

Commentary

A brief history of the Compendium of Physical Activities

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The Compendium of Physical Activities (Compendium) was developed to address consistent assignment of physical activity (PA) intensity values used in PA epidemiology research of the association between PA and health outcomes.¹ The known protective effects of PA on incident health outcomes traces to the mid-1900s, with over 50 studies examining coronary heart disease (CHD) as the outcome of interest. Studies of the occupational PA effects on CHD incidence and mortality used job classifications to assign PA intensities (often comparing jobs requiring walking/lifting with those characterized by sitting/standing^{2–4}) and self-report questionnaires to quantify work time spent sitting, walking, lifting and carrying heavy items.⁵ Methodological evolutions included self-report^{6,7} and interviewer-administered⁸ questionnaires to quantify dose expressed as the frequency, intensity, and duration of PA associated with reductions in CHD incidence events and mortality. These questionnaires varied in the number of questions, administration format (self- or interviewer-administered), and types of PA queried.^{9,10} While these tools illuminated a protective effect of habitual PA on CHD, questions remained concerning their validity and reliability.

From 1987 to 1989, the National Institutes of Health funded 4 research centers (University of Minnesota, Stanford University, University of Wisconsin, and San Diego State University) to examine the value of field methods and clinical trials to study PA. Each Center studied a different approach to using questionnaires to measure PA in adults. The University of Minnesota center, led by Drs. Arthur Leon and David Jacobs Jr., studied the

validity and reliability of 10 PA questionnaires from the previous 40 years focused on the benefits of habitual PA on CHD.

The Compendium, developed in 1989, was modeled after the Standard Occupational Classification document created by the U.S. Office of Management and Budget.¹¹ The Compendium was conceived by Dr. William Haskell (Principal Investigator of the Stanford University Center) and constructed by Dr. Barbara Ainsworth (then a post-doctoral researcher at the University of Minnesota) to assign metabolic equivalent (MET) intensity codes to activities. PAs were identified from existing questionnaires and lists^{7,8,10,12,13} included all those recorded in 2-day PA diaries completed monthly over 14 months as part of a separate PA questionnaire validation study. Each PA coded in the Compendium has 5 digits. The first 2 digits represent the Major Heading (e.g., Bicycling (01); Conditioning (02); Home activity (05)). The remaining 3 digits identify a Specific Activity within the Major Heading. For example, Code 01020 identifies bicycling 10.0–11.9 mph with leisurely or light effort. Code 05030 identifies cleaning a house or cabin with moderate effort. The Compendium also includes a standard MET for each Specific Activity that can be used in research and population settings. Balke¹⁴ recommended using METs as an alternate and simple definition of oxygen consumption, defining MET as the energy (oxygen) cost of activity in mL/kg/min divided by a fixed resting value of 3.5 mL/kg/min.¹⁵ Published energy cost values (e.g., kilocalories per kilogram body weight per minute¹² and activity intensity units⁸) were converted to MET values. The standard MET values should not be confused with corrected METs adjusted for differences in age, height, sex, and body mass to calculate personal energy expenditure from standard MET values.¹⁶

The original Compendium was published in 1993¹⁷ and updated in 2000¹⁸ and 2011.¹⁹ The 1993 Compendium

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contained 19 Major Headings and 477 5-digit Specific Activity codes reflecting sleeping (0.9 METs), sedentary behaviors from 1.5 to 2.8 METs, and Specific Activities ranging from 1.8 to 17.0 METs. The 2000 Compendium added 2 new Major Headings (religious and volunteer activities), 128 new Specific Activity codes (based on data collected from metropolitan African-American women residing in South Carolina and by American Indian women residing in New Mexico (Pueblo and Navajo) and Northern Minnesota (Anishinaabe)), and updated select MET intensity levels. The 2011 update added 217 new Specific Activity codes and increased precision of the MET values in the Compendium based on a systematic literature search to identify PAs with published MET values, replacing estimated METs with measured METs.

Also in 2011, a website was developed to facilitate easy access to Compendium documents (<https://sites.google.com/site/compendiumofphysicalactivities>). The website contains a tracking table cross-listing 1993, 2000, and 2011 MET values. It also contains .PDF files of the Compendium translated into multiple languages, references to source MET values for Specific Activities included in the Compendium, and instructions on the conversion of standard METs to corrected METs. As of July 1, 2023, the Compendium website has logged 1.8 million unique views.

In the 2024 update, the Compendium is re-named the Adult Compendium of Physical Activities²⁰ (2024 Adult Compendium) to differentiate it from the Youth Compendium of Physical Activities published in 2018 (<https://www.nccor.org/tools-youthcompendium/>), and from the Older Adult Compendium of PA²¹ and the 2024 Compendium of PA for Wheelchair Users²² presented in this issue of the *Journal of Sport and Health Science*. The 2024 Adult Compendium adds a new major heading (code 22, Video games), new 5-digit codes, and replaces many previously estimated MET values with measured MET values. The 2024 Adult Compendium reflects the most comprehensive update by combining the 2011 Compendium with new data obtained from systematic literature searches for each Major Heading and providing the latest version on a new website (www.pacompendium.com).

The MET values cataloged in the Compendium of Physical Activities have accumulated over 22,000 combined citations according to Google Scholar (1993 Compendium: 5467 citations; 2000 Compendium: 10,564 citations; 2011 Compendium: 6490 citations). Government agencies use the Compendium to identify Specific Activities and associated MET values that support the attainment of national PA objectives and to recommend activities for use in community initiatives. Schools and universities have used the Compendium to plan health-enhancing PAs and to instruct students in calculating their energy expenditure. The Compendium also has been embedded in commercial products developed to determine the energy expended on gym equipment and in apps to record and track PA and its energy expenditure. The Compendium has exceeded its intended purpose to standardize the assignment of PA intensities on PA questionnaires. In 35 years since its development in

1989, Barbara Ainsworth and her network of mentees have devoted countless hours to keep the Compendium current and relevant.

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Authors' contributions

BEA conceived and drafted the manuscript; SDH, DRJ Jr., MCWG, and CTL edited the manuscript. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

Competing interests

The authors declare that they have no competing interests.

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