

**Title:** A novel method for using accelerometer data to predict energy expenditure

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The accurate measurement of physical activity has received a lot of attention in physical activity and health research. There is no true gold standard for measuring physical activity that could be used in population and intervention studies. Self report measures like a recall questionnaire or a diary are most often used for this kind of research, but are subjective measures of physical activity that are subject to recall bias and social desirability. Objective measures that are often used are pedometers and accelerometers, with the accelerometer being the most promising since it allows study of time spend in different physical activity intensities.

The assessment of accelerometer cut points for light, moderate and vigorous physical activities has traditionally been based on regression models that relate accelerometer counts to energy expenditure assessed by indirect calorimetry. A couple of dozen regression models have been published that all estimate different cut points for the intensity categories. These regression models were either based on walking and running or on moderate lifestyle activities. However, none of these regression models is able to accurately predict energy expenditure or time spent in different intensity categories over a wide range of activities.

The paper by Crouter et al has come up with an inventive alternative method to assess energy expenditure and minutes spend in different intensity categories. Instead of using one regression model they describe a method to calculate two regression models and show that this new method estimates energy expenditure much more accurate than the traditional one regression model.

Forty-eight adult subjects did a series of different activities of different intensities while wearing an Actigraph accelerometer as well as a portable Cosmed to measure energy expenditure through indirect calorimetry. Ten second epochs instead of the more traditional 1 minute epoch to measure acceleration counts were used. This enabled the calculation of a total score for each minute (sum of four 10 sec epochs) but also the calculation of the variance within each of these minutes. Crouter et al showed that cyclical repetitive activities such as walking and running that have low variance can be easily distinguished from non-cyclical lifestyle activities that have higher variance. They then calculated different regression models for cyclical (walking/running) and non-cyclical activities. When compared to indirect calorimetry, this newly developed two-regression models method was able to estimate energy expenditure and time spend in different intensity categories much better than the most frequently used traditional one-regression model methods.

This inventive new method to assess energy expenditure with accelerometers will enable studies to more accurately measure physical activity behaviors. It seems likely that more studies that use a similar approach and look at different brands of accelerometers as well as at different populations such as kids, people with disabilities and elderly people will follow.