

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Obesity prevalence in Brazilian firefighters and the association of central obesity with personal, occupational and cardiovascular risk factors: a cross-sectional study
AUTHORS	Damacena, Fernanda; Batista, Thatiany; Ayres, Lorena; Zandonade, Eliana; Sampaio, Karla

VERSION 1 - REVIEW

REVIEWER	François Trudeau Département des Sciences de l'activité physique Université du Québec à Trois-Rivières Québec, Canada None declared only that we research and publish in the same field as the authors.
REVIEW RETURNED	01-Aug-2019

GENERAL COMMENTS	<p>General impression: interesting paper with a good number of participants. Standardize the term subjects to participants. Sometimes you use one sometimes the other term. No major problem with the English but minor revisions needed. I identified some of them in the different section.</p> <p>Abstract: Page 2 lines39-43: I suggest rewriting this sentence. The authors suggest that «Aging and cardiovascular risk factors...» be addressed. Aging (in fact age is the better term) is an unchangeable risk factor. Therefore, how can it be addressed by a health prevention program? Controllable risk factors should then be those to be targeted.</p> <p>Introduction: Use the same wording as in the abstract for the purpose of the study. Methodology: It would be interesting to compare the sample studied with the Brazilian population corresponding to the sample. The sample include only firefighters in urban areas. Is it typical of military firefighters in Brazil? Page 3 line56-57: what do you define as Leisure practice? Of physical activity? Also found in tables Page 4 line 51 Maximal oxygen consumption instead of maximum consumption of oxygen. It should expressed as ml·min⁻¹·kg⁻¹. Page 5 line 38: change « Involvement of the patient and the public» to Involvement of the participants and the public Page 6 line11: established</p>
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	<p>Discussion</p> <p>Line 57-58: In fact, all the references mentioned refer to USA studies, so you can change other countries by the USA.</p> <p>Page 7 line 55: «... reduced physical fitness among Brazilian firefighters within the overweight...»</p> <p>Page 8 line 11: Donovan and not Donavan</p> <p>line 31-32: acknowledged d is missing</p> <p>Please discuss and compare with the paper from Nogueira, which address a similar population. What is the difference between this paper and yours?</p> <p>Nogueira, E. C., Porto, L. G. G., Nogueira, R. M., Martins, W. R., Fonseca, R. M., Lunardi, C. C., & de Oliveira, R. J. (2016). Body composition is strongly associated with cardiorespiratory fitness in a large Brazilian military firefighter cohort: the Brazilian firefighters study. <i>The Journal of Strength & Conditioning Research</i>, 30(1), 33-38.</p> <p>Another relevant papers from our team: Gendron, P., Lajoie, C., Laurencelle, L., & Trudeau, F. (2018). Cardiovascular disease risk factors in Québec male firefighters. <i>Journal of occupational and environmental medicine</i>, 60(6), e300-e306. Compared to our paper, yours have the advantage of many objective and not self-reported (e.g. body composition)</p> <p>You have very interesting data on body composition that give different pictures according to the measure used. I suggest that you correlate results from WC, %fat and BMI to see It is likely that you have part of your participants that are muscular. Anyway, you should analyse these data deeper to better understand the relationship between those 3 measures of body composition in firefighters.</p> <p>You should compare with e reference population corresponding to the same age group of Brazilian men. Are firefighters better or worst than their corresponding peers in terms of risks factors?</p> <p>Reference list:</p> <p>Please review for minor corrections: e.g. ref #8: the abbreviation is not Env Heal but Environ Health</p> <p>Also ref# 24, 39, 48: the 1st letter of the each word of the article title should be in lower (except for the 1st word)</p> <p>Tables:</p> <p>instead of using until 30 (years) use under</p> <p>some words in Brazilian are still present: e.g. page 15 line35 (operacional) and in table 4</p>
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REVIEWER	Brittany S. Hollerbach Skidmore College, USA
REVIEW RETURNED	16-Sep-2019

