

## **Science of accelerometry-based physical activity assessment: from sensor basics to applications to epidemiology studies**

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### Abstract:

Physical activity can have immediate and long-term health benefits in people of all ages, abilities, and backgrounds. Objective assessments of physical activity started with mechanical pedometers and foot contact switches and developed into smart watches/phone apps with wearable body sensor networks of today. Accelerometers have widely been used in clinical measurements and sport sciences (gait, postures, falls, and performances) and now are the predominant sensors-of-choice for free-living physical activity, sedentary behavior, and sleep in small clinical trials and large epidemiological studies. In the last two decades, the technology and application of wearable devices in physical activity research have experienced tremendous growth and advances. To educate the users and developers of physical activity monitors to better harness their powers and benefits, this lecture intends to describe both design and application insights from past to future sensor technologies:

- Sensor fundamentals of accelerometry-based activity monitor and history of the field
- Data processing approaches ranging from “counts” to machine learning or other sophisticated methods
- Activity, sedentary, and sleep detections
- Current monitor options and how to choose them according to research designs
- Wear locations and their pros and cons
- Validity and potential research use of consumer-based wearable devices
- Comparability of different activity monitors
- Application of activity/sleep monitors to large-scale epidemiology studies
- Future perspectives on the field of objective physical activity measurements

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