Invited Commentary

Invited Commentary: A Challenge for Physical Activity Epidemiology

Howard D. Sesso¹,²

¹ Divisions of Preventive Medicine and Aging, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, MA.
² Department of Epidemiology, Harvard School of Public Health, Boston, MA.

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Numerous epidemiologic studies report an inverse association between increasing levels of regular physical activity and reductions in major morbidity and mortality. Clinical guidelines emphasize the importance of specific amounts of regular physical activity, yet the majority of US adults do not meet these recommended levels. There are comparatively less data on nonexercise, or lifestyle, physical activity that may occur throughout the day in an unstructured setting with variable duration and frequency. In this issue (Am J Epidemiol 2007;165:1343–1350), both regular exercise and other forms of nonexercise physical activity are examined in relation to total and cause-specific mortality in Chinese women. This work illustrates several important issues in physical activity epidemiology regarding the identification, measurement, and analysis of nonexercise components of physical activity. Unlike semiquantitative food frequency questionnaires for studies of individual foods and nutrients, physical activity epidemiology lacks a prevailing measurement tool and analytical technique by which to examine nonexercise physical activity. Our challenge is therefore to more accurately and consistently measure these more subtle components of nonexercise physical activity to better understand its potential clinical effects and role in disease prevention.

exercise; methods; mortality; motor activity; research design

Abundant epidemiologic evidence supports an association between higher levels of physical activity and reductions in the risk of death, cardiovascular disease, various site-specific cancers, and other major morbidity (1). To this end, several clinical guidelines underscore the importance of regular physical activity (2–4), recommending 30 or more minutes/day of at least moderate-intensity physical activity on 5 or more days/week or 20 or more minutes of vigorous physical activity on 3 or more days/week. More than half of US adults still do not participate in physical activity at these recommended levels (5). Less publicized in these physical activity guidelines is that the reports from the Centers for Disease Control and Prevention, the American College of Sports Medicine, and the Surgeon General each emphasize the option to accumulate physical activity as nonexercise, or lifestyle, activities, which may also be of shorter duration but greater frequency.

In this issue of the Journal, Mathews et al. (6) examine whether not only regular exercise but also other forms of physical activity are related to total and cause-specific mortality in a large population of Chinese women. Their observation that an increase in regular exercise decreases the risk of death in women is consistent with the broader literature (7). Of greater interest is whether these mortality reductions may extend to more subtle categorizations of nonexercise physical activity, which included other forms of physical activity that occurred in the context of commuting to work, household activities, and other instances that involve walking, cycling, and climbing stairs. Aside from the usual cast of potential limitations in the analyses and study design that were discussed by the authors, this work illustrates some important, lingering issues in physical activity epidemiology regarding the identification and measurement of nonexercise components of physical activity or energy expenditure.

Correspondence to Dr. Howard D. Sesso, Brigham and Women's Hospital, 900 Commonwealth Avenue East, Third Floor, Boston, MA 02215-1204 (e-mail: hsesso@hsph.harvard.edu).
Nonexercise physical activity includes any physical activity beyond recreational physical activity, such as lifestyle physical activity, household physical activity, and occupational physical activity, though there is overlap among these terms. While most epidemiologic studies have focused on the health effects of recreational physical activity, an increasing appreciation for these other components of nonexerciser physical activity has emerged. The difficulty lies in the identification of the components of nonexercise physical activity, our ability to accurately measure these components in an epidemiologic setting, and ensuring that data analyses examine whether this type of physical activity influences disease risk.

What exactly constitutes nonexercise physical activity? Mathews et al. (6) admirably attempt to quantify nonexercise physical activity, but the reality is that the literature at large is relatively inconsistent. Mathews et al. focused their results on total nonexercise physical activity, as well as its walking and cycling components (6). Separate results for household activity were limited to a single comparison, noting a significant 40 percent reduction in mortality risk for women reporting 4 or more versus less than 2 hours/day of household activity. In fact, household physical activity—that encompasses a wide variety of tasks and activities in and around the house—may be underestimated for its potential contributions toward total physical activity levels (8) and health outcomes in women (9). Stair climbing, which may be relevant on the basis of residential and occupational factors, was also not addressed.