GENERAL COMMENTS	<p>Overall, the manuscript examines an important issue in occupational health. However, the paper needs editing by a native English speaker for clarity. I've attached a number of comments by page/line and hope this is helpful and constructive for the authors.</p> <p>Obesity prevalence and its associations with personal, occupational and cardiovascular risk factors: a study in Brazilian firefighters.</p> <p>Reviewer Comments</p>
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	<p>Overall, the paper is well-written however, I suggest a native English speaker proofread for clarity. There are a couple sentences that don't make sense as written and there are a few grammatical/spelling errors. Below are a list of points that need further clarification. I believe with some revisions this paper is important and worthy of publication.</p> <p>Abstract</p> <p>Page 2, Line 30: The abstract presents an incomplete picture of the results. The first sentence of the Results section of the abstract is misleading. The authors present the prevalence of overweight and obesity classified by BMI and then only the prevalence of obesity measured by body fat % and waist circumference. However, it appears they present the prevalence of overweight and obesity by all three measurement types. Then only the OR associated with the waist circumference measure (central obesity) are presented in the results section of the abstract. This is an incomplete picture of all that was examined in the paper.</p> <p>Page 2, Line 40: The abstract's conclusion is a bit vague in summarizing the results.</p> <p>Page 2, Line 48: Should read "Strengths and Limitations..."</p> <p>Page 3, Line 4: Should this read "in the next year"?</p> <p>INTRODUCTION</p> <p>Page 3, Line 17: Reword this sentence for clarity.</p> <p>Page 3, Line 14: "...with nearly a 7 fold increase..."</p> <p>METHODS</p> <p>Page 3, Line 44-46: What are "trained health professionals"? I suggest the authors add a short description of the certification required by these individuals.</p> <p>Page 3, Line 49: Was data anonymous/de-identified when given to researchers?</p> <p>Page 3, Line 57: More explanation is necessary for the "lifestyle" variable. I'm not sure what this variable explored. What questions were asked regarding "religious and leisure practices"? Is this a validated measure?</p> <p>Page 4, Line 2: Was there any age restriction when examining the data?</p> <p>Page 4, Line 11: "until" should be "less than"</p> <p>Page 4, Line 14: Again, "until" should be "less than". It's interesting that the authors categorized monthly income. I am more familiar with income being represented annually. I suggest the authors check the current literature to see which way is most common to present income data.</p> <p>Page 4, Line 24: I wonder if "inner of the State" should read "inner city"? Again, I think some revision by a native English speaker may make this section more clear.</p> <p>Page 4, Line 25: "exerting" should maybe be replaced with "physical"</p> <p>Page 4, Line 39-40: The first sentence needs editing for clarification; it does not make sense to me the way it is written. What does it mean "when the military had no religion"? Again, what are leisure habits? How was this measured? Was it a validated questionnaire?</p> <p>Page 4, Line 45: It is unclear from the methods section if the tests used to gather information were validated/used in previous research. How was self-reported physical activity measured? (Ie: STROBE Item 8: Describe assessment methods)</p> <p>Page 4, Line 51-52: You might explain the Cooper's Test a little here for those that are unfamiliar. I believe it is similar to the Army PT test, with push-ups, sit-ups, and a run?</p>
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	<p>Page 4, Line 56: "...firefighting duties a minimum of 12 METs of effort is recommended..."</p> <p>Page 4, Line 60: I believe the sentence should read: "Individuals were weighed on a scale..."</p> <p>Page 5, Line 2: "BF% was derived..."</p> <p>Page 5, Line 33: Why were variables with $p \leq 0.20$ included in the model? Should this be $p \leq 0.05$?</p> <p>Page 5, Line 38-43: The authors may need to include a statement about the confidentiality of their subjects in this section about involvement and the public.</p> <p>Page 5, Line 51-53: 108 is a rather large sample of women firefighters. I would be interested to see the results of their data in a future study.</p> <p>Page 6, Line 3: I believe "working time" should be "years of service" (referring to how long a firefighter has been on the job). In general, the methods section and findings should be presented in past tense.</p> <p>Page 6, Line 16: The way the authors present the prevalence of overweight/obesity is confusing. This is similar to the way this is presented in the abstract and my comments above. Cut-offs for overweight and obesity categories are mentioned for BMI, but only obesity was categorized with the other methods. The wording at first makes it seem that BMI greatly overestimated obesity, but a second read shows that BMI was referring to both overweight and obese individuals and the other two methods were referring only to obesity. I suggest either presenting overweight and obese data or just obese data for all three methods of body composition for consistency.</p> <p>Page 6, Line 35: It is interesting to refer to single individuals as "bachelors", I believe in the literature the term "single" is usually used. Check to current literature for consistency.</p> <p>DISCUSSION</p> <p>Overall, the discussion section seems very long. Check journal word/page/section requirements.</p> <p>Page 6, Line 49-50: I would not refer to a "low prevalence" of obesity among this sample. More than a quarter of the sample was considered obese. And, according to BMI, when combined with overweight individuals, that represented nearly 60% of the population. There may be a better way to discuss the findings in comparison with the country as a whole.</p> <p>Page 6 Line 57- Page 7 Line 2: This part of the discussion is confusing. I believe the authors are presenting that this population had a lower than expected prevalence of overweight and obesity however, the last sentence refers to the BMI findings (which I'd assume are similar to the other findings) and state that this is "in tune with other populations of firefighters". So overall, I'm confused by the message.</p> <p>Page 7, Lines 4-21: This whole paragraph is hard to read and jumps from idea to idea. I suggest presenting like-ideas together, then opposing points. For example, I would present data that suggests that BMI overestimates obesity and then follow-up with research suggesting the opposite. I'm assuming that the point of this paragraph is to justify using waist circumference as the main outcome measure, something that probably should have been done in the methods and not again in the discussion.</p> <p>Page 7, Lines 41-60: There are numerous variables where the authors have provided a previous definition and yet write out the whole word/words here. Be consistent with use of abbreviations.</p> <p>Page 8, Lines 4-8: If statistical analysis found that after adjusting for confounders, variables were not significant, statistically</p>
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	<p>speaking, there is no relationship between those variables. Therefor, I believe the authors present an unclear picture of their results because of the way they are presented in the Discussion.</p> <p>Page 8, Lines 4-28: I believe this paragraph may be unnecessary considering the authors are unable to gauge the prevalence of metabolic syndrome among this population. I believe it is an important point to include these variables in future study, but this point probably does not need an entire paragraph.</p> <p>Page 8, Lines 39-47: I believe the cross-sectional nature of the study should also be included as a limitation. The authors are unable to draw correlations or determine direction between the related variables, which could be overcome by collecting data at multiple time points.</p> <p>Table 1, Line 5: "until 30" should be "under" or "less than 30"</p> <p>Table 1, Line 20: I believe the common terminology for "bachelor" is "single"</p> <p>Table 1, Lines 32-33: Capitalize "Operational" and "Administrative" to be consistent with the rest of the table formatting</p> <p>Table 1 should have a notes section at the bottom to identify any acronyms in the table. The table should be able to stand alone from the text. Again, I do not understand what religious or leisure "practice" is. Is this referring to leisure time physical activity?</p> <p>Table 2, Lines 10-12: BMI should have units of measurement presented</p> <p>Table 2, Line 14/15: include units of measurement</p> <p>Table 2, Line 17: Include units of measurement</p> <p>Table 3: Same comments as above regarding formatting. Also, I believe it would be helpful to indicate which variables were significant with either bold typeface or a star or some icon.</p> <p>Tables 3 and 4: note that income is presented monthly</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer Comments

Overall, the paper is well-written however, I suggest a native English speaker proofread for clarity. There are a couple sentences that don't make sense as written and there are a few grammatical/spelling errors. Below are a list of points that need further clarification. I believe with some revisions this paper is important and worthy of publication.

Answer: We thank the reviewer for accepting to review the manuscript and for the positive comments. We have fully reviewed the manuscript and we hope to have addressed the main questions.

Abstract

Page 2, Line 30: The abstract presents an incomplete picture of the results. The first sentence of the Results section of the abstract is misleading. The authors present the prevalence of overweight and obesity classified by BMI and then only the prevalence of obesity measured by body fat % and waist circumference. However, it appears they present the prevalence of overweight and obesity by all three measurement types. Then only the OR associated with the waist circumference measure (central obesity) are presented in the results section of the abstract. This is an incomplete picture of all that was examined in the paper.

Answer: Results description changed specifying the data according to each obesity index measured.

Page 2, Line 40: The abstract's conclusion is a bit vague in summarizing the results.

Answer: Information was added, and conclusion edited for clarification in the revised version of the manuscript

Page 2, Line 48: Should read "Strengths and Limitations..."

Answer: Sentence correct in the revised version of the manuscript

Page 3, Line 4: Should this read “in the next year”?

Answer: We really meant in the next years because this study will be conducted over the next 5 years and not only in the next year.

INTRODUCTION

Page 3, Line 17: Reword this sentence for clarity.

Answer: Sentence reworded in the revised version.

Page 3, Line 14: “...with nearly a 7 fold increase...”

Answer: Sentence corrected in the revised version of the manuscript

METHODS

Page 3, Line 44-46: What are “trained health professionals”? I suggest the authors add a short description of the certification required by these individuals.

