Reviewer’s report

Title: ASSOCIATION BETWEEN CARDIORESPIRATORY FITNESS AND METABOLIC RISK FACTORS IN A POPULATION WITH MILD TO SEVERE OBESITY

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Reviewer: Heini Wennman

Reviewer's report:

Review of manuscript OBSY-D-17-00078

The authors present their article with the title "Associations between cardiorespiratory fitness and metabolic risk factors in a population with mild to severe obesity". The topic is very interesting and important and it constitutes a relevant issue in the current society. The population studied represents the targeted group i.e. persons with higher degree of obesity and the sample size is good. Availability to data on cardiorespiratory fitness from a maximal exercise test strengthens the study. However, there are some severe limitations in the paper that I encourage the authors to give careful consideration and therefore I do not support a publication of the manuscript.

The title is appealing and clear, but when it comes to the introduction and the aims of the study it seems that there is a lack in the focus and the arguments to support this study are not fully convincing. It is suggested that the authors revise the order of the text in the introduction, and also clarify the content to more clearly present what is known and what still needs to be known on the topic to make a more solid claim for their study. For example, there has been a discussion "Fat or Fit" going on in the literature for a while already, and this could be good to highlight also in the introduction. It is also advisable that the authors avoid using the term "effect" in the text, particularly in the abstract, since this gives a notion about causality which is not studied in this current cross-sectional design.

The most severe limitation of the manuscript is the methods and the conclusions. Currently the figures, the results and the conclusion of the paper do not seem to match and the final conclusions even feel wrong relative to the data that is presented. Simply, for the reader to understand what has been done methods are too briefly presented and more details need to be given about the statistical testing. It seems from the figures that ANOVA testing with least square means has been applied and that many pairwise comparisons also have been made. However, it is not enough to state in the methods only that Least Squares means were used. All the essential information regarding the testing needs to be reported to the readers. As a consequence, when there is not enough information about the statistical tests, it is hard to understand the results only based on the figures and it seems that the figures and the presented conclusions do not match. This implies that the authors have made wrong interpretations of the
results. As an example, the authors state that: "In females, a trend towards greater benefits of fitness on HDL in those with severe than mild obesity was seen (p=0.0581)." However, based on the figure, the magnitude of the difference between fit and unfit groups in different obesity categories cannot be concluded on. Furthermore, the BMI*Fitness interaction term that shows a borderline significance for HDL in women (p=0.0581), only describe that the association between fitness and HDL is not similar in across BMI groups, not the trend either over BMI or fitness. The authors conclude that the association between fitness and health may be similar if not augmented in individuals with severe obesity as compared to mild obesity but the figures do not support such a conclusion because it is not possible to see if the difference between unfit and fit groups is bigger or smaller in some obesity group than another. The only significant pairwise comparisons between unfit and fit group seems to be regarding HDL in the severe obesity group and regarding WC in moderate and severe obesity in women.

Because the sample is a selected clinical population consisting of obese subjects who have attended a Medical Clinic perhaps in order to receive treatment for their obesity, the analysis approach of the paper may need to be reconsidered. Instead of averages, maybe it would be better to look at the influence of fitness on the risk of having a poor instead of good level of the different metabolic risk factors? Looking at table 1 and also the figures, it seems that the participants to most part have a stable metabolic profile. As an example, the average blood pressure is above 130/80mmHg only in the unfit-severe obese group. Based on the mean values it seems that medication plays an important role here and how the impact of medication is best dealt with in this sample needs careful consideration. It is not reported how many of the participants were/are on medications for blood pressure, lipids or diabetes even if the authors state that they control their models for medication.

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

No

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

Yes

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

No
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