ORIGINAL ARTICLE

PHYSICAL HEALTH OF FEMALES FROM THE LOWLAND DISTRICTS OF ZAKARPATTIA ACCORDING TO THE METABOLIC LEVEL OF AEROBIC AND ANAEROBIC ENERGY SUPPLY DEPENDING ON THE COMPONENT BODY COMPOSITION

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Olena A. Dulo[1], Yurii M. Furman[2], Olha B. Maltseva[1], Svitlana M. Samoilenko[3]

[1]STATE HIGHER EDUCATIONAL ESTABLISHMENT "UZHHOROD NATIONAL UNIVERSITY", UZHHOROD, UKRAINE

[2]ZHYTOMYR IVAN FRANKO STATE UNIVERSITY, ZHYTOMYR, UKRAINE

[3]NON-COMMERCIAL MUNICIPAL ENTERPRISE "UZHHOROD CITY POLYCLINIC" OF UZHHOROD CITY COUNCIL, UZHHOROD, UKRAINE

ABSTRACT

The aim: To determine the aerobic and anaerobic productivity of females from the lowland districts of Zakarpattia region, depending on the component composition of body weight.

Materials and methods: A comparative analysis of physical health status of females in the post-pubertal period of ontogenesis, was carried out. Physical health status was assessed by indicators of aerobic and anaerobic productivity depending on the component composition of the body, which was determined by impedance measurement.

Results: Physical health of females from the lowland districts depends on the component composition of the body, namely: an excellent level of aerobic productivity is observed in females who have a normal body weight with a high relative fat content and a normal relative content of skeletal muscles, $VO_{2\,max\,rel.} > 38$ ml·min^{-1}·kg^{-1}; as a result, their physical health exceeds the "critical level" according to H.L. Apanasenko and corresponds to "excellent" according to Ya.P. Pyarnat's criteria. Females from lowland districts who are underweight with a normal relative fat content and a high relative skeletal muscle content have an average level of aerobic productivity, $VO_{2\,max\,rel.} < 34$ ml·min^{-1}·kg^{-1}; as a result, their physical health is below the "critical level" according to H.L. Apanasenko.

Conclusions: The presence of fat in females from lowland districts provides energy for muscle work, which contributes to better development of the muscular system. A high level of energy supply due to a high relative fat content determines the excellent physical health status of females from the lowland districts of Zakarpattia.

KEY WORDS: body mass, fat, skeletal muscles, post-pubertal age

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INTRODUCTION

The formation of physical health occurs under the influence of endogenous and exogenous factors [1, 2]. Moreover, prolonged exposure to exogenous factors can cause genetic changes in the body. Therefore, national and population differences in morphofunctional indicators stimulate scientists to search for relative standards for residents of certain regions [3-5]. In particular, there are territories in Ukraine with ecological features that determine the hormonal status, somatometric parameters, individual components of the somatotype, component composition of body weight, and functional state of the residents of these regions [6-8]. Zakarpattia is one of such regions.

According to the existing concepts of physical health, the aerobic productivity of the body is an integral health indicator [9, 10]. Therefore, the somatic health of a specific individual should be evaluated by physiological indicators that reflect the maximum possible metabolic rate of aerobic energy supply processes. To evaluate the aerobic energy supply processes of the organism, it is recommended to use such indicators as the maximum oxygen consumption or the anaerobic threshold (AnT) [11, 12].

A significant role in the formation of physical health is played not only by aerobic, but also by anaerobic energy supply processes. The results of the research indicate the existence of a close correlation between the aerobic and anaerobic productivity of the organism, where the anaerobic (lactic) productivity is a factor indicator [13, 14].

Therefore, in order to carry out an objective analysis of physical health status of people of different ages and

Table I. Distribution of females from the lowland districts of Zakarpattia by component composition of body weight, n=118

Relative fat content (%)							
< 21,0 (-) low		21,0 – 32,9 (0) normal		33,0 – 38,9 (+) high		>39,0 (++) very high	
number of persons	%	number of persons	%	number of persons	%	number of persons	%
8	6,8	65	55,1	45	38,1	-	-
Relative content of skeletal muscles (%)							
< 24,3 (-) low		24,3 – 30,3 (0) normal		30,4 – 35,3 (+) high		> 35,3 (++) very high	
number of persons	%	number of persons	%	number of persons	%	number of persons	%
-	-	76	64,4	42	35,6	-	-

genders, it is necessary to clearly determine the values and limits of physiological fluctuations of indicators of aerobic and anaerobic productivity of the body, depending on the component composition of body weight, in the healthy population of the Zakarpattia region.

