



## The Compendium of Physical Activities

### Introduction

The energy cost of physical activity is a direct outcome of the frequency, duration, and the intensity of human movement performed in a variety of settings. Often expressed as kilocalories (or calories), energy expended in physical activity is related to the prevention of various chronic diseases, improved mental health, and reduced risks for obesity and related disabilities<sup>1</sup>. For nearly 50 years, epidemiologists and exercise scientists have measured participation in physical activity using direct (observation, laboratory measurements) and indirect (questionnaires) methods. In question when using questionnaire methods how to best reflect the intensity of reported physical activities. Traditionally, physical activity intensity units have been determined by direct measurements in laboratories or by the use of charts that list the kilocalorie or related intensity levels for specific activities. However, with the difficulty of measuring all activities performed in field settings and the publication of multiple charts showing the energy cost of physical activities with differing intensity units for similar activities, confusion arose about the most consistent way to identify the intensity of physical activities in population studies. Hence, a Compendium of Physical Activities was developed to standardize the coding for intensity levels of physical

activities used to compute energy expended in physical activity settings. Two versions of the Compendium of Physical Activities have been published: the first version was published in *Medicine and Science in Sports and Exercise* in 1993<sup>2</sup> and an updated version was published in *Medicine and Science in Sports and Exercise* in 2000<sup>3</sup>. An on-line "tracking" version of the Compendium of Physical Activities provides continuity between the 1993 and 2000 versions and can be found on the website, <http://prevention.sph.sc.edu> (click on Reports and Tools).

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### The Compendium of Physical Activities: A Description

The Compendium of Physical Activities was developed to facilitate the coding of physical activities obtained from physical activity records, logs, and surveys and to promote comparison of coded physical activity levels across observational studies. It was conceived in 1987 by Dr. William Haskell to provide consistency in scoring physical activity questionnaires in a multi-site study of physical activity assessment<sup>4-6</sup>. The Compendium has 21 categories for major types of physical activities and provides specific examples of physical activities within each category (see Table 1). The categories include activities performed at home (self-care, home repair, general household and family tasks, lawn and garden activities), during employment, transportation, and in leisure (sports, running, water and winter activities, hunting and fishing, bicycling, conditioning, walking,

**Table 1.**  
**Categories of activities listed in the Compendium of Physical Activities**

<i>Categories</i>	<i>Categories</i>	<i>Categories</i>
01 – Bicycling 02 – Conditioning Exercises 03 – Dancing 04 – Fishing and Hunting 05 – Home Activities 06 – Home Repair 07 – Inactivity	08 – Lawn and Garden 09 – Miscellaneous 10 – Music Playing 11 – Occupation 12 – Running 13 – Self Care 14 – Sexual Activity	15 – Sports 16 – Transportation 17 – Walking 18 – Water Activities 19 – Winter Activities 20 – Religious Activities 21 – Volunteer Activities

dancing, music playing, inactivity, and sexual activity), and in other settings (religious, volunteer, and miscellaneous activities). Within the 21 categories, approximately 605 groups of specific activities are listed. The specific activities are grouped according to the type of physical activity and intensity level for each group. Each category and specific activity is identified by a 5-digit code. For example, category 03025 identifies dancing activities (digits 03) that include types of dancing labeled as general dancing, Greek, Middle Eastern, hula, flamenco, belly, or swing dancing (digits 025). These specific dancing activities require an energy cost of 4.5 METs (see definition in the next paragraph). The example below shows how to interpret the 5-digit code and the associated intensity level for an activity. Figure 1 provides an example of how the entries appear in the Compendium of Physical Activities.

