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DINABANG, a portable measurement device to monitor lower limb explosive torque and velocity with validation

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Simple dynamometers or expensive equipment are available to measure muscular performance of athletes or patients during either training or rehabilitation respectively. During lower limb work, the physiotherapist defines and monitors the effort deployed, based on subjective criteria until formal evaluations of isokinetic or static are obtained at some other time. Namely, when using elastic bands to exercise lower limbs, there remains a certain doubt on whether the force deployed is either excessive or insufficient, both situations being sub optimal due to either and injury risk or non effective. DINABANG addresses this problem by measuring in real time the lower limb torque and the angular velocity to guide at all times the decisions of the physiotherapist or the instructed patient or athlete during rehabilitation or training sessions.

DINABANG was designed with a strain gage affixed between the elastic band and a brace just above the malleoli, an inertial measurement unit (IMU), Bluetooth communication, all housed in a convenient cylinder of less than 100 g, and a special software to display biomechanics parameters and to feed the electronic clinical record of the person under training or rehabilitation.

To validate the instrument force measurements were made using calibrated weights and a pulley with errors below 2% of the standard weight.

To validate static angular position a special purpose protractor was designed with accurate results, below 5% of any measurement angle. Velocity measurement was validated using the integral of the acceleration signal given by the IMU.

The product of maximum torque and maximum angular velocity gives a proxy of power deployed by the patient or athlete in training. This simplified measurement is available for future evaluation as a monitoring figure during rehabilitation or training.

DINABANG has been patented and transferred to industry for commercialization in Latin America and soon worldwide.