THE AIM

The aim is to determine the aerobic and anaerobic productivity of females from the lowland districts of Zakarpattia region, depending on the component composition of body weight.

MATERIALS AND METHODS

A comparative analysis of physical health status of 118 post-puberty females aged 16 to 20, residents of the lowland districts of Zakarpattia region, was carried out. Physical health status was assessed by indicators of the aerobic productivity of the body, namely, the maximum oxygen consumption was measured ($VO_{2\,max}$) using the bicycle ergometry method. To evaluate the level of aerobic productivity, the Ya.P. Pyarnat's rating scale was used [15]. Indicators of anaerobic productivity of the body were studied by: measuring the power of anaerobic alactic energy supply processes by the Peak Power Output in 10 s ($WAnT_{10}$); the power of anaerobic lactic energy supply processes by the Peak Power Output in 30 s ($WAnT_{30}$), using the Wingate anaerobic test described by Yu.M. Furman et al. The anaerobic lactic productivity of the organism was measured by the Peak Power Output (PPO) in 1 min using A. Shogy and G. Cherebetin's method. The component body mass composition was determined using the impedance method with the application of Omron BF511 Body Composition Monitor to estimate the percentage of fat mass (subcutaneous and visceral fat) and the percentage of skeletal muscle [16]. The statistical processing of the material was carried out in Excel 7.0 and SPSS version 10.0 using Student's t-test to find out the reliability of the difference between the average values.

RESULTS

As a result of determining the component composition of body weight, the females studied were divided into three groups depending on the relative content of fat and into two groups depending on the relative content of skeletal muscles. The number of females with a normal relative fat content (21.0-32.9%) was the largest – 65 individuals (51.1%), while the number of females with a low relative fat content (33.0 -38.9%) was the smallest – 8 (6.8%). There were no individuals with a very high relative fat content (> 39.0%) among those studied. There were 76 individuals (64.4%) with a normal and 42 individuals (35.6%) with a high content of skeletal muscles. There were no females with low (< 24.3%) and very high relative content of skeletal muscles (> 35.3%) among those studied (Table I).

The value of the absolute $Vo_{2\,max}$ index in females with a low relative fat content is 2265.3±65.6 ml·min^{-1} and is significantly lower than the value of females with a normal relative fat content of 2474.5±71.2 ml·min^{-1} ($p<0.05$). The average value of $VO_{2\,max\,rel.}$ of individuals with a high relative fat content is 1.15 times lower than the average value of individuals with a normal relative fat content ($p<0.05$); however, it reaches "safe health level", which is estimated by the relative indicator of $VO_{2\,max\,rel.}$ and is 35.02±1.58 ml·min^{-1}·kg^{-1}. For females, "safe health level" is at the limit of 35.0 ml·min^{-1}·kg^{-1}. The average value of $VO_{2\,max\,rel.}$ relative index of maximum oxygen consumption in females from lowland districts with low and normal relative fat content exceeds "safe health level" and is 37.4±1.65 ml·min^{-1}·kg^{-1} and 40, 3±1.71 ml·min^{-1}·kg^{-1}, respectively. Study of the power of anaerobic lactic energy supply processes of the

Table II. Average values of indicators of aerobic and anaerobic productivity of the body (M±m) of females from the lowland districts of Zakarpattia, depending on the relative fat content, n=118

