

## **ASSESSMENT OF BODY COMPOSITION AND THE ANTHROPOMETRIC PARAMETERS OF THE MILITARY PERSONNEL DURING HIGH PHYSICAL LOAD EXERCISES**

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### **ABSTRACT**

Military activities are characterized with high physical endurance exercises and the psychological load. The cadets of the last study year participate in the combat training course lasting for ten days. The combat training course is a challenge for military officers. It is characterized with the transition from the daily military study process routine in the National Defence Academy to military exercises in the external environment. The cadets face feeding limitation, sleeping deprivation, intensive and continuous training, strict discipline, etc. Such a situation requires the adaptation to a novel way of activity, which includes hardships and arduous training. We provided the assessment of the body mass fluctuation during the combat training course. We provided the analysis of anthropometric parameters before, during and after the combat training course, summarized the data of the health statement and health problems that are fixed in the medical cards. The proper body mass supports the good health capacity. The body composition undergoes changes during the higher physical load performance. The analysis of the average value of the body mass and the Body Mass Index have shown large individual changes inside the groups. Physical fitness and body composition have an adverse effect on military performance. The assessment of the results of physical fitness tests is provided differentially according to the individual corresponding age subgroup. The military personnel have a high risk for the health concerning the impact of external and internal factors. According to the review of the medical cards of the cadets group we indicated the main problems which

are fixed after the combat training course. These are acute respiratory infections, dermatological problems, locomotor system problems, gastro-intestinal problems.

**Keywords:** *Anthropometric characteristics of the military personnel; the fitness level of the military personnel; the high endurance exercise effect*

## INTRODUCTION

The military duties are associated with life-style changes – social, environmental, climatic and geographical conditions, biorhythms, nutrition, etc., with increased physical and psycho-emotional loads. The future officer, the cadets of the National Defence Academy, should train in the special military surrounding, and become fit for any military task. High physical load is a compulsory part of the military study programme [1]. The future military officer of the Land Forces, Marine and Air Forces participates in the combat training course that is a compulsory part of the study programme. The combat training course is a unique military environment designed to develop rapid physical, cognitive, social changes in participants [5,6,7,8]. Cadets had military tactical tasks with a high physical load in the military equipment (average moving distance about 10 km), sleeping deprivation and nourishment limitation. There is not any restriction for consuming drinking water. High intensity training (the combat training course) is important for self-confidence, the self-assurance of military leaders. The standardized nature of stressors provides a unique opportunity to examine the changes simultaneously occurring in the conditions of individual adaptation to a new environment. The physical changes [3,4] and psychological adaptation, the problems of personality, mood changes occur during the combat training course [16]. Before high intensity training it is important to provide preventive measures to reduce the risk of health disorders related to a specific job and provide necessary medical help at the early stage. The physical load (dynamic and static) causes overstress with a high risk of health disorders, musculoskeletal pathology and psychological overload [11,12]. The physical fitness level is important for high physical load exercises. Energy expenditure during the high physical load training leads to fatigue and exhaustion. The body composition and physical fitness are related to the demands of the military service [2,10]. The body mass supports the good health capacity [13,14,15,17]. The effects of the excess body mass are widespread, raise the variety of concerns relevant to the health and the performance of the military personnel [9,18,20,24].

Due to the high level of physical and psychological load, to which the participants of the combat training are exposed and the specific military tasks they are required to perform, the cadets run an increased risk of sustaining injuries, including overexertion injuries of the locomotor system [19,22]. Various predisposing factors play an important role as risk factors to injuries to the locomotor system such as the individual fitness age, gender, smoking behaviour, the biomechanical characteristics as the shape of the foot, the spinal curvature [21,23]. One of the main causes of complaints and injuries is carrying various items of the equipment over long distances.

## **AIM**

The purpose of the study is to provide the assessment of the changes of the body composition and anthropometric parameters for the cadets during the ten days long combat training course (CTC) with a high physical load exercises in the extreme military exercise conditions with a dietary limitation.

