ORIGINAL ARTICLE

The correlation between body composition and the ability to perform physical activity in aerobic and anaerobic energy supply modes in females from lowland districts of the Transcarpathian region

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ABSTRACT
Aim: To establish correlations between indicators of aerobic and anaerobic productivity with the body composition of females of different somatotypes from the lowland districts of Transcarpathia.
Materials and Methods: A correlation analysis of physical health was conducted on 118 females (aged 16–20) from lowland Transcarpathia. Aerobic productivity was assessed $VO_{2\,max}$ using bicycle ergometry, while anaerobic capacity was measured using 10-second and 30-second Wingate tests ($WAnT_{10}$ and $WAnT_{30}$) and the 1-minute maximum quantity of external work (MQEW). Somatotypes were classified using the Heath-Carter method.
Results: The muscle component has a positive effect on the aerobic performance of females from lowland districts, but it has a moderate effect. Body mass index has a direct moderate correlation with the absolute $VO_{2\,max}$ and an inverse moderate correlation with the relative $VO_{2\,max}$. The correlation with the indicators of $MQEW_{rel}$., $WAnT_{30\,rel}$. and $WAnT_{10\,rel}$. is characterized as weak, which indicates a slight negative impact of the fat component on the anaerobic productivity of females living in the lowland districts of Transcarpathia
Conclusions: For females from lowland transcarpathia, fat and muscle components (including visceral fat) do not significantly impact aerobic or anaerobic performance across any somatotype. Instead, body mass index (bmi) is the primary determinant: higher bmi correlates with lower relative $VO_{2\,max}$ in endomorphs, but higher absolute anaerobic power $WAnT_{10}$ and $WAnT_{30}$ in ectomorphic and balanced types. Given conflicting literature, the specific influence of body composition on anaerobic capacity requires further clarification.

KEY WORDS: aerobic productivity, anaerobic productivity, physical health, fat, skeletal muscles

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INTRODUCTION
Physical health depends on the body's ability to adapt to environmental conditions, while maintaining normal functional parameters of all physiological systems [1,2]. Aerobic and anaerobic performance of the body are integral indicators of physical health. Aerobic and anaerobic performance indicators allow to assess physical health not only qualitatively, but also quantitatively [3]. The formation of physical health occurs under the influence of both endogenous and exogenous factors [4-6]. It should be noted that the set of various morphological factors which determine the somatotype (in particular, body composition) affects both functional capabilities of the body and predisposition to particular diseases [7-9]. The ability to demonstrate aerobic capabilities largely depends on the percentage of muscles which are the main consumer of oxygen [10]. Fat plays the role of a regulator of metabolic processes and is the main source of energy during prolonged low-intensity work, which is performed due to aerobic mechanisms of energy supply of muscle activity. Data from the scientific literature on the correlation of body composition with $VO_{2\,max}$ are contradictory. Therefore, to clarify the influence of somatotype components and body composition on the functional capabilities of females living in the mountainous districts of Transcarpathia, a correlation analysis should be conducted.

Establishing a correlation between human functional capabilities (aerobic and anaerobic productivity) that characterize the body's ability to adapt to external factors, and body composition of different somatotypes, which is largely genetically determined, will allow to individualize the prevention of certain diseases and choose effective treatment tactics, which is relevant and socially significant. [11-13].

AIM

The aim of the study is to establish correlations between indicators of aerobic and anaerobic productivity with the body composition of females of different somatotypes from the lowland districts of Transcarpathia.

MATERIALS AND METHODS

A correlation analysis of the level of physical health was conducted in 118 females in the postpubertal period of ontogenesis aged 16 to 20 years, residents of the lowland districts of the Transcarpathian region.

The level of physical health was assessed by indicators of the aerobic productivity of the body, namely, the maximum oxygen consumption (VO2 $_{max\ rel}$.) was determined by the method of bicycle ergometry. To assess the level of aerobic productivity, the criteria of the University of Tartu Jürimäe J. [1], Nurmekivi A. [2] were used, which allow to assess the level of aerobic productivity of individuals from 10 years of age. This assessment method has become widely used, in particular, in the study of Ukrainian scientists Yu. Furman [8], V. Miroshnichenko [4].

