Comment on Issues in the Assessment of Physical Activity in Women

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Research Quarterly for Exercise and Sport; Jun 2000; 71, 2; Health Module
pg. 43

Keywords: leisure time, physical activity, exercise, women

In 1993, Barbara Ainsworth, working with my colleagues and me, pointed out that the average woman reports more physical activity than the average man, providing that household chores are included (Ainsworth, Richardson, Jacobs, & Leon, 1993). She now combines feminist ideas with rigorous measurement theory to provide an elegant exposition of issues in physical activity and its assessment in women (Ainsworth, 2000). She points out that much of the activity typically performed by many women has been ignored in academic assessment of physical activity over the past several decades. Most prominent among ignored physical activities have been household tasks, walking for exercise, occupation, childcare, and lawn and garden activities. These omissions substantially influenced our understanding of what women do, compared to men (Ainsworth, 2000); of the lives of women of color (Ainsworth, 2000); and of the association of physical activity with chronic disease in women (Weller & Corey, 1998).

In this work (Ainsworth, 2000), Dr. Ainsworth argues powerfully to correct decades-old tendencies in the thinking of cardiovascular epidemiologists. Of course the goal has always been to improve public health, but how did we acquire the rather short-sighted view that women do little vigorous physical activity and are therefore little protected in this respect from coronary heart disease? From the outset of the study of cardiovascular epidemiology in the late 1940s, coronary heart disease was studied predominantly in men. Keys’ (1950) Seven Countries Study, which began in the late 1940s, involved only 40-59 year old men; it emerged from a study of 300 Minnesota men, started in 1948 (Keys et al., 1963). The Framingham study, begun in 1948, did study women as well as men, but confirmed the strategy of not studying women, because women had little coronary heart disease, with rates lagging behind those of men by 10 years (Kannel, Dawber, Friedman, Glennon, & McNamara, 1964). As recently as several decades ago, people were mostly dying by their 70s, and coronary heart disease did not seem to be as important in women as now, when lives are longer. Taken together with the clinical observation that heart disease hospital wards were filled with men, not women, the field of cardiovascular epidemiology again and again elected to use what was seen as the most powerful design - studies of middle-aged men. The judgement to do studies with “high power” over and over led to excluding women during formative decades of modern cardiovascular disease epidemiology.

We came to the conclusion that sustained and vigorous physical activity was a prerequisite for avoiding coronary heart disease, influenced by the work of Morris (Morris & Crawford, 1958), showing that bus conductors - physically active throughout their workday - had lower heart disease rates than occupationally sedentary bus drivers. He repeated these findings in a study of civil servants (Morris, Everett, Pollard, Chave, & Semmence, 1980). The 1940s through the present have been an era of rapid and unceasing mechanization of all areas of life, and particularly of transportation and occupation in the U.S. As transportation became synonymous with “being carried from place to place in a car” and occupations became progressively more inactive, we focused on leisure activity as the aspect of physical activity that could differentiate those who would and would not develop coronary heart disease. This view was a very natural one in the early 1970s, when Henry Taylor, with my assistance, was formulating the Minnesota Leisure Time Physical Activity Questionnaire for use in the Multiple Risk Factor Intervention Trial, commonly called MRFIT, (Taylor et al., 1978). Taylor had done extensive studies of physical...
activity and heart disease, focusing on occupation (Keys, 1980; Taylor et al., 1962), but omitted occupation from the Minnesota Leisure Time Physical Activity Questionnaire. As his young colleague, I asked him about this, and his explanation was that few vigorous occupations remained. Most workdays consisted then and now of sitting in a car on the way to work, followed by sitting in an office, and ending with sitting in a car on the way home. As this life pattern appeared to apply to the MRFIT men, we focused on those activities that might differ as a result of intervention efforts: leisure time (Taylor et al., 1978). We did additional surveys in whole populations, including women (Jacobs et al., 1991). Not surprisingly, women were not doing much vigorous leisure activity. To the credit of Henry Taylor’s comprehensive view of the science, he added to his Minnesota Leisure Time Physical Activity Questionnaire battery an occupational activity questionnaire and a section on household chores. Thus we could confirm that jobs in men and women are usually sedentary; and that women do the vast majority of the housework.

Thus, our research method, more than our research data, led us to believe that women were inactive. The problem here may be partly semantic—the words “inactive” and “sedentary” came to mean “not vigorously active in leisure time”.

A hint that this view of inactivity might be wrong came with studies which suggested that sustained moderate intensity physical activity could protect against coronary heart disease (Leon, Connell, Jacobs, & Raurama, 1987; Magnus, Matroos, & Strackee, 1979). This line of research led ultimately to the American College of Sports Medicine’s recommendation for population-wide performance of regular, moderate physical activity (Pate et al., 1995). Concurrently, studies were being carried out to assess strengths and weaknesses of existing physical activity questionnaires (Ainsworth, Haskell, Leon, et al., 1993; Ainsworth, Jacobs, & Leon, 1993; Greetebeck & Montove, 1992; Haskell, Yee, Evans, & Irby, 1993; Jacobs, Ainsworth, Hartman, & Leon, 1993; Paffenbarger, Blair, Lee, & Hyde, 1989; Sallis, Buono, Roby, Micale, & Nelson, 1993). Two overriding observations came to the fore. One of these was made saliently by Dr. Ainsworth, that a variety of simple questions easily differentiate vigorous exercisers from those who do not do vigorous activity (Ainsworth, Richardson, Jacobs, & Leon, 1992). The other was that moderate activity was neither reliably nor comprehensively assessed (Jacobs et al., 1993). Exhaustive and exhausting scrutiny by Dr. Ainsworth and Dr. Mark Richardson of 48 hour physical activity records in the SAFE study led me to conclude that many “unnamed” activities, performed repeatedly, in short intervals, throughout the day, were contributing strongly to misclassification of activity. Subsequent rigorous studies by Dr. Ainsworth have named and categorized these activities, including various forms of household tasks, care of children, pets, older and incapacitated adults, and various activities associated with volunteer and religious participation. She has established principles for writing reliable and valid physical activity questionnaires that “speak to the lives” of women and men of several ethnic groups.

