Ontology of time spent in moderate to vigorous physical activity

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Ontology of **time spent in moderate to vigorous physical activity**

**Definition**
The total amount of time spent at an absolute activity level \( \geq 3 \) METs (metabolic equivalent of task), where a single MET is the rate of energy expenditure while sitting at rest (generally corresponds to an oxygen uptake of 3.5mL/kg of body weight per minute).

**Concepts**
- Time spent in moderate to vigorous physical activity (MVPA)

**Properties**
- Total time spent in MVPA
  - Metabolic Equivalent of Task (MET)
  - Duration of activity
- Measurement interval of time spent in activity intensities
  - Start/end
- Individual-specific variables
- Environmental variables
- Context-of-use dependent
- Measurement modality

**Values (or nested properties)**
- \# of minutes spent in MVPA in a week
  - \( \geq 3 \) METs
  - Minutes
  - Week
  - Initiation timestamp/termination
- Height, age, body mass index (BMI), gender/sex, use of walking aid, etc.
- Location, indoor or outdoor, transition of indoor to outdoor (or vice versa), weather, etc.
- Activity type, baseline health status, condition or therapeutic area (if relevant), typical comorbidities
- Technology type & model, method of calculating moderate & vigorous physical activity, evaluation algorithm, form factor, GPS, wear location (if wearable)

**Examples**
- The *World Health Organization* and the *Physical Activity Guidelines for Americans* outline recommendations for number of minutes spent in MVPA in a week. The U.S. Food & Drug Administration (FDA) endorsed time spent in MVPA as a primary endpoint measured by a wearable (1, 2).
- METs can be estimated with inputs such as cadence (steps/minute) (1, 2, 3, 4, 5, 6, 7, 8), actigraphy counts (1, 2, 3), heart rate reserve (beats per minute) (1), and raw acceleration values.
- HL7 Physical Activity IG and industry partners (1, 2) use minutes of moderate to vigorous physical activity.
Time spent in moderate to vigorous physical activity

Measure considerations (assumptions & limitations):

- The metabolic equivalent of a task (MET) is a physiological measure referring to the energy expenditure required to carry out a specific activity. A single MET is the rate of energy expenditure while sitting at rest, which generally corresponds to an oxygen uptake of 3.5 milliliters per kilogram of body weight per minute. Moderate to vigorous physical activity is defined as an activity level $\geq 3$ METs and can be estimated during an exercise test on a treadmill.

- Technology developers should define criteria for labeling a data record as ‘moderate’ or ‘vigorous’ as well as ‘sedentary’ or per breakdown so that all data records can be classified.

- Assumes the epochs for ‘moderate’ and ‘vigorous’ are contiguous.

- Recording activity type can enable more accurate calculation.