Indicators	Aerobic productivity		Anaerobic productivity					
	Maximum oxygen consumption		power of alactic energy supply processes		power of lactic energy supply processes		capacity of lactic energy supply processes	
Relative fat content (%)	VO_{2max} ml·min^{-1}	$VO_{2maxrel.}$ ml·min^{-1}·kg^{-1}	$WAnT_{10,}$ kgm·min^{-1}	$WAnT_{10rel.,}$ kgm·min^{-1}·kg^{-1}	$WAnT_{30.}$ kgm·min^{-1}	$WAnT_{30\ rel.,}$ kgm·min^{-1} ·kg^{-1}	PPO, kgm·min^{-1}	$PPO_{rel.,}$ kgm·min^{-1}·kg^{-1}
< 21,0 (-) low (n=8)	2265,3± 65,6 •	37,4± 1,65	2184,4± 68,4 •	40,1± 1,01 •	2102,5± 67,1 •	38,1± 0,82	1218,6± 36,2	21,8± 0,72
21,0 – 32,9 (0) normal (n= 65)	2474,5± 71,2	40,3 ± 1,71	2401,4± 77,3	43,9± 1,04	2297,4± 69,2	40,3± 1,06	1304,8± 39,3	22,7± 0,69
33,0 – 38,9 (+) high (n=45)	2388,7± 68,4	35,02± 1,58 * •	2384,6± 72,1	37,1± 0,92 • *	2196,8± 71,6	37,4± 0,54 •	1198,2± 30,1 •	18,4± 0,62 • *

Note: the probability of a difference in mean values ($p<0.05$):
* - relatively low fat content;
• - relatively normal fat content;
• - relatively high fat content.

Table III. Average values of indicators of aerobic and anaerobic body productivity (M±m) of girls from the lowland regions of Zakarpattia depending on the relative content of skeletal muscles, n=118

Indicators	Aerobic productivity		Anaerobic productivity					
	Maximum oxygen consumption		power of alactic energy supply processes		power of lactic energy supply processes		capacity of lactic energy supply processes	
Relative skeletal muscle content (%)	VO_{2max} ml·min^{-1}	$VO_{2maxrel.}$ ml·min^{-1}·kg^{-1}	$WAnT_{10,}$ kgm·min^{-1}	$WAnT_{10\ rel.}$ kgm·min^{-1}·kg^{-1}	$WAnT_{30.}$ kgm·min^{-1}	$WAnT_{30\ rel.,}$ kgm·min^{-1} ·kg^{-1}	PPO, kgm·min^{-1}	$PPO_{rel.,}$ kgm·min^{-1}·kg^{-1}
24,3 – 30,3 (0) normal (n=76)	2372,9±102,6	40,19±1,17	2436,0±51,8	41,4±1,73	2418,6±58,46	41,42±2,03	1482,1±27,4	25,2±0,9
30,4 – 35,3 (+) high (n=42)	2707,1±83, 4	39,8±1,73	2619,7±41,6	40,2±1,46	2689,7±73,4	41,2±1,44	1513,6±44,2	23,1±0,8
P	< 0,05	> 0,05	< 0,01	> 0,05	< 0,01	> 0,05	> 0,05	> 0,05

Note: P is the probability of the difference in indicators;

body based on the relative value of $WAnT_{30\ rel.}$ among females from lowland districts revealed a significant prevalence of this indicator in females with a normal relative fat content of 43.9±1.04 kgm·min^{-1}·kg^{-1} compared to individuals with a high relative fat content of 37.1±0 .92 kgm·min^{-1}·kg^{-1} ($p<0.05$). Peculiarities of the manifestation of anaerobic productivity in individuals from lowland districts with different component composition of body weight were also revealed when determining the relative power of anaerobic lactic energy supply processes of the body. It is worth noting that the lowest average values of $WAnT_{30\ rel.}$ 37.4±0.54 kgm·min^{-1}·kg^{-1} and 38.1±0.82 kgm·min^{-1}·kg^{-1} are observed in individuals from lowland districts with high and low relative fat content, respectively. At the same time, in females with a normal relative fat content, the average value of the absolute indicator of the capacity of anaerobic lactic processes of energy supply of the body of the PPO is the highest 1304.8±39.3 kgm·min^{-1} compared to the individuals of lowland districts with low 1218.6±36.2 kgm·min^{-1} and high relative fat content 1198.2±30.1 kgm·min^{-1} ($p<0.05$), respectively. In females from lowland districts with a high relative fat content, there is a significantly low relative index of the power of anaerobic lactic processes of energy supply. 18.4±0.62 kgm·min^{-1}·kg^{-1} compared to the indicator in females with low 21.8±0.72 kgm·min^{-1}·kg^{-1} ($p<0.05$) and normal relative fat content 22.7±0.69kgm·min^{-1}·kg^{-1} ($p<0.05$) (Table II.)

