Author's response to reviews

Title: Associations between VO2max and vitality in older workers: a cross-sectional study

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**Manuscript title:** Associations between VO2max and vitality in older workers: a cross-sectional study.

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**Dear Editor,**

First of all, we would like to thank you and the reviewers for their time and effort in our manuscript. We are very pleased with the opportunity to revise the manuscript according to their suggestions. Herewith, you receive our revised manuscript in which we incorporated the comments of the reviewers. Also, a point-by-point response has been attached, in which we address each comment of the reviewer. We believe that the manuscript has improved and hope you agree with us, and we hope that the revised manuscript is acceptable for publication in your journal. We are looking forward to hear from you.

Yours sincerely, on behalf of the co-authors,

J.E. Strijk, MSc and A.J. van der Beek, PhD

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Reviewer's comments to authors: referee 1

Title: Associations between VO2max and vitality in older workers: a cross-sectional study

Reviewer: Maria Mc Namara

Reviewer’s report:
I deem this paper as publishable with minor revisions.

Authors response: We thank the reviewer for the constructive comments and the needful stylistic suggestions. We changed the manuscript according to these suggestions.

Minor essential revisions

1. Abstract
A short sentence indicating that vitality contributes to healthy aging would be good here. This is in the background section but it would be good in the abstract also (between the first and second sentences).

Authors response: We agree with the reviewer and have inserted therefore an additional sentence in the abstract: ‘One concept that is assumed to be closely related to, and may therefore influence healthy ageing, is vitality’, on the place the reviewer suggested.

2. Background
Paragraph 4
– line 9: insert ‘with’ instead of ‘to’ so that it reads ‘associated with vitality’
– lines 10-11: Do the authors mean to say that the association between VO2max and vitality has not been studied in an older sample? or not at all? From reading lines 10 and 11 it sounds like the association between VO2max and Vitality has not been studied at all. However, the authors mention other studies in the discussion that examine the association between VO2max and various measures of vitality in different samples. I am a bit confused here. I think this should be clarified.

Authors response: We agree with this comment and therefore changed line 9 as the reviewer suggested. Regarding line 10-11, we clarified the sentence that this association has not been studies ‘among older workers’.

3. Methods
Study population
– at the end of this paragraph the authors should state the final number of eligible participants. I know this is stated in the Results section but I think the actual ‘n’ should be noted here.

Authors response: The final number of eligible participants has been placed to the section ‘study population’ of the methods.

4. Measurements
Vitality
– lines 3 and 4: The authors talk of the ‘specific occupational setting of the study, namely older workers’. Is this a scale developed specifically for use with older workers? Or is it for use in an occupational setting? And if so, any specific
occupational setting? Could this be clarified please? I am not familiar with this scale.

**Authors response:** Changed occupation into occupational. To clarify the comment regarding line 3-4: the UWES (Utrecht Work Engagement Scale) is a questionnaire to measure work engagement in the general working population. Vitality is one of the three subscales of the UWES, and was used in this study to assess occupational related vitality in older workers. To clarify this in the manuscript, we added in the first sentence of the third paragraph that the UWES is used to measure work engagement in ‘the general working population’.

**Paragraph 2**
– line 7: it would be helpful to note here what constitutes a high or low score.

**Authors response:** Good point, we added the sentence: ‘A higher score indicates a better vitality’ at the end of this paragraph.

**5. Covariates**
– line 1: replace ‘by’ with ‘using’
– line 2: could the authors please explain what is meant by ‘low/middle/high’ educational attainment?

**Authors response:** We replaced ‘by’ with ‘using’. Regarding line 2, we corrected the explanation of the categories into: education (low = elementary or less, medium = secondary education, and high = college/university).

**6. Statistical analysis**
**Paragraph 1**
– it would be good if the authors referred to the tables here.
– lines 9-11 should be reworded. A suggestion may be…..“To be classified as a confounder, a variable needed to result in at least a 10% change in r## when included in the regression model”.
– Was this the authors own criteria? Or has it been used elsewhere? It would be good to state the origin of this benchmark.
– Lines 12 – 13: which interaction variables were tested? And why? Did the authors use Analyses of Covariance? It would be good to state this.
– Lines 13 and 15: use p<0.10 and p<0.05 and re-word.

