Calibration and comparison of accelerometer cut points to define physical activity intensities in preschool children

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Objective: The present study aimed: (i) to develop accelerometer cut points to classify activities by intensity in preschoolers; and (ii) to investigate discrepancies in physical activity levels when applying various accelerometer cut points. Methods To calibrate the accelerometer, 18 children (5.8±0.4 years) performed ten structured activities and one free play session while wearing a GT1M ActiGraph accelerometer using 15 s epochs. Structured activities were chosen based on the direct observation system Children's Activity Rating Scale (CARS) and the criterion measure of physical activity intensity during free play was provided using a second-by-second observation protocol (modified CARS). Receiver Operating Characteristic (ROC) curve analyses were used to determine cut points for each activity level. To examine the classification differences, accelerometer data of 4 consecutive days from 114 children (5.5±0.3 years) was classified by intensity according to previously published and the newly developed cut points for preschoolers. For each cut point, the proportion of children meeting the physical activity recommendations for preschoolers was determined. Differences in predicted activity levels were evaluated using repeated measures ANOVA, differences in proportion using Chi Square test and levels of agreement between each cut point using Bland-Altman Plots. Main Results Cut points were identified at 373 counts.15 s^{-1} for light (sensitivity: 86%; specificity: 91%; Area under ROC curve: 0.95), 585 counts.15 s^{-1} for moderate (87%; 82%; 0.91) and 881 counts.15 s^{-1} for vigorous activities (88%; 91%; 0.94). Applying various accelerometer cut points resulted in statistically and biologically significant differences in activity levels and a considerable lack of agreement between the accelerometer cut points was found. Conclusion Accelerometer cut points were developed with good discriminatory power for differentiating between activity levels in preschoolers. The present comparison illustrates that the choice of accelerometer cut points can result in large discrepancies.

Keywords: Objective, Measurement, Direct observation, Misclassification.