Typology for Linking Self-Report Methods to Study Design and Data Modeling Strategies

Barbara Sternfeld
Lisa Goldman Rosas

Division of Research, Kaiser Permanente

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Overview

• Current situation
• Framework for selecting self-report method
  – questions to think about
  – database for narrowing the choices
• Applying the framework
  – real life examples
  – lessons to learn
• Future steps
  – web-based smart tool
Current State of the Field

Little systematic guidance for selecting instrument

Types of instruments
- diaries
- logs
- recalls
- semi-quantitative & quantitative questionnaires
- global questions

Reliable, valid, practical, non-reactive

Recall error, social desirability, incomplete assessment
A New Systematic Approach

- Database of instruments
- 10 Questions to narrow the pool of instruments
- Potential instruments to fit needs

- Reflects process of decision-making about study design and implementation
- Widely applicable to variety of different situations
- **Not** proscriptive
No rigorous testing yet of this approach
Building Self-Report PA Database

38 Instruments and counting!

National Health Interview Survey
Baecke
CARDIA
Modifiable Activity Questionnaire
Modified Baecke Questionnaire for Older Adults
IPAO
CAPS
Historical Leisure Activity
Godin
Physical Activity Questionnaire for Older Children
Canada Fitness Survey
Women’s Health Initiative PAQ
NHANES
Stanford Usual Activity Questionnaire
YALE Physical Activity Survey
Friedenrich Lifetime
KPAS
7-d Physical Activity Recall
BRFS
Alumni Study (Paffenbarger)
Minnesota Leisure-time
## Building Self-Report PA Database

<table>
<thead>
<tr>
<th>Rows</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instrument</strong></td>
</tr>
<tr>
<td>Seasonality</td>
</tr>
<tr>
<td>Mode</td>
</tr>
</tbody>
</table>

- **Instrument**: Seasonality, Mode
- **Description**: Walking, Population
- **Domain**: Strength, Type of instrument
- **Frequency**: Flexibility
- **Duration**: Sedentary activity
- **Intensity**: Time frame, Reference
Question #1

What is the primary aim of your study?

- define study aim answers question of why measure PA; won’t answer question of how to do it
- different self-report instruments are not specific to particular purposes
- some instruments better for some purposes than others

Intervention Study: assess targeted behavior
What is the study design?

– narrows choices of PA instruments in terms of temporal relations
  • case-control study
    – diary or short-term recall not appropriate
    – time frame of exposure prior to disease outcome
    – historical questionnaire may be good choice
  – helps determine level on which PA is measured

Cross-sectional survey, retrospective or prospective cohort study, or intervention targeting individuals?
Think individual

Surveillance survey, environmental intervention?
Think population
Where is the PA variable located in the study hypotheses?

- independent variable (exposure, predictor, treatment)
- dependent variable (outcome)
- covariate (confounder, mediator)
- all of the above (large cohort studies)

- may have implications for level of precision of measurement
  - similar level of precision for similar type of variables
- may help narrow appropriate summary PA variable
Some Examples

• Prospective cohort study in midlife women of diverse race/ethnicity, many outcomes (SWAN)
• Community-based participatory obesity intervention in Mexican American teens
• National surveillance survey of temporal trends in sedentary behavior
Question #4

What is the PA construct to be measured?

Human Movement

Behavior

Attributes

Energy Expenditure

Physical Fitness

Metabolic Rate

Basal Resting

Thermic Effect of Food

PA Related EE

Cardiorespiratory Fitness

Muscular Fitness

Endurance

Body Composition

Flexibility

Balance and Coordination

Sedentary

Physical Activity

Leisure

Occupational/School

Household/Caretaking/Domestic

Transportation

Sitting

Media Use

Discretionary

Non-occupational
School Computer use

Sleeping

Occupation/School

Driving

Riding

Non Discretionary

Sedentary

Obesity intervention

SWAN

Question #4
What is the PA construct to be measured?
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Description</th>
<th>Specificity of Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paffenbarger</td>
<td>8-item questionnaire assessing walking, stair climbing and recreational sports and exercise (with open-ended questions).</td>
<td>specific activities: respondent writes down specific sports and exercises individually;</td>
</tr>
<tr>
<td>7-d Recall</td>
<td>5-item recall assessing amount of time over the last 7 days spent sleeping, moderate, hard and very hard activity; time in light activity is inferred.</td>
<td>categories pooled by intensity: interview probes for specific activities by intensity level day by day to aid pooling</td>
</tr>
<tr>
<td>KPAS</td>
<td>19-item questionnaire adapted from the Baecke to assess physical activity specifically in women</td>
<td>specific activities: occupational activity (8 items) active living (4 items) sports and exercise (3 items); up to 2 sports can be listed for open-ended question</td>
</tr>
<tr>
<td>Instrument</td>
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<td>Specificity of Activities</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Physical Activity Question for Children</td>
<td>10-item questionnaire assessing physical activity in the last 7 days among elementary and middle school children</td>
<td>specific activities: gives a long list of activities</td>
</tr>
<tr>
<td>Modifiable Activity Questionnaire for Adolescents</td>
<td>6-item quantitative questionnaire based on the most frequent activities in the past year, including sports teams.</td>
<td>specific activities, chosen from a list of inactivities, plus one category for frequency of hard exercise in past 14 days</td>
</tr>
<tr>
<td>Youth Risk Behavior Survey</td>
<td>8 items that assess vigorous activity, stretching, strengthening, walking/biking and participation in physical education classes and organized sports</td>
<td>categories: asks about types of exercise and participation in PE classes and sport teams</td>
</tr>
<tr>
<td>Instrument</td>
<td>Description</td>
<td>Sedentary activity included?</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Baecke</td>
<td>16-item questionnaire that assesses usual recreation, occupation, and transport physical activity using likert scale responses. For the 2 most frequently reported sports, additional questions query the number of months per year and hours per week of participation.</td>
<td>Television time, sitting at work included</td>
</tr>
<tr>
<td>KPAS</td>
<td>19-item questionnaire, adapted from the Baecke to assess physical activity in women specifically</td>
<td>TV time included</td>
</tr>
<tr>
<td>Arizona</td>
<td>78-item questionnaire assessing activity in a wide range of domains</td>
<td>Several leisure time sedentary activities are included (eg. reading, watching TV, playing cards)</td>
</tr>
</tbody>
</table>
Question #5

