

Smartphones and Wearable Activity Trackers to Measure and Promote Physical Activity

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Sedentary lifestyles increase all causes of mortality, double the risk of cardiovascular diseases, diabetes, and obesity, increase the risks of some types of cancer, high blood pressure, osteoporosis, dyslipidemia, depression, anxiety, and increase the risk of falls and impaired mobility in older adults. Evidence-based physical activity promotion strategies are a powerful tool that physical therapists can employ to help maximize the health of their patients both in rehabilitation settings and in prevention programs.

Currently, a major trend in physical activity promotion is the use of smartphone applications and wearable activity trackers to allow consumers to measure physical activity and set goals for a more active lifestyle. As healthcare professionals that are very well placed for promoting active lifestyles and behavioral changes, it is imperative that we are aware of current technology, its measurement accuracy and effectiveness. The goal of this blast cast is to provide readers with contemporary references about: (a) the accuracy of some of the most popular devices and applications for tracking physical activity and (b) how they may be used to promote activity among patients.

Articles about the accuracy of wearable physical activity monitors:

Sasaki J, Hickey A, Freedson P, et al. Validation of the Fitbit Wireless Activity Tracker for prediction of energy expenditure. *Journal of Physical Activity & Health*. February 2015; 12(2):149-154. <http://www.ncbi.nlm.nih.gov/pubmed/24770438>

Storm F, Heller B, Mazzà C. Step detection and activity recognition accuracy of seven physical activity monitors. *Plos ONE*. March 2015;10(3):1-13. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4366111/>

These two contemporary articles examined popular wearable devices from several well-known companies such as Fitbit and Nike. Sasaki et al. used portable metabolic measurement devices as the criterion standard of energy expenditure and compared the estimation from the device tested to the kcal expenditure that was directly measured. Storm et al. used two wireless inertial measurement units as a gold standard for step count, and compared the step counts from these devices to the wearables being tested. Accuracy was listed as a percentage of relative difference from the true count. In general, the wearable devices underestimated the total amount of steps or energy expenditure. However, from a practical standpoint, wearable devices appear to be a viable option for promoting increased physical activity.

Articles about the accuracy of smartphone application technology:

Nolan M, Mitchell J, Doyle-Baker P. Validity of the Apple iPhone®/iPod Touch® as an accelerometer-based physical activity monitor: A proof-of-concept study. *Journal of Physical Activity & Health* May 2014; 11(4):759-769. <http://www.ncbi.nlm.nih.gov/pubmed/23575387>

Case MA, Burwick HA, Volpp KG, Patel MS. Accuracy of smartphone applications and wearable devices for tracking physical activity data. *JAMA*. 2015; 313(6):625-626. <http://jama.jamanetwork.com/article.aspx?articleid=2108876&linkid=12198424>

Nolan et al. used a metabolic cart to directly measure expired gases as a means of determining energy expenditure in METs, and then compared this to the energy expenditure algorithm developed for the application being tested. Focusing on Apple products, this study asserts that smartphone physical activity monitors are comparable to traditional waist-worn accelerometers. Case et al. used direct step count by an examiner as the gold standard to which the devices listed were compared. A 500 and 1500 step trial was performed and accuracy was determined as a percentage of relative difference from direct step count to that measured by the devices. This study examined devices from several companies including Fitbit, Nike, Samsung, and Apple, and found that, in general, smartphones performed better than wearable devices.

Articles about physical activity promotion and smartphone technology:

Bort-Roig J, Gilson N, Puig-Ribera A, Contreras R, Trost S. Measuring and influencing physical activity with smartphone technology: A systematic review. *Sports Medicine* May 2014; 44(5):671-686. <http://www.ncbi.nlm.nih.gov/pubmed/24497157>

Bort-Roig et al. performed a systematic literature review of the efficacy of using smartphones to track and promote physical activity and concluded that the evidence, while developing and still limited, suggests that smartphones may be a promising intervention to increase physical activity.