Why* measure walking?

*What?

*Who?

*When?

*How?

*Where?

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University of Strathclyde
The original plan ...

recap on “wellbeing”

ICE BREAKER

why measure WfW?
The new plan:

recap on “wellbeing”

why measure walking? (who, what, when, where, how?)
Outline

- What is walking for wellbeing (WfW)?
- Why measure WfW?
- What instruments measure WfW?
- How to choose a WfW measurement instrument?
- How to use WfW data?
Questions I get asked a lot …

- Which pedometer should I buy?
- How much money should I spend on a pedometer?
- Should I buy a pedometer that tells me calories?
- What is the best method for measuring walking?
Questions I asked you ...

- Why do you want to measure walking?
- What is the most important thing you want to take from this session?
- How do you plan to use the information you learn in this workshop?
- How many steps should we (adults) take per day to maintain and improve health?
What is “walking for wellbeing”?

The Evolutionary Model of Walking:
What is “walking for wellbeing”?

Activity:
- Pair up
- Stand up
- 2 x 1-minute telling each other what you think defines “walking” for “wellbeing”

Re-watch the series of photos

Is this “walking for wellbeing”?  
- If so, why?  
- If not, why not?
Definition(s) of walking

- Bipedal locomotion
- Ambulatory physical activity
- Stepping
- A behavior
- Characteristics: rhythm, direction, location, movement, intensity, frequency, duration, efficiency, context
- Classifications: occupational, commuting, leisure
What differentiates walking “for wellbeing”?

- Higher intensity?
- Bouts vs. intermittent?
- Healthy steps ≠ “up and about” steps?
- Is definition the same for different outcomes?
  - Cardio-metabolic health?
  - Bone health?
  - Weight management?
  - Mortality?
  - Mental health and spirituality?
Why measure walking?

- I really am asking YOU!
Why measure walking?

- Understand the determinants of WfW
- Answer questions about relationships between walking and wellbeing-related outcomes
- Determine if an intervention has an effect on WfW behavior
Why measure walking?

- Determine prevalence of WfW
  - Including whether someone is meeting walking recommendations, e.g., 10,000 steps per day(???)
How to measure walking?

- Yes, I really am asking YOU again!
Most Common Methods for Measuring Walking

- Self-report (questionnaires and diaries)
- Pedometers
- Accelerometers
- GPS (GIS)
How to choose?

- Practicality
- Reliability
- Validity
How to choose - practicality

- Cost
  - Purchase and per-use

- Convenience (user and “tester”)
  - Burden
  - Compliance
  - Complexity
  - Time
  - “Fail” rate?
The Accuracy-Practicality trade-off

Region of "No Use"

Region of "No Chance"

Practicality

Accuracy

Questionnaire

Pedometer

GPS

Accelerometer
How to choose - reliability

- Reproducibility
- Dependability
- Consistency

Instrument “performs” consistently, regardless of:
- Which make or model
- What time/which occasion
- Time frame (number of days)
Steps/day for Various Activity Monitors

Type of Monitor

Yamax AE120 AE120XL WFL Omron Actigraph

Steps/day:
- Yamax: 9403
- AE120: 9227
- AE120XL: 9073
- WFL: 9186
- Omron: 8186
- Actigraph: 10504
Individual discrepancy

activPAL – NL-1000 steps
How many days?

<table>
<thead>
<tr>
<th># of days</th>
<th>$R_{xx}$ (children)</th>
<th>$R_{xx}$ (middle-aged)</th>
<th>$R_{xx}$ (older)</th>
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<tbody>
<tr>
<td>2</td>
<td>.69</td>
<td>.64</td>
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<td>7</td>
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<td>.87</td>
<td>.96</td>
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</table>
What time of year?

BSc Students (2012)
BSc Students (2011)
How consistent are individuals?

Selection of data collected from individuals
Which days, and how many?

- Generally speaking:
  - Both weekend days
  - At least 2, preferably all weekdays
- Do the same for everyone
- Sufficient number of days for reliability of at least $R_{XX} = .80$
How to choose - validity

- The “heart” of the matter
- Does the instrument measure what you want to measure?
- Does it enable you to do what you want with the data?
Validity paradigm

Does the instrument measure what you want to measure?
Definitional Stage

- Define the construct ("walking for wellbeing")
- What it is
- What it is not
Domains of Walking

- Theoretical domain
  - The domain of the construct
- Operational domain
  - The measurement domain
Domains of Walking

THEORETICAL
- FREQUENCY
- BUILT ENVIRONMENT
- DURATION
- SOCIAL CONTEXT
- ENERGY EXPENDITURE
- DISTANCE
- INTENSITY

OPERATIONAL
- GIS
- PEDOMETERS
- QUESTIONNAIRES
- ACCELEROMETERS
- DAILY DIARY
- GPS
Domains of Walking

THEORETICAL
- STEP LENGTH
- JOINT TORQUE
- ANTERIOR-POSTERIOR FORCES
- CENTER OF MASS
- DOUBLE SUPPORT TIME
- VERTICAL FORCE

OPERATIONAL
- FORCE PLATFORM
- TELEMETRIC EMG
- IN-SHOE PRESSURE PAD
- PEAK 3D SYSTEM
Jingle, jangle fallacies

- Rockport “walk” test
- 50 ft “walk” test
- YMCA “step” test
- SFT “step in place” test
Measures of Walkability

- Scottish Walkability Assessment Tool
- Walkability Index
- Walkability Checklist
- Walking Security Index
- Walking Permeability Index
- Pedestrian Potential Index
- Pedestrian Performance Measure
- Pedestrian Environmental Factor
- Pedestrian Infrastructure Prioritization System
- Pedestrian Sketch Plan Method
- Pedestrian Deficiency Index
- Pedestrian Level of Service
- Pedestrian Level-of-Service
- Florida Pedestrian Level of Service
Dimensions of Walkability

- Spatiophysical
  - 38 dimensions, 95 characteristics
  - Paths; path width
- Spatiobehavioral
  - 10 dimensions, 30 characteristics
  - Safety; automobile-pedestrian crash factor
- Spatiopsychosocial
  - 4 dimensions, 30 characteristics
  - Perception of walking; comfort
- Policy
  - 5 dimensions, 24 characteristics
  - Plans and programs; public/private partnerships

# Measurement of WfW

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Q’aire</th>
<th>Pedometer</th>
<th>Accelerometer</th>
<th>GPS/GIS</th>
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<tbody>
<tr>
<td>Steps</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
<td>(++)</td>
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<tr>
<td>Distance</td>
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<tr>
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<td>Other “context”</td>
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</table>

[+ measures somewhat accurately; ++ measures moderately accurately; +++ measures very accurately]
Does it enable you to do what you want with the data?
Why measure walking?

- Detect individual differences
- Detect change
- Investigate relationships
- Report prevalence “meeting recommendations”
Tudor-Locke (2001) *RQES*

**Pedometer (steps/day)**

- Baseline: 6000 steps/day
- Post-intervention: 10000 steps/day
- ES = 1.68

**Activity Log (kcal/kg/day)**

- Baseline: 40 kcal/kg/day
- Post-intervention: 40 kcal/kg/day
- ES = -0.03
How to decide?
Activity #2

- Refer to handout for “Instrument selection” activity
- Work in groups
TIME TO WALK!