Instructions for Authors of CISM Sport Science Abstract

CISM Sport Science Abstracts should focus on either “fitness and performance of military sports” or “psychophysiological military fitness and operational readiness”. Please indicate which focus your abstract refers to.

Abstracts should contain no more than 500 words (without title, names and affiliations, figures and references). Write concisely and clearly using complete sentences (not fragments). Avoid using unnecessary jargon and abbreviations, but use an acronym or abbreviation if it is more commonly recognized than the spelled-out version of a term.

Please keep in mind, that the practical implications part is regarded as the most relevant part of a CISM Sport Science Abstract.

Title - The title should accurately reflect the content of the manuscript and be limited to 20 words in length.

Full names of the authors and institutional/corporate affiliations - Do not list academic degrees

Introduction - This paragraph should provide a succinct statement of the context or background and the purpose or the aims of the study. This section ends with a sentence such as 'The purpose of this paper….' or 'This paper aims to….'.

Methods – Study design and subjects (how and with whom were the objectives achieved?), instruments/method(s) used (how were data collected?) and data analysis (how were data processed, what statistical analysis was performed?).

Results - What was found in the course of the work?

Discussion and Conclusion – Discuss your findings in reference to previous research. If possible, discuss the limitations and how the results can be generalized.

Practical implications – This part is important for the know-how transfer from science to military and athletic training praxis. It is therefore the most important part of a CISM Sport Science Abstract. What implications and consequences for the practical applications are identified? What changes to practice should be made as a result of this research/paper?

References – APA Style (http://www.apastyle.org/)

Figures and Tables- the inclusion of one figure or table is allowed. Each figure or table must be presented with a brief caption or title that defines all abbreviations used within it. Figures should be professional in appearance and have clean, crisp lines. Hand drawing and hand lettering are not acceptable. Photographic images should be at a resolution of 300 dots per inch (dpi) for full-size photos and 600 dpi for line art. Explanatory notes should be shown in footnotes below the table. Authors wishing to reproduce previously published material should obtain prior written permission to reprint from the copyright holder(s) of the figure or table. The phrase "used by permission" should appear in the caption of the figure or table.

A comparison of military-specific sensor-systems to estimate energy expenditure in soldiers

Beeler Nadja[1], Veenstra Bertil J.[2], Buller Mark J.[3], Delves Simon K.[4], Roos Lilian[1] & Wyss Thomas[1]

[1]Swiss Federal Institute of Sport Magglingen SFISM, Magglingen, Switzerland
[2]Institute of Training Medicine & Training Physiology, MOD/TGTF, Utrecht, the Netherlands
[3]Biophysics and Biomedical Modelling Division, United States Army Research Institute of Environmental Medicine, Natick, USA
[4]Environmental Medicine & Science, Institute of Naval Medicine, Alverstoke, Hampshire, UK

Introduction

Physical demands during military service are high (Wyss, Scheffler, & Mäder, 2012). To avoid a misbalance between physical requirements and abilities and to prevent overuse injuries, it is crucial to quantify the demands of military-specific activities. One indicator frequently used for this purpose is energy expenditure. Researchers from Switzerland and the Netherlands each developed algorithms for energy expenditure estimation in a military environment. The present study aimed to compare data of the Swiss and the Dutch sensor-system during a military march with values from the compendium of physical activities (Ainsworth et al., 2011).

Methods

Data of sixty-four male Swiss soldiers carrying a load of 24.8 kg of load during a military 35 km march were collected. All subjects wore the sensors of the Swiss and the Dutch sensor-system simultaneously. The Swiss sensor-system developed by Wyss & Mäder (2011) consisted of two PARTwear accelerometers (HuCE microLab, Biel/Bienne, Switzerland) worn at the hip and the backpack as well as a wrist worn heart rate sensor (Mio FUSE, Mio Global, Vancouver, Canada). Only the heart rate values of the Mio FUSE are used in the Swiss algorithm; however, the device also provided its own estimation of energy expenditure, which was included in the analysis as well. The Dutch algorithm relies on acceleration data from the chest belt EQ-02 (Hidalgo Ltd, Cambridge, UK) and established algorithms for different activities (e.g. formula by Pandolf et al. (1978) for loaded marching). As a reference value, energy expenditure was calculated according to Ainsworth et al. (2011) in 1-minute intervals. For military marching with backpack, code 17012 corresponding to 7.8 MET and for breaks, code 07040 corresponding to 1.8 MET was used. A one-way ANOVA with Bonferroni post-hoc test and Bland-Altman plots (Bland & Altman, 1986) were conducted to investigate differences between the sensor-systems.