Answer: Description of all health professionals involved, and their certification is now included in the revised version of the manuscript

Page 3, Line 49: Was data anonymous/de-identified when given to researchers?

Answer: Yes.

Page 3, Line 57: More explanation is necessary for the “lifestyle” variable. I’m not sure what this variable explored. What questions were asked regarding “religious and leisure practices”? Is this a validated measure?

Answer: It is important to state here that our study only refers to secondary data provided by the Military Fire Service of the State of Espírito Santo. Therefore, we did not apply the questionnaire to the population studied. Our study is only describing the questions answered and the measures undertaken during the annual inspections of this firefighter population. However, the questions present in the forms filled up by the firefighters were jointly developed by trained researchers in epidemiological data collection and professionals from the Fire Department team. Questions were objective, with answers for choice selection or just yes or no as an answer. Additionally, the population studied has at least complete high school as level of education and therefore could comprehend the questions present in the forms. There were the following questions referring to religious and leisure practice in the forms:

Religious Practice

1. Do you have any religion?

Among the possible answers present in the form there were a list of the main religions professed among the Brazilian population plus the options Other and None.

If the firefighter marked the option referring to one of the religions listed or the option Other, he was categorized as having religion. If the answer filled up was None, the firefighter was considered as having no religion.

2. The second question was: Do you practice your religion?

The answers available were yes and no or not applicable if the military had previously reported as having no religion.

Leisure Practice

1. The question referring to leisure practice was simply do you practice any kind of leisure activity?

The answers available were yes and no.

Some details on how the questions were presented in the form, is now described in the section Life habits variables in the revised version of the manuscript.

Page 4, Line 2: Was there any age restriction when examining the data?

Answer: No. Information added to the revised version of the manuscript.

Page 4, Line 11: “until” should be “less than”

Answer: Reworded to under in the revised version of the manuscript, according to the other reviewer’s suggestion.

Page 4, Line 14: Again, “until” should be “less than”. It’s interesting that the authors categorized monthly income. I am more familiar with income being represented annually. I suggest the authors check the current literature to see which way is most common to present income data.

Answer: Reworded to less than in the revised version of the manuscript. We agree with the reviewer that income is commonly presented as annual income in the literature. However, as previously mentioned, the data described refers to what was filled up in firefighters’ forms, where the income was monthly reported. The annual income would not be exactly correspondent to month value multiplied by 12-fold, once there are other payments according to the Brazilian labor law. For that reason, we kept the description as originally stated in the forms as month income.

Page 4, Line 24: I wonder if “inner of the State” should read “inner city”? Again, I think some revision by a native English speaker may make this section more clear.

Answer: “Inner of the State” changed to “inner city” to make it clearer, as suggested by the reviewer.

Page 4, Line 25: “exerting” should maybe be replaced with “physical”

Answer: For “exerting” we meant activity performed by the firefighter. This was reworded to performing activities in the revised version of the manuscript.

Page 4, Line 39-40: The first sentence needs editing for clarification; it does not make sense to me the way it is written. What does it mean “when the military had no religion”? Again, what are leisure habits? How was this measured? Was it a validated questionnaire?

Answer: We provided an answer to that question in one of the comments above and changed the manuscript in order to provide more information for clarification on how the questions were presented in the forms.

Page 4, Line 45: It is unclear from the methods section if the tests used to gather information were validated/used in previous research. How was self-reported physical activity measured? (Ie: STROBE Item 8: Describe assessment methods)

Answer: Concerning the self-reported physical activity, in the forms filled up by the firefighters there was the following question: Do you practice any physical activity? The answers options were: Yes or No. If the answer was Yes, the next questions were: How many times a week? What is the time duration of the activity?

Information on that questions is now also inserted into the revised version of the manuscript.

Page 4, Line 51-52: You might explain the Cooper’s Test a little here for those that are unfamiliar. I believe it is similar to the Army PT test, with push-ups, sit-ups, and a run?

Answer: Information is now added to the manuscript

Page 4, Line 56: “...firefighting duties a minimum of 12 METs of effort is recommended...”

Answer: Sentence changed accordingly.

Page 4, Line 60: I believe the sentence should read: “Individuals were weighed on a scale...”

Answer: Reworded in the revised version of the manuscript.

Page 5, Line 2: “BF% was derived...”

Answer: Grammar error corrected.

Page 5, Line 33: Why were variables with $p \leq 0.20$ included in the model? Should this be $p \leq 0.05$?

Answer: The level of $p \leq 0.20$ was used for selecting the variables to insert in the regression logistic model. This is a procedure adopted in epidemiological studies (Celi et al. 2003; Biffi et al. 2011; Greenland et al. 2016). However, in the final model, only variables with p values minor than 0.05 were considered statistically significant. We added a sentence in the Statistical analysis to clarify that question.

Page 5, Line 38-43: The authors may need to include a statement about the confidentiality of their subjects in this section about involvement and the public.

Answer: Statement included at the end of the first paragraph of the Study design section in the revised version of the manuscript.

Page 5, Line 51-53: 108 is a rather large sample of women firefighters. I would be interested to see the results of their data in a future study.

Answer: We appreciate the comment of the reviewer. We will consider the possibility of studying the women firefighters in a future study.

Page 6, Line 3: I believe “working time” should be “years of service” (referring to how long a firefighter has been on the job). In general, the methods section and findings should be presented in past tense.

Answer: Sentence changed in the revised version of the manuscript.

Page 6, Line 16: The way the authors present the prevalence of overweight/obesity is confusing. This is similar to the way this is presented in the abstract and my comments above. Cut-offs for overweight and obesity categories are mentioned for BMI, but only obesity was categorized with the other methods.

The wording at first makes it seem that BMI greatly overestimated obesity, but a second read shows that BMI was referring to both overweight and obese individuals and the other two methods were referring only to obesity. I suggest either presenting overweight and obese data or just obese data for all three methods of body composition for consistency.

Answer: Both sentences (in the abstract and results) have been changed in order to specify the percentage of individuals with overweight and obesity by BMI. However, we chose to maintain the different stratification according to the measures adopted for the following reasons: 1. The categorization of the BMI was kept in three levels because we wanted to draw the attention for the overweight levels observed and for the problem concerning overweight overestimation among firefighters. 2. As for the other measures, we kept the description in two levels according to the cut-off points and stratification stated by the International Diabetes Federation (IDF) and the WHO guidelines. The IDF guideline is adopted by the Brazilian Society of Cardiology as part of the assessment of the Cardiovascular Risk Score. This guideline is considered more appropriate for the Brazilian population, since the distribution of body fat in subcutaneous x ectopic adipose tissue is influenced by the ethnic group and according to this guideline, CO is stratified in two levels only.

