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The Validity of Biometric Feedback from Popular Activity Monitors

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PURPOSE: The purpose of this study was to determine the validity of the step count measurement of different activity monitors during walking, jogging, and running. In addition, the heart rate obtained from one activity monitor was compared with the Polar monitor. **METHODS:** Twenty college students (10 male, 10 female) completed five minutes of walking (2.5mph), jogging (4.5mph), and running (6.5mph) on a treadmill with a three-minute rest period in between each exercise bout. To measure step count, each subject wore an electronic wristband on the non-dominant wrist, carried a cell phone with a pedometer app in same hand and wore a piezoelectric pedometer on the ipsilateral hip. A researcher manually counted the steps during each condition to represent the criterion step count. In addition, HR was recorded at each exercise intensity from a Polar HR monitor and the electronic wristband. The step data were analyzed using a one-way ANOVA with repeated measures with post hoc analysis, Fisher LSD, to determine significant differences ($p < 0.05$). A paired t-test was used to analyze the heart rates ($p < 0.05$). **RESULTS:** Results showed that during walking there was no significant difference between the manual step count and the steps recorded on the hip pedometer (519.9 ± 32.8 and 516.8 ± 36.0). During walking, the electronic wristband and the cell phone app significantly underestimated steps compared to the manual step count, 519.9 ± 32.8 , 482.1 ± 63.6 , 496.9 ± 58.4 , respectively, ($p = 0.002$). During jogging, the cell phone significantly underestimated steps compared to the manual step count, (772.4 ± 60.1 and 743.2 ± 56.7 , $p < 0.01$). Under running conditions, all devices accurately measured step count. Finally, the electronic wristband recorded higher heart rates during walking compared to the Polar HR monitor (99.9 ± 21.5 vs 88.2 ± 13.6 , $p = 0.007$) whereas during jogging and running, similar heart rates were recorded. **CONCLUSION:** As exercise intensity increased, the activity monitors more accurately measured step count and heart rate. Across all the exercise intensities, the hip piezoelectric pedometer produced the most accurate measurements. As new technology emerges, future studies should test the accuracy of activity monitors at different exercise intensities.