Assessment of physical activity level and nutritional status of soldiers serving in the Airborne Battalion

Ocena aktywności fizycznej i stanu żywienia żołnierzy służących w Batalionie Powietrznodesantowym

Maculewicz Ewelina[1], Szarska Ewa[2], Lewicka Aneta[2], Lorenz Katarzyna[1], Łakomy Roman[2], Tomczak Andrzej[3], Bertrandt Jerzy[4]

[1] Department of Biomedical Sciences, Faculty of Physical Education, Jozef Pilsudski University of Physical Education in Warsaw; manager: prof. dr hab. Andrzej Mastalerz
[2] Military Institute of Hygiene and Epidemiology in Warsaw; manager: p. o. płk mgr inż. Paweł Serafin
[3] The War Studies University in Warsaw; manager: gen. bryg. dr Robert Kosowski
[4] Department of Dietetics, Faculty of Health Sciences. Pope John Paul II State School of Higher Education in Biała Podlaska; manager: dr Beata Kosińska

Abstract. Soldiers are a specific social group that is exposed to high, both physical and mental, burden which is associated with their training and service. Rational nutrition and proper level of physical activity play a crucial role in maintaining their good health. Therefore, knowledge about soldiers' nutrition and physical activity is essential to maintain their combat ability. The aim of this work was to assess the nutritional status and physical activity of soldiers serving in the 16th Airborne Battalion in Krakow. A total of 69 soldiers underwent this examination. Analysis of physical activity was assessed by the IPAQ – International Physical Activity Questionnaire, while frequency of food intake was assessed by the FFQ – Frequency of Food Intake Questionnaire. As a result of the examination it was found that 85% of soldiers revealed a high level of physical activity. The additional results obtained in the survey were: the consumption of fruits and vegetables was too low, the consumption of low-quality processed meats, dairy products and sugar was excessive. The conclusions of this study show that the examined soldiers were highly physically active. In addition to that, it is concluded that education about rational nutrition and nutritional prevention of civilization metabolic diseases should be introduced among soldiers.
Key words: food ration, physical activity, soldiers

Streszczenie. Żołnierze są specyficzną grupą społeczną, która narażona jest na duże obciążenie fizyczne i psychiczne związane z ich służbą oraz treningami. Racjonalne odżywianie oraz odpowiedni poziom aktywności fizycznej odgrywają kluczową rolę w utrzymaniu dobrego stanu zdrowia, dlatego wiedza o żywieniu oraz aktywności fizycznej żołnierzy jest niezbędna do utrzymania ich zdolności bojowych. Celem tej pracy była ocena stanu odżywiania oraz aktywności fizycznej żołnierzy służących w 16. Batalionie Powietrznodesantowym w Krakowie. Badaniu poddano 69 żołnierzy. Analizę aktywności fizycznej wykonano za pomocą Międzynarodowego Kwestionariusza Aktywności Fizycznej IPAQ. Częstotliwość spożywania jedzenia oceniano za pomocą Kwestionariusza Częstotliwości Spożycia Żywności FFQ. W wyniku przeprowadzonych badań stwierdzono, że 85% żołnierzy wykazywało wysoki poziom aktywności fizycznej. Dodatkowe wyniki uzyskane w badaniu są następujące: spożycie owoców i warzyw jest zbyt małe, zaobserwowano nadmierne spożycie złej jakości przetworzonych produktów mięsnych, nabiału oraz cukru. Wnioski z przeprowadzonego badania wskazują, że aktywność fizyczna żołnierzy była bardzo duża. Ponadto stwierdza się, że należy prowadzić wśród żołnierzy edukację dotyczącą racjonalnego odżywiania oraz żywieniowej profilaktyki cywilizacyjnych chorób metabolicznych.
Słowa kluczowe: żołnierze, aktywność fizyczna, racja żywnościowa

Nadesłano: 26.03.2021. Przyjęto do druku: 31.05.2021
Nie zgłoszono sprzeczności interesów.
Lek. Wojsk., 2021; 99 (3): 110–115

doi:

