Author's response to reviews

Title: Body Composition, Water turnover and Physical activity among women in Narok County, Kenya

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Version: 6  Date: 5 November 2014

Author's response to reviews: see over
I am writing to submit our revised manuscript entitled ‘Body composition, water turnover and physical activity among women in Narok County, Kenya’ for consideration in the BMC Public Health.

We acknowledge the comments from the reviewers and we thank them for their valuable comments. Here are the comments with point by point responses from us and we have highlighted the major areas of correction in bold within the text for ease of reference.

Response to reviewers comments: Robert J Brychta

Reviewer's report:

Minor Essential Revisions:

1. Comment 1 From Last Round of Review: Pg4, Paragraph 1: “Another aim was to describe the difference in body composition and physical activity among rural and urban Kenyan women.” The authors should also include differences in water turnover amongst the 2 groups in this sentence, since water turnover is in the main subject of the paper.

Author’s Response: In Page 4 Paragraph 1- water turnover has been included in the sentence.

However, when I read the text, this was not added to the last sentence of the background.

Water turnover has been included in the sentence (pg 2 paragraph 1 and pg 5 paragraph 1).
2. Comment 2 From Last Round of Review: “intensity of physical activity was obtained using Troiano et al. cut-off points [15]. To determine the wear time, we used at least 600 minutes per day for the minimum needed for a day to be included as valid.” The authors have still not discussed the method to detect non-wear time. I assume there was an automated method to detect non-wear time and that this method used the NHANES criteria stated in the Troiano paper. This should be noted in the text.

Author’s Response: In Page 7 paragraph 1- we used a 60 minute consecutive zero count non-wear definition and referenced accordingly.

However, the text reads: “To determine the non-wear time, we used at least 60 minute consecutive zero count non-wear definition to detect sedentary behavior (22). “

60 minutes of consecutive zero counts should be used to detect non-wear time, not sedentary behavior. Sedentary time is typically wear-time with activity counts<100. This sentence should be corrected.

This section in the methods has been adapted to further clarify how cut-off points and non-wear time were defined. p.7: – ‘The data was downloaded using the Actilife software and total physical activity was expressed as Vector magnitude counts per day (VM/day). Time spent on different intensities of physical activities were obtained from the cut-offs of Troiano et al., which are included in the Actilife software and based on the activity counts of the vertical axis (22). Actilife software was used to determine the non-wear time and was based on the vector magnitude where at least 60 minutes of consecutive zero counts were required to determine a period as non-wear time (22). Only days with at least 600 min of wear time were included.

3. Multiple Regression Results (Paragraph 2 of Results): I still feel that the multiple regression results are presented in a confusing manner. For instance, the first sentence of Paragraph 2 of the Results section reads, “Multiple regression analysis showed physical activity on top of BMI resulted in an additional 15% variation in
water turnover ($r^2 = .38, p<0.005$; $\Delta r^2 = .15, p<0.05, n=22$) resulting in a total explained variation of 53%.”

I believe what is meant here is: “Multiple linear regression analysis revealed that including both physical activity and BMI in the model resulted in a 15% increase in explained variation in water turnover ($r^2 = 0.53, p<0.05; \Delta r^2 = 0.15, p<0.05, n=22$), compared to BMI alone ($r^2 = 0.38, p<0.005; n=22$).”

The original wording makes it seem that the model with both BMI and PA has an $r^2$ of 0.38, and it is unclear what the two $p$-values are referring to.

The sentences have been rewritten:

‘Multiple linear regression analysis revealed that including both physical activity and BMI in the model resulted in a 15% increase in explained variation in water turnover ($r^2 = .53, p<0.05; \Delta r^2 = .15, p<0.05, n=22$) compared to BMI alone ($r^2 = .38, p<0.005, n=22$). The standardized beta values for BMI and physical activity were 0.544 and 0.393 respectively indicating that BMI was a strong predictor of water loss in this model (Table 4). FMI alone explained 37% of the variation in water loss ($r^2 = .37, p<0.005, n=22$) and adding physical activity to the model explained an additional 12% ($r^2 = .49, p=0.05; \Delta r^2 = .12, p<0.05$). The beta values were .509 for FMI and .359 for physical activity, indicating that FMI was the stronger predictor in this model (Table 5). In Table 6, both physical activity together with FFMI in the model resulted in an additional variation of 26% in water loss ($r^2 = .40, p>0.05; \Delta r^2 = .26, p<0.05$) compared to FFMI alone ($r^2 = .14, p=0.08, n=22$).’  (Pg 9 last paragraph)

4. Multiple Regression Results (Tables 4-6): As with the text portion explaining the multiple regression, the table legends (Notes below the table) are somewhat hard to follow.

