

Accuracy of RT3 Accelerometer and SenseWear Armband to Estimate Free-Living Energy Expenditure

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Devices that estimate energy expenditure (EE), such as the RT3 accelerometer and the SenseWear (SW) Armband, are a convenient way to assess free-living activity, as they store multiple days of data. **Purpose:** This study evaluated the ability of the RT3 accelerometer and the SW Armband to accurately estimate the total EE of adults under free-living conditions compared to indirect calorimetry (IC). **Methods:** A total of three men and six women [mean (SD) age: 30.9 (16.6) y; height: 168.3 (10.2) cm; body mass: 64.2 (10.4) kg; BMI: 22.5 (1.8) kg/m²] participated in this study. Each participant wore the RT3 accelerometer at the waist, the SW Armband positioned midway on the posterior aspect of the right upper arm, and a portable metabolic measurement system (COSMED K4b²) during three hours of free-living activity. Simultaneous measurements of EE were continuously recorded by the RT3 accelerometer, SW Armband, and IC during all activities. Difference scores for EE were calculated as RT3 accelerometer minus IC, SW Armband minus IC, and RT3 accelerometer minus SW Armband. A one-sample t-test was used to determine if the difference between devices was significantly different from zero. Pearson's correlation coefficients were calculated between each of the devices and IC. **Results:** Mean EE estimated by the RT3 accelerometer [338.1 (146.5) kcal] was similar to IC [320.9 (157.1) kcal; $P = 0.31$]; however, the SW Armband [462.6 (137.5) kcal] significantly overestimated EE compared to IC ($P = 0.004$) and the RT3 accelerometer ($P = 0.004$). There was a significant relationship between the RT3 accelerometer and IC ($r = 0.95$; $P < 0.01$), and between the SW Armband and IC ($r = 0.75$; $P < 0.05$). **Conclusion:** The findings indicate that the RT3 accelerometer more accurately estimated EE in adults under free-living conditions than the SW Armband. While the mean difference between RT3 accelerometer-estimated EE and IC-measured EE over the three hour sampling interval was minimal (5.6%), the summative error over a more prolonged measurement period may still produce an unacceptable overestimation of EE.