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Authors(s)	Johnston, William, O'Reilly, Martin, Duignan, Ciara, Coughlan, Garrett, Caulfield, Brian
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Inertial Sensor Data Provides Depth to Clinical Measures of Dynamic Balance

Johnston W^{1,2}, O'Reilly M^{1,2}, Duignan C^{1,2}, Coughlan GF³ & Caulfield B^{1,2}

1. Insight Centre for Data Analytics, University College Dublin, Ireland.
2. School of Public Health, Physiotherapy and Sports Science, University College Dublin, Ireland.
3. Connacht Rugby, College Road, Galway, Ireland.

Contact: William.Johnston@insight-centre.org

Study Design: Case Study

Objective: Establish the role a single inertial sensor may play in the objective quantification of dynamic postural stability following acute ankle injuries.

Background: The Y Balance test (YBT) is one of the most commonly utilised clinical dynamic balance assessments. Research has demonstrated the utility of the YBT in identifying balance deficits in those with acute ankle injuries and chronic ankle instability. However, reach distances fail to provide information relating to the quality of balance strategy and dynamic stability. Motion capture systems are often employed to provide micro-level detail pertaining to an individual's postural stability. However, such systems are expensive, lack accessibility, hinder natural movement and require extensive processing expertise. The addition of inertial sensors may allow for the inexpensive, accessible quantification of postural stability in an unconstrained environment.

Case Description: Forty-two elite under-20 rugby union players were recruited as part of a wider study. Two athletes were identified to have sustained acute ankle injuries two weeks previously; one lateral ankle sprain and one deltoid ligament sprain. A single inertial sensor was mounted at the level of the 4th lumbar vertebra. Participants completed four practice YBTs bilaterally, prior to completing 3 recorded YBTs. Reach distance and inertial sensor data were recorded for each reach excursion.

Outcomes: When compared to the group mean, both athletes demonstrated no clinically meaningful reduction in reach distances for all three reach directions. However, both athletes demonstrated a higher 95% ellipsoid volume of sway than the healthy control group for all three directions of the YBT when completed on their affected limb.

Conclusion: Preliminary analysis suggests that inertial sensor data may provide information relating to the quality of dynamic postural stability following an acute ankle injury. Further investigation is required to establish the role that such measures may play in the assessment and management of ankle injuries.