The value of the absolute $VO_{2\ max}$ indicator in females with a normal relative content of skeletal muscles is 2372.9±102.6 ml·min^{-1} and is significantly lower than

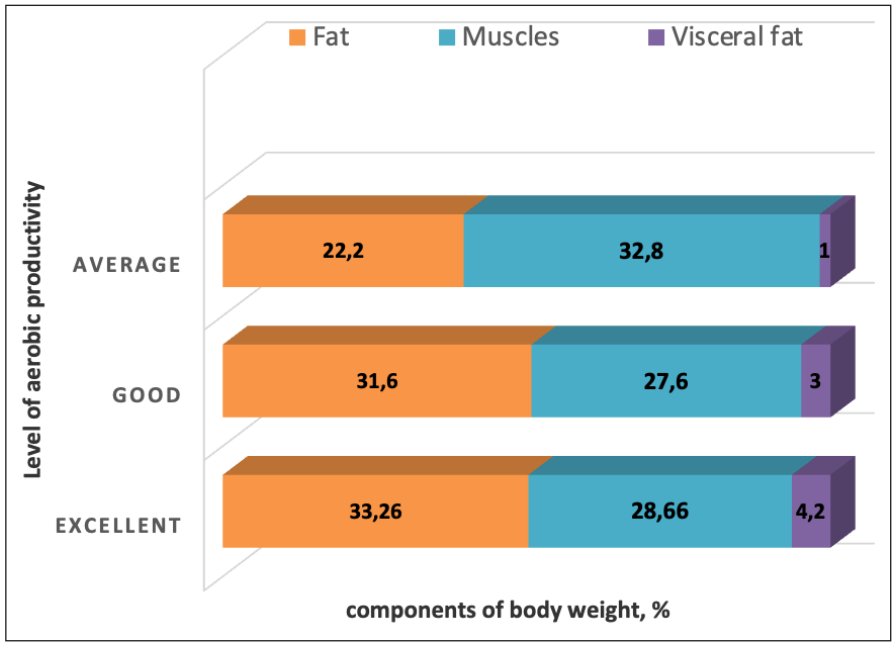

Fig. 1. Graphic representation of the dependence of the level of aerobic productivity of females from the lowland districts of Zakarpattia on the ratio of the component composition of body weight (n=118)

the value in individuals with a very high relative content of skeletal muscles 2707.1±83 .4 ml·min^{-1} ($p<0.05$). The average value of $VO_{2max\ rel.}$ in females from lowland districts with normal and high relative content of skeletal muscles is significantly higher than "safe health status", which corresponds to an excellent level of aerobic productivity and is 40.19±1.17 ml·min^{-1}·kg^{-1} and 39.8±1.73 ml·min^{-1}·kg^{-1}, respectively ($p<0.05$), although the indicators are not significantly different from each other ($p>0,05$). The results of studies of the power of anaerobic lactic processes of energy supply of the body by the absolute value of $WAnT_{10}$ in females from lowland districts revealed a significant prevalence of this indicator in females with a high relative content of skeletal muscles 2619.7±41.6 kgm·min^{-1} compared to individuals with a normal relative the content of skeletal muscles, which is 2436.0±51.8 kgm·min^{-1}. Peculiarities of the manifestation of anaerobic productivity in individuals from lowland districts with different component composition of body weight were also revealed when determining the absolute value of the power of anaerobic lactic energy supply processes of the body. It is worth noting that the lowest average values of $WAnT_{30}$ are reliably observed in females from lowland districts with a normal relative content of skeletal muscles of 2418.6±58.46 kgm·min^{-1}. At the same time, relative indicators of the power of anaerobic lactic energy supply processes of the body of females with normal and high relative content of skeletal muscles probably do not differ from each other. Also, females from lowland districts do not differ in terms of absolute and relative capacity of anaerobic lactic processes of energy supply (PPO) with different relative content of skeletal muscles ($p>0.05$) (Table III).