<u>Category</u>	<u>Specific Activity</u>	<u>MET intensity</u>
03	025 General, Greek, Middle Eastern, hula, flamenco, belly, swing	4.5

The term MET is an abbreviation for metabolic equivalent and is used in the Compendium of Physical Activities to reflect the intensity of the specific activities. A MET is defined as the ratio of the associated metabolic rate for a specific activity divided by the resting metabolic rate. The resting metabolic rate is approximately 1 MET and reflects the energy cost of sitting quietly. Multiples of 1 MET indicate a higher energy cost for a specific activity. For example, a 2 MET activity requires twice the energy cost of sitting quietly. A 3 MET activity requires three times the energy cost of sitting quietly, and so forth. Table 2 provides an example of specific activities from the Compendium of Physical Activities that requires multiples of 1 MET.

<b>CODE</b>	<b>METs</b>	<b>CATEGORY</b>	<b>ACTIVITIES</b>
01009	8.5	Bicycling	BMX, Mountain
01010	4.0	Bicycling	<10 MPH, to work or for pleasure
02010	7.0	Conditioning	Bicycling, stationary, general
02120	4.0	Conditioning	Water aerobics, water calisthenics
03017	10.0	Dancing	Aerobic, step, with 10-12 inch step
03025	4.5	Dancing	General, Greek, Middle Eastern, hula, flamenco, belly, swing

### **Estimating Energy Expenditure with the Compendium of Physical Activities**

MET intensities listed in the Compendium of Physical

Figure 1.

Selected codes, MET intensity levels, activity categories, and examples of specific activities: Compendium of Physical Activities

**Table 2.**  
**Estimated MET levels for selected physical activities in the Compendium of Physical Activities**

<i>METs</i>	<i>CATEGORY</i>	<i>SPECIFIC ACTIVITIES</i>
0.9	Inactivity	Sleeping
1.0	Inactivity	Sitting quietly and watching television
2.0	Transportation	Driving an automobile or light truck (not a semi)
3.0	Walking	Walking very slowly, strolling, household walking
4.0	Lawn and Garden	Raking the lawn, general gardening
5.0	Home Repair	Cleaning gutters, painting outside of home
6.0	Occupation	Using heavy power tools (jackhammer)
7.0	Conditioning	Stationary bicycle, ski or rowing machine
8.0	Sports	Competitive basketball game, touch football
9.0	Walking	Climbing hills with a 42 lb. backpack
10.0	Water	Freestyle lap swimming, vigorous effort
11.0	Running	Running at 9 minutes/mile
12.0	Bicycling	Road cycling 14-16 mph, fast or general racing
13.0/14.0	Running	Running at 7-7.5 minutes/mile
15.0	Winter	Competitive speed skating

Activities can be used to estimate the energy expended during physical activities. Kilocalorie (kcal) energy expenditure at rest is roughly equal to 1 MET per kilogram body weight per hour. Thus, for a 60-kilogram person, the energy expended during one hour of sitting and watching television (Code 07020, 1 MET) is roughly equal to 60 kilocalories (1 MET x 1 hour x 60 kg body weight). Kilocalories expended per week in specific activities can be computed in a similar fashion from knowing the frequency of an activity in sessions per week, the duration of an activity in minutes per session, the MET intensity as obtained from the Compendium of Physical Activities, and one's body weight in kilograms (kg).

*Equation:* Kcal per week = METs x sessions per week x hours per session x body weight in kg.

An example of how to compute the kcal energy expenditure is provided below for an individual who walks briskly (Code 17200, 3.8 METs), 5 times per week, 1/2 hour per session, and weighs 154 pounds (70 kg),

$$\text{Kcal} = 3.8 \text{ METs} \times 5 \text{ sessions per week} \times 0.5 \text{ hours per session} \times 70 \text{ kg body weight}$$

