Real World Evaluation of Physical Activity Using Objective Monitors

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Real world evaluation of physical activity using objective monitors

- Key distinctions between research and evaluation
- Which instrument is best?
- Practical pedometry
  - Expected values
  - Step indices
Key distinctions between research and evaluation: Purpose

- **Research**
  - Advances scholarly knowledge
  - Review by peers
  - Is published

- **Evaluation**
  - Provides timely information for decision making
  - Answers to stakeholders
  - Has practical utility
Key distinctions between research and evaluation: Focus

- **Research**
  - Examines efficacy under highly controlled, artificial conditions
  - Subjects are carefully selected
  - Has strict inclusion, exclusion criteria

- **Evaluation**
  - Examines effectiveness and efficiency under real-world conditions
  - Participants are self-selected
  - No restrictions
Key distinctions between research and evaluation: Methods

- **Research**
  - Rigorous methodologies
  - Research assistants collect data
  - Batteries of tests
  - Significant group differences

- **Evaluation**
  - Good enough methodologies
  - Staff and volunteers collect data
  - Practical assessments
  - Relative client benefits (% improving)
Which instrument is best??
Yamax pedometer - SW Series

Raw Outputs:
Steps

Derived Outputs:
Steps/day
Steps/min

Cost: US$17-22

Yamax Corporation, Tokyo, Japan
ActiGraph

Cost: US$325/unit
US$349 Cable/software

ActiGraph, LLC, Pensacola, FL

Raw Outputs:
Steps
Activity Counts
Time in intensity categories
Energy expenditure
NL-1000

Raw Outputs:
Steps
Distance
Time in MVPA

Cost: US$48

New-Lifestyles, Inc., Lee Summit, MO
activPAL Professional

Outputs:
- Steps
- Time in sitting, standing, ambulating
- Transitions
- Sit/stand bouts
- Energy expenditure

Cost: Initially $US1450
Software, docking station, unit
$US950 additional units

PAL Technologies, LTD, Glasgow
<table>
<thead>
<tr>
<th>What I know now</th>
<th>What I don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial items</td>
<td>The best instrument for all situations</td>
</tr>
<tr>
<td>Patents</td>
<td>How well they translate</td>
</tr>
<tr>
<td>Change</td>
<td>Obsolescence</td>
</tr>
<tr>
<td>Buyer beware</td>
<td>Future</td>
</tr>
<tr>
<td>Choose, rationalize, and justify your own choice</td>
<td></td>
</tr>
</tbody>
</table>
Summary of validity evidence

- Review of 25 articles since 1980
  - median $r = .86$ with different accelerometers
  - median $r = .82$ with time in observed activity
  - median $r = .68$ with different measures of energy expenditure
  - median $r = -.38$ with self-reported sitting time
  - median $r = .33$ with self-reported physical activity

Tudor-Locke et al., *Sports Med* 2002
Practical Pedometry

- Expected values
- Standard protocols
- Screening
- Surveillance
- Program evaluation
- Step indices
- Intervention tool
Mean steps/day

Population groups

Legend
1=8-10 year olds
2=14-16 year olds
3= Healthy younger adults (approx. 20-50 years)
4= Healthy older adults (>50 years)
5= Individuals living with disabilities and chronic illnesses

Tudor-Locke, *Research Digest*, 2002
Normative data

Tudor-Locke et al., *Medicine and Science in Sport and Exercise*, 2004
Normative data
Expected values for special populations

Tudor-Locke et al., *Preventive Medicine*, 2009
Mean Steps/Day

- Boys
- Girls

Craig et al., *MSSE*, under review
Normative values for free-living youth

Tudor-Locke et al., Research Quarterly for Exercise and Sport, 2009
Tudor-Locke et al., *Medicine and Science in Sports and Exercise*, in press
Tudor-Locke et al., *Patient Education and Counseling*, 2002
Meta-analysis of change in steps/day in pedometer-based programming

Bravata et al., *JAMA*, 2007
Graduated Step Index
Adapted from Tudor-Locke and Bassett, 2004 and Tudor-Locke et al., 2009
### Pedometer-determined step guidelines for children (6-12 years of age)

<table>
<thead>
<tr>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&gt;17000 steps/day</strong></td>
<td><strong>&gt;14500 steps/day</strong></td>
</tr>
<tr>
<td><em>highly active</em></td>
<td><em>highly active</em></td>
</tr>
<tr>
<td><strong>15000-17999 steps/day</strong></td>
<td><strong>12000-14999 steps/day</strong></td>
</tr>
<tr>
<td><em>active</em></td>
<td><em>active</em></td>
</tr>
<tr>
<td><strong>12500-14999 steps/day</strong></td>
<td><strong>9500-11999 steps/day</strong></td>
</tr>
<tr>
<td><em>somewhat active</em></td>
<td><em>somewhat active</em></td>
</tr>
<tr>
<td><strong>10000-12499 steps/day</strong></td>
<td><strong>7000-9499 steps/day</strong></td>
</tr>
<tr>
<td><em>low active</em></td>
<td><em>low active</em></td>
</tr>
<tr>
<td><strong>&lt;10000 steps/day</strong></td>
<td><strong>&lt;7000 steps/day</strong></td>
</tr>
<tr>
<td><em>sedentary</em></td>
<td><em>sedentary</em></td>
</tr>
</tbody>
</table>

Tudor-Locke et al., *MSSE*, 2008
At least 6,000 daily steps in moderate-to-vigorous physical activity

At least 15,000 steps/week in moderate-to-vigorous physical activity, e.g., 3,000 daily steps in moderate-to-vigorous physical activity most days of the week

Arrows indicate that higher is even better

Additional benefits can come from adding in vigorous intensity activity

Tudor-Locke et al., in progress
Thank you!