

Heart Rate and Energy Expenditure Concurrent Validity of Identical Garmin Wrist Watches During Moderately Heavy Resistance Training

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ABSTRACT

Consistent with previous years, ACSM has found that wearable technology and resistance training (RT) are two of the top 5 fitness trends in 2023. Our lab recently found that wrist-worn devices, such as Garmin Instinct, are neither valid nor reliable at measuring average or maximal heart rate (HR) or estimating energy expenditure (EE) following light intensity circuit RT. We postulated that the errors may have been due to the device's algorithms assuming higher intensity during RT. **PURPOSE:** The purpose of this study was to determine the concurrent validity of identical Garmin Instinct wrist-watches to record valid measures of average and maximal HR as well as estimated EE following moderately heavy RT. **METHODS:** Twenty-one adult participants completed this study (n=10 female, n=11 male). Two Garmin Instinct wrist-watches were evaluated, along with the Polar H10 chest strap and Cosmed K5 portable metabolic unit as the criterion devices for average/maximal HR and EE, respectively. Participants completed 8 supersets of the reverse lunge and shoulder press exercises using dumbbells at a light (4 sets) and moderately heavy (4 sets) intensity with 1 superset of 6 repetitions per exercise (12 repetitions per superset) and 1 min rest between supersets. Data were analyzed for validity (Mean Absolute Percent Error [MAPE] and Lin's Concordance Coefficient [CCC]), with predetermined thresholds of MAPE<10% and CCC>0.70. A one-way repeated measures ANOVA with Sidak post-hoc test was used to determine differences ($p<0.05$). **RESULTS:** The identical Garmin Instinct devices were not considered valid for average HR (MAPE range: 36.5-81.6%; CCC range: 0.07-0.18), maximal HR (MAPE range: 18.6-18.8%; CCC range: 0.15-0.31), or estimated EE (MAPE range: 14.0-16.4%; CCC range: 0.08-0.32) compared to the criterion references. The devices were significantly different than each other for average HR ($p=0.005$), maximal HR ($p<0.001$), and estimated EE ($p<0.0001$). **CONCLUSION:** The wearable wrist-worn devices tested herein should not be utilized for accurate measurements of HR or EE during RT, and there are even differences between identical devices. People who RT while using these devices should do so with caution if wishing to utilize them for physiological measures.