The anaerobic productivity of the subjects was studied by the power of anaerobic alactic processes of energy supply of muscular activity, which was determined by the indicator of the maximum quantity of external work performed in 10 s. The power of anaerobic lactic processes of energy supply of muscular activity was also determined by the indicator of the maximum quantity of external work performed in 30 s. For this purpose, the 10-second and 30-second Wingate anaerobic tests $WAnT_{10}$ and $WAnT_{30}$, described by Yu.M. Furman and co-authors [15], were used. To assess the capacity of anaerobic lactic productivity, the value of the maximum quantity of external work for 1 minute (MQEW) was determined using the method of A. Shogy, G. Cherebetin [16].

All cycle ergometry tests were performed on a Christopeit Sport AX-1 cycle ergometer.

The somatotype was determined by the Heath-Carter method. This method allows for an anthropometric assessment by the relative fatness – endomorphy, the skeletal-muscular rubustness – mesomorphy, and the relative linearity of the body – ectomorphy [17].

Body composition was determined by the bioelectrical impedance method using the Body Composition Monitor "Omron BF511". This method allows to estimate the percentage of fat mass (subcutaneous and visceral fat) and the percentage of skeletal muscle [18].

Statistical processing of the obtained experimental data was carried out using Excel 7.0 and SPSS version 10.0. Correlation analysis was carried out using the Pearson correlation coefficient. The degree of correlation was assessed by the Chaddock criterion: very strong – $0,90 \le r_{xy} \ge 0,99$; strong – $0,7 \le r_{xy} < 0,9$; noticeable – $0,5 \le r_{xy} < 0,7$; moderate – $0,3 \le r_{xy} < 0,5$; weak – $0,1 \le r_{xy} < 0,3$. A relationship was considered significant at $p < 0.05$.

ETHICS

This work complies with the principles of the Declaration of Helsinki.

RESULTS

The study of the influence of the body composition, body mass index, on the aerobic performance of females from the lowland districts of Transcarpathia demonstrated that the fat component does not affect the absolute indicator of $VO_{2\,max}$. as there is no significant correlation. A slight positive influence of the fat component was found on the relative indicator of $VO_{2\,max}$, as indicated by a weak direct correlation (table 1). A similar trend was found when conducting a correlation analysis between the level of visceral fat and $VO_{2\,max}$. There is no correlation with the absolute indicator of $VO_{2\,max}$, while there is a weak direct correlation with the relative indicator.

The percentage of muscle in the body correlates only with the relative $VO_{2\,max}$. In this case, the correlation is characterized as direct moderate. Thus, the muscle component has a positive effect on the aerobic performance of females from lowland districts, but it has a moderate effect.

Body mass index has a direct moderate correlation with the absolute $VO_{2\,max}$ and an inverse moderate correlation with the relative $VO_{2\,max}$. Since the aerobic performance of the body is usually assessed by the relative $VO_{2\,max}$, it can be argued that higher BMI values determine to some extent the lower level of aerobic performance of females from lowland districts.

The results of the study of correlations of the body composition, BMI with indicators of aerobic productivity of females of different somatotypes of lowland districts are given in Table 2. The correlation of the fat percentage with the absolute indicator of $VO_{2\,max}$ in representatives of all somatotypes is insignificant ($p > 0.05$). A noticeable direct correlation was found with the relative indicator of $VO_{2\,max}$ in females of the endomorphic somatotype, and a

Table 1. The correlation between aerobic performance indicators and body composition in females from lowland districts of Transcarpathia (n = 118)

Indicators	Fat component		Muscle component		Visceral fat		Body mass index	
	r	p	r	p	r	p	r	P
$V_{O2\ ma}x$	0.142	p > 0.05	0.042	p > 0.05	0.096	p > 0.05	0.339	p < .001
$VO_{2\ max.rel.}$	0.279	p < 0.01	0.361	p < 0.001	0.277	p < 0.01	-0.419	p < .001

Note: r is the correlation coefficient; p is the significance level
Source: compiled by the authors of this study

Table 2. The correlation between aerobic performance indicators and body composition in females of different somatotypes from lowland districts of Transcarpathia (n = 118)