Page 6, Line 35: It is interesting to refer to single individuals as “bachelors”, I believe in the literature the term “single” is usually used. Check to current literature for consistency.

Answer: The term “bachelor” has been changed to “single” all over the manuscript.

DISCUSSION

Overall, the discussion section seems very long. Check journal word/page/section requirements.

Answer: After accepting the suggestions raised by the reviewer (see answers below), the size of the discussion has been currently reduced.

Page 6, Line 49-50: I would not refer to a “low prevalence” of obesity among this sample. More than a quarter of the sample was considered obese. And, according to BMI, when combined with overweight

individuals, that represented nearly 60% of the population. There may be a better way to discuss the findings in comparison with the country as a whole.

Answer: Sentence changed in the discussion. We have also added some data on the discussion comparing our data with the prevalence observed for the Brazilian population of adult man.

Page 6 Line 57- Page 7 Line 2: This part of the discussion is confusing. I believe the authors are presenting that this population had a lower than expected prevalence of overweight and obesity however, the last sentence refers to the BMI findings (which I'd assume are similar to the other findings) and state that this is "in tune with other populations of firefighters". So overall, I'm confused by the message.

Answer: We agree with the reviewer and rewrote the paragraph for clarification.

Page 7, Lines 4-21: This whole paragraph is hard to read and jumps from idea to idea. I suggest presenting like-ideas together, then opposing points. For example, I would present data that suggests that BMI overestimates obesity and then follow-up with research suggesting the opposite. I'm assuming that the point of this paragraph is to justify using waist circumference as the main outcome measure, something that probably should have been done in the methods and not again in the discussion.

Answer: We reorder the evidences according to the suggestions of the reviewer. As mentioned by the reviewer, the idea was to justify using the WC as the main outcome measure. However, we decided to maintain the paragraph, once we only mentioned briefly in the methods section the reason for adopting the WC and we wanted to support our choice based on the evidence presented in the literature.

Page 7, Lines 41-60: There are numerous variables where the authors have provided a previous definition and yet write out the whole word/words here. Be consistent with use of abbreviations.

Answer: We have changed the whole words for abbreviations where it was applicable.

Page 8, Lines 4-8: If statistical analysis found that after adjusting for confounders, variables were not significant, statistically speaking, there is no relationship between those variables. Therefore, I believe the authors present an unclear picture of their results because of the way they are presented in the Discussion.

Answer: Agree with the reviewer. Statements referring to an association between variables and outcomes based only in the Chi-Square test (lines 23-26, page 7; lines 4-8; page 8) were removed from the discussion.

Page 8, Lines 4-28: I believe this paragraph may be unnecessary considering the authors are unable to gauge the prevalence of metabolic syndrome among this population. I believe it is an important point to include these variables in future study, but this point probably does not need an entire paragraph.

Answer: We originally contrasted our finds on the firefighters' metabolic profile with other studies addressing this profile through metabolic syndrome (MetS) because we found difficult to contrast each measurement individually. However, we agree with the reviewer that we did not gauge the prevalence of MetS in our study and, therefore, a long discussion on that was not necessary. We have considerably reduced the paragraph, only mentioning the other studies conducted among firefighters, but we kept our point to show the need for adopting other measurements in future studies in order to adequately characterize the metabolic profile of this occupational group.

Page 8, Lines 39-47: I believe the cross-sectional nature of the study should also be included as a limitation. The authors are unable to draw correlations or determine direction between the related variables, which could be overcome by collecting data at multiple time points.

Answer: Limitation added as suggested by the reviewer.

Table 1, Line 5: "until 30" should be "under" or "less than 30"

Answer: Changed to "under" as suggested.

Table 1, Line 20: I believe the common terminology for "bachelor" is "single"

Answer: Word changed.

Table 1, Lines 32-33: Capitalize "Operational" and "Administrative" to be consistent with the rest of the table formatting Table 1 should have a notes section at the bottom to identify any acronyms in the table. The table should be able to stand alone from the text. Again, I do not understand what religious or leisure "practice" is. Is this referring to leisure time physical activity?

Answer: Changes made accordingly. We described in more details what the variables religious and leisure practice account for in the methods section.

Table 2, Lines 10-12: BMI should have units of measurement presented

Answer: Intervals and units included

Table 2, Line 14/15: include units of measurement

Answer: Intervals and units included

Table 2, Line 17: Include units of measurement

Answer: Intervals and units included

Table 3: Same comments as above regarding formatting. Also, I believe it would be helpful to indicate which variables were significant with either bold typeface or a star or some icon.

Answer: Table formatted, and statistical significance is now highlighted in bold typeface.

Tables 3 and 4: note that income is presented monthly

Answer: We explained the reason for presenting income monthly in a previous question.

General impression: interesting paper with a good number of participants.

Answer: We thank the reviewer for accepting to review the manuscript and for the positive comments.

Standardize the term subjects to participants. Sometimes you use one sometimes the other term.

Answer: The term has been changed along the manuscript

No major problem with the English but minor revisions needed. I identified some of them in the different section.

Answer: We thank the reviewer for correcting the English mistakes. We have reviewed the manuscript according to the recommendations stated.

Abstract:

Page 2 lines39-43: I suggest rewriting this sentence. The authors suggest that «Aging and cardiovascular risk factors...» be addressed. Aging (in fact age is the better term) is an unchangeable risk factor. Therefore, how can it be addressed by a health prevention program? Controllable risk factors should then be those to be targeted.

Answer: The term "aging" has been changed to "age" and the last sentence has been changed to indicate specifically that cardiovascular risk factors should be addressed by health prevention programs.

Introduction: Use the same wording as in the abstract for the purpose of the study.

Answer: Sentence changed in the introduction.

Methodology: It would be interesting to compare the sample studied with the Brazilian population corresponding to the sample.

Answer: We appreciate the comment of the reviewer. We have added some data on the discussing comparing the prevalence of obesity observed in the Brazilian adult male population in order to cover that matter. However, it was not under the remit of the present study to compare the present data with a corresponding sample of the Brazilian population, but only describing the data of this firefighter population at this time. Perhaps, this could be the subject of future studies.

The sample include only firefighters in urban areas. Is it typical of military firefighters in Brazil?

Answer: Yes.

Page 3 line56-57: what do you define as Leisure practice? Of physical activity? Also found in Tables

Answer: We have described in more details in the methods section what these variables refer to. In the forms filled up during the annual inspections of the firefighters there were the following question referring to leisure practice: Do you practice any kind of leisure activity? The answers available were yes and no.

