ASSESSING STRIDE PARAMETERS AND VERTCIAL STIFNESS WITH GPS-EMBEDDED ACCELEROMETERS

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Introduction

Classical time-motion analyses in soccer include distance covered into specific speed zones, accelerations, decelerations and accelerometer-derived measures of 'body load'. While these data may be useful to assess match (locomotor) demands, they are very likely dependent on game pace. They might therefore lack of sensitivity to detect neuromuscular fatigue *per se*. The aim of the present study was to examine the ability of GPS-imbedded accelerometers to assess stride parameters and vertical stiffness (K), which are related to neuromuscular fatigue during repeated high-intensity runs [1]. The ability to detect stride imbalances was also examined.

Methods

A team sport player performed a series of 30-s runs on a motorized treadmill (ADAL3D-WR, MD, Andrézieux, France, 6 @10 km/h, 6 @17 km/h and 6 @24 km/h) with or without his right ankle tapped (aimed at creating a stride imbalance), wearing on his back a commercially-available GPS system (VX Sports, VX340a, Lower Hutt, New Zealand) with an embedded 100-Hz accelerometer. Contact (CT) and flying (FT) time, and K [2] were computed from both treadmill and accelerometers (Athletic Data Innovations) data. The agreement between treadmill (criterion measure) and accelerometer-derived data was examined. We also compared the ability of the different systems to detect the lateral imbalance. Data were analyzed using magnitude-based inferences.

Results

Biases were small (CT, -10.4%; 90CI: -12.3,-9.8; K -13.3%; -14.6,-11.9) and moderate (FT, -25.8%; -18.8,-27.7). The typical error of the estimate was trivial (CT: 3.9%, 3.4,4.6), small (K: 6.3%; 5.5,7.5) and moderate (FT: 15.7%; 13.5,18.9), with nearly perfect (CT: r=0.98; 90%CI 0.97,0.99; K: 0.98; 0.97,0.99) and large (FT: 0.68; 0.55,0.78) correlations for treadmill vs. accelerometer. The tape induced very large increase in the right - left foot Δ in CT (4.5%; 4.2,4.9), FT (7.0%; 2.3,11.3) and K (10.3%; 8.6,12.0) on the treadmill. The tape effect observed with the accelerometers on CT (3.7%, 2.3,5.0) and K (6.4%, 3.8,9.2) were also very large but of lower magnitude than with the treadmill (Δ in the Δ CT: -0.9%, -2.4,0.7 and K: -3.9%, -7.5,-0.3). The accelerometer-derived tape effect on FT was unclear (0.3%, -3.7,4.3).

Discussion

Present data highlight the potential of GPS-embedded accelerometers to assess CT and K during ground running. Since CT and K are two important determinants of high-intensity running performance [1], our results open new perspective for the field monitoring of neuromuscular fatigue.

References

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