TACSM Abstract

Accuracy of Wrist-Worn Monitors while Walking in Lower Limb Prosthetic Users

BRIAN G. BURKHOLDER and JOHN D. SMITH

Department of Counseling, Health, & Kinesiology, Texas A&M University-San Antonio, San Antonio, TX

Category: Undergraduate

Advisor / Mentor: Smith, John (jsmith@tamusa.edu)

ABSTRACT

Wrist-worn activity monitors are extremely popular among the general population. These monitors are used to track activity for purposes to lose weight, get healthy, improve performance, and other reasons. While many studies have looked at the accuracy of these monitors in individuals without amputations, there has yet to be any that have examined these monitors in those who use lower-limb prosthetics. **PURPOSE**: to determine the accuracy of wrist-worn activity monitors in individuals using lower-limb prosthetics. **METHODS**: Thirty-four men and women (Age: 48.8±14.2 yrs, Ht: 176.9±11.5 cm, Wt: 88.3±21.1 kg, BMI: 28.3±5.3) with right-, left-leg, or bilateral above and below the knee amputations were fitted with a Polar Loop (PL) and a Fitbit Charge™ (FC) on the left wrist, and an Omron HJ-112 (OM) pedometer on the left hip. After resetting the monitors, they then walked 140m at a self-selected pace followed by the investigator who counted steps with a standard lab hand-tally counter for actual counts (AC). At the conclusion of the walk, step counts were recorded from all devices. A repeated measures ANOVA was used to determine differences in counts registered by the monitors and those registered by AC. Single measure intraclass correlation (ICC) from a two-way random effects ANOVA was used to assess the agreement between AC and monitor counts, with ≥ 0.90 considered high agreement, 0.80 to 0.89 moderate agreement, and ≤ 0.79 low agreement. Bland-Altman plots of AC vs. counts registered by the monitors were used to provide an indication of over/under representation of steps and agreement between the measures. Percent error was calculated as [(counts detected by monitor – AC) / AC] x 100. Alpha was set at .05 for all statistical tests. **RESULTS**: There was a significant difference between counts, $F_{(3, 30)}$=8.8, p=.001, with pairwise comparisons indicating PL was significantly lower than AC, p=.001. There was no significant difference between AC and FC (p>.05) or between AC and OM (p>.05). Agreement according to ICC between AC and PL was low (α=.71, ICC=.42 to .86), between AC and FC was moderate (α =.81, ICC=.61 to .90), and between AC and OM was high (α =.93, ICC=.86 to .97). Bland Altman plots indicate lowest agreement between AC and PL, and with highest agreement between AC and OM. Percent error was greatest with PL (16±12%), lower with FC (8.9±8.9%), and least with OM (4.1±7.3%). **CONCLUSION**: It seems that for this population who might consider wearing either the PL or the FC, the FC would be a better choice given its greater accuracy. Interestingly, the OM is the superior device for counting steps.