DOI: 10.22616/REEP.2021.14.050

Somatic Health Level Assessment Importance in Military Personnel Group

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Abstract: Topicality of research is indicated by importance of somatic health level assessment of military personnel that is a basement for fulfilling military tactical tasks and developing future military career. Physical endurance capacities develop during military training and have impact to the body composition parameters, health capacity level. Medical specialists carried out the assessment of health capacity of military personnel annually. The aim of the study is to evaluate the somatic health and its components in military personnel group that includes cadets from 1st till 5th study year in National Defence Academy of Latvia. The evaluation of somatic health level carried out according H.L. Apanasenko methodology that is a complex approach taking in count anthropometric parameters, physiological measurements, and tests` results in standard physical exercises. The statistical methods were used for analysis of data in SPSS version 20. There are fixed statistically significant correlation between somatic health level and anthropometric parameters (body mass, body mass index value) as well physiological parameters (systolic blood pressure value, hand muscle force, pulmonary vital capacity). The significance of the results is that the level of somatic health level connects to the parameters of body composition and functional parameters. Physical endurance capacities are based on somatic health level assessment, individuals with higher body mass index level, with higher blood pressure parameters, with lower vital index value as well with, longer restoring interval after standard physical exercise had lower somatic health level value. The changes of somatic health level in study group showed the impact of military training duration that important for future military career.

Keywords: military personnel, somatic health level, anthropometric parameters, physiological parameters.

Introduction

Health capacity of military personnel is essential for fulfilling military tactical tasks. Medical specialists assessed annually health capacity of military personnel by from various points of view and aspects. The assessment of somatic health level was provided by using H.L. Apanasenko method that includes combined anthropometric methods, physiological methods, and tests with standard physical exercises. That is known that such factors as the age indicated changes of anthropometric parameters (body mass value, waste circumference and waste and hip circumference ration) and physiological parameters (arterial blood pressure) as well in military personal selection (Neves, 2008; Wenzel, Souza, Souza, 2009; Guziy, Romanchuk, 2016; Prontenko et al., 2018; Plavina, Karklina, 2018). Stressful military surrounding had impact on hypertension incidence in military personnel population comparing data of arterial hypertension incidence to civil population group (Lee et al., 2018).

Analysis of health status and health problems in military personnel group revealed that individuals with higher body mass index (BMI) value as well had higher rate of arterial hypertension (Burley et al., 2018). There are various risk factors correlated to arterial hypertension rate: age, overweight, adiposity and professional activities. The level of health capacity is crucial for manifestation of functional disorders, musculoskeletal pathological changes and diseases also in military personnel group (Platsas et al., 2014; Ashnagar, Sartang, Habibi, 2017). Topical problem in modern society is overweight and high adiposity rate (Yumuk et al., 2015). Overweight problems have found in military personnel group despite to their higher physical activity rate and physical endurance level and dietary habits (Plavina, Gegere, 2019). Evaluation of body composition parameters and indices like Body Mass Index, fat mass value undergone periodically assessment.

Adiposity problem has fixed for 14 % participants in military personnel selection group as well the increasing of BMI value and free fat mass % (Durán-Agüero et al., 2017; Fajfrová et al., 2016). Military training is important for support and development physical endurance of military personnel. It has

impact on the body composition parameters and,–cardiovascular response (Looney et al., 2018). Therefore, it is important to use objective methods for precise evaluation of body composition with its connection to the somatic health level. It also allows to escape wrong interpretation analysis of BMI value and changes of body composition in cases when body mass and BMI value exceed standard (Heinrich et al., 2008, Aandstad et al., 2014). Purposeful physical training brought changes of physical/sport tests` results and body composition parameters. Individuals with higher value of BMI shown increasing of running time in exercises (Pierce et al., 2017), but individuals with BMI over 30 (with adiposity) shown lower sports` results than individuals whose BMI was below 30 (Sanderson et al., 2018).