Corresponding author
Maculewicz Ewelina PhD
Jozef Pilsudski University of Physical Education in Warsaw
ul. Marymoncka 34, 00-809 Warsaw, Poland
mobile/tel.: +48 505 704 292
e-mail: ewelina.maculewicz@awf.edu.pl

Introduction

Issues concerning proper nutrition are very important factors affecting maintaining good health and good physical fitness levels among soldiers. Soldiers are exposed to high physical and mental burden resulting from the training process and the nature of their service. Therefore, alimentation of soldiers should be rational, i.e. it should cover their requirements for energy and for all nutrients, as well as act preventively in relation to diet-dependent civilization diseases. To be able to meet the above-mentioned conditions of rational nutrition, soldiers must have adequate knowledge about it [1]. The character of service, its nature, the type of unit and training required, as well as duties, are factors essentially affecting nutritional needs of a soldier. Hence, the diet and eating habits must be constantly adapted to the changing conditions of training and service. Keeping good health and adequate physical condition are basic requirements predisposing to perform professional military service. It is especially important for soldiers serving and fulfilling training tasks in special units, including 16th Airborne Battalion in Krakow. The battalion is assigned mainly to perform actions on enemy territory. The aim of the battalion's airborne activities is liberation of own troops and disruption of enemy actions, especially in the rear area, mainly by engaging enemy's reserves and reducing its combat potential. Therefore, soldiers' training includes fulfillment of many tasks, both strictly military ones, as well as activities shaping mental resistance and physical fitness, such as parachute training, climbing, skiing, etc. [2]

Aim

The aim of this work was to evaluate diet and level of physical activity of soldiers doing professional military service in the 16th Airborne Battalion in Krakow

Material and Methods

A total of 69 soldiers underwent this examination. All subjects provided data on consumption frequency and 48 performed physical activity test. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of 1/XXI/2016. The assessment of physical activity was done based on the International Physical Activity Questionnaire – IPAQ. IPAQ is a written assessment of physical activity that is made based on the description of weekly (7-day) activities [3]. The following factors are assessed: physical activity associated with work, with movement, with housework, and physical activity at leisure time, as well as duration of passive actions. In the IPAQ questionnaire any type of physical activity is expressed in MET (metabolic energy turnover) – minutes/week units. It is a product of MET factor value assigned to individual physical effort and duration of such physical exercise in minutes per day and number of days per week in which it was executed. Weekly physical activity (PA) is a sum of individual physical activity outcomes [4]. The time spent during each activity in the last week was recorded, however, only efforts lasting at least 10 minutes without interruption were taken into consideration. This allowed to estimate an overall physical activity expressed in MET/min/week. Statistical analysis was made with R program (version 2.0–1, R Foundation for Statistics Computing, https://cran.r-project.org). Differences between group was checked using u test. Frequency of food intake was assessed by the FFQ (Food Frequency Questionnaire). Assessment of food intake frequency according to FFQ is a valuable quality measurement tool in nutritional epidemiology. This is an easy method to apply [5] and it is 30 times cheaper than a four day long permanent registering [6]. Based on the obtained data, it is possible to point out individuals with different levels of individual product consumption or characteristic patterns of consumption. Based on the FFQ, food consumption preferences were assessed in a group of soldiers within the last 12 months. This questionnaire contained questions regarding 8 groups of food products. Products were combined in groups: sweets

Table 1. Percentage of examined soldiers classified into three categories of physical activity
Tabela 1. Procent badanych żołnierzy zaklasyfikowanych do jednej z trzech kategorii aktywności fizycznej

examined subjects	physical activity level		
	high	moderate	low
soldiers (n=41)	85,4% (35)	12,2% (5)	2,4% (1)

Table 2. Average value of total MET/min/week for intense and moderate activity and for walking (±SD)
Tabela 2. Średnia wartość całkowitego MET/min/tydzień dla intensywnej i umiarkowanej aktywności fizycznej i dla chodzenia (±odchylenie standardowe)

examined subjects	total intense activity	total moderate activity	total walking	total activity in MET/min/week
soldiers (n=41)	5000.98* ±4024.49	3337.74* ±2834.65	4386.18 ±3829.72	12 724.9

