A Framework for Physical Activity as a Complex and Multidimensional Behavior

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OBJECTIVES

- PA Self-Report Methods: ‘Hit and Miss’
- Conceptual Framework: PA
- Revisiting Definitions
- Considerations: Selecting Self-report Methods
Research Link: PA and Health Outcomes

PA Incorporated: Design and Implementation
  - Need: Accurate Quantification of PA

Lack of ‘Gold Standard’ Measure(s)

Relevant Construct Confusion
SELF-REPORT HIT AND “MISS”

- Misconstrue
- Miscount
- Misstate
- Misjudge
- Misplace
- Misprint
- Misread
- Misreport
- Missay
- Misdescribe
- Misguide
- Misinform
- Misinterpret
- Misname
- Misrepresent
- Mischoose
- Mischief
- Miscommunication
- Misunderstand
- Mistake
- Mislead
- Miscode
- Misquote
- Misidentify
- Miscue
- Mischievous

Individual-Level
Population-Level
Surveillance
FRAMEWORK
CONCEPTUAL FRAMEWORK
HUMAN MOVEMENT

Physical Activity

Behavior

Human Movement

Physiological Attributes

Energy Expenditure

Physical Fitness

Sedentary
Human Movement Framework

Behavior

Physical Activity

Leisure
Occupational/School
Household/Caretaking/Domestic
Transportation

Sedentary
Discretionary

Sitting
Media Use
Non-Occupational School
Computer Use
Sleeping
Occupation/School
Driving

Attributes

Energy Expenditure

Physical Fitness

Metabolic Rate
Basal
Resting
Thermic Effect of Food
PA Related EE
Cardiorespiratory Fitness
Muscular Fitness
Body Composition
Strength
Endurance
Flexibility
Balance and Coordination

Non

Discretionary

Occupational/School

Riding

Sitting
FIGURE 1—A conceptual model of the relationships between movement, physical activity, and energy expenditure, as well as methods of assessment.
## Physical Activity Model Comparison

<table>
<thead>
<tr>
<th></th>
<th>Bouchard &amp; Shephard 1994</th>
<th>LaMonte &amp; Ainsworth 2001</th>
<th>Pettee Gabriel &amp; Morrow 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Construct</strong></td>
<td>Health-Related Fitness</td>
<td>Movement</td>
<td>Movement</td>
</tr>
<tr>
<td><strong>Sedentary Behavior</strong></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Relationship between Behavior &amp; Attributes</strong></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Diagram

- **Physical Activity**
- **Sedentary**
- **Energy Expenditure**
- **Behavior**
- **Human Movement**
- **Physiological Attributes**
- **Physical Fitness**
DEFINITIONS
DEFINITIONS

Physical Activity, Exercise, and Physical Fitness: Definitions and Distinctions for Health-Related Research

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Tearsheet requests to Dr. Caspersen.

Synopsis

“Physical activity,” “exercise,” and “physical fitness” are terms that describe different concepts. However, they are often confused with one another, and the terms are sometimes used interchangeably. This paper proposes definitions to distinguish them.

Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. The energy expenditure can be measured in kilocalories. Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities. Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness. Physical fitness is a set of attributes that are either health- or skill-related. The degree to which people have these attributes can be measured with specific tests.

A national framework for comparing studies that relate physical activity, exercise, and physical fitness to health.
Terminology of Physical Activity, Physical Fitness, and Health

This section discusses four broad terms used frequently in this report: physical activity, exercise (or exercise training), physical fitness, and health. Also included is a glossary (Table 2-1) of more specific terms and concepts crucial to understanding the material presented in later parts of this chapter and report.

**Physical activity.** Physical activity is defined as bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level. Physical activity can be categorized in various ways, including type, intensity, and purpose.

**Physical activity**—Bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure.
Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure above resting level (Caspersen et al., 1985).

Health Enhancing Physical Activity is any form of activity that benefits health.