Trauma risk factors in military field are higher level than in civil life, but analyses of incidence traumatic injuries shown that the age, and anthropometric parameters (higher value of BMI) have not expelled influence on injuries rate (Rappole et al., 2017). Epidemiologic studies of health problem (diseases rate) in military personnel group revealed that incidence of metabolic syndrome is ten times less than in civil population (Weber, 2018; Schulze et al., 2017).

Importance of correct evaluation of impact the professional training to anthropometric and physiological parameters was essential for management preventive measures and support health capacity. The aim of the study is to evaluate the somatic health and its components in military personnel – cadets' group in the National Defence Academy of Latvia.

Methodology

The study was conducted on military personnel (n=177) in aged from 19 years till 30 years, of both genders (male (n=160) and female (n=17) in National Defence academy of Latvia; the study group included cadets from 1st till 5th study year. To assess the somatic health level, data collected by using morpho-functional methods that included anthropometric measurements and tests with standard physical exercises were used. The evaluation of somatic health level was carried out according H.L. Apanasenko. The following anthropometric and physiological parameters are determined: body mass (kg), body height (cm), dynamic hand flexor muscle force (kg) by using hydro-dynamometer SAEHAN, pulmonary vital capacity (ml) by using spirometer, heart rate in rest and recovery time after standardized physical load (in 30 s); blood pressure by using electronic manometer A&D Medical.

The assessment of systolic blood pressure data was done according European Guidelines about arterial hypertension (Williams et al., 2018). Skin folds thickness fixed by using calliper (SAEHAN) in four places (in bicipital, tricipital, subscapular and supra-iliac regions), and measurements used for calculation body fat mass (in %). Analysis of following indices are completed: body mass index (in points) that calculates as ratio of body mass (in kg) and squared body height (in m); vital index (in points) that calculates as ratio of pulmonary vital capacity (in ml) and body mass (in kg); power index (in %) that calculates as ratio of hand dynamometry (in kg) and body mass (in kg). Robinson index (in %) is calculated to multiply heart rate per min to systolic blood pressure (mm Hg column). All indices value summarized, and total sum has evaluated according somatic heath level scale in five levels (low (< 3), below moderate (4-6), moderate (7-11), above moderate (12-15), high (16-18).

Statistical analysis shows that only body mass and body height correspond to the normal distribution, accordingly Spearman correlation was used for nonparametric data analysis. Statistical analysis has been done by using SPSS version 20.

Results

The analysis of the somatic health level in study group had shown that among the respondents in groups from 1st till 5th study years have not revealed significant changes (Figure 1). The average moderate somatic health level (7-11 points) occurred in 44.6 % (n=78) respondents of study group; the high somatic health level found for 2.8 % (n=5) respondents. The individual variants of Somatic health level have influence on developing physical endurance during military training process, also have impact on physiological and anthropometric parameters level.