I think it should read:

“Step1: $R^2=0.38$ ($p<0.005$); Step 2: $R^2=0.53$ ($p<0.05$), $\Delta R^2$ from step 1=$0.15$; L/day = liters per day, BMI = Body mass index, VM/day = Vector magnitude counts per day”

The legends in table 4-6 have been corrected accordingly:
For example for table 4 it reads: Note Step 1: \( R^2 = .38 \) (\( p<0.005 \)); Step 2: \( R^2 = .53 \) (\( p<0.05 \)), \( R^2 \Delta \) from step 1 = 0.15: L/day = liters per day, BMI= Body mass index, VM/day=Vector magnitude counts per day. (Pg. 21)

Step 1: \( R^2 = .37 \) (\( p<0.005 \)), Step 2: \( R^2 = .49 \) (\( p<0.05 \)), \( R^2 \Delta \) from Step 1 = .12: L/day = liters per day, FMI= Fat mass index, VM/day=Vector magnitude counts per day (pg. 22)

Step 1: \( R^2 = .14 \) (\( p=NS \)), Step 2: \( R^2 = .40 \) (\( p<0.01 \)), \( R^2 \Delta \) from Step 1 = .26: L/day = liters per day, FFMI= Fat free mass index, VM/day=Vector magnitude counts per day, NS= not significant (pg. 23)

I assume here that what the authors have written as \( R# \) means \( #R^2 \).

We have changed the \( R\Delta \) to \( \Delta R^2 \) in tables 4-6 (pg. 21, 22 and 23)

Discretionary Revision:

Table 2 and 3, some variables have units next to them in parentheses, like TBW (L) and Water Turnover (L/day), while others, like Fat Mass and Fat Free Mass, have a superscript and then units below the table. This seems inconsistent, but it is the authors’ choice to present it this way.

To create more consistency, we have added all the units next to the variables in table 2, as suggested by the reviewer. In table 3, the unit is always the same (min/day) so we have written the unit in the table legend.

Response to reviewer: Maciej Buchowski
Minor Essential Revisions.

Abstract

Methods.

1. Authors should omit “randomly” since there is no evidence of random selection from the general population.

   The word randomly has been omitted

2. “Body mass index (BMI) was calculated from anthropometric measurements to assess nutritional status of the women” – It is unclear how BMI was used to assess nutritional status. Perhaps authors should omit the phrase “..to assess nutritional status of the women.”

   The phrase “to assess nutritional status of the women” has been omitted in the sentence.

3. “..expressed as magnitude counts per day.” this is unclear. Perhaps”..as vector magnitude (VM) counts per day.”

   The sentence has been revised to read ‘expressed as vector magnitude counts per day (VM/day)

Results.

1. Mean BMI was 23.4 ± 4.1 and 21.5 ± 3.8 (n=28 suggests that there were 28 urban women.

   The n=28 has been deleted from the statement. (pg 2)

2. 29.3 ± 4.2 liters (L).

   We have included brackets in the liters to read (L)

3. “Water loss…”. It is unclear how it was calculated.

   Water loss was calculated from $^2$H elimination as described in the ‘methods’ section

4. “Water loss was significantly related to.. “ Rather “..associated with..”

   The sentence ‘water loss was significantly related ….’ has been changed to ‘water loss was associated with…’ (pg 2)

5. “Water loss was also significantly related to physical activity (PA)” . Rather
6. Fat mass index (FMI) – it is unclear what is FMI was and how it was calculated.

The FM and FFM indices have been explained in the background and methods and how they were calculated. We could not put all the information in the abstract.