$$\text{Kcal} = 665 \text{ per week}$$

The ability to estimate energy expended during a variety of physical activities has public health significance. In 1996, the Surgeon General released a report to the nation about physical activity and health<sup>1</sup>. The report contained a recommendation for all adults to expend at least 150 kilocalories per day or 1,000 kilocalories per week in moderate and vigorous intensity physical activities. Moderate intensity activities are those that increase the body's resting metabolic rate by 3 to 6 fold (3-6 METs) and is characterized by an increase in one's heart rate and breathing depth and frequency but is not to levels that restrict conversation during the physical activity event. At a MET level of 3.8, brisk walking is considered to be moderate intensity physical activity. Vigorous intensity activities are those that increase the body's resting metabolic rate in excess of 6 fold (>6 METs) and are characterized by a near maximal increase in one's heart rate and breathing depth and frequency<sup>7</sup>. Except for the most highly trained individuals, it is generally difficult to carry on a conversation during vigorous intensity activities. Jogging (code 12020, 7.0 METs) and running (codes 12030 to 12180, 8.0 to 18.0 METs) are considered vigorous intensity activities. An energy expenditure of 150 kcal per day or 1,000 kcal per week is deemed

sufficient to reduce the risks for some types of chronic diseases (e.g., coronary heart disease) and to improve the overall quality of mental and physical health. In the example presented for the individual who walks briskly for 1/2 hour per day, 5 days per week, he or she would need to expend an additional 335 kcal per week by either walking a little faster (code 17220, walking 4.0 mph, 5.0 METs), walking every day (increasing the frequency from 5 to 7 days per week), or by increasing the time spent walking (from 30 to 45 minutes per day) to reach the recommended level of 1,000 kcal per week. The individual could also accumulate the additional kilocalories by performing additional moderate and vigorous intensity activities during selected days of the week.

## Uses of the Compendium of Physical Activities

The Compendium of Physical Activities has many uses in research, clinical, and community settings to inform others about the health benefits of regular physical activity and about ways they can become more physically active.

### *Physical Activity Research Settings*

In health research designed to determine the associations between physical activity and disease risk reduction, researchers can use the Compendium to assign MET intensities to specific activities on physical activity questionnaires. The use of the Compendium of Physical Activities in this way provides consistency among research studies in assigning MET intensities and prevents multiple uses of different intensity levels for similar activities. An example of why this is important is shown here. Assume Study A assigns a MET level of 4.5 to a specific activity identified on a physical activity questionnaire and Study B assigns the same activity a MET level of 6.5. This will result in inconsistent kcal scores between the studies. Assuming the activity was performed by a 60 kilogram person for 3 days per week at 1/2 hour per session, in Study A, the dose will yield an estimated energy expenditure of 405 kcal per week; whereas, in Study B, the same activity will yield an

estimated energy expenditure of 585 kcal per week. Which estimate of the energy expenditure is correct? Use of the MET levels from the Compendium of Physical Activities eliminates this inconsistency and provides a clearer idea of the amount of physical activity individuals may need to obtain to reduce their risks for chronic diseases and disability.

The Compendium of Physical Activities also is useful to researchers to identify the types of physical activities people perform during their daily routines. In 2000, public health researchers noted a trend for increasing rates of overweight and obesity among U.S. adults<sup>8,9</sup>. National data also showed that over half of adults were not regularly active in moderate and vigorous intensity activity at levels sufficient to prevent diseases and disabilities<sup>10</sup>. Several health researchers have used the Compendium of Physical Activities to identify the types of activities people are performing in their daily routine. Ainsworth et al.<sup>11</sup> examined the moderate and vigorous intensity physical activity patterns of 141 African American and Native American women enrolled in the Cross-Cultural Activity Participation Study. They used the Compendium of Physical Activities to assign 5-digit activity codes and associated MET intensity levels to over 100,000 activities recorded in 12 days of detailed physical activity records kept by the study participants. Nearly two hours per day were spent in moderate intensity activities (3-6 METs) with the most prevalent activities listed as household chores, walking for exercise, occupational tasks, caring for children, and lawn and garden activities. Fewer than 5 minutes per day was spent in vigorous intensity physical activities. Matthews et al.<sup>12</sup> used the Compendium of Physical Activities to identify daily activity patterns among adults enrolled in a yearlong study of seasonal variations in physical activity and blood cholesterol levels. They used a series of telephone 24-hour recalls to identify the type, frequency, and duration of physical activities performed during a previous day and then coded the recalls with the Compendium of Physical Activities. Their results showed increases in household and leisure-time physical activities during summer months. In the winter, women increased their

