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Part C: Key Terms

This section provides definitions for many of the major terms used in this report and in the scientific literature reviewed during the preparation of the report. We have attempted to use definitions that have been generally accepted in the scientific literature and in major reports and recommendations for physical activity and public health. As scientists, educators, and practitioners continue to strive to better understand new concepts and explore the numerous characteristics of physical activity and their relations to various aspects of health and physical fitness, new terminology is introduced and existing definitions are modified. As new measurement tools are developed and new health outcomes are identified, accepted terminology will continue to evolve as part of the science of physical activity and health.

Included in this section are a number of the terms that pertain to physical activity, physical fitness, and study design. Definitions for disease or condition-specific terms are defined within individual chapters in **Part G: The Science Base**. Additional discussion of the terminology used in the presentation of research results or the development of physical activity and public health guidelines can be found in the following publications: *Public Health Aspects of Physical Activity and Exercise* (1), *Toward Active Living* (2), *Physical Activity and Health: A Report of the Surgeon General* (3), *Dose-Response Issues Concerning Physical Activity and Health: An Evidence-Based Symposium* (4), *American College of Sports Medicine's Guidelines for Exercise Testing and Prescription* (5), and *Advancing Physical Activity and Guidelines in Canada* (6).

Physical Activity and Exercise

Two terms are widely used to describe human movement: *physical activity* and *exercise*. Although they are often used interchangeably, their definitions differ.

Physical activity is any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level. Among the ways physical activity can be categorized is according to mode, intensity, and purpose (3). Mode and intensity are defined below. With regard to classification by “purpose,” physical activity frequently is categorized by the context in which it is performed. Commonly used categories include occupational, leisure-time or recreational, household, self-care, and transportation or commuting activities. In some studies, sports participation or “exercise training” is assessed and analyzed separately from other leisure-time activities.

Exercise is a subcategory of physical activity that is “planned, structured, and repetitive and purposive in the sense that the improvement or maintenance of one or more components of physical fitness is the objective” (7). *Exercise* and *exercise training* frequently are used

interchangeably and generally refer to physical activity performed during leisure time with the primary purpose of improving or maintaining physical fitness, physical performance, or health.

Other terms that describe additional types of physical activity or exercise are defined here:

Activities of daily living. Activities required for everyday living, including eating, bathing, toileting, dressing, getting into or out of a bed or chair, and basic mobility.

Aerobic exercise (training). Exercise that primarily uses the aerobic energy-producing systems, can improve the capacity and efficiency of these systems, and is effective for improving cardiorespiratory endurance.

Anaerobic exercise (training). Exercise that uses the anaerobic energy-producing systems and can improve the capacity of these systems and increase the tolerance of acid-base imbalance during high-intensity exercise.

Balance training. Static and dynamic exercises that are designed to improve individuals' ability to withstand challenges from postural sway or destabilizing stimulus caused by self-motion, the environment, or other objects.

Endurance exercise (endurance training). Exercises that are repetitive and produce dynamic contractions of large muscle groups for an extended period of time (e.g., walking, running, cycling, swimming).

Flexibility exercise. Exercises that enhance the ability of a joint to move through its full range of motion.

Instrumental activities of daily living. Activities related to independent living, including preparing meals, managing money, shopping for groceries or personal items, performing housework, and using a telephone.

Leisure-time physical activity. Physical activities performed by a person that are not required as essential activities of daily living and are performed at the discretion of the person. These activities include sports participation, exercise conditioning or training, and recreational activities such as going for a walk, dancing, and gardening.

Lifestyle activities. This term is frequently used to encompass activities that one carries out in the course of one's daily life, that can contribute to sizeable energy expenditure, e.g., taking the stairs instead of using the elevator, walking to do errands instead of driving, getting off one bus stop earlier, or parking further away than usual to walk to a destination.

Resistance training (strength training, muscle-strengthening activities, or muscular strength and endurance exercises). Exercise training primarily designed to increase skeletal muscle strength, power, endurance, and mass.

Terms related to patterns of physical activity or exercise are defined here:

Accumulation. The concept of meeting a specific physical activity dose or goal by performing activity in short bouts, then adding together the time spent during each of these bouts. For example, a 30-minute per day goal could be met by performing 3 bouts of 10 minutes each throughout the day.

Dose. In the field of physical activity, dose refers to the amount of physical activity performed by the subject or participants. The total dose or amount is determined by the three components of activity: frequency, duration, and intensity. Frequency is commonly recorded as sessions, episodes, or bouts per day or per week. Duration is the length of time for each bout of any specific activity. Intensity is the rate of energy expenditure necessary to perform the activity to accomplish the desired function (aerobic activity) or the magnitude of the force exerted during resistance exercise.