Thus, according to the results of the research of aerobic and anaerobic processes of energy supply in females from lowland districts, we came to the conclusion that females with a high relative fat content (33.0-38.9%) and a normal relative content of skeletal muscles (24, 3 – 30.3%) with normal body weight (18.5 ≤ BMI < 25 kg/m^2) have an excellent level of aerobic productivity, i.e. $VO_{2\ max\ rel.}$ > 38 ml·min^{-1}·kg^{-1}. Females with a normal relative fat content (21.0 – 32.9%) and a normal relative skeletal muscle content (24.3 – 30.3%) with normal body weight have a good level of aerobic productivity, i.e. $VO_{2\ max\ rel.}$ > 34 to 38 ml·min^{-1}·kg^{-1} (Fig. 1).

Females with a normal relative fat content and a high relative skeletal muscle content (30.4 – 35.3%), but insufficient body weight (BMI<18.5 kg/m2), have an intermediate level of aerobic productivity, i.e. $VO_{2\ max\ rel.}$ 28 – 33 ml·min^{-1}·kg^{-1}. At the same time, all the individuals studied have a normal level of visceral fat, in the range from 1 to 9%.

DISCUSSION

Current scientific research in clinical medicine is impossible without clinical anthropology and its methodology. Anthropometry, which is the basis of anatomical constitution and indicators of physical development, is successfully applied to identify the relationship with certain somatic diseases. A.V. Bobryk identified certain constitutional features in mature men with pathology of the respiratory, cardiovascular and digestive systems. Thus, mesomorphs with increase in longitudinal dimensions of the body and a decrease in body weight are prone to pathology of the respiratory system; mesomorphs with obesity of the first degree are prone to

heart disease, and ectomorphs with a Quetelet's index <18.5 kg/m^2 are prone to diseases of the gastrointestinal tract [17].

Specific types of constitution are characterized by various features of immunity and susceptibility to infectious diseases. Body structure or morphological phenotype, being one of the phenotypic characteristics of an organism, determines its characteristic reactivity, which determines the correlation between constitution and disease. Thus, E.G. Kornetova researched that individuals with schizophrenia have predominantly the asthenic type of constitution [18]. E.K. Grebennikova et al., studying the constitutional features of females with hyperplastic diseases of the uterus during perimenopause, found that 84.75% of females with gynecological pathology had the highest indicators of body length and weight, a higher relative content of the fat component and a low relative content of the muscle component, compared to females of other constitutions [19]. According to O.V. Yakovlev et al. pregnant women with the same type of constitution, are prone to the threat of premature birth in the 28-34th week of pregnancy due to the high probability of detecting isthmic-cervical insufficiency, premature ripening of the placenta, disruption of the uteroplacental blood flow and changes in the blood coagulation system [20].

The anatomical manifestation of the constitution is the somatotype. The somatometric or anthropometric factor is a significant indicator at the basis of a person's physical condition. It is also important to study the somatotypological and functional features of the body of people living in certain territories. Thus, O.V. Kalmin et al. conducted a comparative study of the level of physical development of individuals in post-pubertal period of the Krasnodar Krai, describing that young men of Krasnodar have average height, long limbs, a low relative content of muscle and a high content of fat component, which indicates a sedentary lifestyle. Krasnodar females, compared to individuals from other regions, have a tall height and a relatively high body weight, a narrow chest, a narrow pelvis, a mesomorphic somatotype with a high content of the fat component and a low relative content of skeletal muscles [21]. Also, T.V. Kazakova et al. conducted a comparative analysis of indicators of the autonomic nervous system activity in young males and females of different somatotypes and came to the conclusion that regardless of gender, adolescents with a high relative content of the muscle component have the highest reaction to orthostasis. At the same time, the greatest inertia of changes in indicators of the activity of the autonomic nervous system during orthostasis was recorded in adolescents who have a high relative content of the fat component [22]. Therefore, the anthropometric approach with the determination of the parameters of physical development and the component composition of the body is perfect for monitoring health and physical status.

CONCLUSIONS

Research results indicate that the physical health of females from the lowland districts of Zakarpattia depends on the component composition of body weight, namely: an excellent level of aerobic productivity is observed in females who have a normal body weight with a high relative fat content and a normal relative skeletal muscle content, with a normal level of visceral fat. As a result, their physical health status exceeds the "critical level" according to H.L. Apanasenko [23] and corresponds to "excellent" according to Ya.P. Pyarnat's criteria. An average level of aerobic productivity is observed in underweight females from lowland districts with a normal relative fat content and a high relative skeletal muscle content, with a normal level of visceral fat. As a result, their physical health status is below the "critical level" according to H.L. Apanasenko, i.e. $VO_{2max.} < 34$ ml·min^{-1}·kg^{-1}. The presence of fat in females from lowland districts provides energy for muscle work, which contributes to better development of the muscular system. A high level of energy supply due to a high relative fat content determines excellent physical health status of females from the lowland districts of Zakarpattia.

