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Response to the letter to the editor from Dr. Kawada, “Comparison of two accelerometers for monitoring sleep: Agreement and validity”

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To the Editor

We would like to thank Dr. Kawada for his interest and comments about our recent work [1]. We agree with Dr. Kawada that the output of different accelerometers should be compared with caution, due to differences by device (e.g., number of axes used, sensitivity level, sampling rate) and software (e.g., different algorithms for sleep and/or physical activity scoring, post-acquisition filtering) attributes. For this very reason, and since several wearable products are to date commercially available and used daily in both clinical, research, and consumer settings [2], the aim of our work was to describe how two widely-used wearable monitors behave in a free-living situation during about 60 h of continuous monitoring of sleep and physical activity.

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Conflicts of interest

Authors declare the absence of any conflicts of interest.

We are fully aware that the current work lacks a gold standard for sleep and physical activity assessment with polysomnography (PSG) and indirect calorimetry, respectively. This has been acknowledged in our manuscript. However, we would like to mention that in a previous study we assessed in a laboratory setting the agreement of sleep parameters of this very same wearable monitors with concurrent PSG recoding [3]. Thus, our interpretation of the data in this study was grounded on ours and others previous validation studies [4,5]. Furthermore, our goal was to strive for ecological validity and practicality by cross-validating commonly used monitors that measure complementary and related behaviors (i.e., sleep and physical activity across the 24 h). The use of PSG and indirect calorimetry would not have been practical given the context and goals of our study.

Dr. Kawada also suggests that the results we reported here using a sample of healthy subjects may not be valid for individuals with insomnia. We agree with his view, and in our manuscript we acknowledged that accelerometer recordings have several limitations in assessing sleep-wake activity individuals with insomnia or suffering from other sleep disorders. In line with this, we acknowledged that our results should be interpreted taking into account our experimental sample, i.e., healthy young adults.

Notwithstanding these acknowledged limitations, we think that free-living comparisons of different wearable monitors may be very useful in order to (a) show that these devices may not be fully interchangeable; (b) quantify the discrepancies in the output provided by these devices; and (c) facilitate the selection of the optimal monitor depending of the aim of the research or the clinical study (e.g., sleep or physical activity monitoring, 24 h health behaviors, nighttime recording, etc...).

Considering the growing need for extended free-living monitoring of the full 24 h spectrum of behaviors (i.e., sleep, sedentary, and physical activity; [6,7]) with a single device, and the recent development of several cost-effective systems aimed to objectively assess these behaviors [2], we think the comparison of wearable monitors in real-world environments will provide useful information for clinicians, researchers, and also for the new generation of “self-monitoring” individuals.

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