Validation of automatic wear-time detection algorithms in a free-living setting of wrist-worn and hip-worn ActiGraph GT3X

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Wrist-worn accelerometers are increasingly used in epidemiological studies to record physical activity. The accelerometer data are usually only analyzed if the convention for compliant wear time is met (i.e. $\geq$ 10per day) but the algorithms to detect wear time have been developed based on data from hip-worn devices only and have not been tested in a free-living setting. The aim of this study was to validate the automatic wear time detection algorithms of one of the most frequently used devices in a free-living setting.; Sixty-eight adults wore one ActiGraph GT3X+ accelerometer on the wrist and one on the hip and additionally recorded wear times for each device separately in a diary. Monitoring phase was during three consecutive days in a free-living setting. Wear time was computed by the algorithms of Troiano and Choi and compared to the diary recordings.; Mean wear time was over 1420per day for both devices on all days. Lin's concordance correlation coefficient for the wrist-worn wear time was 0.73 (0.60; 0.82) when comparing the diary with Troiano and 0.78 (0.67; 0.86) when comparing the diary with Choi. For hip-worn devices the respective values were 0.23 (0.13; 0.33) for Troiano and 0.92 (0.88; 0.95) for Choi. Mean and standard deviation values for absolute percentage errors for wrist-worn devices were - 1.3 ś 8.1% in Troiano and 0.9 ś 7.7% in Choi. The respective values for hip-worn devices were - 17.5 ś 10% in Troiano and - 0.8 ś 4.6% in Choi.; Hip worn devices may be preferred due to their higher accuracy in physical activity measurement. Automatic wear-time detection can show high errors in individuals, but on a group level, type I, type II, and total errors are generally low when the Choi algorithm is used. In a real-life setting and participants with a high compliance, the algorithm by Choi is sufficient to distinguish wear time from non-wear time on a group level.
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