**Authors response:** Referred to the tables in the text and changed line 9-11 as the reviewer suggested. Regarding the 10% change of the beta, this criteria was based on epidemiological literature of Prof. dr. JWR Twisk. To clarify this, we stated in the text that this was based on Twisk, including the references: 27) Twisk JWR. Applied multilevel analysis. Cambridge: Cambridge University Press; 2006, and 28) Twisk JWR. Introduction in de Biostatistiek [Introduction into Biostatistics]. Maarsen: Elsevier Gezondheidszorg; 2007. As to line 12-13, we added the variables which were tested including an explanation. As this is a cross-sectional study, we did not use analyses of covariance as defined by the follow-up measure as the dependent variable and the baseline measure as the independent variable (covariate). If the reviewer means whether we adjusted for covariates, yes we did. The potential effect modifiers were tested using linear regression models consisting of the interaction term (effect modifier * independent variable), the independent variable and the effect modifier. We changed the explanation in the text to clarify this. Line 13 and 15 are changed and re-word as the reviewer 2 suggested.

**7. Results**
**Paragraph 1 - Study population**
It would be useful if the authors could elaborate on what the mean scores for
UWES and RAND-36 indicate, at the end of this paragraph.

**Authors response:** This is indeed a good substitute and therefore the following sentences were added: *Workers had a mean score of 3.5 (SD=0.9) on the UWES vitality scale, which corresponded with the category ‘average’ according to the UWES classification. The mean score on the RAND-36 vitality scale was 66.4 (SD=16.9), which corresponded with the average norm score of this scale.*

Paragraph 2 – Correlations VO2max and vitality
– line 2 – capital ‘T’ for table

**Authors response:** We now used a capital ‘T’ for the tables.

– lines 3, 4 and 5: could the level of probability be inserted here? And r values rounded to 2 decimal places.

**Authors response:** We added the probability levels and rounded the r values to 2 decimal.

Paragraph 4
– line 5: I presume that age, gender and chronic diseases explained more than 10% of the variance and were therefore categorised as confounding variables. It would be good to restate this so as to remind the reader.

**Authors response:** The reviewer is right. We changed the sentence into: ‘Age, gender, and chronic diseases appeared to be confounders in this association since these variables caused a more than 10% change of the regression coefficient after adding to the regression model’

8. Methodological considerations;
Measuring two constructs of vitality
Paragraph 1
– line 2: please give the probability level.

**Authors response:** Changed line 2 as suggested.

**Minor Discretionary Revisions**
These are mainly typographical errors and stylistic suggestions.

1. Background

Paragraph 1
– Line 1: insert ‘an’ instead of ‘the’
– Line 4: insert ‘services’ instead of ‘care’
– line 5: remove the ‘s’ at the end of ‘cardiovascular diseases’
– line 6: substitute ‘density’ for ‘mass’
– line 8: delete ‘a’ in front of ‘good health’

Paragraph 2
– line 2: remove “As to” and replace with “Regarding”
– line 3: replace ‘less feelings of fatigue’ with ‘lower levels of fatigue’

Paragraph 3
– line 2: add ‘s’ to ‘component’ to make it plural
– line 5: replace first word ‘for’ with ‘of’ so it reads ‘reduced risk of suffering symptoms....’
Paragraph 4
– line 9: insert ‘with’ instead of ‘to’ so that it reads ‘associated with vitality’

2.Methods
Study population
– line 4: add ‘s’ to ‘hospital’ to make it plural
– line 7: add ‘ly’ to ‘physical’ so that it reads ‘physically active’
– line 11: replace ‘have a risk for’ with ‘be at risk of’
– line 12: replace 1st word of line 12 (‘of’) with ‘or’

3.Measurements
Paragraph 2
– line 7: remove one bracket at the beginning of the sentence.

4.Discussion
Paragraph 2
– line 2: capital ‘F’ for ‘Finish’
– line 5: replace ‘among’ with ‘of’ so it reads ‘another study of middle-aged ….’
– line 5: replace ‘men’ with ‘male’
– line 6: replace ‘difference in gender..' with ‘gender focus’
– line 11: replace ‘feeling of low energy....’ with ‘low energy levels..’
– line 15: replace ‘among’ with ‘of’
– line 15: add ‘ly’ to ‘relative’
– line 18: replace ‘there have not been published any studies....’ with ‘there have been no published studies....’

5. Methodological considerations;
Paragraph 3
– line 4: replace ‘oppositely’ with ‘opposite to the’

Authors response: All typographical errors and stylistic suggestions mentioned above have been changed as the reviewer suggested.