Concerning the self-reported physical activity, there were the following questions: Do you practice physical activity? The answers options were: Yes or No. If the answer was Yes, the next questions were: How many times a week? What is the time duration of the activity?

Information on that questions is now inserted into the revised version of the manuscript.

Page 4 line 51 Maximal oxygen consumption instead of maximum consumption of oxygen. It should expressed as $\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$.

Answer: Sentence and unit changed accordingly.

Page 5 line 38: change « Involvement of the patient and the public» to Involvement of the participants and the public

Answer: Unfortunately, the change could not be made as suggested by the reviewer. When submitting the revision, we attended the request of the reviewer. However, the revision was sent back because the editorial office requested that the item should state patient instead of participant.

Page 6 line11: established

Answer: Word corrected.

Discussion

Line 57-58: In fact, all the references mentioned refer to USA studies, so you can change other countries by the USA.

Answer: Suggestion accepted.

Page 7 line 55: «... reduced physical fitness among Brazilian firefighters within the overweight...»

Answer: Word inserted in the revised version of the manuscript.

Page 8 line 11: Donovan and not Donavan

Answer: The author's name was deleted in the revised version of the manuscript, as the information was summarized according to the other reviewer's suggestion for reduction of the paragraph.

line 31-32: acknowledged d is missing

Answer: Letter inserted

Please discuss and compare with the paper from Nogueira, which address a similar population.

What is the difference between this paper and yours?

Nogueira, E. C., Porto, L. G. G., Nogueira, R. M., Martins, W. R., Fonseca, R. M., Lunardi, C. C., & de Oliveira, R. J. (2016). Body composition is strongly associated with cardiorespiratory fitness in a large Brazilian military firefighter cohort: the Brazilian firefighters study. *The Journal of Strength & Conditioning Research*, 30(1), 33-38.

Answer: In the study by Nogueira and colleagues (2016), the body composition (BC) and cardiorespiratory fitness (CRF) of 4,237 male firefighters from the Federal District in Brazil were evaluated. The data was collected during their annual physical fitness examination in 2011. Obesity estimated by the BMI showed 54.3% of overweight and 14.7% of obese firefighters in this Brazilian population. They also showed that CRF was lower in the obese when compared with the non-obese for all ages and BC indices. The unfit group was more likely to have a poor BC. The great difference of their study from ours, it is that they did not measure cardiovascular risk factors as well as did not approach personal and occupational factors as accessed in our study. We added the reference in the discussion and contrasted some of their data with ours.

Another relevant papers from our team: Gendron, P., Lajoie, C., Laurencelle, L., & Trudeau, F. (2018). Cardiovascular disease risk factors in Québec male firefighters. *Journal of occupational and environmental medicine*, 60(6), e300-e306. Compared to our paper, yours have the advantage of many objective and not self-reported (e.g. body composition)

Answer: In the study conducted by Gendron and colleagues 2018, 779 male firefighters from Canada (Quebec) answered an online questionnaire evaluating lifestyle and the presence of cardiovascular disease (CVD) factors and symptoms. BMI was also estimated through the height and body weight provided by the firefighter in the online questionnaire. They found that 23.6% of the firefighters were obese according to the BMI. Similar to our study they also investigated occupational and cardiovascular risk factors. However, different from ours all variables analyzed were self-reported. We have added the reference in the manuscript and contrasted some of the data with ours.

You have very interesting data on body composition that give different pictures according to the measure used. I suggest that you correlate results from WC, %fat and BMI to see It is likely that you have part of your participants that are muscular. Anyway, you should analyse these data deeper to better understand the relationship between those 3 measures of body composition in firefighters.

Answer: We did a statistical analysis on the agreement of the three obesity measures using the Kappa index and the McNemar test. However, as we had a limit on the number of tables and figures, as well as a limited number of words in the manuscript, we choose to leave this results out of this manuscript. We save this data for another study specifically comparing the three obesity measurements through different statistical approaches, as developed by Porto and colleagues, 2016.

You should compare with e reference population corresponding to the same age group of Brazilian men. Are firefighters better or worst than their corresponding peers in terms of risks factors?

Answer: As previously mentioned, we have added some data on the discussion contrasting the prevalence of obesity in the Brazilian adult male population with our data. However, as this occupational group possess very specifics characteristics, we choose to focus our discussion in the contrast of our data with other groups of firefighters with similar occupational profile.

Reference list:

Please review for minor corrections: e.g. ref #8: the abbreviation is not Env Heal but Environ Health

Answer: Reference corrected.

Also ref# 24, 39, 48: the 1st letter of the each word of the article title should be in lower (except

for the 1st word)

Answer: References corrected.

Tables:

instead of using until 30 (years) use under

Answer: Word changed in the revised version of the manuscript.

some words in Brazilian are still present: e.g. page 15 line35 (operacional) and in table 4

Answer: Word corrected.

VERSION 2 – REVIEW

REVIEWER	François Trudeau Département des Sciences de l'activité physique Université du Québec à Trois-Rivières
REVIEW RETURNED	07-Nov-2019

GENERAL COMMENTS	The authors made substantial and required changes according to reviewers comments
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REVIEWER	Brittany S Hollerbach Skidmore College United States
REVIEW RETURNED	28-Oct-2019