The principles that she used involved three steps. First, she held focus groups with women of different ethnicities to learn in what terms they thought about physical activity and what kind of questionnaire would be most appealing to them. What questionnaire strategies would catch a woman’s attention and lead her to help the researcher to characterize her physical activity? Second, she enrolled a substantial number of women to keep detailed physical activity diaries for 12 days during 6 months. These records were analyzed meticulously to discover what activities the women were doing, including nuances such as pace and posture. Third, a questionnaire was written that reflected activities in the record book, with questions framed to match how the women thought about physical activity, as expressed during the focus groups. I contrast this three step process with some of the methods used in questionnaires in which I have been involved. Montove and his colleagues (Reif et al., 1967) developed a lengthy, open-ended physical activity interview for use in the Tecumseh study. Each participant was asked in depth and interactively about his/her activities and performance style. To my knowledge, there was no specific consideration of the participant’s framework for thinking about physical activity. Taylor (Taylor et al., 1978) abstracted activities from Montove’s lists, and organized them according to frequency and duration of performance, focusing on activities of middle-aged white men in the U.S. Railroad Study and the Multiple Risk Factor Intervention Trial. Years later, William Haskell and I formulated the CARIMA Physical Activity History (Jacobs, Hahn, Haskell, Pirie, & Sidney, 1989). The basis for this questionnaire was a listing of all activities reported on the Taylor Minnesota Leisure Time Physical Activity Questionnaire as filled out by several thousand Minnesotans in the early 1980s. To arrive at a shorter and more reliable questionnaire we combined activities that were similar in MET level. We believed (without formal evidence) that people tended to group activities in their minds as we had combined them. We also omitted questions of detail about frequency and duration that had apparently low reliability. In comparison, Dr. Ainsworth’s careful and thorough three step method yields a more complete, empirically-based questionnaire that attracts the participant’s attention and cooperation.

In contrast to the focus Dr. Ainsworth has taken on questionnaire development, a great deal of progress has been made with objective monitoring of physical activity, using devices such as vertical accelerometers, pedometers, or heart rate monitors. While these devices are unquestionably an advance and useful in research, the need
for excellent physical activity questionnaires is not diminished. The optimal measurement method depends on several factors, most broadly the nature of the question being asked and the research design. For example, in detailed studies of exercise physiology or energy balance, involving perhaps 50 people, what may be most important is the specific activity done in a narrow time window. An activity monitor may work well in this design. Another important case in which activity monitors may be useful is an intervention study, in which the intervention lasts for weeks and activity specific to that period of weeks is of most interest. Questionnaires have not done well at discerning differences or changes in physical activity over relatively short periods of time. An activity monitor worn for 4–6 days may well represent such activity. Similarly, because pregnancy is a state in which the body and physical activity practices may change rapidly, activity during pregnancy may be well measured by an activity monitor worn 4–6 days each month. At the other end of the spectrum are large epidemiologic studies or clinical trials with chronic disease endpoints, often involving many thousands of people. Use of activity monitors may be problematic in this case. First, the interest here is in typical physical activity performed over months or years, and monitoring for several days may not well represent such long-term patterns. Second, the logistics of providing activity monitors to participants and collecting them again may be insurmountable, particularly when the great bulk of data is collected by mail.

Dr. Ainsworth's work, focusing on women, goes beyond women. By bringing work on physical activity and coronary heart disease on men and women of different ethnicities together, we get new insights into lives and health of diverse people, not only of women. We see that a narrow view of physical activity limits potential for prevention of chronic disease. I take from her observations that women are doing more physical movement than we had judged. Nevertheless, the average woman and man is gaining weight and getting chronic disease; neither group is doing enough activity. We see the importance of a wide-range of vigor in our lives - not only in the sense of high heart rate and rapid respiration during physical activity, but also in the sense of a balanced, persistent, non-sedentary pace. We see that we are going nowhere in our transportation policy, which effectively engineers an important physical activity out of our lives. We see the same in many areas of mechanization at home and work. In the interest of convenience and efficiency, we deny ourselves the opportunity to use our bodies for the motions for which they were designed. Among our rewards for these policies are obesity, back and digestive problems, depression, and coronary heart disease. To combat these problems, we must continue to look at a larger population picture. We cannot afford to return to research focused predominantly on middle-aged, white men. And, on a personal note, based on all these considerations, I judge this work of my student, colleague, and friend, Barbara Ainsworth, to be of the first rank in rigor and importance.

REFERENCES


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