

## Physical Activity Assessment With Accelerometers in Children

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Accelerometers for movement registration have the potential to reflect the volume, pattern, intensity, type, and energy expenditure of physical activity(1,2). Developments are still ongoing with regard to reduction of the size of the instruments, lengthening of battery life and translation of the output to meaningful information for the user. Instruments with the capacity for most or all functions mentioned are tri-axial and mounted on a waist belt.

Krishnaveni, *et al.*(3) measured physical activity in children with uni-axial accelerometers (MTI Actigraph AM7164, MTI Health Services, Florida, USA). Time spent in sedentary-, light-, moderate- and vigorous intensity activity, as calculated with self-defined cut-off levels for accelerometer counts, was compared with simultaneously kept diaries of the child's activities by parents and teachers. The wide limits of agreement between accelerometer-assessed and diary-assessed time spent in activities of varying intensity was seen as a limitation of the data accelerometers generate.

One can argue on the conclusion derived from the data as stated by the authors. The interrelation of accelerometers with diaries may be of some value, but because there are potentially errors in both methods, it is impossible to determine the true validity of any one of them in doing so. Calorimetry, more specifically the doubly labeled water method, has become the gold standard for the validation of field methods of assessing physical activity(4). Then, accelerometers show a high potential as a field method for the assessment of volume, pattern,

intensity, type, and energy expenditure of physical activity.

The conclusion as derived by Krishnaveni, *et al.*(3) generalizes the results as derived with one type of uni-axial accelerometer (MTI Actigraph AM7164, MTI Health Services, Florida, USA) to accelerometers in general. However, the capacity of accelerometers to assess physical activity dimensions like volume, pattern, intensity, type, and energy expenditure of physical activity is a function of the characteristics of the sensor and the data processing. Again, doubly labeled water is the indicated reference for evaluation. Thus, it appeared using a tri-axial instead of a uni-axial accelerometer improved the performance significantly(5).

The study by Krishnaveni, *et al.*(3) shows modest relations between Actigraphs and diaries for time spent in sedentary-, light-, moderate intensity activity, but not for vigorous intensity activity. Future evaluations on physical activity assessment in children should specifically focus on the capacity to detect high-intensity activity. Hoos, *et al.*(6) did a study on physical activity in similar aged children with a tri-axial accelerometer, showing that to obtain a higher physical activity level in children, they should be given opportunities to perform high-intensity activities.

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### REFERENCES

1. Bonomi AG, Goris AHC, Yin B, Westerterp KR.

- Detection of type, duration and intensity of physical activity using one tri-axial accelerometer. *Med Sci Sports Exerc* 2009; 41: 1770-1777.
2. Van Hees VT, van Lummel RC, Westerterp KR. Validity of a seismic accelerometer for estimating energy expenditure under sedentary conditions. *Obesity* 2009; March 12, Epub ahead of print.
  3. Krishnaveli GV, Mills IC, Veena SR, Wootton SA, Wills AK, Coakley PJ, *et al.* Accelerometers for measuring physical activity behavior in Indian children. *Indian Pediatr* 2009; 46: 1055-1062.
  4. Westerterp KR. Assessment of physical activity: a critical appraisal. *Eur J Appl Physiol* 2009; 105: 823-828.
  5. Plasqui G, Joosen AMCP, Kester AD, Goris AHC, Westerterp KR. Measuring free-living energy expenditure and physical activity with tri-axial accelerometry. *Obes Res* 2005; 13: 1363-1369.
  6. Hoos MB, Kuipers H, Gerver WJM, Westerterp KR. Physical activity pattern of children assessed by tri-axial accelerometry. *Eur J Clin Nutr* 2004; 58: 1425-1428.
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