Author's response to reviews

Title: Feasibility of three wearable sensors for 24 hour monitoring in middle-aged women

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Author's response to reviews: see over
<table>
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<th>Reviewer</th>
<th>Importance</th>
<th>Critique (please include verbatim), if more than one idea is included in a statement, break out into multiple lines</th>
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<td>Critique 1</td>
<td>Minor essential</td>
<td>I agree there are not well-defined methods for estimating meaningful metrics from the ActiGraph on the wrist. However, the rationale for moving the ActiGraph monitor to the hip during the day is still unclear, particularly because the rationale is focused around the NHANES protocol, which does not switch back and forth. Have any other studies used this type of protocol? These results are limited to studies that would choose a similar protocol, and do not generalize to studies using a consistent wrist protocol for the ActiGraph. This should be clarified in the limitations section.</td>
<td>We agree that our methodology does not align with the NHANES protocol and this does limit the generalizability of our findings. However, as stated on line 141-143, we attempted to align our protocol with the location that yielded the best available evidence for that particular wearable sensor. 24h monitoring is still in its infancy and the findings from the manuscript are simply meant to contribute to knowledge base on the feasibility of various approaches. Troiano et al. (2014) even state that non-dominant wrist location should not be considered a standard for 24h acceleorimeter-based protocols. If we would have chosen a 24h wrist protocol, then our findings would have also been limited given the lack of validated algorithms for physical activity at that location. We have now appropriately noted this limitation on lines 569-573.</td>
</tr>
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</table>
Critique 1 | Minor essential
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The previous literature also seems incomplete. Have any sleep studies looked at these feasibility issues and monitor placement? A recent review (Troiano et al., Evolution of accelerometer methods for physical activity research Br J Sports Med 2014) documents differences in compliance between hip and wrist protocols. They also cite other studies using wrist protocols, which may provide comparative data for wear time.

Surprisingly there are no feasibility studies that we are aware of for sleep to learn from. With regard to placement, some other devices have shown limited validation at other locations, but the present validation data for sleep is on the wrist for Actigraph, wrist for GeneActiv, and upper arm for Sensewear. This is in line with our protocol. We thank the reviewer for pointing out the Troiano et al. (2014) paper which we have now referenced in the introduction of the manuscript (line 23). We have also compared our results to those of Troiano et al. in the discussion on lines 516-518. Finally, we reviewed the literature, including works cited by Troiano, and were not able to find any that had actual reported wear times using 24 protocols. Troiano et al. (2014) primary cite validation studies and one methodological paper that describe a protocol that is ongoing.

Critique 1 | Minor essential
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The writing quality could be improved. There are numerous typos/unclear and run-on sentences. There are some examples below, but these are not exhaustive and I suggest copyediting carefully and making the writing more concise where possible.

Changes have been made to improve the writing quality.

Critique 1 | Minor essential
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Line 1: state you mean moderate-to-vigorous physical activity (otherwise next sentence doesn't make sense with light-intensity activity).

This has been modified

Critique 1 | Minor essential
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Line 4: Suggest changing the word additive- possibly to additional? some relationships could be multiplicative etc.

This has been modified

Critique 1 | Minor essential
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Line 20: change i.e., to e.g. and then remove “ect…” that sentence is also missing a parenthesis.

This has been modified

Critique 1 | Minor essential
---|---
Line 51: missing a parenthesis

This has been added

Critique 1 | Minor essential
---|---
Line 64: missing were

This has been added

Critique 1 | Minor essential
---|---
Line 318: “similarly” seems out of place changed this to "the same way that physical activity does"
| Critique 1 | Minor essential | 356- this sentence is unclear, what is “primary activity” referring to? | Changed this statement so it is clearer |
| Critique 1 | Minor essential | Line 358: This sentence is unclear. (in addition to measuring behaviors?) Elevated compliance compared to what? | This has been deleted. |
| Critique 1 | Minor essential | Line 371: Add “these” to findings. | This has been added |
| Critique 1 | Minor essential | Table 2: inconsistent use of capitalization (e.g., Comfortable during Sleep) | This has been modified. |
| Critique 1 | Minor essential | In regards to behavioral feedback content- does that mean women felt it was provided, or felt it was accurate? | Changes have been made to clarify this. |
| Critique 1 | Minor essential | Figure 1: additional markers on the y-axis would be helpful- or numbers in the figure with each of the means and SD | These have been added. |
| Critique 1 | Minor essential | References #25 and #26 have multiple numbers next to them. | This has been deleted. |
| Critique 1 | Discretionary | Line 17-20: remove semi-colons | This has been deleted. |
| Critique 1 | Discretionary | 351- change title to strengths and limitations | This has been modified. |
| Critique 1 | Discretionary | Line 53/throughout: the terminology for monitors is inconsistent- wearable sensors, behavior monitor, accelerometer, devices etc. | The term "wearable sensor" has been used throughout for consistency. |
| Critique 1 | Discretionary | Methods 57-75: suggest reorganizing to provide an overview of study protocol in the first paragraph and moving details about the timing of appointment etc. to the second paragraph. When the 3 monitors are introduced it’s not clear if they’re worn at the same time or what the overall study design is. | This has been re-organized. |
| Critique 2 | Minor essential | Please give producer/company, city and country for the monitor the first time mentioned (in the Background). | This has been added |
| Critique 2 | Minor essential | On page 6, did the women wear all three monitors simultaneously? | No they did not and a sentence about this has been added to page 6. |
| Critique 2 | Minor essential | I do not find table 4, referred to on page 17. | This may not have come through in the system after submission - We apologize for this and it is attached in revisions. |