

A person wearing a blue t-shirt and a smartwatch is shown from the chest down. The background is a bright, sunny outdoor setting. Overlaid on the image are several circular icons representing various health and activity metrics: a checkmark, a trophy, a person running, a cloud with rain, a bar chart, a location pin, a globe, a musical note, and a line graph.

Wearable Technology for the Promotion of Active Living

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12 slides are shown of 125 slides

Objectives

1. Review PA and energy expenditure
2. Discuss the various methods for measurement of physical activity (PA) using wearable technology
3. Understand the main purposes, advantages, disadvantages for use of PA monitors
4. Review the validity of devices for research and consumer use
5. Discuss the recommendations for use of PA monitors

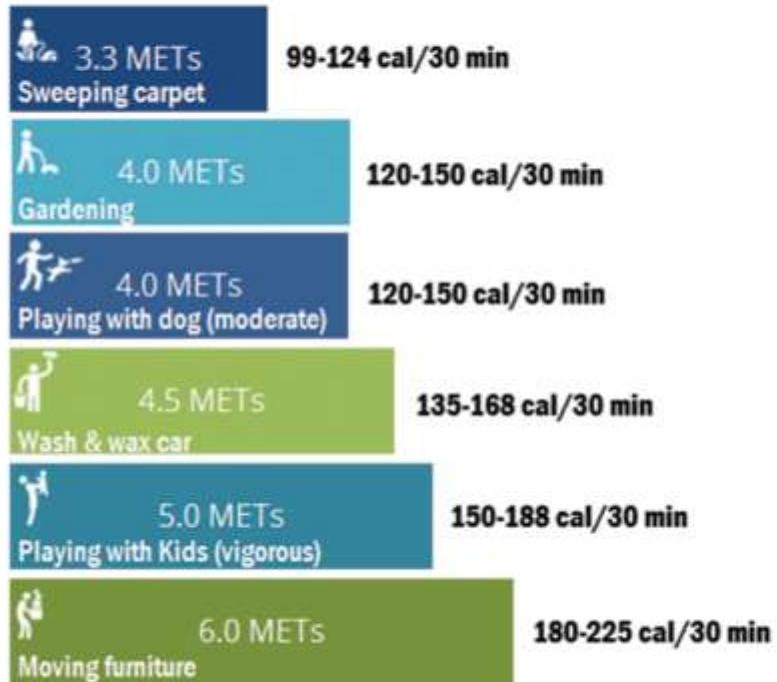
Wearable monitors and energy expenditure

Wearable monitors are more **quantitative** than qualitative

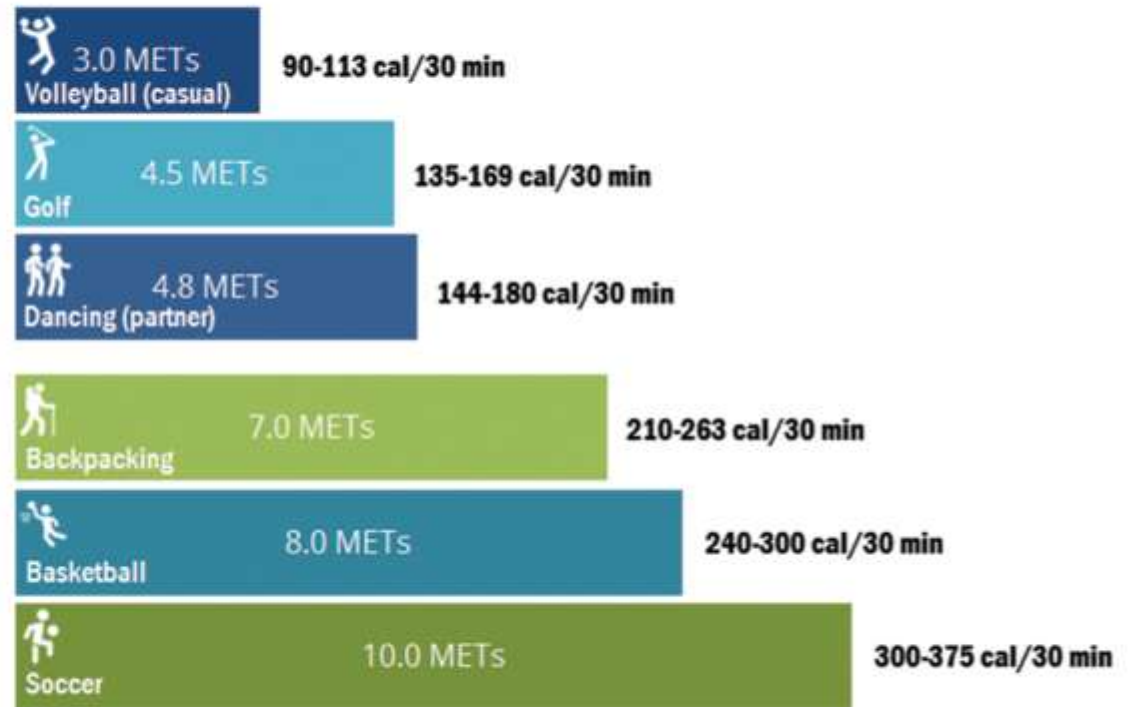
The quantitative assessment of physical activity using wearable monitors is based on the **indirect measurement of energy expenditure (EE)**.

What is a MET ?