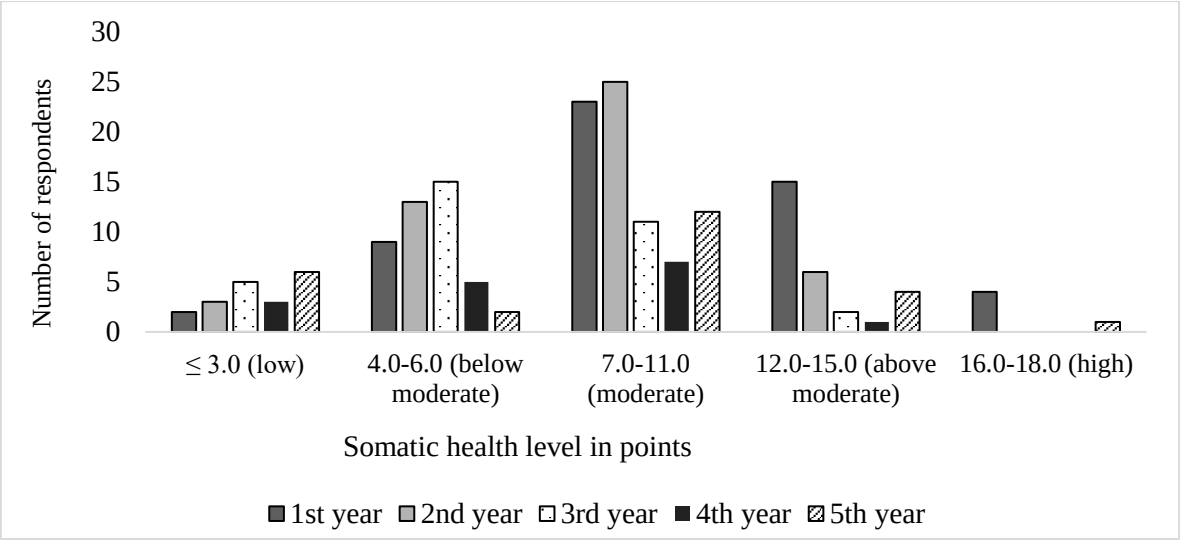

Figure 1. Distribution of respondents of the study group (from 1st till 5th study year) according somatic health level value.

Anthropometric parameters

Average value of Body mass in study group was 80.18 ± 11.72 (SD) kg. The largest number of respondents of study group (35.5 %, n=63) had body mass value in the interval from 71 kg until 80 kg (Figure 2). Body mass value increased with age, and the negative statistically significant correlation was found between body mass and somatic heath level ($r = –0.432$, $p<0.01$).

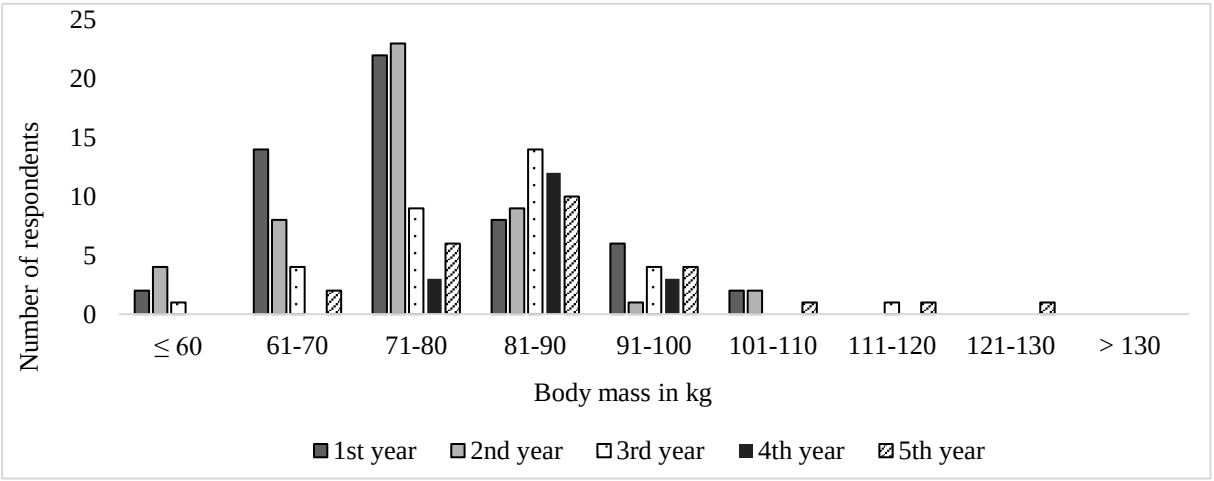

Figure 2. Distribution of respondents of the study group (from 1st till 5th year) according Body mass value.

Average value of body height in study group was 180.04 ±7.44 (SD) cm. The largest number of respondents of study group (45.8 %, n=81) had body height in the interval from 181 cm until 190 cm. Male respondents composed 90.4 % (n=160) in study groups. The value of body mass index in 61.25 % (n=98) male respondents corresponded to standard (from 20.1 until 25.0). The overweight problem with BMI value corresponded to interval from 25.1 until 28 was determined in one fourth of male respondents (25.6 %, n=21), but the pre-adiposity stage with increased BMI value above 28 were fixed in 13.13 % (n=21) of male-respondents. Female respondents composed 9.6 % (n=17) of study group. The value of BMI in female respondents group corresponded to standard (from 18.1 until 23.8) in 76.5 % (n=13), but some female respondents (n=3) had BMI value into interval 23.9 till 26 that evaluated as overweight and for one respondent BMI value was above 26. The negative statistically significant correlation was determined between value of BMI and somatic health level ($r=-0.433$, $p<0.01$). There were gender differences in standard value of body fat %. Analysis of body fat mass in study group show that the moderate body fat mass (that corresponded to 18.0-24.9 %) fixed in 63.1 % (n=101) of male respondents of study group, but