GENERAL COMMENTS	<p>Overall, the paper is improved from the previous version, however, I believe there is more work necessary to prepare the manuscript for publication. Please see the attached comments.</p> <p>The authors have made revisions that strengthen the paper compared to it's first edition. However, I do not think that this paper is suitable for publication. I still recommend English language editing for content and clarity. Please see comments below.</p> <p>OVERALL:</p> <p>The authors noted in the response to reviewers that they did statistical analysis on the agreement of the three obesity measures yet did not include this in the paper. I think this information should be included in this manuscript. Especially because the authors list that they measured/assessed BMI, BF%, and WC. Why then only present WC in the regression analysis? The title of the paper suggests obesity in general will be discussed in association with a number of variables. However, the authors only focus on central obesity.</p> <p>I recommend English language editing for clarity</p> <p>Overall, the discussion section seems long and is disorganized. I suggest organizing with a brief summary of study findings followed by identifying study strengths and weaknesses, limitations, and future directions. Further, the Discussion is a bit confusing. The authors present that there was a high prevalence of overweight</p>
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	<p>and obesity among their sample but then discuss how the prevalence of obesity was quite low.</p> <p>ABSTRACT: Results, Line 32/33: what does it mean 18.61% of firefighters were “at risk” by waist circumference?</p> <p>INTRODUCTION</p> <p>Page 3, Line 14-17: reword for clarity</p> <p>Page 3, Line 17: should be “...nearly a 7-fold increase...”</p> <p>Page 3, Line 21: “...activities lead...”</p> <p>Page 3, Line 22: “...worker categories...”</p> <p>Page 3, Line 31: The authors state that the investigation of these factors has been poorly explored, but there are at least two other studies that examine Brazilian firefighters and a number of studies that examine US firefighters with associations between overweight, obesity, physical activity, and a number of lifestyle factors. I think the Introduction could be greatly strengthened by examining other work done in this area and explaining what is novel about this study.</p> <p>Page 3, Line 39: The main aim of this study was to explore a number of variables and their association with obesity in a population of Brazilian firefighters. I think there should be a justification for why the authors only examine waist circumference in analyses.</p> <p>METHODS</p> <p>Page 4, Line 18: define the education level categories. Does “high school” indicate some high school was completed or a high school diploma was received? Does “graduation” mean from high school or college/university? Does “post-graduate” refer to those with more than a 4 year degree?</p> <p>Page 4, Lines 53-54: reword for clarity. I don’t understand what it means “when the military had no religion.”</p> <p>Page 4, Line 56: define leisure activity</p> <p>RESULTS</p> <p>Page 6, Lines 42-43: The percentage of firefighters that are overweight and obese are presented for BMI, why not present both overweight and obesity for BF% and WC as well? Further, obesity alone is not necessarily a risk factor for heart disease and I believe dichotomizing WC and presenting it as such is incorrect.</p> <p>Page 6, Line 52: Why only present associations with central obesity?</p> <p>Page 7, Line 1: Same, why only present regression models with central obesity?</p> <p>DISCUSSION</p>
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	<p>Page 7, Line 12: The authors state their population had a high prevalence of overweight and obesity, and then later in the Discussion state that their population actually had low rates of obesity. I think the discussion of the information presented is confusing.</p> <p>Page 7, Lines 14-17: I agree, but I believe this is an incomplete picture.</p> <p>Page 7, Lines 20-33: This paragraph is overall a little confusing and should be rewritten for clarity</p> <p>Page 7, Line 22: If this is the case and the rates of obesity are relatively low among Brazilian firefighters, that makes this study seem less important, which I do not believe it is. I believe this is very important information, but the authors must present it as such in a consistent manner.</p> <p>Page 7, Lines 31-32: The numbers of overweight and obese firefighters in this study is awfully close to the prevalence observed among Brazilian men, are they statistically significantly different? If not, again, I think the authors have to sell the importance of examining this population.</p> <p>Page 7, Lines 35-52: This paragraph may fit better as a part of the discussion of strengths/limitations of the study.</p> <p>Page 7, Lines 48-52: "Therefore, as we were particularly..." This sentence should go in the methods to explain the use of only central obesity (waist circumference).</p> <p>Page 7, Line 52: "well-established"</p> <p>Page 7, Line 55: "against" should be "compared to"</p> <p>Page 8, Line 2: Why target younger adults as the issue seems to be aging? (I.e.: why not target all firefighters or have a transitional program for prevention/intervention?)</p> <p>Page 8, Lines 10-27: Instead of a comparison to the author's findings, this appears as a review of the literature and would be better suited in the Introduction</p> <p>Page 8, Lines 29-42: Maybe this belongs in the future investigations section? I agree these factors are important but the authors could not completely examine the presence of MetS so this might fit better as a future direction item.</p> <p>Page 9, Line 1: "bellow" should be "below"</p> <p>CONCLUSION</p> <p>Page 9, Line 7: "obese" should be "obesity"</p> <p>Page 9, Line 10: Again, it seems counterintuitive that younger firefighters should be the target of prevention efforts when the data shows that age is associated with weight gain.</p>
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	Table 3: I don't understand which comparison the p-value represents. Is it the difference between the total N in the WC <94 cm group vs. the WC ≥ 94 cm? If so, why stratify/dichotomize the variables and only present one p-value for between groups differences?
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VERSION 2 – AUTHOR RESPONSE

Reviewer Response bmjopen-2019-032933

The authors have made revisions that strengthen the paper compared to its first edition. However, I do not think that this paper is suitable for publication. I still recommend English language editing for content and clarity. Please see comments below.

Answer: We thank the reviewer for the comments. We have addressed all the points raised in this second revision.

OVERALL:

The authors noted in the response to reviewers that they did statistical analysis on the agreement of the three obesity measures yet did not include this in the paper. I think this information should be included in this manuscript. Especially because the authors list that they measured/assessed BMI, BF%, and WC. Why then only present WC in the regression analysis? The title of the paper suggests obesity in general will be discussed in association with a number of variables. However, the authors only focus on central obesity.

Answer: We value the consideration of the reviewer. However, the agreement analysis was not under the remit of the present study and therefore, it is our understanding that this should not be included in the present manuscript. The analysis that we performed so far, only included the kappa index and McNemar test, as stated in the previous answer. We have included the tables with the results from that analysis below for the reviewer's inspection. However, a full approach of agreement between measures requires many other analyses which include: Sensitivity; Specificity; Positive likelihood ratio; Negative likelihood ratio; Positive predictive value; Negative predictive value and in some cases even Receiver Operating Characteristic (ROC) curves (See Porto et al. 2016 for reference). Most of these analyses will only be performed later and will be the subject of whole independent study as we previously stated.

BMI vs Waist Circumference

		Waist Circumference		Total
		No risk	At Risk	
BMI	Normal weight	352	2	354
	Overweight+obese	368	164	532
Total		720	166	886

McNemar= p=0.000 (p<0.001)

Kappa= 0.258; p = 0.000 (p<0.001)

BMI vs Body Fat Percentage (BF%)

		BF%		Total
		Normal	Obese	
BMI	normal	323	31	354
	Overweight+obese	324	205	529

Total	647	236	883
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McNemar: $p=0.000$ ($p<0.001$)
Kappa = 0.264; $p = 0.000$ ($p<0.001$)

Waist Circumference vs Body Fat Percentage (BF%)

		Waist Circumference		Total
		No Risk	At Risk	
BF%	normal	595	55	650
	obese	126	110	236
Total		721	165	886

McNemar: $p=0.000$ ($p<0.001$)
Kappa = 0.422; $p = 0.000$ ($p<0.001$)

Considering the question: Why then only present WC in the regression analysis? The main reason relies upon the fact that we were particularly interested in measuring the association between all the factors analyzed and an adiposity measure that is more closely related to cardiovascular risk as supported by a plethora of evidence available in the literature. Although the relationship between obesity and CVD has long been recognized, obesity measured by BMI has not been identified as an independent predictor of cardiovascular events in observational studies, a finding probably explained by the failure of BMI to identify individuals with excess of visceral (ectopic) fat (Stefan et al. 2008; Goyal et al. 2014; Antonopoulos and Tousoulis 2017; Piché et al. 2018). Despite BMI has been historically used for the purpose of identifying obesity, some recent studies have identified that other obesity measures, notably those indicating visceral adiposity, such as WC, have a linear relationship with mortality from cardiovascular disease (The et al. 2013; Lavie et al. 2015; Reis et al. 2015; Ortega et al. 2016; Antonopoulos and Tousoulis 2017; Piché et al. 2018). We had previously stated some explanation for the choice of WC in the methods section and discussion. However, attending the request of the reviewer we have now also included in the introduction, some information regarding the relationship between WC and cardiovascular risk to justify our choice.