occupational activities and men engaged in more vigorous household activities. Conway et al.<sup>13</sup> used the doubly labeled water method to evaluate the accuracy of the Compendium of Physical Activities MET intensities used to estimate of daily energy expenditure. Twenty-four men completed detailed physical activity records for seven days during which time their energy expenditure was measured by doubly labeled water. The records were coded using the Compendium of Physical Activities and kilocalorie energy expenditure was calculated by multiplying the MET intensity and duration in minutes for each activity. The estimated weekly kcal values were similar enough between the physical activity records and doubly labeled water for the investigators to conclude that the physical activity records provided an acceptable way to record physical activities and estimate energy expenditure when scored using the Compendium of Physical Activities. However, the records required good

subject compliance and careful instructions for their proper use.

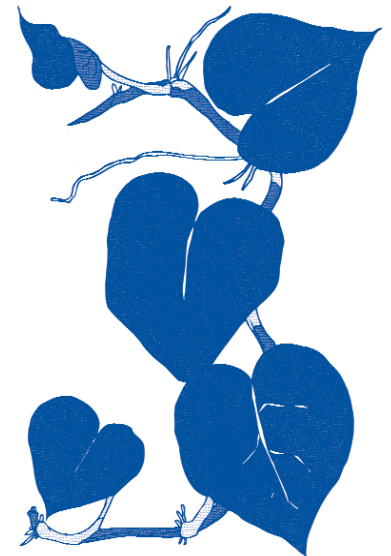
**Clinical Settings**

For patients in rehabilitation settings, the Compendium of Physical Activities can be used to identify types of activities one can perform within prescribed MET intensity levels. For example, in a cardiac rehabilitation setting, a patient who is recovering from a heart attack may be advised to engage in physical activities within a narrow range of intensities (e.g., 3-5 METs) outside of the formal rehabilitation setting. Whereas the patient may not know what are appropriate activities, the Compendium of Physical Activities can provide a useful guide to identify activities with appropriate intensity levels.

**Physical Activity Promotion**

The Compendium of Physical Activities also can be used in health promotion initiatives to provide examples of activities that can be performed within a range of settings. For example, gardening is a popular activity with nearly 30% of adults in 1991 reporting participation in some form of lawn and garden activity<sup>1</sup>. In the 2000 version of the Compendium of Physical Activities, 21 entries are provided under the category of lawn and gardening with about 43 types of different activities listed. Figure 2 shows an example of how information can be shared about the various types of lawn and garden activities of differing intensities that can be used to improve one’s health and fitness. Other themes for

physical activity promotion can be applied with data obtained from the Compendium of Physical Activities, for example a chart based on winter chores (e.g., shoveling snow, chipping ice from walkways, pushing the car out of the ditch) or other seasonal activities.



<b>METs</b>	<b>Activity</b>
6.0	Chopping wood Using power tiller Using push mower
5.5	Using power mower
5.0	Hauling branches Laying sod or rocks Digging or filling the garden
4.5	Planting trees and shrubs Trimming shrubs (manual tools)
4.0	Raking the lawn Sacking leaves General gardening
3.5	Trimming shrubs (power tools) Blowing leaves
3.0	Picking fruit from trees
2.5	Applying fertilizer Riding a power mower
1.5	Watering the lawn or garden

Figure 2.  
Illustrative example of a use for the  
Compendium of Physical Activities