the body fat mass level in 42.9 % (n=9) of female respondents of study group corresponded to low level (from 10 till 13 %). The negative statistically significant correlation is fixed between body height and fat mass ($r = -0.336$, $p<0.01$). The statistically significant correlation is found between thickness of sub-scapular skin fold and BMI value ($r=0.498$, $p<0.01$) and thickness of supra-iliac skin fold and BMI ($r=0.566$, $p<0.01$). The negative statistically significant correlation is revealed between somatic health level and sub-scapular skin fold thickness ($r=- 0,197$, $p<0.01$) and between somatic health level and supra-iliac skin fold thickness ($r=-0.206$, $p<0.01$), as well between somatic health level and BMI value ($r=-0.479$, $p<0.01$).

Physiological parameters

The evaluation of physiological measurements included following parameters: systolic blood pressure level, hand muscle force level, pulmonary vital capacity value and calculated Robinson index, vital index, power index. The analysis of systolic the blood pressure level in 33.3 % (n=59) of respondents of study group corresponded to standard level (120-129 mmHg), in 17.5 % (n=31) of respondents of study group the systolic blood pressure level was below the standard interval, that assessed as standard (norm) according European Guidelines (Williams et al., 2018). The analysis of individual variants of systolic pressure data revealed that in 28.2 % (n=50) respondents of study group the systolic blood pressure level was higher and included into interval 130-139 mmHg, but it assessed as standard. The systolic blood pressure level in 18.6 % (n=33) respondents have determined and assessed as the 1st level of hypertension found (into interval 140-159 mm Hg), but in 2,3 % (n=4) the systolic blood pressure value was higher and included into interval 160-179 mm Hg. The positive statistically significant correlation was revealed between systolic blood pressure value and body mass value ($r=0.477$, $p<0.01$) and between systolic blood pressure value and body mass index value ($r=0.335$, $p<0.010$).

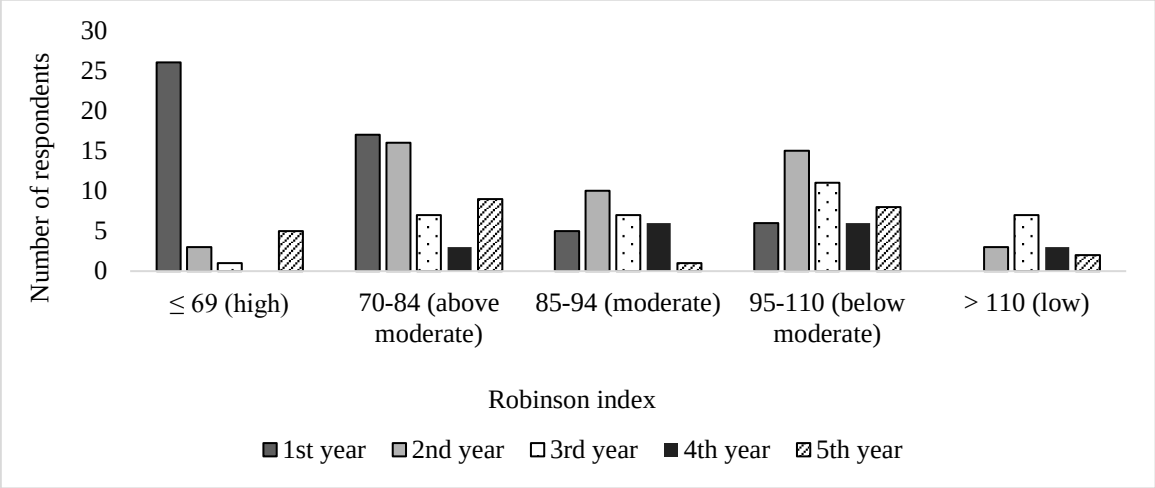

Figure 3. Distribution of respondents of the study group (from 1st till 5th year) according Robinson index value.