The authors attempted to isolate particular types of walking as a form of nonexercise physical activity. Walking is a common, easily achievable form of light- to moderate-intensity physical activity that has been extensively studied for its health benefits in several large cohort studies (10) and incorporated into intervention studies (11). Walking for exercise and walking for work have typically not been distinguished in cohort analyses, instead typically combining all walking into a single global question. While there may be differences in the pace and distance one may walk when exercising versus commuting to work, any differences in exercise intensity are not likely to be great enough to necessitate distinction. If the amount of physical activity expended from walking is great, then it may become increasingly important to distinguish walking for exercise versus other reasons. Alternatively, pedometers and accelerometers (12, 13) help to capture walking distance (or number of steps) along with the total and/or intensity of free-living physical activity, and they may present an effective, low-cost approach to physical activity promotion (14). These devices have yet to be fully utilized in large-scale epidemiologic investigations. When possible, studies should aim to quantify and compare the various types of walking (e.g., for exercise, for transportation, and for other daily activities) for examination of any differential impact on health.

Cycling to and from work and for other reasons, but not for exercise, was also included in the definition of nonexercise physical activity. Impressively, 24.6 percent of women aged 40–70 years residing in urban communities in Shanghai reported nonexercise cycling (6). Factors in the physical environment all greatly influence the opportunity to cycle for reasons other than exercise (15). Cultural and geographic considerations are also relevant. The prevalence of cycling for reasons other than exercise, which would be expected to predominantly consist of cycling to and from work, is likely to markedly differ according to the population under study. What may constitute an integral component of energy expenditure among Shanghai women may not be relevant in the United States and other locations that are dependent upon other forms of transportation.

Do nonexercise components of physical activity contribute meaningfully to total daily physical activity levels? This is difficult to gauge, since the amount of nonexercise physical activity measured in any study is highly dependent on the extent of the physical activity assessment used in each study. Both the absolute amount of nonexercise physical activity and the relative contribution of nonexercise physical activity to total physical activity must be considered. For highly active individuals who regularly exercise, the relative contribution of nonexercise physical activity may not be enough to substantially improve their health further. This question was not specifically examined by Mathews et al. (6); on the other hand, they did assess whether nonexercise physical activity may be of greater importance among less active and sedentary individuals. Women who did not exercise had a lower risk of death with increasing levels of nonexercise physical activity. Because the walking and cycling components of nonexercise physical activity were likely identical to that which may be done during formal exercise, this finding is not necessarily surprising.

The lack of a universal, standard method to assess the various components of physical activity poses a challenge to epidemiologists. In comparison, nutritional epidemiology is largely derived from the development of semiquantitative food frequency questionnaires. While the foods included may differ slightly from one food frequency questionnaire to the next, physical activity epidemiology lacks this sort of predominant measurement technique by which to isolate and measure nonexercise, or lifestyle, physical activity, as well as the individual components that may comprise it. Another challenge is that information collected from study participants on walking, cycling, climbing stairs, and other forms of physical activity may reflect not only recreational physical activity but also nonexercise physical activity. The measurement of physical activity must be explicit and specific to ensure an accurate response, and various methods of physical activity assessment are readily available (16), though they quantify slightly different aspects of physical activity. While more rigorous and objective methods may exist for the measurement of physical activity and physical fitness, the relative ease of collecting self-reported physical activity will remain a primary method by which to quantify physical activity in epidemiologic studies.

Intervention studies have demonstrated that walking, climbing stairs, and other short bouts of moderate-intensity physical activity related to lifestyle physical activity have been associated with improvements in peak oxygen consumption, physical fitness, body composition, and lipid levels (17, 18). Long-term compliance, however, remains a challenge and should factor in the methods used in physical activity intervention studies (19). More research is
needed to understand how nonexercise physical activity may be translated into measurable clinical effects and whether a certain threshold may be required. Despite consistent, well-elucidated findings of an inverse association between recreational physical activity and both major morbidity and mortality, the prevalence of physical inactivity remains fairly constant in the United States (5). For sedentary individuals, any increase in physical activity has the potential to yield health benefits. Mathews et al. (6) have provided additional data to support the notion that physical activity to increase longevity may not just include structured exercise but rather increases in nonexercise physical activity that correspond with changes in everyday lifestyle habits. Examples of such changes may include trading a car for a train or bicycle to commute to work or deliberately selecting a parking spot far away from a store. Our challenge is to more accurately and consistently measure and describe these more subtle components of nonexercise or lifestyle physical activity to understand its potential promise in disease prevention.

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REFERENCES