Level of interest: An article of importance in its field
Quality of written English: Needs some language corrections before being published
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
Reviewer’s comments to authors: referee 2

Title: Associations between VO2max and vitality in older workers: a cross-sectional study

Reviewer: Robert Newton

Reviewer’s report:
Fitness appears critical to both physical and mental health. This paper adds to the body of knowledge supporting the importance of staying active throughout life by adding evidence for older working people. The relationship between vitality and estimated maximum aerobic capacity suggests older workers should try to maintain recommended levels of physical activity if they are to feel more energetic and less tired. Such a finding lends support for workplaces to provide opportunities and support for their older workers to exercise as this should translate to greater energy in the workplace, satisfaction and better performance. There are some limitations to the study. Actual measurement of VO2max and BMI may have increased the strength of association but as this is part of a much larger study, the authors acknowledge that this was not feasible.

Authors response: We thank the reviewer for his positive and valuable comments and useful minor suggestions to further improve our manuscript.

Major Compulsory Revisions
None

Minor Essential Revisions
1. page 4 suggest change to "...major academic hospitals in the Netherlands..."

2. page 4 suggest change to "...if they had not completed at baseline a 2-km UKK walk test..."

3. page 6 Try not to ascribe actions to inanimate objects. Tables and figures cannot really "show" or "present" anything. Authors can "present" in a table. This needs to be changed for each instance. e.g. "Results of crude and adjusted linear regression analyses for the association between VO2max and the RAND-36 Vitality Scale are presented in table 2."

4. page 7 - suggest change to "...cross-sectional Finnish study,..."

Authors response: We made the changes as suggested by the reviewer (point 1-4).

5. page 8 - why did you not measure height and weight as they have large impact on VO2max estimation and are so easy and quick to measure?

Authors response: Indeed, measuring body height and body weight is an easy and quick measure. At the start of the Vital@Work study we discussed this issue and came to the conclusion that for practical reasons the only option for measuring height and weight was at the 2-km UKK walk test. Since only a subsample of the total study population completed a 2-km UKK walk test, and subjects had to be measured with clothes on because the walk test was outside, we decided to assess self-measured body height and body weight, to calculate BMI, using a questionnaire. Furthermore, as stated in the discussion it is known from literature that self-measured BMI is reasonably accurate. We added to the discussion that these quick and easy measures were self-reported for practical reasons:
Furthermore, although measuring body height and body weight are quick and easy measures, for practical reasons self-reported body height and body weight were in this study used to calculate BMI, and subsequently VO$_{2\text{max}}$.

6. page 8 suggest change to "involved in the development of the Utrecht BurnOut Scale"

Authors response: We made the change as suggested.

7. page 9 - "...considered work engagement to be the positive oppositely concept of burnout and should therefore be measured with different instruments..." This sentence must be rewritten as it does not make sense. What are you trying to say here?

Authors response: We agree with this comment and removed the sentence, since the idea is explained in the following sentence (p.9, third paragraph, line 3-5): ‘The UWES was developed by reversing the three negative dimensions of the UBOS (i.e. exhaustion, cynicism, and professional efficacy) into the three positive dimensions of the UWES (i.e. vitality, dedication, and absorption’.

Discretionary Revisions
page 3 - suggest change to "...promote and maintain good health."

Authors response: We changed the sentence as suggested.

page 3 - "it is hypothesised that VO2max is related to vitality." - It would seem more logical to state that vitality is related to VO2max as this was the premise of your introductory remarks.

Authors response: Good point. We understand that paragraph 1, line 7,8 could imply that vitality is related to VO2max since it was stated that ‘vitality was characterised by feeling strong and fit. Furthermore, the direction of the relationship is still unclear, so both statements (VO2max is related to vitality as well as vitality is related to VO2max) may be true. Therefore, we changed the word ‘related’ into ‘associated’ making no suggestions out the direction of the ‘relation’.

page 6 suggest change to "...less than 0.05 was applied as the criterion to indicate..."

Authors response: We changed the sentence as suggested.

page 6 suggest find a better reference than the "Physical Fitness Specialist Certification Manual" for normative values of VO2max.


page 7 - citation Puetz should place the reference immediately after author name e.g. Puetz[13]

Authors response: We added the reference immediately after authors name, as suggested.

page 8 - suggest change to "...have not been any published studies investigating..."
Authors response: We changed the sentence as suggested.

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

Quality of written English: Needs some language corrections before being published

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