* There is statistically significant difference between total intense activity and total moderate activity

Table 3. Average values of physical activity level expressed in MET units (±SD)
Tabela 3. Średnie wartości poziomu aktywności fizycznej wyrażone w MET (±odchylenie standardowe)

examined subjects	activity related to work	activity related to movement	activity related to housework	activity related to recreation	total activity in MET/min/week
soldiers (n=41)	5566.90* ±4526.56	1629.48* ±1587.08	1696.77* ±1859.45	3831.76* ±3215.03	12 724.9

* There are statistically significant differences between every variable in the table except activity related to movement with activity related to housework, where no differences were found

and snacks, dairy products and eggs, fruit, vegetables and grains, meat products and fish, cereals, fats, and beverages [7]. Respondents had 8 categories of food intake frequency to choose. They were marked with numbers: never or almost never (1), once a quarter or less (2), once a month or less (3), several times a month (4), once a week (5), several times a week (6), everyday (7), and several times a day (8). Researchers responsible for conducting the survey were present in the room while the participants were filling in the questionnaires. Data received from the FFQ was presented as a median, assuming that the results would be given as integer values (corresponding to frequency of product consumption). For the rest of data average values and standard deviation were calculated.

Results

Level of soldiers' physical activity was assessed based on the survey forms analysis. Obtained results were presented in the form of tables showing average values of MET expressed in MET/min/week units. Based on obtained average value of physical activity, expressed in MET-min/week units, examined persons were classified into one of three levels of physical activity: high, moderate and low [4].

More than 85% of soldiers revealed a high level of physical activity (Table 1).

Structure of physical activity is as follows: 39.2% of subjects displayed high activity, 26.2% – moderate activity, and 34.5% were only walking (Table 2).

Work and recreation play a key role within soldiers' physical activity structure (Table 3). Intense physical activity while working was found among 49.2% of the subjects (Table 4).

Examined soldiers moved around by bike or walking (Table 5). In the examined group walking constitutes for 94% of this activity.

42.6% of the subjects exercised very intense housework activities, but there were significant differences among particular examinees. During leisure time subjects undertook mainly moderate efforts (Table 7).

Table 4. Average MET values (MET/min/week) during military service (±SD)
Tabela 4. Średnie wartości MET (MET/min/tydzień) podczas służby wojskowej (±odchylenie standardowe)

examined subjects	intense MET	moderate MET	MET walking	total MET
soldiers (n=41)	2739.51* ±2718.46	1176.59* ±1618.49	1650.80* ±1747.11	5566.90 ±4526.56

* There are statistically significant differences between every variable in the table expect moderate MET with MET walking, where no differences were found

Table 5. Average MET value (MET/min/week) associated with soldiers exercise (±SD)
Tabela 5. Średnie wartości MET (MET/min/tydzień) związane z ruchem żołnierzy (±odchylenie standardowe)

examined subjects	MET bicycle	MET walking	total MET
soldiers (n=41)	96.59 ±314.61	1532.89 ±1562.35	1629.48 ±1587.08

Tabla 6. Average MET value (MET/min/week) associated with housework done by soldiers (±SD)
Tabela 6. Średnie wartości MET (MET/min/tydzień) związane z pracami domowymi żołnierzy (±odchylenie standardowe)

examined subjects	intensive MET	moderate MET (at home)	moderate MET (around home)	total MET
soldiers (n=41)	722.38 ±1191.94	484.88 ±611.96	489.51 ±596.51	1696.77 ±1859.45

Results presented in Table 8 show a short time spent in a sitting position at work, which confirms high levels of physical activity of examined soldiers.

Based on the analysis of results obtained in studies where the FFQ was applied, the consumption frequency of products from 8 food groups was assessed. Frequency of food intake is presented as median (Table 9).

