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Statistical advancements in analyzing
accelerometer-measured physical activity
intensity

av

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Abstract

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Physical activity (PA) is widely recognized as an important factor in preventing and treating cardiometabolic diseases and reducing mortality. Yet, the health implications of specific PA intensities and the intricate role of fitness in the relationship between PA and health remain less clear. While accelerometers provide objective measurements of PA intensity, established methods for data processing and statistical analysis often underutilize this information. Recent advancements in accelerometer data processing and multivariate statistical methods promise enhanced detailed analyses of PA intensity. This doctoral thesis aimed to introduce and further develop multivariate statistical methods to analyze accelerometer-measured PA intensity.

Data previously collected from four separate studies were re-analyzed using improved accelerometer data processing methods and multivariate statistical approaches. Specifically, data from the LIV 2013, SCAPIS, I.Family, and Bunkeflo studies were included. The improved accelerometer data processing method employed a 10 Hz frequency filter, instead of the common 1.63 Hz filter, facilitating the capture of moderate-to-vigorous intensity PA. All the multivariate statistical techniques employed were based on partial least squares regression (PLS). PLS was applied to explore the association between PA intensity and health. Extensions of the PLS model, including PLS discriminant analysis and PLS structural equation modeling, were used for group comparisons and mediation analysis, respectively.

The results highlight the importance of detailed analyses of PA intensity. Using a wider frequency filter in the processing of raw accelerometer data resulted in stronger associations with health indicators and allowed for a more detailed interpretation of PA intensity. The patterns of PA intensity relating to health were different for different health indicators and different groups. Fitness level determined the PA intensity required for associations with health and can be considered an indicator of sufficient PA for health benefits. Analysis of PA patterns using multivariate statistical methods captures more detail in the accelerometer data and enables studying the complex role of PA intensity in different study designs.