Health Enhancing Physical Activity is any form of physical activity that benefits health and fitness without undue harm or risk (Foster, 2000). This can be all daily activities and can, but does not necessarily, include sports. Not all physical activity is beneficial for health (Hagströmer, 2007). To be beneficial for health, physical activity should be ‘moderate’ or ‘vigorous’:

- **Moderate-intensity** physical activity raises the heart-beat and leaves the person feeling warm and slightly out of breath. It increases the body’s metabolism to 3-6 times the resting level (3-6 MET’s) (Cavill et al., 2006). Brisk walking, for example, has an equivalent of 4.5 MET’s (Ainsworth et al., 2000).

- **Vigorous-intensity** physical activities enable people to work up a sweat and become out of breath. They usually involve sports or exercise, like running or fast cycling. They raise the metabolism to at least six times its resting level.
WHAT’S MISSING?

- Recognition that PA is a Complex Behavior
- Sedentary Behavior
- PA in Context of Other Constructs of HM
- Appropriate Use of Measurement Tool(s)
Physical Activity: The behavior that drives human movement which results in physiological attributes including increased physical activity-related energy expenditure and improved physical fitness.

Sedentary: Behavior that produces little to no human movement resulting in minimal (or no) physiological gain.

Health Enhancing PA: Activity that, when added to the light-intensity activities of daily life, produces health benefits.

Human Movement

Physiological Attributes

Physical Activity

Sedentary

Physical Fitness
FRAMEWORK COMPONENTS
PHYSIOLOGICAL ATTRIBUTES

Human Movement

Physiological Attributes

Energy Expenditure

Physical Fitness

Direct Measures
PHYSICAL ACTIVITY DOMAINS

Leisure

Occupational School

Household Caretaking Domestic

Transportation
Physical inactivity is not the inverse of physical activity

Physical fitness often inferred with physical activity assessment
BEHAVIOR

Perceived Behavior

Human Movement

Self-Report

Occupational/School

Household/Caretaking/Domestic

Transportation

Sitting

Non-Occupational & School computer use

Media Use

Sleeping

Occupation/School

Non-Discretionary

Discretionary

Physical Activity

Driving

Riding

Sitting

Non

Discretionary

Sedentary

Leisure

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Perceived Behavior
CONSIDERATIONS
Physical Activity

Activity Characteristics
Population/Sample Characteristics
Study Characteristics
Instrument Characteristics

METHODOLOGICAL ISSUES
METHODOLOGICAL ISSUES
STUDY CHARACTERISTICS

- Study Characteristics
  - Budget
  - Staff Resources
  - Study Design
  - Population
  - Sample Size
  - Study Objectives
    - Outcomes and Confounders
  - Geographical Location/Seasonality
    - Temperature, Precipitation, Daylight Hours
METHODOLOGICAL ISSUES
POPULATION CHARACTERISTICS

Population Characteristics

- Age
- Gender
- Race
- Ethnicity
- Primary Language
- Cultural Norms
- Socio-Economic Status
- Educational Attainment
- Health Status
- Cognition
- Disability Status
- Functional Ability
METHODOLOGICAL ISSUES
INSTRUMENT CHARACTERISTICS

- Activity v Intensity Specific
- Psychometric Properties: Reliability, Validity, Sensitivity
- Measured Constructs: Relevant to Study Population and Outcomes
- Mode of Administration: Interviewer, Self, Computer/Electronic
- Recall Time Frame: Specific, Historical, Usual
METHODOLOGICAL ISSUES

Physical Activity

Activity Characteristics

Population/Sample Characteristics

Study Characteristics

Instrument Characteristics
Assessing Component(s) of Human Movement v Measuring the Whole of Human Movement and the Possible Implications.

Consider what Physical Activity *Connotes* to the Health Outcomes of the General Population.

Consider what Physical Activity *Denotes* to the Researcher or Health Practitioner.
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