I recommend English language editing for clarity

Answer: Revision has been performed as recommended.

Overall, the discussion section seems long and is disorganized. I suggest organizing with a brief summary of study findings followed by identifying study strengths and weaknesses, limitations, and future directions. Further, the Discussion is a bit confusing. The authors present that there was a high prevalence of overweight and obesity among their sample but then discuss how the prevalence of obesity was quite low.

Answer: We appreciate the comment of the reviewer.

Considering the size of the discussion, we have much reduced it according to both reviewer's recommendation in the previous version. We have also excluded many citations in the present revision. However, attending to the reviewer's present request (see further answers), some new information has been added.

Considering the presentation of results in terms of overweight and obesity prevalence by the BMI, we rewrote most of the information in the previous version in order to attend requirements stated by both reviewers separating the discussion in terms of obesity alone from the overweight plus obesity data. We have also added some information in the first paragraph of the discussion to enlighten the further discussion on the BMI results (see further answers).

As for the suggestions of reorganizing the discussion, we followed the following sequence:

1. Main findings of the study
2. What is already known on this topic, where we contrast our main findings in view with what has been described by other authors, according to the presentation of results:
 - a. Obesity prevalence by BMI
 - b. The problem of overweight estimation by BMI in the population of firefighters
 - c. Discussion of significant findings observed between central obesity and the factors investigated.
3. Strengths and Limitations of the Study
4. Conclusions

ABSTRACT:

Results, Line 32/33: what does it mean 18.61% of firefighters were “at risk” by waist circumference?

Answer: In the methods section, we stated that central obesity (CO) was obtained through the measurement of waist circumference (WC). Data obtained was categorized as no risk when the values of WC measured were <94 cm and at risk for WC≥94 cm. These are the cut-off points stated by the International Diabetes Federation (IDF). Similar categorization for WC has been adopted in other studies (See Sanderson et al. 2018 for reference). We choose this categorization because as stated by the IDF and the Brazilian Society of Cardiology, WC≥94 cm represents an increased risk for metabolic syndrome and cardiovascular disease. We have added the term central obese together with at risk in the abstract, to make it clearer.

INTRODUCTION

Page 3, Line 14-17: reword for clarity

Answer: Changed according to requirements.

Page 3, Line 17: should be “...nearly a 7-fold increase...”

Answer: Sentence changed.

Page 3, Line 21: “...activities lead...”

Answer: Sentence changed.

Page 3, Line 22: “...worker categories...”

Answer: Sentence changed.

Page 3, Line 31: The authors state that the investigation of these factors has been poorly explored, but there are at least two other studies that examine Brazilian firefighters and a number of studies that examine US firefighters with associations between overweight, obesity, physical activity, and a number of lifestyle factors. I think the Introduction could be greatly strengthened by examining other work done in this area and explaining what is novel about this study.

Answer: We have changed the introduction according to the reviewer’s recommendation.

Page 3, Line 39: The main aim of this study was to explore a number of variables and their association with obesity in a population of Brazilian firefighters. I think there should be a justification for why the authors only examine waist circumference in analyses.

Answer: We stated the answer to that question above and have added some information in the introduction in order to cover that matter. We have also changed the title and aims of the article accordingly.

METHODS

Page 4, Line 18: define the education level categories. Does “high school” indicate some high school was completed or a high school diploma was received? Does “graduation” mean from high school or college/university? Does “post-graduate” refer to those with more than a 4 year degree?

Answer: “High school” indicates that the firefighter completed high school. “Graduation” means that the firefighter had a college/university degree and “post-graduate” when the firefighter had a master's degree or the Ph.D. Information added to the manuscript.

Page 4, Lines 53-54: reword for clarity. I don't understand what it means “when the military had no religion.”

Answer: As previously mentioned, in the forms filled up by the firefighter there were the following questions referring to religious practice:

1. Do you have any religion?

Among the possible answers present in the form there was a list of the main religions professed among the Brazilian population plus the options Other and None.

If the firefighter marked the option referring to one of the religions listed or the option Other, he was categorized as having religion. If the answer filled up was None, the firefighter was considered as having no religion.

2. The second question was: Do you practice your religion?

The answers available were yes and no.

Based on the answers to these questions, religious practice was categorized as yes, no or not applicable. This last option was marked by the firefighters if they selected in the first question the option “none”.

Sentence reworded to clarify.

Page 4, Line 56: define leisure activity

Answer: Unfortunately, in the forms filled up by the firefighters the question referring to leisure practice was simply do you practice any kind of leisure activity? The answers available were yes and no. There was no definition available for that practice apart from that question.

RESULTS

Page 6, Lines 42-43: The percentage of firefighters that are overweight and obese are presented for BMI, why not present both overweight and obesity for BF% and WC as well? Further, obesity alone is not necessarily a risk factor for heart disease and I believe dichotomizing WC and presenting it as such is incorrect.

Answer: As previously stated, we kept the categorization of the BMI in three levels because we wanted to draw the attention for the overweight levels observed and for the problem concerning overweight overestimation by BMI among firefighters. However, the standard cut off points adopted for BF% and WC are in two levels only and these cut off points have been adopted in the studies conducted in the population of Brazilian firefighters and therefore, keeping the same levels allows present and future comparisons.

Concerning the comment of the reviewer: Further, obesity alone is not necessarily a risk factor for heart disease and I believe dichotomizing WC and presenting it as such is incorrect.

Answer: We understand the point of the reviewer once, although the relationship between obesity and CVD has long been recognized, obesity measured by BMI has not been identified as an independent predictor of cardiovascular events in observational studies, a finding probably explained by the failure of BMI to identify individuals with excess of visceral (ectopic) fat (Stefan et al. 2008; Goyal et al. 2014; Antonopoulos and Tousoulis 2017; Piché et al. 2018). However, in terms of CO, we respectfully disagree with the reviewer. Some recent studies have identified that WC has a linear relationship with mortality from cardiovascular disease (The et al. 2013; Lavie et al. 2015; Reis et al. 2015; Ortega et al. 2016; Antonopoulos and Tousoulis 2017; Piché et al. 2018).