## **MATERIAL AND METHODS**

We provided the evaluation of the anthropometric characteristics of the cadets, the participants of the combat training course. The cadets' group included 49 military persons of both genders (41 males and 8 females) in the age of 22–30 years (average age 24.9 years). We provided the body mass registration on the first day, the third day and on the seventh day of the combat training course. We evaluated the anthropometric data, the data of physical fitness tests and the data concerning the health statement fixed in the medical cards. We provided the analysis of basic anthropometric measurements: body mass, body height. The Body Mass Index was calculated by dividing the body mass (kilograms) by the square of height (meters). We evaluated the cadets' results in the complex of standard physical tests: push-ups tests, sit-up tests and the cross country race (for males 3,000m) according to the points table from poor till excellent and with distinction.

## **RESULTS AND DISCUSSION**

The combat training course is a ten days long military training that focuses on the general military training unit, on general military subjects, on military tasks when the cadets work as a team. During the combat training course cadets

wore the standard equipment of soldiers that consists of a helmet carrying strap, backpack, and the rifle. The weight of total equipment was over 21–23 kg. The combat training course is mentally, emotionally and physically stressful. The cadets participate in the rigorous physical and mental training, including loaded road marching, obstacle exercises, swim survival exercises, confidence exercises. The training for males and females is similar the respondents of the study group participate in the combat training course, which is a unique military environment designed to develop rapid physical, cognitive, social changes in participants. The combat training course is a challenge for the future military officers where they check their physical fitness and endurance, psychological adaptation abilities and social skills to deal with the problems of personality, mood changes. The respondents of the study group were in the age from 23 years to 30 years (average age 24.9 years) that corresponds to the early adulthood and is characterized with specific substantial psychosocial development and vulnerability. The age distribution of the participants of the study group is shown in Figure 1. The participants are the cadets who study in the National Defence Academy in the programme of the Military leadership being in the military service until five years, and the cadets who study in the programme of the Command staff officer having the experience in the military service for one year. The experience of the military service is important for executing the military exercise task and the self-management of physical and intellectual capacities. 54.5% of participants of the examined groups were in the military service for one year, 31.8% of the respondents were in the military service by five years, 13.6% of cadets were engaged in the Armed Forces for ten years.

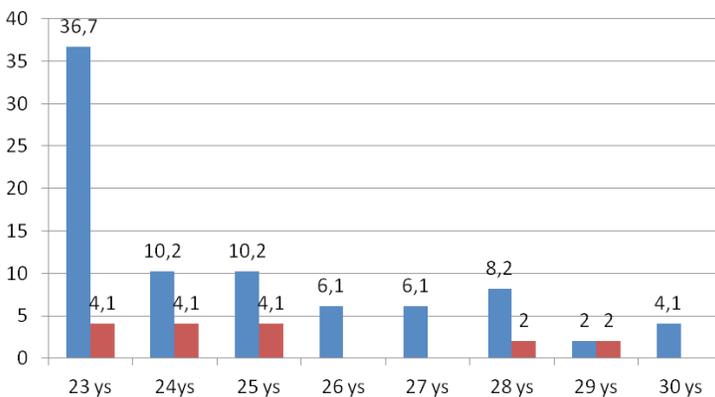
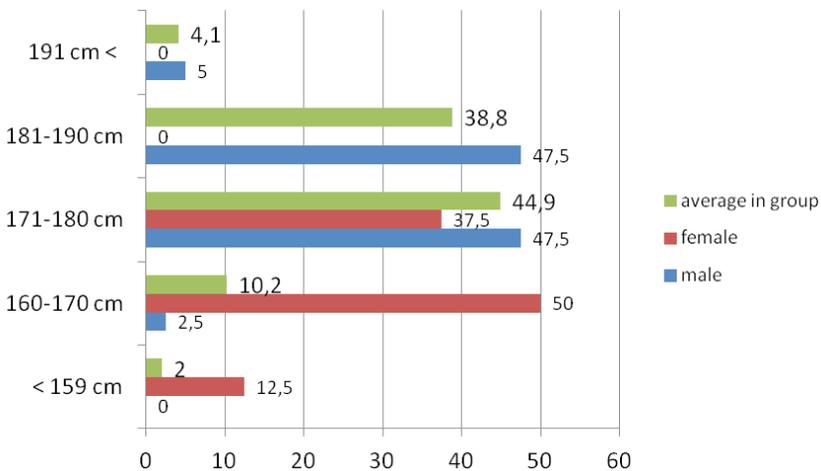


Figure 1. Cadets' distribution (%) into groups concerning age.