Table 7. Average MET value (MET/min/week) associated with physical efforts done by soldiers in their spare time (±SD)
Tabela 7. Średnie wartości MET (MET/min/tydzień) związane z wysiłkiem fizycznym żołnierzy w czasie wolnym (±odchylenie standardowe)

examined subjects	intense MET	moderate MET	MET walking	total MET
soldiers (n=41)	1202.49 ±1694.90	2261.46* ±2104.40	367.80* ±472.99	3831.76 ±3215.03

* There is statistically significant difference between moderate MET and MET walking

Table 8. Time spent in sitting position at work and during leisure time by soldiers of 16th Airborne Battalion (±SD)
Tabela 8. Czas spędzony w pozycji siedzącej w pracy oraz w czasie wolnym przez żołnierzy 16. Batalionu Powietrznodesantowego (±odchylenie standardowe)

examined subjects	time spent in sitting position	
	time spent sitting at work (min.)	time spent sitting at home (min.)
soldiers (n=41)	184.39 ±110.75	254.63 ±131.30

Table 9. Groups of food products analyzed in this research and frequency of their consumption by examined soldiers (n=69) in the last 12 months
Tabela 9. Grupy produktów żywności analizowane w tym badaniu i częstość ich konsumpcji przez żołnierzy (n=69) w ciągu ostatnich 12 miesięcy

food groups	items (median frequency)
sweets and snacks	sugar (6), honey (3), chocolate and chocolate candies (4), sweets (3), biscuits and cakes (4), ice-cream and blancmange (3), salty snacks (3)
dairy products and eggs	milk and natural milk drinks (6), sweetened milk drinks (6), cottage cheese (5), flavored cottage cheese (3), other hard cheese (6), eggs (6)
cereal products	brown bread (6), white bread (6), coarse groats (5), small-grained groats (5), ready to eat breakfast cereals (4)
fat	oil (5), butter (6), margarine (3), cream (4), lard (2), mayonnaise (3)
fruit	all kinds of fruit (6), dried fruit (3), fruit preserves (3)
vegetables and grains	all kinds of vegetables (6), nuts (4), grains (3)
meat and fish products	sausages (7), high quality cold meat i.e. ham (6), offal (3), beef/pork meat (6), poultry (6), game (2), lean fish (4), oily fish (4)
beverages	fruit juice (5), vegetable juice (4), energy drinks (3), sweet beverages (4), beer (4), wine and drinks (3), vodka and high-proof alcohol (3)

Frequency categories are: 1 (never or almost never), 2 (once per quarter or less), 3 (once a month or less), 4 (few times a month), 5 (once a week), 6 (few times a week), 7 (every day), 8 (few times a day)

The answers: 'never, or almost never (1)' and 'several times a day (8)' were not noticed. Game and lard had the lowest frequency of consumption, soldiers ate them once a quarter or less (2). Honey, candies, ice cream and salty snacks, flavored cottage cheese, margarine, mayonnaise, dried fruit, fruit preserves and grain were eaten once a month or less (3). Examined soldiers ate chocolate candies, cookies, breakfast cereals, cream, nuts and fish a few times a month (4). Natural cottage cheese, groats and oil were eaten once a week (5), while poultry meat, red meat, vegetables and fruit, butter, brown and white bread, dairy products, cheese, eggs and sugar were eaten a few times a week (6). Everyday consumption (7) regarded only sausages in the group of meat products and fish. When analyzing the consumption of beverages, it is shown that the examined group drank fruit juices once a week, vegetable juices, sweetened drinks and beer a few times a month, and energy drinks as well as wine and spirits once a month or less (Table 9).

Discussion

The international IPAQ used in this examination allowed objective assessment and comparison between types of physical activity of different professional groups [8]. The level of physical activity found among examined soldiers was high. Comparing MET values obtained for examined soldiers from the special unit in this research with the results obtained by Mrozik and Stupnicki [9] during the examination of students connected with sport, there is a significantly higher level of physical activity undertaken by soldiers (5566 MET) compared to students (3746). Sławecki [10], presenting the diversity of physical activity levels among males depending on age and education, has shown that both of these factors significantly differentiate levels of physical activity related to work and leisure time. Males aged 30–39 were the most active at work. The average value of MET/min/week at this age was 714. Physical activity related to recreation and sport was most willingly undertaken by males aged 20–29, obtaining average value of 516 MET/min/week. MET values obtained by this author were significantly lower than the values characterizing examined soldiers in this research. Piątkowska [11] analyzed the age as a differentiation factor of physical activity level of Polish population. The results showed that Poles' physical activity level is not as low as it was presented in numerous studies. According to the results of her research 33.5% of Poles reveal high level of activity, 32.3% – moderate, and