In addition, the IDF guideline for WC cut off points, is adopted by the Brazilian Society of Cardiology as part of the assessment of the Cardiovascular Risk Score. This guideline is considered more appropriate for the Brazilian population since the distribution of body fat in subcutaneous x ectopic adipose tissue is influenced by the ethnic group. According to what is stated by the IDF and the Brazilian Society of Cardiology central obesity (CO) is a risk factor either for metabolic syndrome as well as for cardiovascular disease. The cut-off point stated for WC in these guidelines is ≥ 94 cm and for that reason, the stratification adopted in our study was two levels only.

Page 6, Line 52: Why only present associations with central obesity?

Answer: Answer provided in previous questions.

Page 7, Line 1: Same, why only present regression models with central obesity?

Answer: Answer provided in previous questions.

DISCUSSION

Page 7, Line 12: The authors state their population had a high prevalence of overweight and obesity, and then later in the Discussion state that their population actually had low rates of obesity. I think the discussion of the information presented is confusing.

Answer: We provided more details in this first paragraph regarding the different findings in terms of obesity alone and overweight plus obese individuals identified by BMI to clarify the discussion conducted in the following paragraph.

Page 7, Lines 14-17: I agree, but I believe this is an incomplete picture.

Answer: We are not completely sure of what is the specific request of the reviewer on that matter, but we have included some information by the end of this paragraph to cover more aspects of the importance of the study.

Page 7, Lines 20-33: This paragraph is overall a little confusing and should be rewritten for clarity

Answer: We rewrote the paragraph.

Page 7, Line 22: If this is the case and the rates of obesity are relatively low among Brazilian firefighters, that makes this study seem less important, which I do not believe it is. I believe this is very important information, but the authors must present it as such in a consistent manner.

Answer: Compared with the general population and with the firefighters' population of USA and Canada, the prevalence of obesity by BMI of our study is in fact lower. Part of the explanation for these results is what has been described as a phenomenon known as "healthy worker effect". Many workers, such as firefighters, police officers and the military in general, undergo exhaustive physical and resistance tests for health-based selection before admission to work. This selection criteria could contribute to lower frequencies of obesity observed among this work population. Some explanations and references have been added to the discussion to cover that matter. However, we respectfully disagree with the reviewer on the fact that observing lower rates makes the study less important.

Page 7, Lines 31-32: The numbers of overweight and obese firefighters in this study is awfully close to the prevalence observed among Brazilian men, are they statistically significantly different? If not, again, I think the authors have to sell the importance of examining this population.

Answer: The data on the Brazilian population was included for a comparative notion as requested by one of the reviewers in the previous submission. In order to perform a comparative statistical test between results, it would be necessary to have a better description of the general population data. However, we agree with the reviewer that the prevalence of our data and of the general population seem very similar. There are two possible explanations for these apparently conflicting results. One possibility is that, despite the health-based selection process, as mentioned in the previous answer, some occupational factors may be contributing to health status worsening and, consequently, to an

increase in the overweight prevalence in this occupational group. However, it is also possible that the high prevalence of overweight plus obese firefighters may reflect a problem related to the overweight estimation by BMI in this occupational group. The points raised here have been added to the discussion for clarification.

Page 7, Lines 35-52: This paragraph may fit better as a part of the discussion of strengths/limitations of the study.

Answer: We respectfully disagree with the reviewer. The whole point of having this paragraph in this sequence is to point and discuss the problem related to the overweight estimation by BMI, as stated in the previous answer.

Page 7, Lines 48-52: "Therefore, as we were particularly..." This sentence should go in the methods to explain the use of only central obesity (waist circumference).

Answer: Sentence added to methods.

Page 7, Line 52: "well-established"

Answer: Sentence changed in the revised version of the discussion.

Page 7, Line 55: "against" should be "compared to"

Answer: Word changed.

Page 8, Line 2: Why target younger adults as the issue seems to be aging? (I.e.: why not target all firefighters or have a transitional program for prevention/intervention?)

Answer: Our point was if our study showed that CO was more likely present in older firefighters, a prevention work among younger firefighters would probably lead to different results in the future. However, we agree with the reviewer that intervention among the older population is also needed. Sentence changed accordingly.

Page 8, Lines 10-27: Instead of a comparison to the author's findings, this appears as a review of the literature and would be better suited in the Introduction

Answer: We agree with the reviewer that many citations were quoted in this paragraph. We have much reduced it, but it is our understanding that it should be kept in the discussion as it is confronting our data in terms of CRF and obesity with other studies addressing similar issues.

Page 8, Lines 29-42: Maybe this belongs in the future investigations section? I agree these factors are important but the authors could not completely examine the presence of MetS so this might fit better as a future direction item.

Answer: This paragraph is dedicated to comparing the observed associations in terms of central obesity and the biochemical variables analyzed. The data available in the literature on the evaluation of these variables in firefighters always address the results obtained in terms of metabolic syndrome (MetS), since, as previously explained, these variables are used to characterize the syndrome. Therefore, the confrontation of our findings with these variables was with the data available in terms of MetS. However, although we have pointed out at the end of the paragraph, that it is important to add other measures to the annual inspections to allow the characterization of the MetS in this population, we understand that it is important to maintain this paragraph as part of the discussion, otherwise the biochemical findings observed will remain without confrontation with the literature on firefighters.

Page 9, Line 1: "bellow" should be "below"

Answer: Misspelling corrected

CONCLUSION

Page 9, Line 7: “obese” should be “obesity”

Answer: Corrected.

Page 9, Line 10: Again, it seems counterintuitive that younger firefighters should be the target of prevention efforts when the data shows that age is associated with weight gain.

Answer: Conclusion changed accordingly.

Table 3: I don't understand which comparison the p-value represents. Is it the difference between the total N in the WC <94 cm group vs. the WC ≥ 94 cm? If so, why stratify/dichotomize the variables and only present one p-value for between groups differences?

Answer: The p-value of the chi-square association test indicates a statistically significant association between two variables, in our case, each variable analyzed and central obesity (i.e. age vs central obesity). The test points to a global association and to see in which category this association is, we need to analyze the percentages by category, but the p-value is unique. Additionally, in our analysis, this test was used to identify variables that were associated with the CO outcome for further inclusion in the logistic regression model. As for the stratification of WC in two levels, we have provided an answer to that in previous questions.

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