We provided the assessment of the main anthropometric characteristics of the persons of the examined group during the combat training course. The analysis of the main body height of the individuals in the examined group revealed the variations of the height of the persons in the male group from the minimal value 163 cm to the maximal value 197 cm, the mean value of the body height for the male was  $181.2 \pm 1.2$  cm. The body height variations in the female group were from the minimal value 157 cm to the maximal value 176 cm, the mean value of the body height for the female was  $167.8 \pm 2.3$  cm. The height parameters of 83.7% of the respondents were found in the interval from 170 to 190 cm and only few respondents were above 191 cm and below 169 cm (Figure 2). The analysis of the body mass value of the respondents-participants of the combat training course reflects a large scale of variation in the age period of early adulthood from 23 to 30 years (Figure 3): the value of the body mass for individuals (in the male group) varies from the minimal body mass value 54 kg to the maximal body mass value – 95 kg, the mean value of the body mass for the male was  $78.4 \pm 1.7$  kg. The value of the body mass for the individual (in the female group) changes from the minimal body mass value 54 kg to the maximal body mass value 74 kg, the mean value of the body mass for the female was  $62.0 \pm 2.4$  kg. The body mass value of 67.5% of the respondents (in the male group) was found in the interval from 76 to 95 kg. The 87.5% of the respondents of the female group had the body mass value in the interval from 54 kg to 74 kg.



**Figure 2.** Cadets' distribution (%) into groups concerning the body height value.

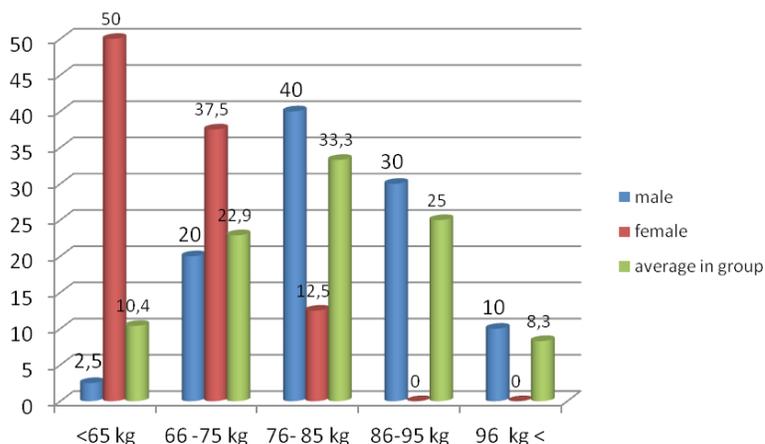


Figure 3. Cadets' body mass value distribution (%) into groups.

We provided the analysis of the anthropometric index – the Body Mass Index. The mean value of the Body Mass Index for the male was  $23.82 \pm 0.03$  with the variations in the interval from 20.31 to 28.5. The mean value of the Body Mass Index for the female was  $21.9 \pm 0.5$  with variations in the interval from 19.8 to 23.8. The Body Mass Index value in the male group for 50% of respondents corresponded to the standard Body Mass Index value (norm) data (up to 24.9). The Body Mass Index values for 42.1% of respondents were included in the interval from 25.0 to 27.9 that indicated overweight problems. The few respondents (7.8%) had the Body Mass Index value in the interval from 28.0 to 30.0 (Figure 4).