Pg. 4… To make up for this shortcoming, there is need to measure FM and FFM and adjusting it for height$^2$ to get fat mass index (FMI) and fat free mass index (FFMI), since these measures may have advantages in assessing adiposity.

Pg. 6…. FFM and FM indices (FMI and FFMI) were calculated, which are equivalent concepts to the BMI as shown in the following definition by Schutz et al (15), FFM=FFM/height(m)$^2$ and FMI = FM/height (m)$^2$. Thus, BMI=FFMI+FMI.

7. “Multiple regression analysis showed that BMI and physical activity together (n=22)” This is unclear.

The sentence has been corrected accordingly: pg. 2 and 3.

Conclusions.

1. “Water loss is related to body composition and physical activity and BMI was the strongest predictor of water loss.” This statement should be rephrased.
We have rephrased the sentence to read ‘BMI together with physical activity were the strongest predictors of water loss.’

(Pg. 3)

Several statement are unclear and could be rewritten. For example (page 5):
Thirty women aged (15-45 y) were selected to participate in this study. The group included 10 women from the rural and 20 from the urban Narok North Country in
Kenya. We intentionally sampled out the women from two clusters in both the rural (Rotian) and urban (Majengo) settings. The inclusion criteria were willingness to participate in the study, having a child 5-year-old or younger and not being pregnant at the time of data collection. Participants’ characteristics are in Table 1. One participant withdrew after recruitment and another subject was left out of the analysis because of not adhering to the protocol resulting in invalid total body water and water turnover results. Twenty-two women wore the accelerometer for at least 2 days and 600 minutes per day set as minimum criteria for inclusion in the data analysis.

The sentences have been rephrased in pg 5

A total of 30 women aged 15-45 years old in Narok County, Kenya were sampled from two clusters namely Rotian and Majengo which are both rural and urban settings respectively to participate in this study. The study group included 10 women from the rural and 20 from the urban Narok North Country in Kenya. The inclusion criteria were that the woman had to have a child less than five years old and were not pregnant at the time of data collection. One subject declined to participate after recruitment and another subject was left out of the analysis because of violation of the protocol resulting in invalid numbers for total body water and water turnover leaving a total of 28 women. After the accelerometer data was downloaded and validated, 22 women wore the accelerometer for at least 2 days and 600 minutes per day was set as a minimum criteria for inclusion of the person for data analysis.

Page 6.

1. …(SECA, USA) should be: (SECA, Chico, CA, USA).

   The sentence has been corrected as suggested above. Pg. 6.
2. “... was calculated using weight in kilograms divided by height..” Perhaps: “...was calculated by dividing weight in kilograms by height..”

The sentence has been corrected accordingly. Pg. 6

‘Body mass index (BMI) was calculated by dividing weight in kilograms by height in meters square (BMI=kg/m²)’

3. “.70 ml water with an enrichment of 5g atom % excess 2H” – this is unclear.

4.

5. Authors might consider:

“TBW was measured using the deuterium dilution method according to a modified Maastricht protocol (18). Participants drank a 70 ml dose of deuterium (2H2O) water with an enrichment of 5g atom % excess 2H. Subsequently, two urine samples were collected 6 hours after dosing and one sample after the third day. Water loss was calculated from 2H elimination using Fjeld et al. (20) equation. Fat free mass (FFM) was calculated from TBW assuming a 73.2% constant FFM hydration fraction. FFM and FM indexes (FMI and FFMI) were calculated as proposed by Schutz et al (15 using a concept similar to BMI calculation. FFM=FFM/height(m²) and FMI = FM/height (m²). Thus, BMI=FFMI+FMI.

We have modified the sentences as to read

‘Total body water (TBW) was measured using Deuterium oxide dilution technique according to a slightly modified Maastricht protocol (18) i.e. water turnover was measured from deuterium elimination over a 3-day period instead of the 7-day period that was described by Goris et al (19). In the morning participants drank a dose of 70 ml deuterium oxide water (²H₂O) water (70 ml water is enriched with 5 atom percentage excess, so approximately 3.5g ²H) resulting in an enrichment of 50-100 ppm above background levels (~150 ppm). Given the low price of the deuterium isotope, the same dose of deuterium was used for all women, thereby reducing preparation time.
Subsequently, two urine samples were collected 6 hours after dosing and one sample after the third day. Water loss was calculated from deuterium elimination by using the isotopic enrichment above baseline from the initial and final samples of the 3 day observation interval (20). Fat free mass (FFM) was calculated from TBW assuming a 73.2% constant FFM hydration fraction. FFM and FM indices (FFMI and FMI) were calculated as proposed by Schutz et al (15) using concepts equivalent to the BMI calculations as shown in the following definition FFMI = FFM/height(m)^2 and FMI = FM/height (m)^2. Thus, BMI = FFMI + FMI'. (Pg 6 Paragraph 2)

