Calibration of Built-in Accelerometer Using a Commercially Available Smartphone

Jung-Min Lee  
University of Nebraska at Omaha, jungminlee@unomaha.edu

Youngwon Kim  
Iowa State University

Yi-Suk Kwon  
Yonsei University

Timothy R. Derrick  
Iowa State University

Gregory J. Welk  
Iowa State University

Follow this and additional works at: http://digitalcommons.unomaha.edu/pahppresentations

Part of the Health and Physical Education Commons, and the Other Analytical, Diagnostic and Therapeutic Techniques and Equipment Commons

Recommended Citation
http://digitalcommons.unomaha.edu/pahppresentations/13

This Poster is brought to you for free and open access by the Physical Activity in Health Promotion Lab at DigitalCommons@UNO. It has been accepted for inclusion in Research Presentations by an authorized administrator of DigitalCommons@UNO. For more information, please contact unodigitalcommons@unomaha.edu.
ABSTRACT

PURPOSE: The purpose of the study is to develop algorithms to predict energy expenditure (EE) and to evaluate their utility compared to existing accelerometer technology. METHODS: Twenty-one healthy males (n=21) and twenty-three healthy females (n=23) wore an ActiGraph (AG) (GT3X+) monitor on a waist belt and placed the Samsung Galaxy S2 SP in a front trouser pocket, while completing a routine of 13 physical activities over a 69 min period. Oxygen consumption was simultaneously measured by indirect calorimetry using an Oxygen Mobile metabolic analyzer. Accelerometer data from the SP were downloaded after each trial along with raw AG counts (100Hz). EE prediction equations for the SP were developed from the walking and running activities using standard regression methods. The vector magnitude of standard deviation of horizontal and vertical (i.e., 5x-counts) and BMI were employed to develop the prediction equation. This equation was then cross-validated on a separate holdout sample (n=22) using equivalence testing to evaluate accuracy.

RESULTS (Cont.)

Table 2. Measurement agreement between measured MET and predicted MET

Figure 3. Results from 95% equivalence testing for agreement in total MET between Smartphone and OM (left), and in AEE (MET) between Actigraph and OM (right). *Black solid bar: Equivalence zone of measured MET. Grey solid line: 90% CI of predicted MET

DISCUSSION

• None of the estimated MET estimates from the Actigraph (using Freedson equation, 2011) were significantly equivalent to the OM for the group-level comparisons.
• The estimated METs from the smartphone for walking 2.5 mph and running 5.5 mph (illustrated in Table 3) were significantly equivalent to the measured EE from the OM.
• The overall MAPEs were large for both the SP algorithm (42.4%) and the Freedson’s AG algorithm (38.2%).
• Bland-Altman plots indicated that there were some degree of significant proportional bias for both estimates.

• The present study demonstrated the accelerometer-enabled smartphone can be a competitive and objective tool in estimating EE for adults.
• The estimates of MET from the developed equation model provide valid estimates for quantifying physical activity patterns.
• The new technology, for instance, using built-in technology in the smartphone can open up unlimited opportunities in the field of PA assessment.