

Sensor based objective measurement of physical activity in the Swiss Armed Forces

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Introduction

For many recruits of the Swiss Armed Forces, the physical demands of daily military life are greater compared to civilian life. A study by Wyss et al. (2012) investigated distance covered on foot (DOF) and physical activity energy expenditure (PAEE) in different occupational specialties of the Swiss Armed Forces during the first ten weeks of basic military training (BMT). Mean DOF was 12.9 ± 3.3 km/d and mean PAEE was 10.5 ± 2.4 MJ/d. In recent years, the Swiss Armed Forces reorganized BMT with now progressively increasing intensities (instead of the previously observed decreasing physical demands) in daily activities and physical training. **The aim of this study was to assess DOF and PAEE in three different Swiss Army occupational specialties today.**

Methods

Volunteers from three BMT schools were asked to participate. Participants wore a heart rate monitor on the upper arm, an accelerometer on the hip and another accelerometer on the backpack each day of weeks two to nine during BMT (Figure 1). The sensors were programmed to store HR, hip acceleration, step count and backpack acceleration data at 2s epoch time. PAEE and DOF calculations were based on algorithms developed by Wyss et al. (2010, 2011 & 2012).



Figure 1: Soldier wearing a heart rate monitor (Rhythm24; Scosche Industries Inc., Oxnard CA, USA) on the upper arm, an accelerometer (Axiomo PADIS 2.0, Axiomo GmbH Biel, Switzerland) each on the hip and the backpack.

For each occupational specialty the mean DOF and PAEE were calculated. Additionally the difference of DOF and PAEE from week two to week nine were calculated. One-way analysis of variance (ANOVA) and Tukey post-hoc tests were conducted to compare anthropometric data, PAEE and DOF among occupational specialties.

Results

The 63 participants were 20.0 ± 1.0 years old, 177.8 ± 6.7 cm tall and weighed 74.2 ± 11.1 kg. The three investigated groups did not differ in age, height and weight. There was a significant effect for the three groups concerning mean PAEE ($F(2,20) = 7.59$, $p = 0.004$; Figures 2 and 3). Post-hoc comparisons indicated that the mean PAEE of the armoured infantry was significantly lower compared to the PAEE of the rescue technicians ($p = 0.007$) and also lower compared to the fusilier infantry ($p = 0.01$). In all investigated occupational specialties mean DOF increased from week two to week nine (1.3 ± 0.8 km/d) and showed a decrease of PAEE of -2.3 ± 1.7 MJ/d.

