Concurrent Validity and Reliability of Average Heart Rate and Energy Expenditure of Identical Garmin Instinct Watches During Low Intensity Resistance Training

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ABSTRACT

Wearable technology and resistance training are two of the top five worldwide fitness trends for 2022 as determined by ACSM. Many devices, such as Garmin's Instinct, have functions to track various physiological aspects during resistance training. However, to our knowledge, independent verification of the validity and reliability of these devices for estimating average heart rate (HR) and energy expenditure (EE) during resistance training are nonexistent. **PURPOSE**: To determine the concurrent validity and reliability of identical Garmin Instinct watches during resistance training. **METHODS**: Twenty subjects (n=10 female and male; age: 23.2±7.7 years; height: 169.7±11.1; weight: 76.3±15.7 kg) completed this study. Two Garmin Instinct watches were evaluated, along with the Polar H10 chest strap and Cosmed K5 portable metabolic unit as the criterion devices for average HR and EE, respectively. Subjects completed 4 circuits of 4 exercises (front squat, reverse lunge, push-ups, and shoulder press) using dumbbells at a light intensity with 1 set of 10 repetitions per exercise, 30 seconds rest between exercises, and 1-1.5 min. rest between circuits. Data were analyzed for validity (Mean Absolute Percent Error [MAPE] and Lin's Concordance Coefficient [CCC]) and reliability (Coefficient of Variation [CV]), with predetermined thresholds of MAPE<10%, CCC>0.70, and CV<10%. A one-way repeated measures ANOVA with Sidak post-hoc test was used to determine differences (p<0.05). **RESULTS**: Garmin Instinct 1 and Instinct 2 were significantly (p<0.001) different than the Cosmed K5 for EE in kcals (28.0±12.2 and 38.0±14.2 vs 20.3±5.5 kcals, respectively) and Polar H10 for average HR in bpm (117.7±7.0 and 123.8±20.4 vs 128.9±19.0 bpm, respectively). Neither Garmin Instinct 1 or Instinct 2 were considered valid for EE (MAPE: 208.4% or 369.8% and CCC: 0.16 or 0.11, respectively) or average HR (MAPE: 34.8% or 18.4% and CCC: 0.4 or 0.8, respectively). Also, estimated EE was not reliable as Garmin Instinct 1 was significantly (p<0.0001) different than Instinct 2, with a 26.6% CV. However, average HR was reliable with a 5.9% CV, despite a significant (p<0.001) difference between devices. **CONCLUSION**: Individuals who resistance train and use these devices should be aware of these findings and consider their implications.