6. More details regarding the isotope dilution measurement is needed since the Maastricht protocol was modified. Also, the Field equations were specifically developed for measuring milk intake in infants rather than water loss in free-living women in hot climate.

We have added a sentence indicating how the Maastricht protocol was modified (Pg 6 Para 1, line 2) and the Field equation has been omitted from the sentence.

7. It might be beneficial to know what was the rationale for using the same dose for all women (independent of body weight) and when (e.g. morning) the sample was ingested.

Given the low price of the deuterium isotope, the same dose of deuterium was used for all women, thereby reducing preparation time and the dose was ingested in the morning.

Page 7.

Information on Page 7 is still incorrect.
1. Please remove a statement: “The GT3X actigraph records accelerations ranging from 0.5 - 2.5 G’s and the output are digitized at a rate of 30x per second (30 Hertz).”

The sentence has been removed.

2. Please list the vector magnitude (VM) cutoff points used for calculations. Reference #22 (Troiano) used cutoff points from vertical axis (one of the 3 axis used in the VM calculations) of the Actigraph GTM1 monitor (not used in this study). This is a rather serious methodological issue and the paper cannot be published until it is clarified.

   **Troiano (2008)** the vector magnitudes cut off points used were as follows:

   - Sedentary: 0 - 99 CPM
   - Light: 100 - 2019 CPM
   - Moderate: 2020 - 5998 CPM
   - Vigorous: 5999 - \(\infty\) CPM

   These cut points were not availed in the text but it is in the reference (Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. Medicine & Science in Sports & Exercise [Internet]. 2007:[181-8 pp.]. Available from: [http://www.researchgate.net/publication/5757920_Physical_activity_in_the_United_States_measured_by_accelerometer](http://www.researchgate.net/publication/5757920_Physical_activity_in_the_United_States_measured_by_accelerometer)

3. In other words, if Troiano cutoff points were used in the calculations, then data from vertical axis of the GT3X should be used. If the VM data were used for assessing time spent in the activity intensity categories, the cutoff points for VM from reference #21 (Santos-Lozano et al.) should be used.

   Indeed, we have expressed our total physical activity as vector magnitude counts per day, but the cut-off points are based on Troiano et al., which are included in the
Actilife software and based on the activity counts from the vertical axis. So for the intensity categories, we have not used the cut-off points of Santos-Lozano et al. We have modified the text, p.7:

4. “To determine the non-wear time, we used at least 60 minute consecutive zero count non-wear definition to detect sedentary behavior”. It is still unclear how it was done. First, were the participants asked to wear the monitor for 24 hours or just during the waking hours (day).

The participants were asked to wear the monitor during the waking hours of the day and remove it while sleeping or taking a shower (pg 6 last paragraph).

Data analyses.
This section should be edited for clarity. Second statement should be omitted.

This section has been edited and the second sentence (‘Excel was also used to generate the scatter plots’) was omitted.

Results.
The section should be divided into subsections: Body composition; Total body water. The content should be edited for clarity.

The section has been divided into subsections.

Discussion.
The content should be edited for clarity. Several statements are grammatically awkward. Some facts require explanation. For example, the outside temperature during the study was 14-24 degrees which is not usually consider as characteristic to a “hot” climate. It is unknown how much time (out of 800 minutes) women spend outside and how much inside.
We have revised the sentences and are highlighted in bold. We have included the temperatures for dry seasons. In addition, we did not assess the time that the women spend outside and inside their homes; however, most of their activities took place outside the house like herding livestock, fetching water etc.

Thank you again for accepting this manuscript for review and we look forward to a positive response.

Kind regards,

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