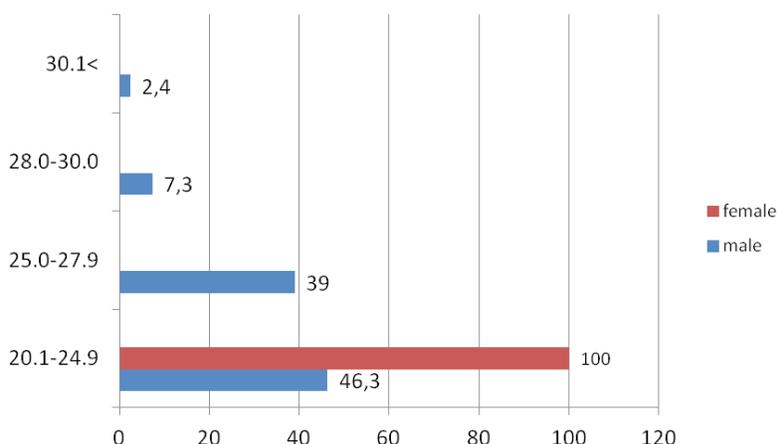
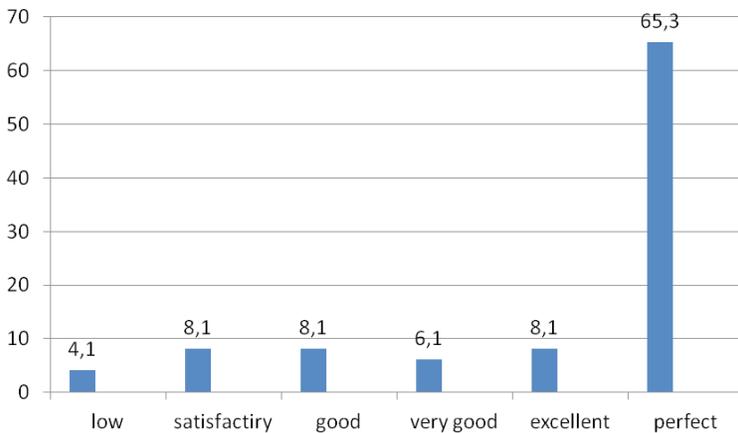


Figure 4. Cadets' Body Mass Index value distribution (%) into groups.

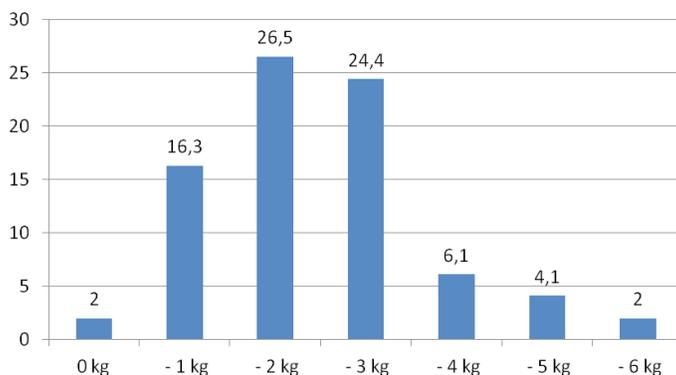
A very important component of the preparedness of the military officer is physical training and the assessment of physical fitness tests results. The sports instructors have provided the assessment the complex of standard physical tests (push-ups, sit-ups and the country cross race (3000 m, for the males; 1500m for the females). The results were equated to the points with the differential approach according to the age of the individual (in age subgroups). The assessment of complex standard physical tests (push-ups, sit-ups and the country cross race) was performed by the sport instructors. The results were equated to the points with the differential approach according to the age of the individual (in age subgroups). 73.43% of cadets show excellent results and the results with distinction in the physical fitness test. The number of individuals who get low and satisfactory assessment in physical fitness tests is 12.1% of respondents of the examined group, good and very good tests results are shown by 14.1% of cadets (Figure 5).



**Figure 5.** Cadets' distribution (%) into groups concerning the assessment of the results complex of standard physical tests.

