A DYNAMOMETRIC SYSTEM FOR STUDIES OF BALANCE WHILE QUIET STANDING (PROTOTYPE)

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INTRODUCTION: Studies on balance while quiet standing are frequently conducted through the measurement of the Center of Pressure (COP). Usually, a triaxial force platform is used in such studies, where the horizontal forces can be considered negligible. However, the cost of such instrument is a high limitation for research in this field. Considering that vertical reactions are significant they can be used to measure COP oscillations. This work describes the development of an inexpensive uniaxial dynamometric system to be used in balance studies.

METHOD: The prototype was designed to measure only vertical reaction forces. For its construction, a rectangular model of steel plates (0.5000 x 0.3900 x 0.0125) m was employed. Four 1000 N load cells (TU-K1C, Gefran) were placed between the plates at each corner. A specific system with spheres was designed to detach the horizontal reactions, to minimize hysteresis effects and vertical reaction errors. A four-channel DC amplifier and a microprocessed acquisition system (PIC 18F4550), supplied by a rechargeable battery were designed and fabricated to be placed between the plates. The USB data transmission to a PC allows acquisition frequencies up to 5 kHz per channel and 10 bits A/D conversion with unipolar input (from 0V to 5V). The acquisition software was developed with C++ language for Windows. The development of a database is still in progress. For the preliminary tests, three standard weights (20 kg) were placed (one onto another) at previously determined locations on the dynamometric system.

RESULTS: The amplifiers present low level noise and temperature drift. The software allows frequency acquisition selection, load cells off-set, “real time” COP visualization and data file generation. Errors below 10 % were found to COP localized with the dynamometric system.

DISCUSSION: The technology of the commercially available platform forces is already consolidated. This research work proposes technology innovation by designing and producing the whole dynamometric system. Among its advantages are the portability (allowing the system transport) and easy of use.

CONCLUSION: The next step of the project consists on the calibration and validity experiments. For this purpose, a stress-strain machine (DL – 3000, EMIC) will be adapted in order to apply forces in different locations of a reference matrix, previously placed on the dynamometric system.

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