REFERENCES

1. Bekas O.O. Otsinka aerobnoyi produktyvnosti molodi 12-24 rokiv [Assessment of aerobic productivity of youth aged 12-24]. Physical education, sport and health culture in modern society. 2002; 1:198-199. (in Ukrainian).
2. Dulo O.A. Porivnyal'na kharakterystyka aerobnoyi ta anaerobnoyi produktyvnosti u divchat nyzynnykh i hirs'kykh rayoniv Zakarpats'koyi oblasti zalezhno vid komponentnoho skladu tila [Comparative characteristics of aerobic and anaerobic productivity in girls of lowland and mountain regions of the Transcarpathian region depending on body composition]. Experimental and clinical physiology and biochemistry. 2019; 2(86):51-58. (in Ukrainian). doi:10.25040/ecpb2019.02.051.
3. Dulo O.A., Hema-Bahyna N.M. Porivnyal'na kharakterystyka aerobnoyi ta anaerobnoyi produktyvnosti u yunakiv nyzynnykh i hirs'kykh rayoniv Zakarpats'koyi oblasti zalezhno vid komponentnoho skladu tila [Comparative characteristics of aerobic and anaerobic productivity in young men from the lowland and mountain regions of Zakarpattia region depending on the component composition of the body]. Science and Education a new dimension (Natural and Technical sciences). 2020;8 (27): 224:37-40. (in Ukrainian).