Robinson index reflects cardiovascular system functional capacity. Evaluation of Robinson index value shown that in 65.5 % (n=116) of respondents have had parameters that corresponded to optimal level (moderate, above moderate, and high) (Figure 3). The analysis of restoring period of heart rate after standard physical load shown that in 92.5 % (n= 161) of respondents the results were excellent until 60th that indicated the cardiovascular system economization. The negative statistically significant correlation has determined between heart rate restoring time and somatic health level ($r = –0.192$, $p<0.01$).

The respiratory capacity of respondents was assessed by using data of pulmonary vital capacity (in ml) and pulmonary vital index. The analysis of individual data of pulmonary vital capacity revealed in 22.5 % (n=36) male respondents pulmonary vital capacity value corresponded to interval 3501-4000 ml and in 58.8 % (n = 10) female respondents the value of pulmonary vital capacity fitted into intervals 2501 – 4000 ml.

The evaluation the pulmonary vital index value individual variants shown that the vital index was observed in 61.8 % (n=99) into male group at interval above 51 (Figure 4).

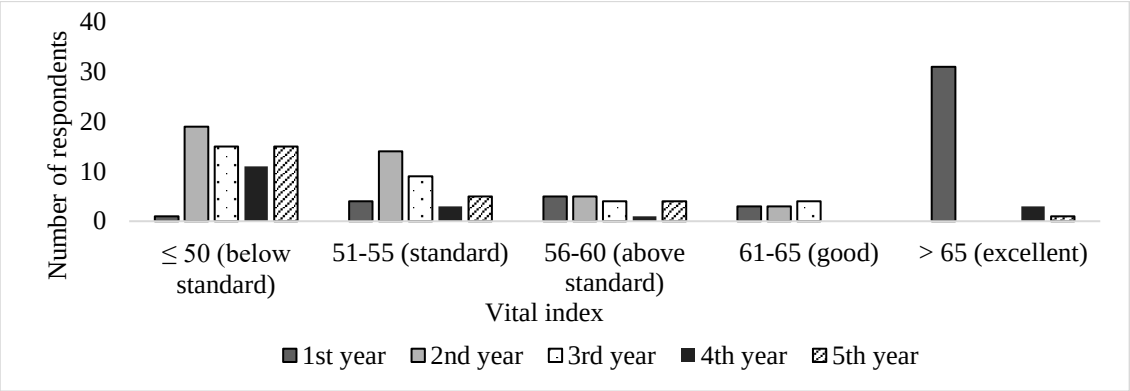

Figure 4. Distribution of male-respondents of the study group (from 1st till 5th year) according vital index value.

Analysis of the data revealed the statistically significant correlation between somatic health level and vital index value ($r= 0.327$, $p<0.01$).

There was wide individual variation range of dynamic muscle work capacity. The analysis of individual variants revealed that that in 78.1 % of male respondents dynamic muscle force value are included into interval from 41 until 60 kg and in 52.9 % of female respondents dynamic muscle force value are included in the interval from 31 till 40 kg, the analysis of individual variation of power index represented on the Figure 5.