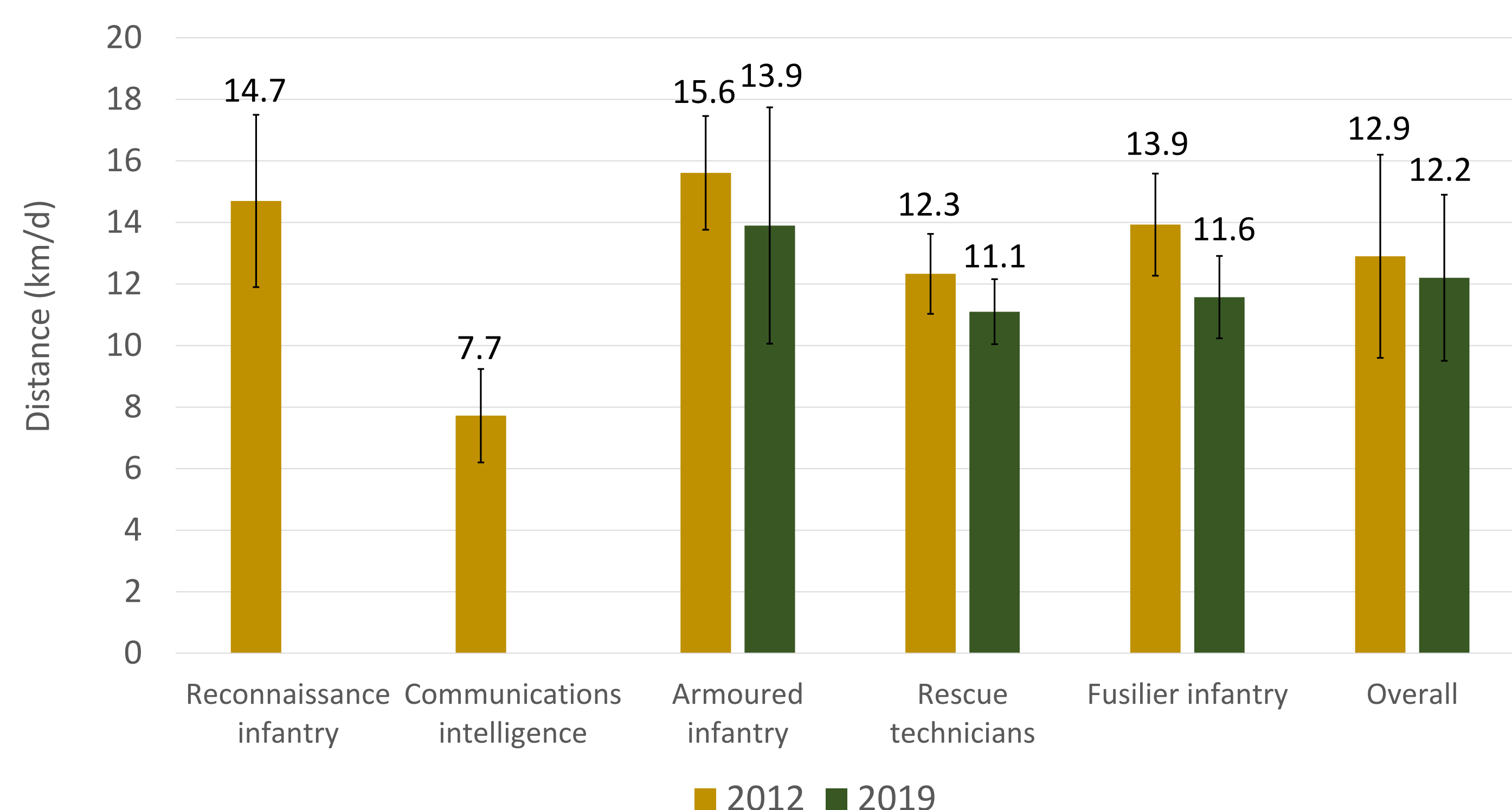


Figure 2: Comparison of the mean distance covered on foot (DOF) per day in the years 2012 and 2019.

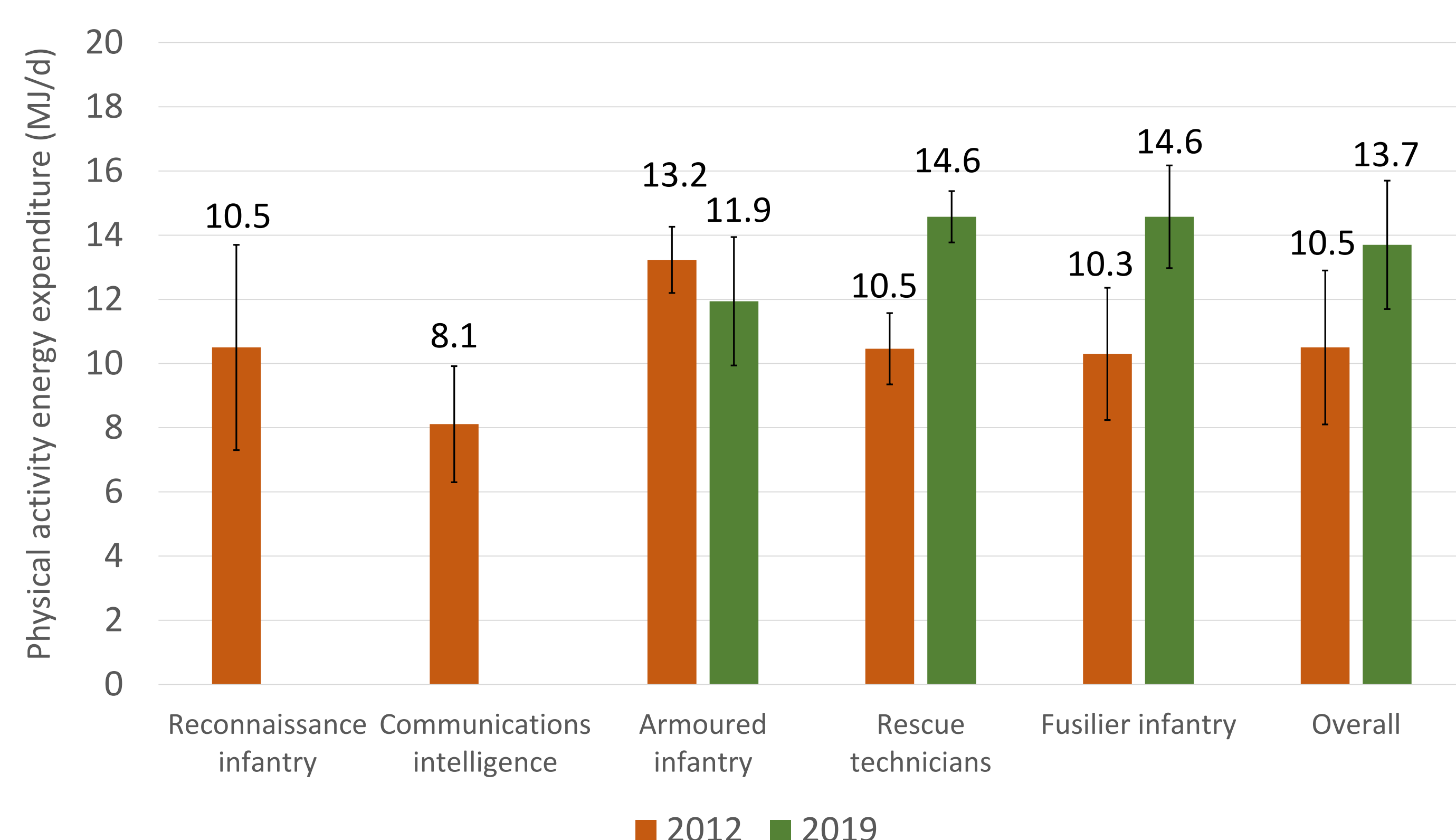


Figure 3: Comparison of the mean physical energy expenditure (PAEE) per day in the years 2012 and 2019.

Discussion

The recruits of the four investigated occupational specialties reported slightly lower mean DOF compared to the study by Wyss et al. (2012). An increase of DOF over the first nine weeks was observed in all occupational specialties which is promising because increasing rather than decreasing DOF over the weeks is sought. The mean PAEE over all groups was higher in this present study compared to the study by Wyss et al. (2012). The improvement of sensor-based objective measurement systems to record HR over the last few years and less data loss could be a possible explanation for these higher values. On the other hand PAEE today is still decreasing from week two to week nine with a difference of -2.9 ± 3.0 MJ/d in 2012 compared to -2.3 ± 1.7 MJ/d in 2019. It is assumed that the implementation of the new concepts in BMT will still take some time.

References

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