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Validity of Wearable Activity Monitors for Estimation of Resting Energy Expenditure in Adults

Zachary Motz  
*University of Nebraska at Omaha, zmotz@unomaha.edu*

Yang Bail  
*Iowa State University*

Youngwon Kim  
*Iowa State University*

Danae M. Dinkel  
*University of Nebraska at Omaha, dmdinkel@unomaha.edu*

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

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Validity of Wearable Activity Monitors for Estimation of Resting Energy Expenditure in Adults

Zachary Motz¹, Yang Bail², Youngwon Kim², Danae Dinkel³ Jung-Min Lee⁴
¹ School of Health, Physical Education, and Recreation, University of Nebraska at Omaha, Omaha, NE
² Department of Kinesiology, Iowa State University, Ames, IA

INTRODUCTION

Wearable accelerometers have become the standard method for assessing physical activity for both individuals and field-based research [1]. These new devices allow consumers to have the ability to estimate total energy expenditure and track it over time.

Resting Energy Expenditure plays a critical role in estimating daily total energy expenditure as it contributes 60-70% of total energy expenditure [2,3].

Little to no information is available to substantiate the validity of these consumer-based activity monitors under free-living conditions.

PURPOSE

The purpose of this study was to evaluate the validity of Resting Energy Expenditure estimates from Fitbit Flex and SenseWear Mini in adults.

ABSTRACT

Purpose: To evaluate the validity of Resting Energy Expenditure (REE) estimates from Fitbit Flex and SenseWear Mini in adults

Methods: Sixty healthy adults (26.4±7.7 years) participated. REE measurements were performed in the morning after a 10-hour fast via open-circuit indirect calorimetry (IC) following previously published guidelines [4]. Estimates of REE from the Fitbit Flex and SenseWear Mini were computed and compared to IC and estimated REE values from Institute of Medicine and the World Health Organization equations.

Results: Analyses of covariance (ANCOVA) showed no significant effects of gender for any of the comparisons with IC REE; therefore, males and females were combined for all analyses. No significant difference were observed between the measured REE and the estimates from Fitbit Flex, SenseWear Mini and the equations from the Institute of Medicine and the World Health Organization

Conclusion: The derived REE value from the Fitbit Flex and the SenseWear Mini provide reasonable estimates of measured REE. The equations from Institute of Medicine and the World Health Organization are also consistent with the measured REE from IC

METHODS

Table 1: Participant demographics

<table>
<thead>
<tr>
<th>Females (N=30)</th>
<th>Males (N=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>24.2±4.1</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>166.0±7.0</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>60.3±8.5</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>20.4±5.8</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>21.8±2.7</td>
</tr>
</tbody>
</table>

Procedures

- Participants signed an informed consent
- Participants fasted for 10 hours before coming into lab the next morning
- Resting energy expenditure was measured using open-circuit indirect calorimetry following previously published guidelines [4]
- Estimates of REE from the Fitbit Flex and the SenseWear Mini were obtained from the corresponding software and website

RESULTS

Table 2: REE (kcal/day) from each method of measure measurement

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean ± SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured Resting IC</td>
<td>1554.2±249.3</td>
<td>1189.0-2500.2</td>
</tr>
<tr>
<td>SenseWear Mini</td>
<td>1587.1±247.7</td>
<td>1239.8-2101.3</td>
</tr>
<tr>
<td>Fitbit Flex</td>
<td>1528.0±213.0</td>
<td>1152.0-1920.0</td>
</tr>
<tr>
<td>Institute of Medicine</td>
<td>1599.1±217.7</td>
<td>1218.5-1986.8</td>
</tr>
<tr>
<td>World Health Organization</td>
<td>1598.3±246.0</td>
<td>1180.1-2099.8</td>
</tr>
</tbody>
</table>

- ANOVA and post-hoc analyses showed no significant effects of gender for any of the comparisons with REE from IC

CONCLUSIONS

- The estimates of REE from the Fitbit Flex, SenseWear Mini, Institute of Medicine, and World Health Organization are consistent with IC REE measurement
- The derived REE value from the two wearable devices as well as the equations from the Institute of Health and World Health Organization provide reasonable estimates of REE

REFERENCES