4. Furman Yu.M., Miroshnichenko V.M, Drachuk S.P. Funktsional'na pidhotovlenist' [Functional readiness]. Promising models of physical culture and health technologies in physical education of students of higher educational institutions. Kyiv: Olympic literature. 2013, 42 p. (In Ukrainian).
5. Miroshnichenko V.M., Furman Y.M., Bohuslavska V.Yu. et al. Funktsional'na pidhotovlenist' zhinok pershoho periodu zriloho viku riznykh somatotypiv [Functional preparedness of women of the first period of mature age of different somatotypes]. Pedagogy of Physical Culture and Sports. 2021; 25(5):232–240. (in Ukrainian). doi:10.15561/26649837.2021.0504.
6. Dulo O., Furman Y., Hema-Bahyna N. Gender and Somatotypological Peculiarities of Indicators of Aerobic and Anaerobic Productivity of Energy Supply of the Body in the Post-Pubertal Period of Ontogenesis in the Residents of the Zakarpattia Region. Wiad. Lek. 2022;75(10):2359-2365. doi: 10.36740/WLek202210108.
7. Furman Yu.M., Miroshnichenko V.M., Brezdeniuk O.Yu. et al. Otsinka aerobnoyi ta anaerobnoyi produktyvnosti orhanizmu molodi 17-19 rokiv Podil's'koho rehionu [An estimation of aerobic and anaerobic productivity of an organism of youth aged 17-19 years old of Podilsk region]. Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports. 2018;22(3):136–141. doi:10.15561/18189172.2018.0304. (in Ukrainian).
8. Furman Y.M., Miroshnichenko V.M., Bohuslavska V.Yu. et al. Modeling of functional preparedness of women 25-35 years of different somatotypes. Pedagogy of Physical Culture and Sports. 2022;26(2):118–125. doi:10.15561/26649837.2022.0206.
9. Zimnitskaya R., Paramonova N., Jakubovskii D. Comparative analysis of functional state and working capacity on veloergometer of average training level women of age. Sporto Mokslas. 2017; 1(87):32–37. doi:10.15823/sm.2017.5.
10. Larry Kenney W., Wilmore J.H., Costill D.L. Physiology of Sport and Exercise. Human Kinetics. 2021, 611 p.
11. Gaul C.A., Docherty D., Cicchini R. Differences in anaerobic performance between boys and men. Int. J. Obes Relat. Metab. Disord. 2000;24:7841-7848.
12. Ryan-Stewart H., Faulkner J., Jobson S. The influence of somatotype on anaerobic performance. PLoS ONE. 2018;13(5):e0197761. doi:10.1371/journal.pone.0197761.
13. Astrand J. Aerobic work capacity in men and women with special reference to age. Acta Physical. Scand. 1960;49(169):1-92.
14. Shakhlina L.YA.-H., Kohan B.H., Tereshchenko T.O. et al. Sportyvna medytsyna [Sports medicine]. Kyyiv: Natsional'nyy universytet fizychnoho vykhovannya i sportu Ukrayiny. 2019, 424 p. (in Ukrainian).
15. Pyarnat Y.A.P. Vozrastno-polovyye standarty (10-50 let) aerobnoy sposobnosti cheloveka [Age-sex standards (10-50 years) of human aerobic capacity]: avtoref. dis. dokt. med. nauk: 03.00.13. M.: 1983, 44 p. (In Russian).
16. Dovgiy Yu.I. Impedansometriya yak metod monitorynhu komponentnoho skladu masy tila studentiv [Impedancemetry as a method of monitoring the component composition of students' body mass]. Prospects, problems and existing achievements of the development of physical culture and sports in Ukraine IV All-Ukrainian Internet Conference "Color of Science". 2021, 302p. (in Ukrainian).
17. Bobrik A.V. Konstitutsional'nyye osobennosti muzhchin zrelogo vozrasta s nekotoroy somaticheskoy patologiyey [Constitutional features of men of mature age with some somatic pathology].GrGMU. 2007;2:69-72. (in Belarus).
18. Kornetov N.A. Kontseptsiya klinicheskoy antropologii v meditsine [The concept of clinical anthropology in medicine]. Byulleten' sibirskoy meditsiny. 2008;7(1):7-31. (In Russian).
19. Grebennikova E.K., Tskhay V.B., Nikolayev V.G. Konsitutsional'naya kharakteristika zhenshchin s giperplasticheskimi zabolevaniyami matki v period perimenopauzy [Constitutional characteristics of women with hyperplastic diseases of the uterus during perimenopause]. Meditsinskiye i farmatsevticheskiye nauki. 2012;1:23-26. (In Russian).
20. Yakovleva O.V., Muzurova L.V. Prognozirovaniye prezhdevremennykh rodov u beremennykh razlichnykh konstitutsional'nykh tipov [Prediction of preterm birth in pregnant women of various constitutional types]. Izvestiya vysshikh uchebnykh zavedeniy. Povolzhskiy region, Meditsinskiye nauki. 2009;2(10):71-75. (In Russian).
21. Kalmin O.V., Afanasiyevskaya Yu.S., Samotuga A.V. Sravnitel'naya kharakteristika urovnya fizicheskogo razvitiya lits yunosheskogo vozrasta g. Krasnodara i Krasnodarskogo kraya [Comparative characteristics of the level of physical development of persons of youthful age in Krasnodar and the Krasnodar Territory]. Izvestiya vysshikh uchebnykh zavedeniy. Povolzhskiy region. Meditsinskiye nauki. 2009;3(11):12-25. (In Russian).
22. Kazakova T.V., Fefelova V.V., Nikolayev V.G. et al. Sravnitel'nyy analiz pokazateley deyatel'nosti vegetativnoy nervnoy sistemy v zavisimosti ot pola i tipa teloslozheniya [Comparative analysis of indicators of the activity of the autonomic nervous system depending on gender and body type]. Okhrana materinstva i detstva. Byulleten' SO RAMN. 2009;6 (140):54-60. (In Russian).
23. Apanasenko G.L., Popova L.A., Magliovaniy A.V. Sanolohiya [Sanology]. Kyiv-Lviv: PP Kvart. 2011, 303 p. (in Ukrainian).

ORCID and contributionship:
Olena A. Dulo: 0000-0003-0473-5605 [A, B, D, F]
Yurii M. Furman: 0000-0002-5206-7712 [A, C, E, F]
Olha B. Maltseva: 0000–0001–6583–5074 [A, E]
Svitlana M. Samoilenko: 0009-0001-8472-983X [B, E]

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CORRESPONDING AUTHOR

Olena A. Dulo
Uzhhorod National University
3 Narodna Square, 88000 Uzhhorod, Ukraine
e-mail: olena.dulo@uzhnu.edu.ua

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