Reviewer's report

Title: Intensity and timing of physical activity in relation to postmenopausal breast cancer risk: the prospective NIH-AARP Diet and Health Study

Version: 1 Date: 3 August 2009

Reviewer: Evelyn Marielle Monninkhof

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General comments:

This is a well written paper on an import topic: the intensity of timing and physical activity in relation to postmenopausal breast cancer risk. This information is important for preventive strategies and to get more insight in the biological mechanisms by which physical activity influences breast cancer risk. The study is performed in a large cohort of postmenopausal women of whom extensive information on potential confounders and effect modifiers is available. The analytic methods and presentation of the results are appropriate, even as the discussion of the results.

My remarks concern the physical activity measure and whether a cohort study is the optimal design to study the effect of intensity of physical activity on breast cancer risk.

1) Physical activity is measured with a short and simple questionnaire: 2 questions with pre-specified answer categories (duration per week of light and moderate-to-vigorous activities). By merging activities of varying intensities (e.g. golf = 4.5 MET and swimming= 8 MET) to assess moderate-to-vigorous activities, misclassification of intensity is introduced and power is lost. Moreover, the authors were not able to distinguish between the separate effects of moderate and vigorous activities on breast cancer risk. To a lesser extent, the same problem applies for light activities. Furthermore, misclassification might be introduced by the range of durations of activities in the pre-specified answer categories (e.g. 1-3 hours per week).

2) Since the risk of recall problems and misclassification is higher for activities of light and moderate intensities (like walking and household activities) compared to vigorous activities, it is difficult to get evidence on the most optimal intensity of activities for breast cancer risk in a cohort study. Intervention studies (RCTs) in which various intensities of physical activities will be compared on breast cancer biomarkers might be adding more to the evidence.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable
**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests