DIVERSITY OF SOMATIC CONSTRUCTION AND BODY CONTENT IN POLISH TERRITORIAL DEFENSE FORCES

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- Somatic construction
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- BMI
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Abstract:

The somatic potential, which is brought with a candidate for military service is an attitude of construction in his future subsequent value. Recruitment to the Territorial Defense Forces - TDF (Polish: Wojska Obrony Terytorialnej - WOT) since the beginning of formation of the first brigades, it was introduced the obligation to study the somatic construction and body composition of candidates for service. As the main indicators BMI (Body Mass Index), and the content of fat in the body were adopted.

The purpose of the research was to determine whether there are relevant differences in the somatic construction and body content among candidates to serve in Territorial Defense Forces.

The study involved 121 men, candidates to 3. Carpathian Brigade of Territorial Defense in Rzeszów, who were categorized in two age groups 20-29 years (n = 83) and 30-39 (n = 48). Body height was measured using the anthrop meter Martin. Study of body content was performed by BIA method using the analytical scale TANITA MC-180.

As the study revealed, there are statistically significant differences in the somatic construction of tested group only in terms of visceral fat tissue indicator (VFATL). Close to statistical significance is also the value of BMI. Statistically significant differences were found also in the content of the upper and lower limbs in tested group (segment analysis), mainly in terms of fat tissue content. The average BMI and fat tissue indicator in both groups is in the standards adopted in the TDF.

INTRODUCTION

The somatic potential, which is brought with a candidate for military service is an attitude of construction in his future subsequent value. Apart from physical fitness at the required level (validated in the recruitment phase, and then controlled every year on mandatory exam at physical education), it is the main information about what resource persons the armed forces have.

The impact of the various determinants on biological condition of human, including the level of his physical fitness is commonly known. Factors of the external environment, and genetic factors clearly influence human development [Szopa et al. 2000].

Environmental influence reveal inter alia, in the global image of active man's behavior and individual variability in the motor components of the human skills [Przewęda 1993, Sławińska 2000]. Due to the nature of service in Territorial Defense Forces and the age span of candidates (18-55 years in the private rank, and up to 63 years in the non-commissioned officers and officers) these factors become very important.

In recruitment process to TDF since the beginning of formation of the first brigades, the obligation to study the somatic construction and body composition of candidates for service were introduced. As the main indicators BMI (Body Mass Index) and fat content in the body were adopted. As BMI is relatively easy to determine (weight in kilograms is divided by the height in meters squared) with so much precise measurement of body content (fat treasure content) is a bit more complicated.

For this purpose mainly anthropometric measurements are applied, bio impedance analysis, isotopic methods, x-ray absorb meter, CT scan, ultrasound or magnetic resonance imaging. However, in clinical practice, most of them are not available, primarily due to the long and complex measurement method, the high cost of testing or irradiation.

The electrical impedance, also known as bio impedance, is a fast, non-invasive measurement way. It can be used practically in all, with the exception of those with an implanted pacemaker. Examination of the BIA is to measure the impedance (that is, a kind of electrical resistance of resistance and reactance) tissue, through which is passed the low-current ($\leq$ 1mA). The phenomenon of resistance is associated with resistance to the competent individual tissues while capacitance greater is mainly due to electrical capacitance of cell membranes, which due to its construction of the act as capacitors [Lewitt et al. 2007]. This technique is used extensively in research on eating disorders, for forecasting the risk of cardiovascular disease and metabolic or in sports medicine.

Aim of the work

The aim of the work was to determine whether there are relevant differences in the somatic construction and body content of candidates to serve in the Territorial Defense Forces. Not less research is introduction to larger research project, both in terms of the evaluation of the somatic construction of the candidates for service and diagnostics and programming their physical activity.

Material and Method

The study involved 121 men, candidates to 3. Carpathian Brigade of Territorial Defense in Rzeszów (Poland), who were categorized in two age groups 20-29 years (n = 83) and 30-39 (n = 48).

Analysis of somatic construction

Study of body height were performed using anthropometer (Martin Type) in accordance with the description given by the A. Malinowski and W. Bożiłow [Malinowski, Bożiłow 1997].

Measurement was performed on the Basis-Vertex (B-V), it was noted that the tested person was up to erect, while the head set in the Frankfurt position. Anthropometer was set perpendicular to the base, the measure was read to the nearest 0.1 cm. Body weight was established on the basis of the measuring body composition Analyzer type TANITA MC-180.

Analysis of body content

Body content was carried out by using the Bioelectrical Impedance Analysis method (BIA) with body composition monitor TANITA type MC-180.

