

# Innovations in the use of raw accelerometry in epidemiology: A basis for harmonisation of physical activity outcomes across international datasets

Alex V. Rowlands, Charlotte L. Edwardson, Tatiana Plekhanova, Evgeny M. Mirkes, Melanie Davies, Kamlesh Khunti, Tom Yates

Category: Measurement /surveillance

**Background:** To capitalise on the increasing availability of accelerometry data for epidemiological research it is desirable to pool data from multiple surveys worldwide. This study aimed to establish which physical activity outcomes can be considered equivalent between three research-grade accelerometer brands worn on the dominant and non-dominant wrist. **Methods:** Eleven adult participants wore a GENEActiv, Axivity and ActiGraph on both wrists for up to 7-days. Accelerometer data were processed using open-source software (GGIR) to generate mean daily activity outcomes (including average dynamic acceleration (ACC), intensity gradient, time inactive ( $\leq 50$  mg) and time active ( $\geq 100$  mg)). Agreement was assessed using pairwise 95% equivalence tests ( $\pm 10\%$  equivalence zone) and intra-class correlation coefficients (ICC, 95% confidence interval (CI)). **Results:** ACC and time active were higher ( $p < 0.01$ ) when measured at the dominant wrist (31.9 vs 28.8 mg and 124 vs 114 min, respectively). ACC could be considered equivalent between monitors worn on the non-dominant wrist (ICC  $\geq 0.88$ , lower 95%CI  $\geq 0.61$ ). The intensity gradient (ICC  $\geq 0.88$ , lower 95%CI  $\geq 0.55$ ), time inactive (ICC  $\geq 0.69$ , lower 95%CI  $\geq -0.06$ ) and the number of valid days (ICC  $\geq 0.95$ , lower 95%CI  $\geq 0.81$ ), could be considered equivalent between all monitor/wrist pairings. **Conclusion:** Free-living measures of average dynamic

acceleration, and outputs that depend on acceleration magnitude, are higher at the dominant relative to the non-dominant wrist. Outputs that take into account the distribution of data, e.g. the intensity gradient and wear-time, are more consistent across wrist and monitor brand. These results will provide an evidence base for researchers wishing to harmonise data from surveys using different protocols and/or monitor brands.