

Can Smart Phone Pedometer Applications Accurately Estimate Caloric Expenditure During Exercise?

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ABSTRACT

Mobile devices are increasingly being used to track various fitness and activity parameters via free applications (apps). Numerous pedometer apps are available that in addition to tracking steps, also provide an estimation of calories expended. The accuracy of these apps in their estimation of caloric expenditure during activity is not well documented. **PURPOSE:** The aim of this study was to investigate the accuracy of the Stepz® free pedometer app in estimating kcal burned while walking on a treadmill by comparing this method to the validated method of indirect calorimetry. **METHODS:** Twenty-four students with mean age 20.5 ± 1.4 years volunteered for our study comparing caloric expenditure reported by indirect calorimetry and a phone-based pedometer application. Each subject was screened using the PAR-Q & You© questionnaire and completed an informed consent. Descriptive measures of height, weight, age and gender were collected. Participants then installed the Stepz® free pedometer app to their smartphone. Subjects were asked to remove all other fitness trackers such as fitbits®, Garmin® watches, apple® watches or pedometers as not to interfere with any other metabolic measurements. They were then fitted with a heart rate monitor and prepped with headgear, mouthpiece and nose clip for indirect calorimetry (Parvo Medics TrueOne® 2400 Measurement System). Participants walked on a treadmill for 10 minutes at a speed of 3.5 mph at 0% incline while maintaining a normal arm swing and holding their phone in the hand of their choice. This allowed for concurrent measurement of metabolic kcal (METCal) and pedometer app kcal (APPCal). At the end of the 10 minutes we recorded the distance walked, number of steps taken, and kcal reported by both the metabolic system and the app. We compared means of the METCal and the APPCal using a paired samples t-test. We also used a Pearson correlation to look for a relationship between the two measures. **RESULTS:** The mean difference in kcal between the two methods was 4.13 which was identified by the paired samples t-test as a significant difference ($p < 0.05$). The Pearson correlation between METCal and APPCal showed a strong relationship ($r = .898$). A strong correlation ($r = .98$) was also found between APPCal and the participants' weight. **CONCLUSION:** The APPCal differed from METCal by roughly 4 kcal within the activity parameters set forth in our study. While this difference was statistically significant, it is up to discussion whether it is a meaningful difference. As an estimation of caloric expenditure during exercise, this might be an acceptable difference given the ease of use and accessibility of the free app. The strong positive correlation indicates that there is a general trend of agreement between the methods. Based on the almost perfect correlation between the APPCal and participant weight, it is likely that body weight is a large determining factor in the pedometer app calculation of kcal expended.