Furthermore, the following parameters were checked: **BMI -** Body Mass Index, **FATP -** Body Fat Percentage, **FATM -** Body Fat Mass, **PMM -** Predicted Muscle Mass, **VFATL -** Visceral Fat Level, **BONEM -** Bone Mass, **FFM -** Fat-free Body Mass, **TBW -** Total Body Water, **ECW -** Extra Cellular Water, **ICW -** Intra Cellular Water, **BMR -** Basal Metabolic Rate. Segmental body analysis was also carried out and included: left/right leg, left/right hand, the trunk and concerned PPM, FFM, fat body mass.

Statistical analysis

Analysis of survey results was made using Statistica 9.0. PL. Elaboration and analysis of collected data were based on correct grouping and presentation in tabular and graphical composition. Quantitative data were subjected to statistical analysis: basic characteristics is the mean, median, standard deviation, coefficient of variation, minimum, maximum, and the coefficients of skewness and flatten. To examine the differences between levels dependent variable factor used was ANOVA, (dependent variable and independent of the repeated measurements – Anova). In all analyses carried out during the elaboration of collected research material p-value was adopted as the statistical significance threshold < 0.05 [Ostasiewicz et al. 2006].

RESULTS

As a result of research revealed the results of relevant or close to statistical significance.

Table 1. General characteristics of the analyzed parameters – multi divided array

Variable	Age: 20-29 (N=83)					Age: 30-39 (N=48)					d	ANOVA	
	x	min	max	sd	V	x	min	max	sd	V		F	p
HEIGHT	177,8	160,0	192,0	6,6	3,7	177,1	164,0	198,0	6,3	3,5	0,8	0,420	0,518
WEIGHT	80,0	56,6	112,8	13,0	16,3	83,1	55,5	114,4	12,7	15,3	-3,1	1,725	0,191
BMI	25,3	17,7	35,9	3,7	14,7	26,4	19,0	35,1	3,5	13,1	-1,2	3,121	0,080
FATP	16,6	5,1	29,6	6,2	37,2	18,4	4,7	28,6	5,8	31,4	-1,8	2,662	0,105
FATM	13,9	3,3	33,3	7,0	50,6	15,8	2,6	30,4	6,5	41,4	-1,9	2,348	0,128
PMM	62,8	48,3	80,3	7,1	11,2	63,9	50,3	89,2	7,1	11,1	-1,1	0,756	0,386
VFATL	3,9	1,0	13,0	2,9	74,2	6,1	1,0	13,0	2,8	45,4	-2,2	17,846	0,000
BONEM	3,3	2,6	4,2	0,3	10,5	3,3	2,7	4,6	0,3	10,2	-0,1	0,708	0,402
FFM	66,1	50,8	84,3	7,4	11,2	67,2	53,0	93,7	7,4	11,1	-1,2	0,752	0,387
TBW	48,2	38,0	61,5	5,3	10,9	48,6	39,0	67,9	5,4	11,0	-0,4	0,194	0,661
ECW	18,8	15,4	23,4	1,8	9,8	19,2	15,6	25,0	1,8	9,5	-0,4	1,822	0,179
ICW	29,4	22,6	38,8	3,6	12,1	29,4	23,5	43,0	3,6	12,3	0,0	0,002	0,969
BMR	8177,4	6309,0	10652,0	977,4	12,0	8236,1	6305,0	11832,0	1007,4	12,2	-58,7	0,107	0,744
RLFATP	14,0	5,2	25,6	4,8	34,4	15,9	5,1	29,2	4,8	30,0	-1,9	4,984	0,027
RLFATM	2,0	0,6	4,1	0,9	45,5	2,3	0,5	4,3	0,9	39,1	-0,3	3,430	0,066
RLFFM	11,7	9,2	15,1	1,2	10,7	11,7	9,1	15,8	1,3	11,0	0,0	0,004	0,950
RLPMM	11,1	8,8	14,3	1,2	10,6	11,1	8,6	14,9	1,2	11,0	0,0	0,006	0,941
LLFATP	14,5	5,7	26,4	4,7	32,2	16,6	7,2	27,8	4,3	26,1	-2,1	6,358	**0**,013
LLFATM	2,0	0,6	4,2	0,9	44,2	2,3	0,7	4,3	0,8	36,4	-0,3	3,950	0,049
LLFFM	11,3	9,0	14,7	1,3	11,1	11,3	8,8	15,5	1,3	11,5	0,0	0,005	0,945
LLPMM	10,7	8,6	13,9	1,2	11,0	10,7	8,4	14,6	1,2	11,4	0,0	0,006	0,936
RAFATP	14,5	6,1	25,3	4,2	29,3	16,2	8,1	25,7	3,8	23,6	-1,7	5,040	0,026
RAFATM	0,7	0,3	1,6	0,3	42,7	0,8	0,3	1,5	0,3	34,8	-0,1	3,134	0,079
RAFFM	4,1	3,0	5,5	0,6	14,2	4,1	3,0	5,9	0,6	13,7	0,0	0,018	0,893
RAPMM	3,8	2,8	5,2	0,5	14,2	3,8	2,8	5,6	0,5	13,8	0,0	0,015	0,903
LAFATP	15,0	6,1	28,8	4,9	32,4	16,6	8,1	27,1	4,3	26,0	-1,6	3,452	0,065
LAFATM	0,8	0,3	2,0	0,4	46,3	0,9	0,3	1,5	0,3	36,4	-0,1	2,403	0,124
LAFFM	4,1	2,9	5,8	0,6	15,6	4,2	3,0	6,3	0,6	14,6	0,0	0,131	0,718
LAPMM	3,9	2,8	5,4	0,6	15,6	3,9	2,8	6,0	0,6	14,6	0,0	0,162	0,688
TRFATP	18,5	3,0	35,1	7,8	42,1	20,1	3,0	32,3	7,2	36,1	-1,6	1,375	0,243
TRFATM	8,4	1,0	21,5	4,7	55,6	9,5	0,9	18,8	4,3	45,5	-1,1	1,762	0,187
TRFFM	34,9	26,0	43,8	3,9	11,3	36,0	28,6	50,1	3,9	10,8	-1,1	2,563	0,112
TRPMM	33,3	24,6	41,9	3,8	11,4	34,4	27,1	48,0	3,8	11,0	-1,1	2,510	0,116

