The Validity of Apple Watch For Energy Expenditure Estimation In Physical Activity

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As the technology advance, both consumers and researchers become more interested in using wearable fitness devices to monitor and measure physical activity (PA). Apple Watch® (Apple Inc, Cupertino CA) is designed to track individual’s PA and has a built-in exercise application, Workout App which tracks user’s energy expenditure and exercise time. Even though Apple Watch claims to be a useful wearable fitness technology, the validity of its PA measures is unknown. PURPOSE: The purpose of the study was to investigate the validity and reliability of the energy expenditure estimation of Apple Watch among college students. METHODS: A total of 30 college students (17 males and 13 females) from a state public university in Pennsylvania participated into the study. All participants completed two sets of three 10-minute treadmill walking and running trials while wearing three apple watches and being connected to indirect calorimetry. The two sets of bouts were arranged on two separate days with a randomization and >48-hour rest in between. The three walking trials were at speeds of 54, 80, and 107 m•min⁻¹ while the running trials were at speeds of 134, 161, 188 m•min⁻¹. Resting Metabolic Rate was collected by the indirect calorimetry along with a familiarization trial prior to the execution of the exercise protocol. Energy expenditure comparisons was made using Two-way ANOVA with repeated measures. Reliability was analyzed by Intraclass Correlation. RESULTS: There was no significant device x speed interactions (F (15, 696) = 1.113, p > 0.05) between the indirect calorimetry (criterion) and watches. Bonferroni post hoc analysis revealed no significant differences between the criterion energy expenditure estimates and Apple Watch (B) (p = 0.117). The reliability analysis: A moderate to high agreement among the three apple watches examined in this research. The Inter-Class Correlation (ICC) scores were 0.49 (95%CI) at 2mph, 0.66 (95%CI)) at 3mph, 0.72(95%CI)) at 4mph & 5mph, 0.71(95%CI)) at 6mph & 7mph. CONCLUSION: Apple watches demonstrated a moderate to high level of validity and reliability on measuring physical activity. Supported by a University Leveraging Grant # 2015021.