27.9% – low activity. Average energy expenditure related to physical activity of the whole population amounted to 2331.26 ±2159.43 MET/min/week. Tomczak [12] obtained similar results while examining soldiers from Special Forces unit. For efforts related to work, the value of weekly energy expenditure amounted to 5083 MET, and for efforts related to recreation – 3540 MET. Quoted results coincide with findings obtained in this research, and describe well the weekly physical activity of special troops soldiers. Average MET/min/week values analysis indicated that more than 40% of subjects' activity is military service related (Table 2), because they participate in organized physical education classes 2–4 times a week and high levels of physical activity is required. High physical activity and balanced diet are the main ways to prevent civilization diseases such as obesity, diabetes, motor system or circulatory system disorders [13]. Rational nutrition that ensures keeping the body in good health and optimum work output is of particular importance in the army. Selection of proper nutrients and their proportion is important in military service. The body must receive essential nutrients, which will ensure adequate combat capability and body work efficiency. As a result of studies and thanks to the FFQ, errors in nutrition were revealed. The subjects admitted that fruits and vegetables were eaten few times a week. According to the new food pyramid, fruit and vegetables should be eaten as often as possible and in biggest quantities, in proportions ¾ vegetables to ¼ fruit [14]. In the research carried out by Szczepańska et al. [15], it was revealed that among young people aged 13 to 18.9, fruit juice was drunk more often by girls than by boys. Girls drank fruit juices more than 4 times a week. Consumption of fruit and vegetable juices among examined males was very low. Examined soldiers drank fruit juices once a week, while vegetable juices were drunk equally rarely (a few times a month). Fruit and vegetable consumption in Poland is low. Research carried out in Wrocław among people aged 50 showed that average daily intake of vegetables, not taking into account potatoes, expressed as median amounted to 155.9 g/day [16] and was comparable with the data from the Central Statistical Office (GUS), according to which the average intake of vegetables in Poland was 150.7 g/day, and in Lower Silesian voivodship it was 169.7 g/day [17]. It is well known the Mediterranean diet, that is rich in fruits and vegetables, prevents the occurrence of several civilization diseases, and is also an important factor in cancer prevention [18]. According to the healthy lifestyle principles, consumption of vegetables and fruit among soldiers should be increased. Research on the quality of diet among dietetics students showed high consumption of vegetables and fruit, and low intake of cereal products [19]. Soldiers examined in this study revealed the consumption of white and brown bread (probably interchangeably), meat, dairy products, butter, cheese, eggs, and above all sugar, a few times a week, while groats were eaten once a week on an average. It is alarming that low quality cold meats (sausages, luncheon meat, bacon, etc.) were eaten every day. Hyżyk et al. [20], analyzing diet of soldiers in selected military units in years 2006/2007, stated that the examined population was characterized by incorrect nutrition. Authors revealed that the energy value of daily food rations provided in soldiers' nutrition significantly exceeded current obligatory standards in the army. Gaździńska et al. [21] have also observed increased values of some nutrients and energy of daily food rations of students from the Polish Air Force Academy (PAFA) in Dęblin.