x - arithmetic average; **sd** - standard deviation ; **min** –minimum result; **max** – maximum result; **V** - coefficient of variation ; **d** – difference in groups;

Table 2. Numerical characteristics of the basic morphological test.

Variable	Age: 20-29 (N=83)					Age: 30-39 (N=48)					d	ANOVA	
	x	min	max	sd	V	x	min	max	sd	V		F	p
HEIGHT	177,8	160,0	192,0	6,6	3,7	177,1	164,0	198,0	6,3	3,5	0,8	0,420	0,518
WEIGHT	80,0	56,6	112,8	13,0	16,3	83,1	55,5	114,4	12,7	15,3	-3,1	1,725	0,191
BMI	25,3	17,7	35,9	3,7	14,7	26,4	19,0	35,1	3,5	13,1	-1,2	3,121	0,080

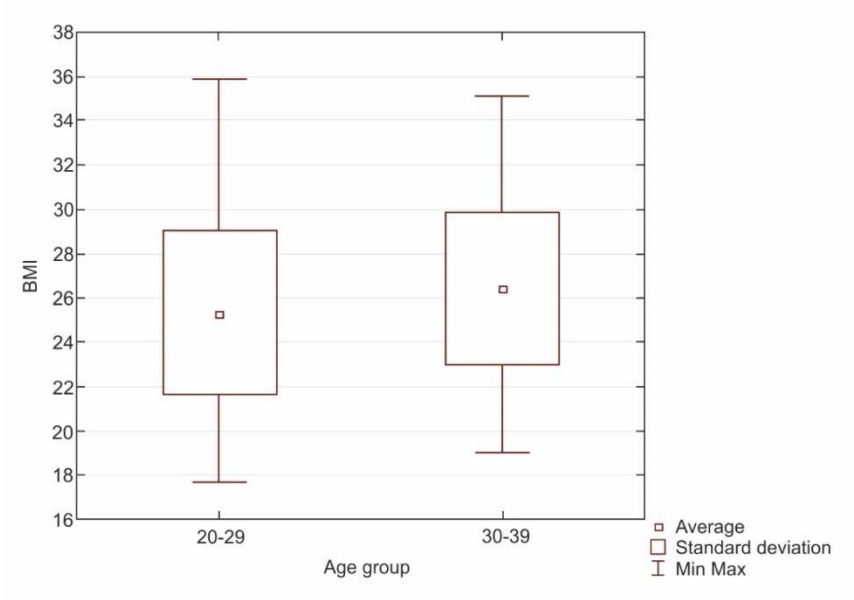

Figure 1. Characteristics of morphological characteristics analyzed by BMI

High statistical significance occurred in terms of visceral fat indicator (VFATL) subjects.

Table 3. Numerical characteristics of the tested components.

