in a sample of healthy young adults. Results suggest that smartphone sensors provided valid measurements of movement timing and amplitude variables but were sensitive to anatomical placement. In addition, the fidelity of measurements compared to the laboratory-system was dependent on the version of sensor firmware and Android OS running on the smartphone. High test-retest reliability was shown for the temporal and spatial variables of interest during the stepping-in-place task. The researchers plan to collect data from healthy Service members to develop a baseline dataset.

Collectively, these experiments suggest that the AccWalker smartphone application is a valid and reliable way to measure leg movement characteristics during dynamic balance activity, which could provide an objective way to assess neuromotor function after head trauma closer to the point-of-injury.

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REFERENCES:

Kuznetsov, N. A., Robins, R. K., Long, B., Jakiela, J. T., Haran, F. J., Ross, S. E., . . . Rhea, C. K. (2018). Validity and reliability of smartphone orientation measurement to quantify dynamic balance function. Physiol Meas, 39(2), 02NT01. doi:10.1088/1361-6579/aaa3c2