Calibration and Validation of a Wrist Worn Accelerometer for 8 to 12 Year Old Children

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Currently, there is no valid method of distilling physical activity data from the wrist-worn ActiGraph GT3X+ accelerometer in 8-12 year old children. Without cutoff values, the raw data can not be meaningfully interpreted. The purpose of this study was calibrate and cross-validate a wrist-worn accelerometer in 8-12 year old children in a free-living setting.

This field-based calibration study was the first to our knowledge to calibrate a wrist-mounted accelerometer for children ages 8-12. The derived cutpoints can distinguish sedentary, light, moderate, and vigorous physical activity. The ROC curves were calculated by dichotomizing intensities and then determining the cutoff value at which both sensitivity and specificity were maximized. A 10-fold calibration and cross validation were performed to ensure the most accurate derivation of cutoff values and area under the curve (AUC) values.

There were 45 total participants with an average age of 9.3±1.2 years. Participants were 49% male and 40% were overweight or obese. The average height of participants was 143±9.5 centimeters, and the average weight was 40.1±10.6 kilograms. Cutpoints were derived based on 5 second epochs, and were translated into 15 second cutpoints for comparison to other published cutpoints.

This field-based calibration study was the first to our knowledge to calibrate a wrist-mounted accelerometer for children ages 8-12. The derived cutpoints can distinguish sedentary, light, moderate, and moderate-to-vigorous physical activity with confidence. The ROC analysis to derive the vigorous outcomes resulted in poor classification ability. However, for purposes of measuring sedentary, light, and moderate-to-vigorous physical activity, these cutpoints can be used with confidence in settings where wrist placement is advantageous.