Results

The data of forty-six subjects (age 20±1 y; height 1.78±0.07 m; body mass 76.2±10.0 kg) was included in the analysis. The reference method revealed a total energy expenditure of 17.3±2.3 MJ during the whole march (approximately 490 min, of which 80 min were spent resting). The Swiss sensor-system showed no significant differences ($p<0.05$) from the reference value but large standard deviations (mean overestimation of 8.0±19.7%). While the Dutch sensor-system significantly underestimated energy expenditure by -27.8±6.7%, the Mio FUSE showed a significant overestimation of the energy expenditure by 23.9±19.8%.

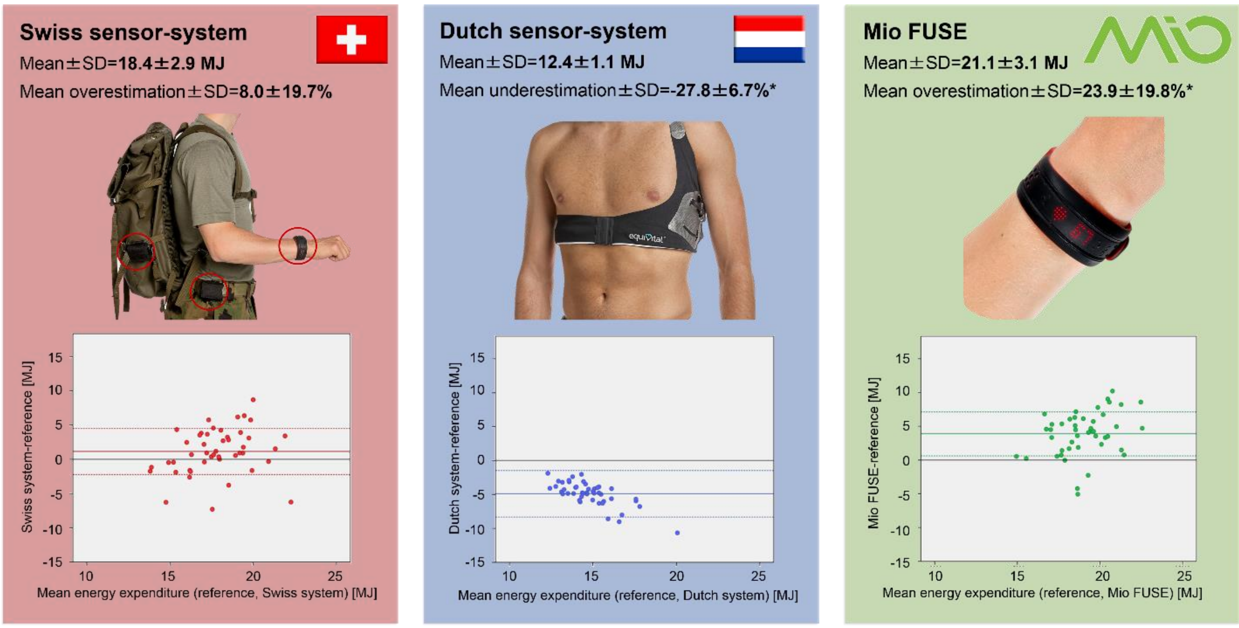

Figure 1: Mean, standard deviation (SD) and Bland-Altman plot of the energy expenditure estimated during the march by the investigated sensor systems.
Mean: * Indicates a significant over-/underestimation (p<0.05).
Bland-Altman plot: The bold line marks the mean difference between the reference and the value recorded by the sensor systems (dotted lines: ±1.96 SD).

Discussion and Conclusion

The Swiss sensor-system demonstrated the most accurate energy expenditure estimation during military marching compared to the MET values based reference value. The Dutch sensor-system and the Mio FUSE significantly under- or over-estimated energy expenditure.

Practical implications

The actual Dutch sensor-system and the Mio FUSE cannot be recommended for estimating energy expenditure during military marching tasks. The Swiss sensor-system proved accurate on a group level, but not for each single individual. This exploratory data provides that current sensor-system need to be further improved and that further studies using a gold standard method to measure the energy requirements of military tasks are necessary.

References

Ainsworth, B. E., Haskell, W. L., Herrmann, S. D., Meckes, N., Bassett, D. R., Jr., Tudor-Locke, C., & Leon, A. S. (2011). 2011 Compendium of Physical Activities: a second update of codes and MET values. *Medicine & Science in Sports & Exercise, 43*(8), 1575-1581.

Bland, J. M., & Altman, D. G. (1986). Statistical methods for assessing agreement between two methods of clinical measurement. *The Lancet, 1*(8476), 307-310.

Pandolf, K., B. Givoni, & R. Goldman. (1978) Predicting energy expenditure with loads while standing or walking very slowly. *Journal of Applied Physiology*, 43, 577-581.

Wyss, T., & Mäder, U. (2011). Energy expenditure estimation during daily military routine with body-fixed sensors. *Military Medicine, 176*(5), 494-499.

Wyss, T., Scheffler, J., & Mäder, U. (2012). Ambulatory physical activity in Swiss Army recruits. *International Journal of Sports Medicine, 33*, 716-722.