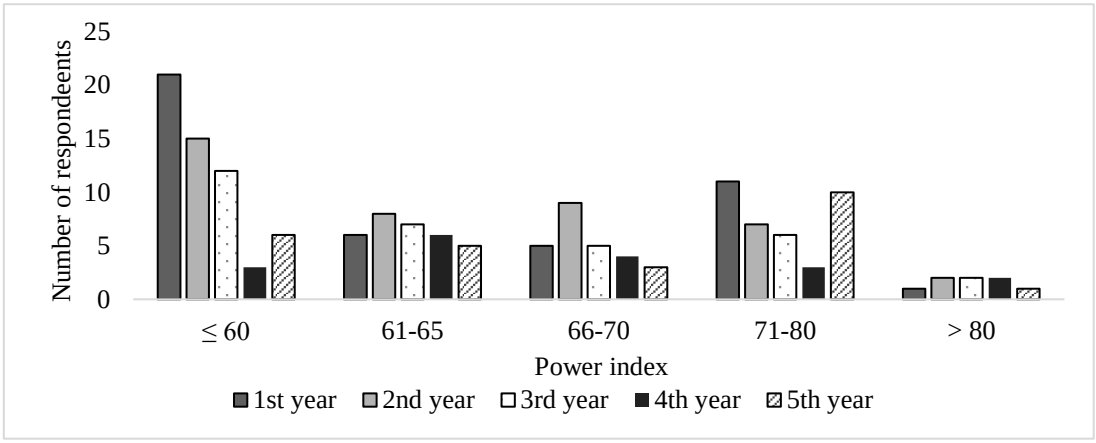

Figure 5. Distribution of respondents (%) of the study group according dynamic muscle work capacity.

The positive statistically significant correlation is found between power index and somatic health level ($r=0.332$, $p<0.01$). Somatic health level increased from with the training of physical skills, endurance, to the body composition and to physiological and anthropometric parameters.

Discussion

Physical training process had impact on body composition of respondents, it induced increasing the body mass that related to increasing muscle mass and decreasing body fat level concerning skin fold thickness diminishing. Assessment body mass value, body height parameters, and calculation body mass index revealed that about 40 % of respondents of study group had BMI value above standard level (according H.L. Apanasenko method), but evaluation physiological parameters shown that body mass connected to increasing muscle force dynamic parameters, vital capacity value. The statistically significant correlation has revealed between systolic blood pressure level and body mass value, between systolic blood pressure level and body mass index value. According European Guidance for assessment BMI value (Yumuk et al., 2015) in 60.7 % (n=108) respondents BMI value corresponded to standard (from 18.5 until 24.9). There were 34.8 % (n=62) of respondents with BMI value into interval from 25.0 until 29.9 that evaluated as overweight. Small number of respondents (4.5 % (n=8) had BMI value that were into interval from 30.0 until 34.9 and were evaluated as adiposity. Assessment of various physiological parameters revealed that

systolic blood pressure level in 20 % of respondents of study group were above standard, calculation of Robinson index indicated cardio-vascular problems for one third of respondents of study group. Dynamic muscle force parameters in 78.1 % of respondents corresponded to optimal level, but the study has shown that respondents with low level of dynamic muscle force parameters, that indicates physical fitness and endurance problems (low physical fitness level, low muscle mass value or increased body mass/ body mass index value). Physical fitness training had impact on anthropometric and physiological parameters of respondents and on somatic health level, that is supported by revealed correlation between somatic health level and anthropometric parameters (body mass index value and skin fold thickness). The statistically significant correlation has found between somatic health level and anthropometric parameters (negative correlation with body mass index value and skin fold thickness). Somatic health level evaluation according H.L. Apanasenko method used as assessment method of military training impact.

Conclusions

- Physical training process had impact on body composition of respondents, it induced increasing the body mass that related to increasing muscle mass and decreasing body fat level concerning skin fold thickness diminishing**.**
- Assessment of body mass value, body height parameters, and calculation of body mass index revealed that about 40% of respondents of the study group had BMI value above standard level, but evaluation physiological parameters shown that body mass connected to increasing dynamic muscle force parameters, vital capacity value.
- Evaluation of functional parameters revealed increasing blood pressure level over standard value in 20.9% of respondents that to statistically significant lowering of somatic health level.
- Physical fitness training had impact on anthropometric and physiological parameters of respondents and on somatic health level. There is found correlation between somatic health level and anthropometric parameters (body mass index value and skin fold thickness). Somatic health level evaluation according H.L. Apanasenko method has been using for assessment military training impact.

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