ENERGY INTAKE AND DLW ENERGY EXPENDITURE DURING A 2-WEEK MILITARY TRAINING PERIOD

Tanskanen Minna1, Uusitalo Arja2, Häkkinen Keijo1, Santtila Matti3, Kyröläinen Heikki1
(1) Department of Biology of Physical Activity, University of Jyväskylä1, Department of Clinical Physiology and Nuclear Medicine, Helsinki University Hospital2, Training Division of the Defence Staff3, Finland

The doubly labeled water (DLW) methodology has been used as a gold standard for the measurement of total daily energy expenditure (TDEE) (3). A majority of DLW studies concerning military operations have been done during rigorous field exercises. No TDEE studies among soldiers have been investigated during a basic training season (BT) by DLW method. Thus, the purpose of this study was: 1) to determine energy intake (EI), TDEE and the physical activity level (PAL) by DLW method (TDEEdlw) during the two hardest weeks of BT, and 2) to evaluate the validity of intake/balance (I/B) method to measure TDEE in military environment without food weighing but with the known food consumed.

Voluntary 24 male conscripts (age 19.7 ± 0.3) were measured by bioimpedance (InBody 720) after overnight fast in the beginning (pre) and at the end (post) of the study. Changes in body energy stores (ESchange) were calculated from changes in fat free mass (FFM) and fat mass (FM) between pre and post values. Change in FFM was assumed to be 27% protein and 73% water, and change in FM was assumed to be 100% fat (2). Energy equivalents used for protein and fat were 18.4 and 39.8 kJ/g, respectively. EI was analyzed from pre-filled diaries of seven days. I/B was determined using the EI and ESchange. Energy expenditure difference between I/B and TDEEdlw was assumed to be dietary records reporting error. To define true energy intake (TrueEI), EI was corrected with reporting error. To test the validity of I/B, the degree of agreement between I/B and TDEEdlw was tested by the method described by Bland and Altman (1). The basal metabolic rate (BMR) was measured with indirect calorimetry and PAL was calculated as TDEE/BMR.

PAL was 2.0 ± 0.2 MJ/d. I/B method (13.8 ± 4.1 MJ/d) significantly underestimated TDEE compared to TDEEdlw (15.5 ± 1.6 MJ/d) (mean difference 1.9 ± 3.6, p<0.05). The 95% limits of agreement were wide (-5.1-8.8 MJ/d). There was a significant correlation (r = -0.79, p<0.001) between the mean of the methods and the difference between the methods, indicating a higher degree of underestimation at high values for TDEE.

There was a significant difference (26.0 ± 17.5%, p<0.001) between TDEEdlw and the mean reported EI (11.5 ± 3.2 MJ/d). When reported EI was corrected with reporting error (-12.3 ± 23.4%), the TrueEI (13.8 ± 3.5 MJ/d) differed still significantly from TDEEdlw (-12.1 ± 21.1%, p<0.05).

The study was done at winter time in Finland. At that time military service during BT requires an average TDEE equivalent to approximately 2.0 x BMR. These factors together may influence the incidence of energy deficit. Furthermore, the I/B method does not seem to be a valid method to measure TDEE in military environment because of underreporting.


Keywords: Military, Energy Expenditure