

## **Muddying the waters: Moderate-to-vigorous intensity physical activity calculation in epidemiological studies of youth**

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Dear Editor,

Recently Martikainen et al. [1] examined an interesting and under-researched issue- the association between physical activity and psychiatric difficulties in prepubertal children. The authors concluded that both higher daily activity volume, and moderate-to-vigorous (MVPA) intensity physical activity are associated with reduced odds of social, emotional, and behavioural problems [1]. However, for the benefit of future readers it should be noted that these results may be biased by the choice of MVPA cut-points used to reduce this accelerometer-measured data.

The Heil MVPA cut-points [2] utilised by Martikainen et al. [1] were derived using the Actical accelerometer, which has different hardware specifications (i.e. frequency filtering, sensor orientation and data integration) to the Actiwatch [3] used by Martikainen et al [1].

Therefore the MVPA data used by Martikainen et al. [1] in their analyses is likely quite inaccurate. The recently derived Ekblom et al. [4] cut-points are the only device-specific published thresholds for the Actiwatch when worn on the wrist, as per the children in the study of Martikainen et al. [1]

The use of the Heil MVPA cut-points [2] could have resulted in the calculation of odds ratio's that deviate from the 'true' odds for differences in the probability of psychiatric problems between MVPA tertile groups (i.e. high vs. low MVPA). In future, as several youth-specific MVPA cut-points exist for the most popular accelerometer devices, researchers should

analyse data using multiple published intensity cut-points to determine whether results differ by threshold choice. The selection of cut-points for use in such analyses could be informed by consulting the findings of 'cross-validation' studies e.g. Trost et al. [5]. This issue of cut-point non-equivalence is not new in the field of physical activity measurement [6], but is worth highlighting again for the benefit of accelerometer end-users engaged in the epidemiologic study of youth populations.

[1] Martikainen S, Pesonen AK, Lahti J, Heinonen K, Tammelin T, Kajantie E, et al. Physical activity and psychiatric problems in children. *J Pediatr*. 2012;161:160-2 e1.

[2] Heil DP. Predicting activity energy expenditure using the Actical activity monitor. *Res Q Exerc Sport*. 2006;77:64-80.

[3] Chen KY, Bassett DR, Jr. The technology of accelerometry-based activity monitors: current and future. *Medicine and science in sports and exercise*. 2005;37:S490-500.

[4] Ekblom O, Nyberg G, Ekblom Bak E, Ekelund U, Marcus C. Validity and Comparability of a Wrist-Worn Accelerometer in Children. *Journal of Physical Activity and Health*. 2011.

[5] Trost SG, Loprinzi PD, Moore R, Pfeiffer KA. Comparison of accelerometer cut points for predicting activity intensity in youth. *Medicine and science in sports and exercise*. 2011;43:1360-8.

[6] Bornstein DB, Beets MW, Byun W, Welk G, Bottai M, Dowda M, et al. Equating accelerometer estimates of moderate-to-vigorous physical activity: in search of the Rosetta Stone. *Journal of Science and Medicine in Sport*. 2011;14:404-10.