At home activities



Sports and leisure



Session two: Wearable devices for monitoring PA



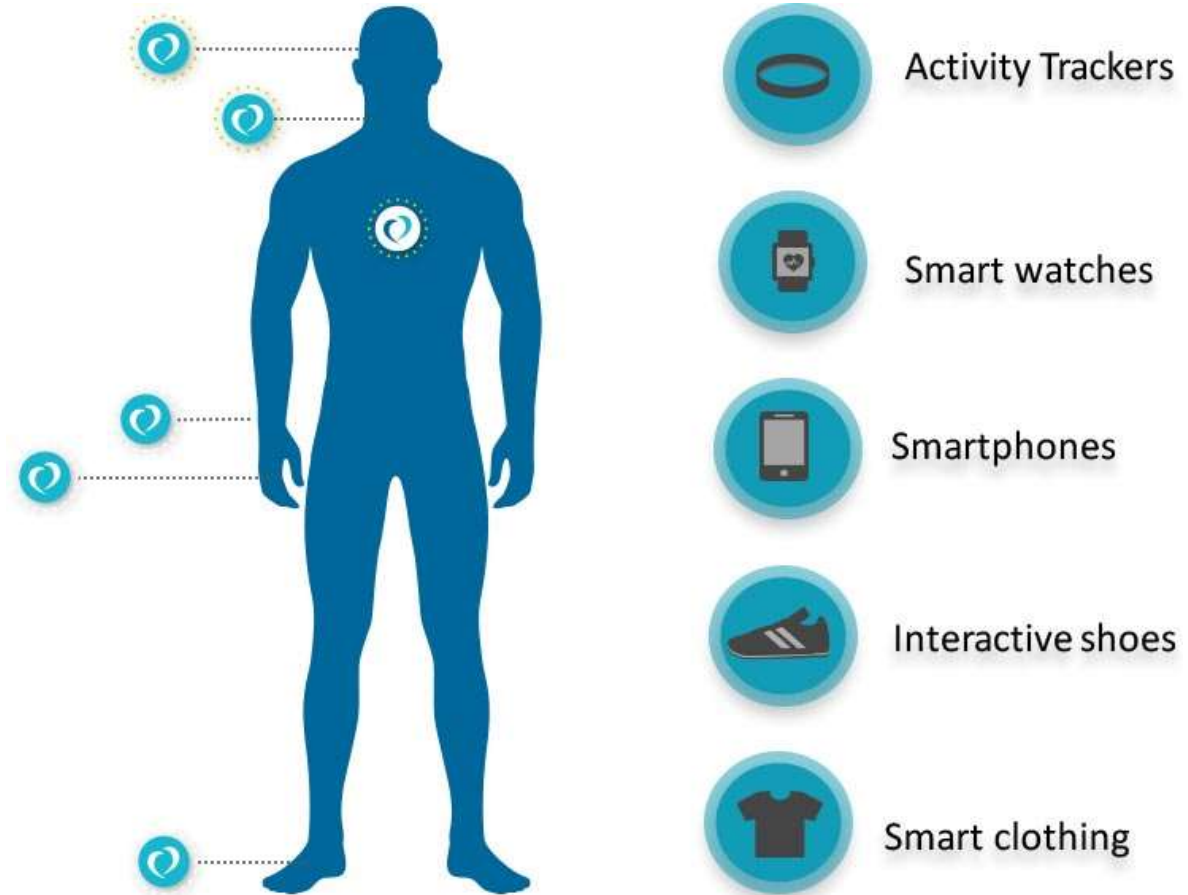
FIGURE 1 | Summary of current technologies for monitoring health/performance and targeted physical measurements.

Functions of wearable devices (WD) for monitoring health

- monitor hydration status
- metabolism
- physical and psychological stress
- physical biofeedback (e.g., muscle stimulation, haptic feedback)
- cognitive feedback and training
- monitor and promote sleep
- evaluate concussion (monitoring oculomotor activity, eye movement..)
- physical activity monitoring
- provide cues (reminders) to user
- motivate the user

What can be measured with PA monitors?

- # of steps - walking (number of steps, stride, speed, distance)
- Duration of PA
- Frequency of PA
- Intensity of PA (Sedentary, light, ...)
- Classification of locomotive activities (walking, jogging, running)
- Posture (lying, sitting, standing)
- Sleep/awake time
- Prediction of TEE, PAEE, and SMR
- Studying lifestyle habits
- Falls
- Monitoring elderly
- Postural stability
- Developing biomarkers - emerging research on identifying motor biomarkers in genetic neurodegenerative diseases



Types of wearable devices used for monitoring PA

Brief review of types of motion **sensors**

- Accelerometers
- Gyroscope
- Compass-magnetic sensors
- Barometer-Pressure Sensors

Types of PA wearable devices

- Heart rate monitors
- Load transducers
- Pedometers
- Accelerometers
- GPS - global positioning systems

➤ Purpose

➤ Advantages

➤ Disadvantages

Session Three:

Validity of activity monitors

How is validity of activity monitors determined ?

Comparison with “gold standard” (criterion measure)

- HR – use ECG
- Pedometers – use observed step count
- Accelerometers - Use indirect calorimetry- oxygen uptake (VO_2) or doubly labelled water

How to select a PA monitor

Selection of the assessment tool depends on ?

Purpose- physical activity component of interest

Study objectives (assessment, promotion...)

Characteristics of the target population

Feasibility - cost , logistics , technical resources