Dose response. The relation between the dose of physical activity and the health or fitness outcome of interest is considered the dose response. The dose can be measured in terms of a single component of activity (e.g., frequency, duration, intensity) or as the total amount. This concept is similar to the prescription of a medication where the expected response will vary as the dose of the medication is changed. The dose-response relation can be linear, exponential, or hyperbolic, and the dose-response relation is likely to vary depending on the primary measure of interest. For example, improvements in cardiorespiratory fitness, bone health, or adiposity are common dose-response measures of interest. A dose of physical activity may exist below which no effect has been detected as well as a dose above which no effect has been detected. These seemingly lowest and highest doses of activity may be called “thresholds,” but the term should be used cautiously as these apparent limits may be more related to limitations of measurement than to true biological limits.

Duration. The length of time in which an activity or exercise is performed. Duration is generally expressed in minutes.

Frequency. The number of times an exercise or activity is performed. Frequency is generally expressed in sessions, episodes, or bouts per week.

Intensity. Intensity refers to how much work is being performed or the magnitude of the effort required to perform an activity or exercise. Intensity can be expressed either in *absolute* or *relative* terms.

- **Absolute.** The absolute intensity of an activity is determined by the rate of work being performed and does not take into account the physiologic capacity of the individual. For aerobic activity, absolute intensity typically is expressed as the rate of energy expenditure (e.g., milliliters per kilograms per minute of oxygen being consumed, kilocalories per minute, METs) or, for some activities, simply as the speed of the activity (e.g., walking at 3 miles per hour, jogging at 6 miles per hour),

or physiologic response to the intensity (e.g., heart rate). For resistance activity or exercise intensity frequently is expressed as the amount of weight lifted or moved.

- **Relative.** Relative intensity takes into account or adjusts for a person's exercise capacity. For aerobic exercise, relative intensity is expressed as a percent of a person's aerobic capacity (VO_{2max}) or VO_2 reserve, or as a percent of a person's measured or estimated maximum heart rate (heart rate reserve). It also can be expressed as an index of how hard the person feels he or she is exercising. A person's subjective assessment of how hard he or she is working relative to his/her own capacity is called *rating of perceived exertion*. The Borg Scale is a commonly used numerical scale for rating perceived exertion (8). Rating of perceived exertion is used for both aerobic and muscle-strengthening types of activities.

MET. MET refers to *metabolic equivalent* and 1 MET is the rate of energy expenditure while sitting at rest. It is taken by convention to be an oxygen uptake of 3.5 milliliters per kilogram of body weight per minute. Physical activities frequently are classified by their intensity, using the MET as a reference (see Table D.3 in **Part D: Background**).

Mode. The type of activity or exercise that is being performed. Biking, walking, rowing, and weight lifting are all examples of different modes of activity.

Progression. The process of increasing the intensity, duration, frequency, or amount of activity or exercise as the body adapts to a given activity pattern.

Physical Fitness

During the 20th century, **physical fitness** has been defined in a variety of ways, but a generally accepted definition is “the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies” (3, p.20). It has been defined by the World Health Organization as “the ability to perform muscular work satisfactorily” (9, p.6). Physical fitness includes a number of components consisting of cardiorespiratory endurance (aerobic power), skeletal muscle endurance, skeletal muscle strength, skeletal muscle power, flexibility, balance, speed of movement, reaction time, and body composition. Because these attributes differ in their importance to athletic performance versus health, a distinction has been made between *performance-related fitness* and *health-related fitness* (7). Performance-related fitness includes those attributes that significantly contribute to athletic performance and places emphasis on aerobic endurance or power, muscle strength and power, speed of movement, and reaction time. Health-related fitness includes cardiorespiratory fitness, muscular strength and endurance, body composition, flexibility, and balance. The relative importance of any one attribute depends on the specific performance or health goal.

The following terms relate to specific aspects of physical fitness.

Adaptation. The body's response to exercise or activity. Some of the body's structures and functions favorably adjust to the increase in demands placed on them whenever physical activity of a greater amount or higher intensity is performed than what is usual for the individual. It is these adaptations that are the basis for much of the improved health and fitness associated with increases in physical activity.

Agility. A performance-related component of physical fitness that is the ability to change position of the entire body in space with speed and accuracy.

Balance. A performance-related component of physical fitness that involves the maintenance of the body's equilibrium while stationary or moving.

Body composition. A health-related component of physical fitness that applies to body weight and the relative amounts of muscle, fat, bone, and other vital tissues of the body. Most often, the components are limited to fat and lean body mass (or fat-free mass).

Cardiorespiratory fitness (endurance). A health-related component of physical fitness that is the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity. Usually expressed as measured or estimated maximal oxygen uptake (VO_{2max}).