References

1. Bembnowicz A, Bertrandt B, Kler P, Bertrandt J. Ocena poziomu wiedzy żywieniowej żołnierzy pełniących służbę w polskiej jednostce Wojsk Specjalnych „GROM". Probl Hig Epidemiol, 2015; 96 (4): 782–784
2. 16 Batalion Powietrznodesantowy. www.16bpd.wp.mil.pl/pl/18.html
3. International Physical Activity Questionnaire. www.ipaq.ki.se
4. Biernat E. Aktywność fizyczna mieszkańców Warszawy. Na przykładzie wybranych grup zawodowych. Oficyna Wydawnicza Szkoła Główna Handlowa, Warszawa, 2011
5. Lewandowicz M, Krzymińska-Siemaszko R, Wieczorowska-Tobis K. Przegląd metod oceny sposobu żywienia z wyróżnieniem metody fotografowania żywności z możliwością ich zastosowania u osób starszych. Geriatria, 2015; 9: 3–10
6. Wądołowska L. Walidacja kwestionariusza częstotliwości spożycia żywności – FFQ. Ocena powtarzalności. Bromat Chem Toksykol, 2005; 37 (1): 27–33
7. Wądołowska L. FFQ Kwestionariusz częstotliwości spożycia żywności (Food Frequency Questionnaire). www.uwm.edu.pl/edu/lidiawadolowska/pdf/ffq.pdf
8. Bergier J. O ocenie aktywności fizycznej z wykorzystaniem polskiej wersji Międzynarodowego Kwestionariusza Aktywności Fizycznej (IPAQ) – udział w dyskusji. Człowiek i Zdrowie, 2013; 1 (VII): 91–94
9. Mrozik WJ, Stupnicki R. Ocena aktywności fizycznej studentów WSKFiT za pomocą kwestionariusza IPAQ. Zeszyty Naukowe WSKFiT, 2015; 10: 1–10
10. Sławecki K. Aktywność fizyczna mężczyzn oceniana za pomocą międzynarodowego kwestionariusza aktywności fizycznej IPAQ – wersja długa. Antropomotoryka, 2012; 59: 57–66
11. Piątkowska M. Wiek jako czynnik różnicujący poziom aktywności fizycznej polskiej populacji. Antropomotoryka, 2012; 59: 17–29
12. Tomczak A. Physical activity of soldiers in the Polish Armed Force's military administration units and special units. Biomed Hum Kinetics, 2012; 4: 93–97
13. Lewicka A, Lewicki S, Kłos A, Bertrandt J. Wpływ dozowanego treningu fizycznego na zawartość i dynamikę zmian wielonienasyconych niezbędnych kwasów tłuszczowych (WNKT) w surowicy krwi szczurów. Probl Hig Epidemiol, 2013; 94 (2): 332–335
14. Instytut Żywności i Żywienia im. prof. dra med. Aleksandra Szczygła. www.izz.waw.pl/pl/zasady-prawidlowego-zywienia
15. Szczepańska J, Wądołowska L, Słowińska M, et al. Porównanie częstości spożycia soków owocowych i słodzonych napojów przez młodzież w różnym wieku. Probl Hig Epidemiol, 2011; 92 (4): 832–835
16. Ilow R, Regulska-Ilow B, Misiewicz D, et al. Ocena spożycia warzyw i owoców w grupie 50-letnich mieszkańców Wrocławia. Roczn PZH, 2011; 62 (3): 301–306
17. Zgierska A, Antczak R, Barlik M, et al. Budżety Gospodarstw Domowych w 2009 r. Główny Urząd Statystyczny, Zakład Wydawnictw Statystycznych, Warszawa, 2010: 135–137, 174–178

18. World Cancer Research Fund/American Institute for Cancer Research. Food, Second expert report: Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. AICR, Washington DC, 2007: 18
19. Kubiak J, Różańska D, Regulska-Ilow B, et al. Ocena jakości diet studentek dietetyki na podstawie wskaźnika K. DQI (diet quality index). Bromat Chem Tiksykol, 2015; XLVIII (3): 429–432
20. Hyżyk AH, Krejpcio Z, Dyba S. Ocena sposobu żywienia żołnierzy w wybranych jednostkach wojskowych. Probl Hig Epidemiol, 2011; 92 (3): 526–529
21. Gaździńska A, Kłos A, Bertrandt J, et al. Wartość energetyczna i zawartość składników podstawowych w całodziennych racjach pokarmowych słuchaczy Wyższej Szkoły Oficerskiej Sił Powietrznych (WSOSP) w Dęblinie. Żyw Człow Metab, 2009; 36 (1): 215–220