Accuracy and reliability of the Memsens system to evaluate a squat jump.

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During these last five years, devices with small accelerometer have been increasingly used to measure human sport motion. Few studies have defined the measurement errors and limits of agreement of Chose sensors in the particular case of squat jumps when the accelerometer was attached on the athlete.

The aim of this study is to define the accuracy and reliability of measurement with the use of a nIMU Memsens sensor. Measurements of Memsens device is compared to these of a force plate. Nine male subjects (mean f standard deviation), with 179.8 ± 5.12 cm height and 76.02 ± 6.9 kg body mass performed squat jumps on a force plate (Kisler, 500 Hz). For each jump, the nIMU sensor (Memsens, USA) was attached at the hip of the athlete. The Memsens device includes the nIMU (120 Hz) sensor and software developed at INSEP laboratory. The device finds the motion start, defines the vertical acceleration of the subject, provides a 500 Hz interpolation, and then estimates the maximal velocity (Vmax), the take off velocity (Vtoff) and the flight time (t). The data of both devices of measurement (force plate and Memsens system) are synchronized. For each jump, data of the force plate were converted to define Vmax, Vtoff and t. Paired t-test, R correlation coefficient and Bland & Altman test were used to compare the validity and the limits of agreement between the two devices.

Results show no significant difference between the measurement of Vmax, Vtoff and t. The correlation between the tool's measurements is R> 0.91 for each parameter. Bland & Altman test shows very low bias and good reliability between measurements. In conclusion, the Memsens system can be used to evaluate the squat jump with acceptable accuracy and reliability. This study shows that a sensor attached on the hip permits to estimate kinetic's variables of a squat jump in agreement with measurement of the centre of mass maximal velocity time flight as well as using a force plate. The underestimation of the take off velocity using the sensor could be explained by the difference of the point of measurement between the devices. In the case of training and testing, this study shows that a sensor using tri-axial accelerometers can help to estimate human motion accurately. This new device could help the athletic subject to test his physical abilities without laboratory restriction.

Keywords : accelerometer, Memsens sensor, squat jump