IMPORTANCE OF THE ACTIHEART INDIVIDUAL CALIBRATION TO ESTIMATE ENERGY EXPENDITURE DURING FIELD ACTIVITIES
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Accurate assessment of energy expenditure (EE) in free living condition is a big challenge. The Actiheart-AH (Cambridge Neurotechnology, UK) is a small monitor attached to the chest with two standard ECG electrodes and it is able to measure acceleration, HR, HR variability and ECG magnitude for objectively measuring PA and inferring EE. The purpose of the present study was to examine the importance of individual calibration (IC) vs no individual calibration (NO IC) using AH to calculate EE during light (<3 METS) to moderate (3-6 METS) and vigorous (>6 METS) intensity daily living activities in laboratory and field settings.

8 physically active women (age 22.88 ± 0.83 yr; BMI 20.81 ± 1.64 kg/m2; resting VO2 4.27 ± 0.38 ml/kg/min) volunteered to participate in the study and performed in two separate days 12 activities that ranged from sedentary behaviours to vigorous exercises. Participants performed each activity in a routine for 10 min with a 1 to 2 min break between each activity. They wore an AH and actual physical activity EE (PAEE) was simultaneously measured with a portable metabolic system (K4b2, Cosmed, Italy). The AH gives the possibility to estimate PA intensity and hence EE during PA in daily living activities using activity (Act-PAI) or heart rate (HR-PAI) only modes or combining the two relationships (Branched model). There is considerable variation between individuals with regard to the HR-PAI relationship, so that it is claimed that EE can be estimated more accurately by using IC (sleep heart rate, resting metabolic rate, heart rate/oxygen consumption relationship). We used the Branched model to assess EE, expressed in METS, for both IC and NO IC models and to compare IC vs NO IC data with indirect calorimetry.

Even if the two analyzed algorithm methods were highly correlated with indirect calorimetry (IC r= .769, p< .0001; NO IC r= .817, p< .0001), estimated EE resulted significantly different for both models (p> .0001) when compared with measured PAEE. The positively correlated errors with measured PAEE in the plots of both IC and NO IC algorithm models indicate a systematic error in these equations. In both cases the explained variances from the AH were lower if light and moderate intensity exercises are considered (IC, mean difference between methods= <3METS: 0.23 ± 0.5, 3-6METS: 1.75 ± 2.24, >6METS: 2.55 ± 3.0, 95% limits of agreement= <3METS: -0.78 to 1.23, 3-6METS: -2.74 to 6.23, >6METS: -3.45 to 8.55; NO IC, mean difference between methods= <3METS: 0.26 ± 0.45, 3-6METS: 1.67 ± 2.38, >6METS: 2.27 ± 2.65, 95% limits of agreement= <3METS: -0.64 to 1.16, 3-6METS: -3.09 to 6.44, >6METS: -3.03 to 7.56).

In conclusion no differences exist between IC and NO IC groups. The AH for both algorithm modes provides reliable estimate of EE for light and moderate intensity activities; on the contrary it sometimes underestimates vigorous activities.
Keywords: Energy Expenditure, Physical Activity

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