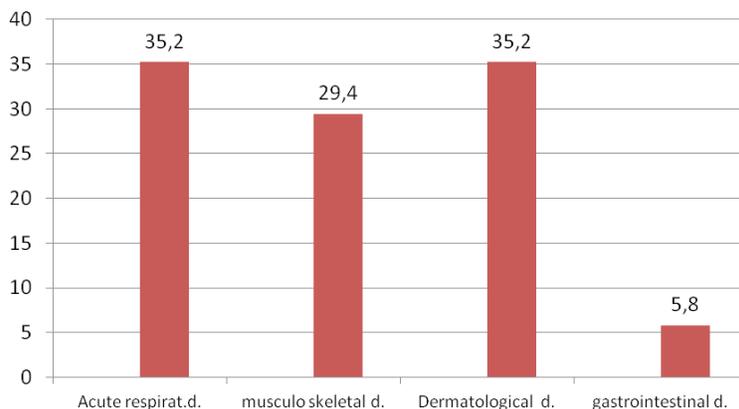
The combat training course is a challenge for cadets. It is a transition from the daily military training routine in the NDA from classroom training to military exercise, being extremely intense and highly structured in the external environment. Such a situation requires adaptation to the special military environment, which includes hardships and arduous training, group living, feeding limitation, and sleeping deprivation, intensive and continuous training, strict discipline. We fixed changes of the body mass during the courses that are represented on Figure 6. The cadets had feeding limitation, and sleeping deprivation, intensive and continuous training. The body mass value in the cadets group

decreased about 2–3 kg for half of respondents (50.9%). The small body mass value changes (diminishes the body mass by one kg) are found for 18.3% of participants of the combat training course. There were 12.2% of participants for whom the changes (decreasing) of the body mass value were up to six kg.



**Figure 6.** Cadets' distribution (%) into groups concerning the lost body mass (kg) during the combat training course.

We provided the analysis of medical cards data about the participants of the combat training course that were represented in Figure 7. Each cadet had medical card, the active participation in the military training caused different health problems. The surgical (orthopaedic) problems were fixed for 44.9% of cadets. These were various traumatic injuries. 18.4% of the participants of the combat training course had a fixed diagnosis of flat foot that had an impact on individuals during the combat training course.



**Figure 7.** Cadets' distribution (%) into groups on the basis of fixed health problems after the combat training course.

## CONCLUSION

1. The analysis of anthropometric characteristics has shown large changes of the body mass and the Body Mass Index. The body mass of the military personnel (cadets) in early adulthood, in the age period from 23 to 30 years for 67.5% of respondents (in the male group) was found in the interval from 76 to 95 kg, and for 87.5% of the respondents of the female group had the body mass value in the interval from 54 kg to 75 kg. The Body Mass Index value for early adulthood in the male group for 50% of respondents and for 100% of respondents in the female group corresponded to the standard Body Mass Index value (norm) data (up to 24.9). For the rest part of the respondents' Body Mass Index value was included in the interval from 25.0% to 29.9% that indicates overweight problems.
2. The assessment of the complex of standard physical tests (push-ups, sit-ups and the country cross race (3000 m, for the males) of cadets (early adulthood) has shown that 73.43% of the respondents had excellent results and the results with distinction in the physical fitness test. The number of individuals who get a low and satisfactory assessment in physical fitness tests is 12.1% of the respondents of the examined group, good and very good tests results are shown 14.1% of the cadets that reflect a high operational readiness of the responding group.
3. The combat training course with the transition from the daily military training routine to the military exercise in the external environment revealed changes of the body mass: the body mass value decreased about 2–3 kg for half of the respondents (50.9%), for 18.3% of the participants on the combat training course the body mass value changes were small; they diminished in the interval of one kg. There were 12.2% of participants for whom the changes of the body mass value were about six kg.
4. The analysis of the health problems of the participants after the combat training course revealed such problems as acute respiratory infections (35.2), dermatological problems of feet (35.2%), the symptoms of the musculoskeletal disorders (29.4%) and the gastrointestinal problems (5.8%).

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