Reviewer's report

Title: Association of total daily physical activity with disability in community-dwelling older persons: a prospective cohort study

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Reviewer: Claudia Drossel

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BRIEF SUMMARY: The current study analyzes a subset of data from the Rush Memory and Aging Project, a longitudinal study of aging and functional status. Eight-hundred and seventy adults, on average about 82 years old at baseline, participated in ten-day actigraphy and reported exercise/leisure activities as well as degree of independence with basic activities of daily living. The authors found that, in an adjusted logistic regression model, with the report of dependence on any ADL as the outcome, greater total physical activity was associated with a lower likelihood of reporting disability. Additional longitudinal analyses (adjusted discrete time Cox proportional hazard model) of data from 584 participants without a self-reported disability at baseline suggested that, within a period of 3.4 years on average, the hazard of self-reported disability decreased by 25% with each 105 count/day of total daily physical activity. Total daily physical activity and self-reported physical activity were independent predictors of incident disability. The authors concluded that an active lifestyle in general, regardless of exercise, may promote independence.

IMPACT

This study is very important in its goal, to clarify the relationships among total activity data obtained via accelerometer, self-reported activity level, and prospective functional status. Statistical analyses, with inclusion of covariates, fit the goals of the study. The interpretation of the results, that not only exercise but physical activity of any kind or intensity may reduce incident disability, has wide-ranging public health implications.

Reading the study left me with questions I recommend be answered prior to publication. To facilitate the authors' interpretation of my suggestions, I am labeling them MCR (major compulsory), MER (minor essential), and DR (discretionary) revisions below.

METHODS

(1) Participant selection (MER). (a) How many participants lived in continuous care retirement facilities and how many lived in their homes? (b) As many lifestyle variables correlate with educational level, could authors please comment on the selection of participants, who seemed to have an unusually high educational level (mean = 14.8 years, SD = 3.0)?
(2) Longitudinal design (MER). How many annual evaluations did participants complete, and what was the span of follow-up (e.g., x evaluations in y years)? What was the distribution of follow-up evaluations and durations?

(3) Actigraphy (MCR). Please clarify the methods and provide details regarding the “quantification of total daily physical activity,” including information regarding reliability and validity. Did participants wear the Actical instruments during the daytime only? What were the designated wearing times? What amount of wearing time was considered adherent to the protocol? How were valid sedentary hours (“values of zero reflect no activity”, p. 7) distinguished from non-wear times or non-adherence? Why was the non-dominant wrist chosen, rather than the hip? What software was used to interpret the raw data? Buchman, Wilson, & Bennett (2008), cited as a reference, do not provide sufficient information and discuss a sample different from the one included in the current study (N = 521 vs. N = 584).

Regarding the authors’ research question, it seems important to determine whether actigraphy outcomes and ADLs are independent. Could it be that actigraphy actually overlaps with and measures the completion of activities of daily living? Considering individuals who do not self-report any additional leisure/exercise activities, could actigraphy have recorded completion of activities of daily living exclusively, thereby generating the relatively low observed correlation between self-report of leisure/exercise and actigraphy, yet the high predictive value of actigraphy with regard to ADLs?

RESULTS

(1) Participants (MER). (a) Please include an additional Table that details Participant Characteristics by Incident Disability – Characteristics at Follow-Up, including the follow-up duration (mean, standard deviation). (b) Please provide the age range/frequency distribution at baseline and follow-up, given that the introduction notes paucity of data related to “persons over the age of 80” and the discussion relates the results to “very old adults.” (c) Please provide the distribution of activity counts/day at baseline and follow-up for the 584 participants; see Buchman et al. (2008) cited in text as a model.

(2) Statistical analyses (DR). Please provide visual representations of the Cox hazard models, to enhance the impact of results on the reader.

DISCUSSION

Actigraphy (MER). Given that “measures do not directly respond to observed movements but are proportional to the degree and intensity of movements as reflected in recorded activity curves,” what is the clinical significance of the data? How would a reader translate the difference between the 10th percentile (1.01 x 105 counts/day) and the 90th percentile (4.72 x 105 counts/day) into clinically meaningful recommendations for titration of intervention, as suggested? Is there a counts/day cut-off for sedentary lifestyle, given the concurrently available self-report data? Authors argue that actigraphy “captures movement more precisely … and results in a more robust measure of effect size” than self-report. However, no data on reliability/validity are provided (see comments in Methods
above).

General comments (DR). It seems that the discussion repeats parts of the introduction. Authors may consider omitting repeated materials and, instead, spend more time on the implications of the finding that cognitive limitations and dementia diagnoses did not affect the relation between physical activity and disability. This is very interesting and potentially broadens clinical applicability of the findings.

Thank you for giving me the opportunity to review this manuscript.

**Level of interest:** An article of importance in its field

**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.