THE VALIDITY OF THE SHADOWBOX™ MAGNETIC AND INERTIAL MOTION TRACKING SYSTEM FOR MEASURING SOCCER-SPECIFIC MOVEMENTS

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Introduction

There are some motion-tracking technologies, such as GPS, that can effectively measure global movements made by soccer players on the field [1]. However, it has been difficult for sport scientists to remotely measure the soccer-specific actions of players such as kicking, tacking, passing the ball and gait biomechanics during a game. The purpose of this study, therefore, was to evaluate the validity of the 3D displacement data derived by a portable and miniature magnetic and inertial motion tracking system, the Shadowbox™ (Shadowbox, Park City, USA), against a criterion camera-based 3D motion capture system, the Vicon MX™ (Vicon Motion systems Ltd, Oxford, UK), during a series of soccer-specific actions.

Methods

A male subject was asked to perform a kick (drive) of a ball, a one-touch pass and a slide tackle with a Shadowbox™ attached firmly to his right ankle. The Shadowbox™ hardware contained a triaxial accelerometer, gyroscope and magnetometer which sampled at 600 Hertz. The raw data was converted into 3D displacement data using a quaternion filter method [2]. A reflective marker was placed on the Shadowbox™. This enabled the previously calibrated Vicon MX™ strobe cameras to precisely track the displacement of the Shadowbox™ during each trial.

Results & Discussion

Displacement data from the Shadowbox™ and Vicon MX™ motion tracking systems had a high Pearson correlation coefficient and variance explained (R^2). The Shadowbox™ system, therefore, tracked the ankle during soccer specific actions with the same accuracy and precision as the criterion method.

Table 1. The correlation between the Shadowbox™ and Vicon MX™ systems

Action	R^2
Kicking a ball (drive)	0.932
One-touch pass of a ball	0.919
Slide Tackle	0.947

Conclusion

The Shadowbox™ motion tracking system was proven to have high validity against the criterion method, the Vicon MX™ motion tracking system, during a series of soccer specific movements including kicking a ball, one-touch pass of a ball and a slide tackle.

References

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