Variable	Age: 20-29 (N=83)					Age: 30-39 (N=48)					d	ANOVA	
	x	min	max	sd	V	x	min	max	sd	V		F	p
FATP	16,6	5,1	29,6	6,2	37,2	18,4	4,7	28,6	5,8	31,4	-1,8	2,662	0,105
FATM	13,9	3,3	33,3	7,0	50,6	15,8	2,6	30,4	6,5	41,4	-1,9	2,348	0,128
PMM	62,8	48,3	80,3	7,1	11,2	63,9	50,3	89,2	7,1	11,1	-1,1	0,756	0,386
VFATL	3,9	1,0	13,0	2,9	74,2	6,1	1,0	13,0	2,8	45,4	-2,2	17,846	0,000*

* statistical significance level of $\alpha = 0.05$

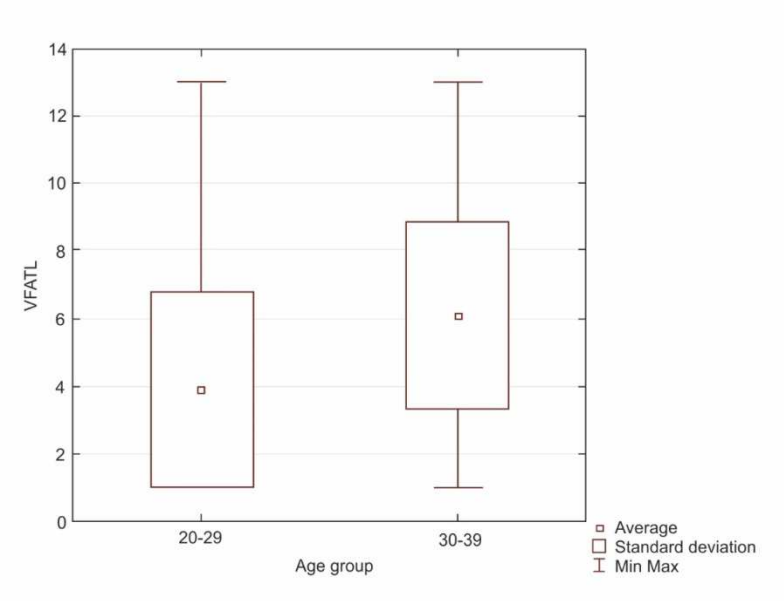

Figure 2. Characteristics of the analysis VFATL component.

In the segmental analysis (legs, arms and torso), statistical significance was revealed mainly in terms of fat content (RLFATP, LLFATP, LLFATM, RAFATP, LAFATP).

SUMMARY

As it was mentioned in the introduction, the somatic potential, which has a candidate for military service and his physical efficiency are the basis for the construction of his future combat capabilities. Obviously each uniformed formation depends on the fact that its officers (and candidates) have these indicators at a sufficiently high level. In the Territorial Defense Forces, due to the nature of the service (volunteers every day performing different jobs), this level is varied.

However, unlike other types of troops, already at the stage of recruitment was introduced, in addition to measuring the basic characteristics of somatic features (body weight and height), the obligation of determining the composition of the body, and in particular the fat content. These two indicators together much more are accurately characterized by the construction of the body other than the same BMI.

A survey revealed that the average score of both age groups does not differ from the TDF (BMI 17-35, FATP 12-30%).

However, in extreme cases of entry for the service decisions are made by the medical commission. Both these indicators are characterized by the construction of a candidate to serve exactly enough to ask about the suitability of the service, the next step is a mandatory physical education exam. The highest statistical significance was shown to visceral fat (very important from a health point of view), and its average value in any of the examined groups did not exceed the permissible range (1-12%). Sectional analysis (body composition of upper and lower limbs, trunk) revealed statistically significant differences in terms of fat and muscle components. They are probably related to lateralization in the body test, but at this stage of the research there are no information about right-or left hand in tested group, so it does not allow for a deeper analysis.

In the subsequent stages of the study, it will be extended with data concerning the living environment of tested groups, physical fitness and their preferences in terms of physical activity out of service. The aim of the larger project is precise diagnosis in psychophysical

possibilities of candidates and soldiers of the TDF and their physical evolution, taking into account age and functional motor capacity.

CONCLUSIONS

1. There are statistically significant differences in the somatic construction and body composition only in respect of indicator of visceral fat (VFATL). Close to statistical significance is also the value of body mass index (BMI).
2. There are statistically significant differences in the composition of the lower limbs, trunk and upper, mainly in terms of fat content.
3. The mean value of body mass index (BMI) and percentage fat content (FATP) in both groups is in the standards adopted in the TDF.

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