Coordination. A performance-related component of physical fitness that is the ability to use the senses, such as sight and hearing together with body parts in carrying out motor tasks smoothly and accurately.

Flexibility. A health and performance-related component of physical fitness that is the range of motion possible at a joint. Flexibility is specific to each joint and depends on a number of specific variables, including but not limited to the tightness of specific ligaments and tendons.

Maximal oxygen uptake (VO_{2max}). The body's capacity to transport and use oxygen during a maximal exertion involving dynamic contraction of large muscle groups, such as during running or cycling. It is also known as maximal aerobic power and cardiorespiratory endurance capacity. Peak oxygen consumption (VO_{2peak}) is the highest rate of oxygen consumption observed during an exhaustive exercise test.

Power. A performance-related component of physical fitness that describes the rate (or speed) at which work can be applied.

Speed. A performance-related component of physical fitness that is the ability to perform movements rapidly or within a short period of time.

Strength. A health and performance-component of physical fitness that is the ability of a muscle or muscle group to exert force.

Health

Numerous definitions of **health** exist and, in this report, we have adopted the following: “Health is a human condition with physical, social and psychological dimensions, each characterized on a continuum with positive and negative poles. Positive health is associated with a capacity to enjoy life and to withstand challenges; it is not merely the absence of disease. Negative health is associated with morbidity, and in the extreme, with premature mortality” (10, p.100).

Health-related quality of life is an individual's overall sense of well being and includes such factors as pain, mood, energy level, family and social interactions, sexual function, ability to work, and ability to keep up with routine daily activities.

Study Design and Measurement

Absolute risk. The percentage of subjects in a group that experiences a discrete negative outcome, such as death or hospital admission.

Case-control study. A type of epidemiologic study design in which subjects are selected based on the presence or absence of a specific outcome of interest, such as cancer or diabetes. The individual's past physical activity practices are assessed, and the association between past physical activity and presence of the outcome is determined.

Case report. This includes single case reports of individual patients and published case series.

Confidence interval. When relative risk (see definition below) is calculated, one can also calculate a confidence interval, or a band of uncertainty, around the estimate of the relative risk. Typically, 95% confidence intervals are used in epidemiologic studies. For example, if the estimated relative risk for colon cancer associated with physical activity, compared with inactivity, is 0.5 with a 95% confidence interval of 0.3 to 0.8, this means that we are 95% certain that the true estimate of the relative risk lies between 0.3 and 0.8.

Cross-sectional study. Studies that compare and evaluate specific groups or populations at a single point in time.

Observational studies. Studies in which outcomes are measured but no attempt is made to change the outcome. The two most commonly used designs for observational studies are case-control studies and prospective cohort studies.

Odds ratio. A measure of probability used in epidemiologic studies. It measures the chances of an event (or disease) occurring in one group of people as compared to another group with different characteristics. For example, an odds ratio of 0.5 for high blood pressure in people who participate in physical activity, compared with people who are inactive, indicates that active persons are 0.5 times (50%) less likely to have high blood pressure, compared with those who are inactive (see also **Confidence interval**).

Prospective cohort study. A type of epidemiologic study in which the physical activity practices of the enrolled subjects are determined and the subjects are followed (or observed) for the development of selected outcomes. It differs from clinical trials in that the exposure, in this case physical activity, is not assigned by the researchers.

Randomized controlled trial (also known as a randomized clinical trial). A type of study design in which participants are grouped on the basis of an investigator-assigned exposure of interest, such as physical activity. For example, among a group of eligible participants, investigators may randomly assign them to exercise at three levels: no activity, moderate activity, and vigorous activity. These participants are then followed over time to assess the outcome of interest, such as change in abdominal fat. Randomized controlled trials are often considered the “gold standard” of human intervention study designs. However, because of the cost and issues regarding compliance with an assigned activity level, it may not always be feasible, or even desirable, to conduct this type of trial.

Relative risk. A measure of association used in epidemiologic studies. It measures the magnitude of association between the exposure (such as physical activity) and the disease (such as colon cancer). A relative risk of 0.5 for colon cancer associated with physical activity, compared with inactivity, indicates that active persons have 0.5 times (or 50%) the risk of developing colon cancer compared to inactive persons.

Retrospective study. A study in which the outcomes have occurred before the study has begun.

Publication Types

Cochrane Collaboration. An internationally organized effort to bring existing clinical studies into systematic reviews to facilitate the process of bringing clinical evidence to bear on decisionmaking in patient care.

Meta-analysis. A review of a focused question that follows rigorous methodological criteria and uses statistical techniques to combine data from studies on that question.

Systematic review. A review of a clearly defined question that uses systematic and explicit methods to identify, select, and critically evaluate relevant research, and to collect and analyze data from the studies to include in the review.

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