What domains of PA are of interest?

- Capture the full spectrum of women’s activities
- Attractive feature of KPAS domain specific activity indices

SWAN

- School/community partnerships
- PE curriculum development, teacher training
- Recreational team sports, swimming, running, track and field
- Activities in PE class

Obesity intervention

- Recreational (tv screen time)
- transport

Sedentary trends
What parameters of PA are of interest?

- Duration
- Frequency
- Intensity
- Seasonality

Relevant question for every study aim, design:

Duration, frequency and intensity necessary for establishing specific dose response relations

Duration and intensity helpful for translation of summary activity measure into meaningful behavior

Seasonality important source of intra-individual variability
Should intensity be measured in relative or absolute terms?

- **absolute intensity**
  - standard values of energy expenditure (METs, kcals) assigned to activities
- **relative intensity**
  - respondent-determined intensity with or without providing physiological cues

Relative: allows for individual variability, open to interpretation

Absolute: provides comparability across studies, but doesn’t account for differences due to age, gender, mechanical efficiency, environmental conditions
Should activities be listed individually or pooled by category?

Activity lists
- cohort studies capturing major contributors to MVPA
- interventions targeting specific behaviors
- surveillance of trends in activities

Pooling categories
- intensity, activities of similar intensity
- advantages: more efficient, more comprehensive, allows for individual variability in energy expenditure of same activity
- disadvantages: more challenging cognitive tasks

Whoa, pooling my activities together is hard!
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Specificity of Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Aerobics Center Longitudinal Study Physical Activity Questionnaire</td>
<td>9 recreational activities, 2 categories of moderate and vigorous sports, 2 household activities</td>
</tr>
<tr>
<td>Historical Leisure Activity Questionnaire</td>
<td>specific list 40 of activities, including an 'other' category</td>
</tr>
<tr>
<td>IPAQ long and short forms</td>
<td>Categories pooled by intensity</td>
</tr>
</tbody>
</table>
Question #8

What is the desired summary PA measure?

**SWAN**
- Ranking: exercise units
- Categorical: low, medium, high
- Quantitative: hrs/wk, kcals/wk, MET-hrs/wk

**Obesity intervention**
- Quantitative: hrs/wk, kcals/wk, MET-hrs/wk

**Sedentary trends**
- Dichotomous: active vs. not, sedentary vs. not
- Quantitative: hrs/wk, kcals/wk, MET-hrs/wk
Who is the target/sample population?

- **SWAN**
  - midlife women
  - diverse race/ethnicities
  - non-English speaking (Cantonese, Spanish)

- **Obesity intervention**
  - Mexican American adolescents
  - Spanish speaking

- **Sedentary trends**
  - population
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPAS</td>
<td>adult women (20-65) and pregnant women; Kaiser members</td>
</tr>
<tr>
<td>PASE</td>
<td>older adults (men and women at least 65)</td>
</tr>
<tr>
<td>CAPS</td>
<td>minority women over 40</td>
</tr>
<tr>
<td>PDPAR</td>
<td>adolescents (grades 7-12)</td>
</tr>
<tr>
<td>IPAQ</td>
<td>multinational populations</td>
</tr>
</tbody>
</table>
What are the practical/logistical constraints? 

- often driving factor in choice

Mode of administration

- self-administered, mail or in-person
- interviewer-administered, phone or in-person
- mobile or web technology

- time burden/cost
  - participants
  - staff
  - competing investigator interests/needs
Lessons from 25 Years of PA Assessment

• Think about study comprehensively before looking at specific instruments; think long-term
  – framework proposed here can help

• Understand a PA instrument thoroughly before choosing it
  – sources of error
  – interpretation
  – resources required
  – comparison with other options

• No need to be apologetic about self-reported PA measurement
  – no less accurate than
    • objective measures of PA
    • other self-reported measures (e.g. diet, quality of life)
    • many “gold standard” measures (e.g. DXA for body composition)
General Thoughts

Making more specific lists vs. broader pooled categories
  – adding to lists to be more relevant
  – broadening categories to be more comprehensive
  – both may lead to over-reporting
    • social desirability with lists, cognitive challenges with categories

De-constructing, re-constructing existing instruments
  – different types of questions in same instrument
  – using them separately, or putting them together in different ways

Tendency to make “little fixes”
  - makes sense in any specific situation
  - makes it an untested instrument
  - creates yet another instrument, has led to current situation
Next Steps

- A web-based smart tool
  - continue building PA self-report database
  - develop expert system for linking user needs to database
  - test tool, disseminate tool

- Could lead to set of “good” practices in self-reported PA assessment

- BUT, always think critically
  - never trust the GPS lady when you know where you’re going!