Actigraph Calibration in Obese/Overweight and Type 2 Diabetes Mellitus Middle-Aged to Old Adult Patients

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**Background:** Several methods exist to assess and control physical intensity levels of subjects engaged in physical activities programs. Accelerometry is a method that could be easily used in the field. The purposes were: to calibrate Actigraph in middle-aged to old obese/overweight and DM2 adult patients; and to determine the threshold counts for sedentary, light, moderate, and vigorous physical activity (PA).

**Methods:** Sample comprise 26 participants (62.6 ± 6.5 years of age) of both gender. Counts and VO2 were simultaneously assessed during: resting, seating, standing, walking at 2.5 km·h⁻¹, 5 km·h⁻¹, and 6 km·h⁻¹. A hierarchical linear model was used to derive a regression equation between MET and counts. Receiver operating characteristics (ROC) analysis was used to define thresholds for PA levels.

**Results:** The regression equation was: MET = 1.388400490262 + 0.001312683420044 (counts·min⁻¹), \( r = .867 \). The threshold counts for sedentary-light, light-moderate and moderate-vigorous PA were: 200, 1240, 2400 counts·min⁻¹ respectively.

**Conclusion:** The Actigraph is a valid and useful device for the assessment of the amount of time spent in each PA intensity levels in obese/overweight and DM2 middle-aged to old adult patients.

**Keywords:** intervention study, exercise prescription, motion sensors

One of the most important factors in preventing and treating obesity as well as some of the morbidities associated with it, namely type 2 diabetes mellitus (DM2), is physical activity (PA). Regular PA is a fundamental part of lifestyle behavior in treating DM2 and on the primary prevention of this disease. There are several benefits of regular PA in individuals with DM2: it reduces the risk of cardiovascular disease, glycated hemoglobin A1c, blood pressure, and total abdominal fat; it also improves insulin sensitivity, glycemic control, and increases the muscle mass. Regular moderate-intensity PA can be used to improve metabolic risk variables such as insulin and leptin in overweight/obese postmenopausal women.

Since PA improves energy expenditure which can cause a negative energetic imbalance, it should be considered as one of the most important factors in weight control. As a consequence, PA is important for the prevention of comorbidities associated with overweight and obesity, namely DM2.

In this context, it is important to control the exercise and PA intensity of obese and diabetic individuals that are engaged in PA programs. Among several instruments available for that purpose, accelerometers have been used as objective measurement tools, that allow the quantification of the amount of time spent in light (<3 metabolic equivalents, or METs), moderate (3–5.99 METs), and vigorous (≥6 METs) PA. This way, accelerometers should be calibrated to have population specific energy expenditure equations. This is due to the fact that PA habits change with age. On one hand, children are characterized as having short bouts of relatively intense PA interspersed with frequent rest periods. On the other hand, adults have continuous periods of PA, mostly in ambulatory activities. In older adults, the main mode of PA is walking and other ambulatory activities, and they perform significantly fewer minutes of moderate to vigorous PA than young adults. The measurement of lifestyle activities with accelerometers is somewhat limited. Nevertheless they measure locomotor activities quite well, which makes them quite suitable to measure PA in an old adult population.

There are some previous calibration studies performed on adults, although they were done with young and healthy adults. As far as we know, no calibration studies with middle-aged to old obese/overweight and DM2 adult patients were performed.

For the same physical activity effort obese/overweight subjects spend more energy than normal weight