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Abstract Category: Post-Injury Assessment/ Advanced or Novel Testing

Title: Objective Quantification of a Clinical Dynamic Balance Assessment

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Competing Interests: None

Objective: To investigate whether addition of inertial sensor data can provide additional insight into the nature of postural stability deficits during a clinical dynamic balance assessment, with a view to enhancing accuracy of post-concussion monitoring protocols.

Design: Descriptive laboratory study.

Setting: University performance laboratory.

Participants: Fifteen physically active adults (age 23 ± 4 years, height 175 ± 8 cm, weight 67.5 ± 8 kg).

Interventions: An inertial measurement unit (IMU) was mounted at the level of the 4th lumbar vertebra. Subjects completed repeated Y-Balance tests (YBT) 10 minutes and immediately prior to a modified 60 second Wingate anaerobic fatiguing test. Post-fatigue YBTs were completed immediately following the test, and at 10 and 20 minutes.

Outcome Measures: Normalised YBT reach distances, and IMU derived RMS acceleration, velocity and angular velocity.

Main Results: Prior to the fatiguing intervention, participant's demonstrated excellent stability/reliability for all reach directions (Intra-class correlation coefficient 0.872-0.994). Significantly lower reach distances ($P < 0.05$) were observed immediately post-fatigue for the postero-medial and postero-lateral, but not anterior reach direction. Observed deficits returned to pre-fatigue levels by 10 minutes. However, IMU derived measures of postural stability remained significantly reduced ($P < 0.05$) for up to 20 minute post-fatigue.

Conclusions: These results demonstrate the ability of both traditional YBT reach distances and inertial sensor data to detect centrally driven postural stability deficits. However, the inertial sensor provided a greater degree of granularity in characterising the nature of these postural stability deficits. This suggests that addition of IMUs to clinical balance measurement tests/protocols may better detect deficits associated with concussion.