Sedentary Behavior

What's in a Definition?

To the Editor: Over the past decade, we have witnessed an increasing number of observational research studies investigating the impact of sedentary behavior on health; these studies were recently summarized in a systematic review.[1] Although we recognize the need and importance of this review and support the authors' conclusions, we feel that the review succumbed to a common pitfall when trying to disentangle the effect of sedentary behavior from that of physical activity.

Sedentary behavior commonly is defined as a MET of 1.5 or less.[2] This definition corresponds to activities undertaken while sitting, such as watching TV; of importance, any standing activity (unless absolutely still) is classified as nonsedentary. Some have suggested that sedentary behavior is a paradigm in its own right, distinctive to that of moderate- to vigorous-intensity physical activity (MVPA), with independent effects on health.[3] This new paradigm is based on the fundamental principle that sedentary behavior is not simply the absence of MVPA as the authors acknowledge.[1]

The importance of this principle can be elucidated by a study that we feel was erroneously included in the review. Graff-Iversen et al.[4] investigated whether occupational activity was associated with overweight and mortality. Occupation was classified into one of four categories: (1) mostly sedentary, including light manual labor; (2) work requiring a lot of walking; (3) work requiring a lot of walking and lifting; or (4) heavy manual labor. Overweight and mortality rates were then assessed across the different categories. In essence, this is an ordinal scale of physical activity intensity; that is, we can assume that Group 2 engaged in a higher intensity of work-related physical activity than Group 1 and so on. However, this is not an ordinal scale of sedentary behavior. For example, workers engaged in heavy manual labor could spend a proportion of their work hours sedentary (e.g., sitting), whereas those in Group 1 (e.g., security guard or bartender) could, potentially, not spend a minute sedentary because they stand throughout their working day. Therefore, we cannot make any inferences about the impact of sedentary behavior from this study.

Others have made similar errors: For example, a recent article commenting on the sedentary behavior paradigm suggested that individuals could reduce their sedentary behavior by taking the stairs rather than lifts or escalators[5]; however, as all these activities are likely to be nonsedentary (lifts and escalators involve standing), it was not a recommendation to reduce sedentary behavior but to increase physical activity. Although this distinction is subtle and may seem pedantic, it is vitally important if the area of sedentary behavior is to progress.

In order to convince the wider medical establishment of the potential importance of sedentary behavior, researchers need to be very clear and precise in their definition and measurement. An established taxonomy and consensus on the measurement and outcomes in sedentary behavior research would greatly aid this process. The benefits of physical activity are unequivocal, widely accepted, and do not, generally, need replicating with further observational research. In contrast, the benefits of reducing sedentary behavior, such as by sitting less and standing more, are equivocal and incompletely understood and therefore require further research of all kinds.

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Author Response

In our review,[1] we examined the longitudinal relationship between sedentary behavior and health outcomes in adults. The main reason for this review was the increasing awareness and literature on the adverse health effect of sedentary time, independent of physical activity. We followed a systematic approach, including predefined criteria for the literature search, selection of studies, and subsequently their methodologic appraisal. To be included in the review, the study had to examine the prospective relationship between sedentary behavior and a health indicator. The definition we applied for *sedentary behavior* was the one proposed by Pate et al.[2]: "Sedentary behavior refers to activities that do not increase the energy expenditure substantially above the resting level and includes activities such as sleeping, sitting, lying down, and watching television, and other forms of screen-based entertainment; or those activities that involve energy expenditure at the level of 1.0-1.5 metabolic equivalent units." In the process of study selection, we excluded many articles that used the term sedentary behavior, while in fact the authors meant lack of or insufficient physical activity. This confirms the frequent inappropriate use of sedentary behavior.

Yates et al.[3] support our conclusions, but questioned the inclusion of one article in our review because of the use of having a sedentary job as measure of sedentariness. Graff -Iversen et al.[4] classified occupation into one of four categories: (1) mostly sedentary, including light manual labor; (2) work requiring a lot of walking; (3) work requiring a lot of walking and lifting; and (4) heavy manual labor. We agree with Yates et al. that this is not an ordinal scale of sedentary behavior. We also agree that there is much confusion and misclassification around sedentary behavior, and that researchers should consider the distinctiveness between the effects of sedentary behavior and physical (in)activity. However, we still believe the article of concern has been included appropriately. This can be explained by the definition of sedentary work applied and the examples of occupations given, which were office work, watchmaker, mounting of instruments.[4] Although we acknowledge that the classification of occupational physical activity into the four categories, including sedentary work as one category, is sensitive for such misclassification, we trust the sedentary work category meets the definition of Pate et al.[2] The examples of professions included in this category namely include work that is performed mainly sitting. The examples given by Yates et al. (security guard or bartender) include mostly standing and walking work and would fall under category 2, namely, light occupational physical activity.

Considering the above, it is clear that there is still much work to do as to the topic of sedentary behavior. We would like to take this opportunity to plead for further research into the health effects of sedentary behavior and the development of valid and reliable measures of sedentary behavior.

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