University of Lethbridge Human Performance Lab Validates Kinetisense. Accuracy and validity of Kinetisense joint measures for cardinal movements, compared to current experimental and clinical gold standards.

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OVERVIEW

New marker-less motion tracking systems use skeletal tracking, gesture recognition, and predictive modelling to provide high fidelity, low cost, 'plug and play' motion capture in real-world contexts. Given these features, this technology has the potential to revolutionize clinical assessment, where subjective evaluations plus simple empirical measures have previously been the norm. The proposed study will examine a novel entry into this marketplace, namely the Kinetisense, specifically examining the validity of measures of basic anatomical postures from the new system against current experimental and clinical gold standards, namely three-dimensional motion analysis from a passive marker infrared light system (VICON Peak) and analog goniometer respectively.

RESEARCH QUESTIONS

Validity of Kinetisense joint measures for cardinal movements in the sagittal and frontal planes, compared to current experimental and clinical gold standards; repeatability of Kinetisense motion assessments.

METHODS

24 healthy young adults performed 8 different actions, each to two different levels (specific normal range deflection, maximal deflection) and at one of two different clinically relevant camera-subject distances, inside the shared calibration volume of the Kinetisense and VICON Peak motion capture systems.

DATA ANALYSIS AND COMPARISON

Bland-Altman agreement analysis will be used to compare perceived and maximum joint angles from the Kinetisense, the VICON Peak, and the clinical tools (goniometer, inclinometer).

The primary purpose for the Kinetisense unit is as a clinical measurement tool, useful in measuring, charting, and demonstrating joint postures for clients. In that capacity, then, the Kinetisense (Kinect sensor plus Kinetisense software [as of November 18, 2014,]) has been validated in these comparisons against the current clinical standard, which is hand goniometer. Goniometry, was done here by a registered clinician (athletic therapist), and sensor to

participant distances were maintained at typical clinic ranges (1.5m and 2.5m).

EXPERIMENTAL COMPARISON

The Kinetisense unit is not an experimental motion capture tool, as the software does not support interval-based whole body capture, analysis, and export. Even without these functions, however, the system does operate on current best practices and technology in marker-less motion capture. In that interest, and to further establish measurement validity, the Kinetisense (Kinect sensor plus Kinetisense software [as of November 18 2014]) has been validated against a current experimental standard, namely passive marker infrared three-dimensional motion capture using a VICON, Peak Motus system. Analysis in the experimental comparisons are restricted to 16 samples at each of three join motions, to prescripted and maximal joint deflections, with sensor to participant distances at 2.5m.

SUMMARY

Kinetisense measures are valid compared to VICON-Peak measures, based on Bland-Altman agreement analysis. Differences that do exist may be a function of different segmental models (skin surface for the VICON, simplified skeleton for the Kinetisense), different data capture methods (time-based three-dimensional position sample for the VICON, instantaneous angular interpolation for the Kinetisense).