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Oral presentations

95 ACCURACY OF OFF THE SHELF ACTIVITY TRACKERS IN AMBULATORY SETTINGS IN YOUNG AND OLD ADULTS

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Background: Wrist-worn activity trackers have experienced a tremendous growth lately. Robust studies of the comparative accuracy of currently available, mainstream trackers, in young adults versus older adults are still scarce in literature. This study explores the performance of ten trackers estimating steps, travelled distance, and heart-rate measurements against gold-standards in two cohorts of young and old adults.
Methods: Overall, 38 subjects completed a structured protocol involving walking tasks, simulated household activities, and sedentary activities, including less standardised activities, such as dusting, vacuuming, or playing cards, in order to simulate real-life scenarios. Both wrist-mounted and chest/waist-mounted devices were considered. Gold-standards included treadmill, waist-mounted pedometer, ECG-based chest strap, direct observation or video recording according to the activity and parameter.
Results: Every tracker shows a decreasing accuracy with slower walking speed, which resulted in a significant step under-counting. Large mean absolute percentage error (MAPE) was displayed by every monitor at slower walking speeds.
During household activities, the MAPE in young adults climbing up/down-stairs ranged from 3.91-11.41% and 4.34-11.92% (dominant and non-dominant arm), respectively. However, for the same activities older adults displayed a larger MAPE, at 8.38-19.3% and 10.06-19.01%, respectively. Chest-worn or waist-worn devices had more uniform performance. However, unstructured activities (dusting, vacuuming, playing cards), and accuracy in people using a walking aid represent a challenge for all consumer-level trackers as evidenced by large MAPE. Poor performance in travelled distance estimation was also evident during walking at low speeds and household activities for both cohorts.
Conclusion: This study shows a number of limitations to current, mainstream consumer-level wrist-based activity trackers, requiring caution if adopted in healthcare, whether clinical or research. This study demonstrates the particular deficits in commercial devices for use in an aging population, and provides some indications on how to best measure these health parameters in this population.

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