Ability of Fitness Trackers to Accurately Measure Caloric Expenditure of College-Aged Students during Submaximal Exercise

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Since the early 2000s, fitness trackers have grown in popularity; especially among those looking to become more active. **PURPOSE:** To determine the accuracy of caloric expenditure as measured by fitness tracker 1 (FT1) and fitness tracker 2 (FT2) when compared to indirect calorimetry (IC) using expired gas analysis. A secondary objective was to determine differences in caloric expenditure between an athletic and non-athletic sample. **METHODS:** Nineteen (10 athletes and 9 non-athletes) college-aged subjects participated in the study and completed three exercise protocols. The protocols were: (1) orientation to testing, (2) walking one mile at 3.0 mph, 0% grade and (3) walking one mile at 3.0 mph, 3% grade. During testing sessions, all subjects wore both fitness tracker devices on the left hip and noseclip and mouthpiece apparatus to obtain and analyze expired gases. Data were analyzed using 2x3 ANOVAs with repeated measures. **RESULTS:** When comparing caloric expenditure on a flat surface to a graded surface, there was a statistically significant interaction ($F = 9.10$, $p < .01$) and main effect for the devices ($p < .01$). There were statistically significant differences in caloric expenditure output between FT1 and FT2 ($p < .01$), as well as FT2 and IC ($p < .01$). However, there was not a difference shown between FT1 and IC. There were no significant interactions or main effects when comparing the caloric expenditure of athletes and non-athletes after walking on a flat surface ($p > .05$) or graded surface ($p > .05$, Table 1). **CONCLUSION:** FT2 overestimated caloric expenditure when compared to FT1 and IC. However, there was not a difference in caloric expenditures between the athletic and non-athletic population samples.

Table 1: Comparison (M±SD) of caloric expenditure (kcal) as measured by fitness trackers and indirect calorimetry by group and grade condition. Total distance = 1 mile.

Treadmill Walking at 3 mph on Flat Surface			
Group	Fitness Tracker 1	Fitness Tracker 2	Indirect Calorimetry
Athletic (n = 10)	96.20±20.20	116.40±18.57	93.50±18.08
Non-Athletic (n = 9)	98.00±10.68	114.44±13.35	92.11±17.78
Total (N = 19)	97.05±15.99	115.47±15.89	92.84±17.45
Treadmill Walking at 3 mph on 3% Graded Surface			
Group	Fitness Tracker 1	Fitness Tracker 2	Indirect Calorimetry
Athletic (n = 10)	104.10±16.24	113.30±15.47	111.30±25.19
Non-Athletic (n = 9)	102.67±19.22	114.89±16.18	108.78±21.29
Total (N = 19)	103.42±17.22	114.05±15.39	110.11±22.82