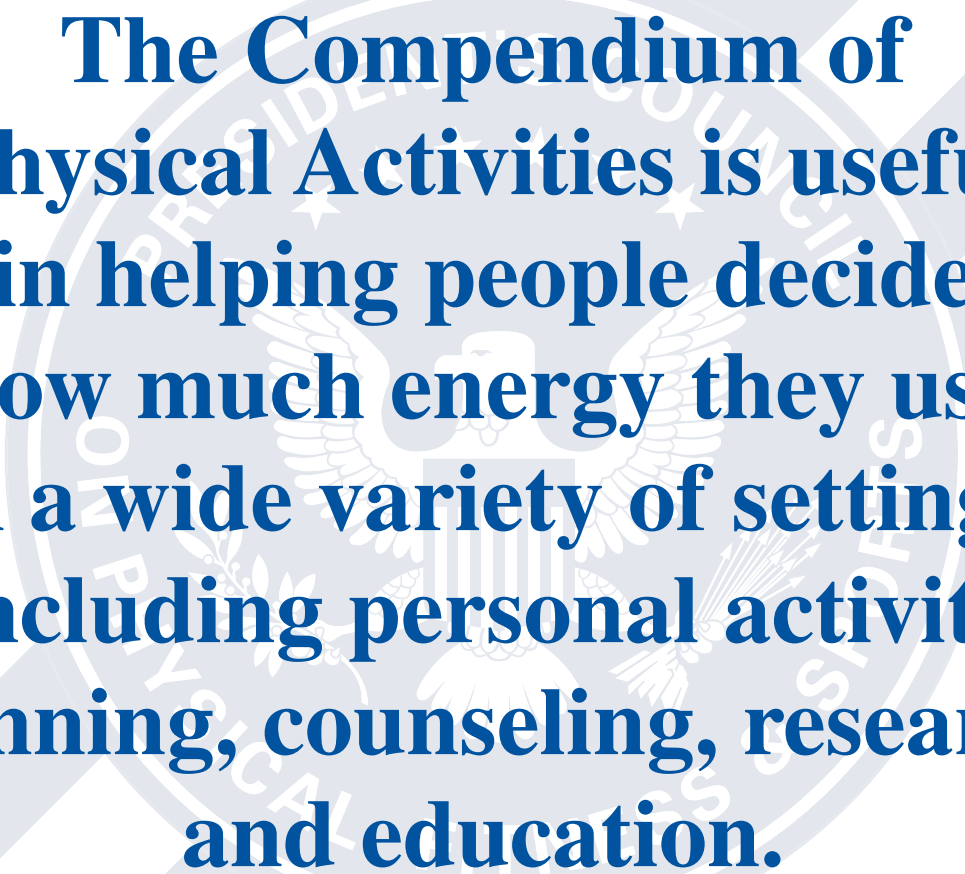
## **Summary and Conclusions**

The Compendium of Physical Activities was developed to provide a coding system to score physical activity questionnaires and to facilitate consistency in the assignment of intensity levels to physical activities. The system was developed for use in adults and does not account for adiposity, efficiency of movement, geographic and environmental conditions in the energy cost of movement. It is likely that such differences will affect the accuracy of the energy expenditures estimated for use of the MET levels obtained from the Compendium of Physical Activities. Nevertheless, the Compendium of Physical Activities is useful in coding physical activity

questionnaires and records and in providing examples of activities within a broad range of intensity levels for use in physical activity counseling, research, education, and in clinic settings.

## **Acknowledgements**

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The seal of the President's Council on Physical Fitness & Sports is centered in the background. It features an eagle with wings spread, perched on a shield with vertical stripes. The shield is flanked by olive branches and arrows. The words "PRESIDENT'S COUNCIL ON PHYSICAL FITNESS & SPORTS" are written around the perimeter of the seal.

**The Compendium of  
Physical Activities is useful  
in helping people decide  
how much energy they use  
in a wide variety of settings  
including personal activity  
planning, counseling, research,  
and education.**

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