Indicators	Fat component		Muscle component		Visceral fat		Body mass index	
	r	p	r	p	r	p	r	P
ectomorphic somatotype (n = 12)								
$VO_{2\ max}$	0.279	p > 0.05	0.235	p > 0.05	0.189	p > 0.05	0.357	p > 0.05
$VO_{\ 2max\ rel.}$	-0.155	p >0.05	0.278	p > 0.05	-0.297	p > 0.05	-0.411	p > 0.05
endomorphic somatotype (n = 16)								
$VO_{2\ max}$	0.187	p > 0.05	0.019	p > 0.05	0.136	p > 0.05	0.225	p > 0.05
$VO_{2\ max\ rel.}$	0.538	p < 0.05	0.497	p < 0.05	0.343	p > 0.05	-0.737	p < 0.01
endomesomorphic somatotype (n = 38)								
$VO_{2\ max}$	0.198	p > 0.05	0.158	p > 0.05	-0.068	p > 0.05	0.337	p < 0.05
$VO_{2\ max\ rel.}$	0.486	p < 0.01	0.335	p < 0.05	0.319	p > 0.05	-0.672	p<0.001
balanced somatotype (n = 41)								
$VO_{2\ max}$	0.124	p > 0.05	-0.021	p > 0.05	0.092	p > 0.05	0.575	p< 0.001
$VO_{2\ max\ rel.}$	0.393	p< 0.05	-0.161	p > 0.05	0.236	p > 0.05	-0.498	p < 0.01
mesoectomorphic somatotype (n = 11)								
$VO_{2\ max}$	0.030	p > 0.05	-0.162	p > 0.05	0.378	p > 0.05	0.537	p > 0.05
$VO_{2\ max\ rel.}$	-0.296	p > 0.05	0.105	p > 0.05	-0.446	p > 0.05	-0.593	p > 0.05

Note: r is the correlation coefficient; p is the significance level
Source: compiled by the authors of this study

moderate direct correlation in females of the endomesomorphic and balanced somatotypes. In representatives of other somatotypes, there is no correlation with the relative indicator of $VO_{2\ max}$. The level of visceral fat does not correlate with the absolute and relative indicators of $VO_{2\ max}$ in representatives of all somatotypes (Table 2). The muscle mass percentage does not correlate with the absolute indicator of $VO_{2\ max}$ in representatives of all somatotypes. A noticeable direct correlation between the muscle percentage and the relative $VO_{2\ max}$ index was found in representatives of the endomorphic somatotype, and a moderate direct correlation was found in representatives of the endomesomorphic somatotype. Thus, a positive effect of the muscle component on aerobic performance in females of the endomorphic and endomesomorphic somatotypes was established (Table 2).

Correlation analysis between BMI and absolute $VO_{2\ max}$ revealed a noticeable direct correlation in females of balanced somatotype and a moderate direct correlation in females of endomesomorphic somatotype. Research on the relationship between BMI and aerobic performance indicators revealed a strong inverse correlation with relative $VO_{2\ max}$ in females of endomorphic somatotype, a noticeable inverse correlation in females of endomesomorphic and mesoectomorphic somatotypes, and a moderate inverse correlation in females of balanced somatotype (Table 2).

The results of the study of the influence of the body composition, BMI on the anaerobic performance of females of lowland districts are shown in table 3.

The correlation of visceral fat content with absolute indicators of anaerobic productivity is insignificant ($p > 0.05$). The correlation of visceral fat content with relative indicators of anaerobic productivity of the body is characterized as a weak inverse correlation. Therefore, visceral fat does not have a significant effect on the anaerobic productivity of the subjects (Table 3).

The percentage of fat content has a significant inverse correlation only with relative indicators of anaerobic

Table 3. The correlation between anaerobic productivity indicators and body composition in females from lowland districts of Transcarpathia (n = 118)

Indicators	Fat component		Muscle component		Visceral fat		Body mass index	
	r	p	r	p	r	p	r	P
MQEW	-0.028	p > 0.05	0.131	p > 0.05	0.157	p > 0.05	0.160	p > 0.05
$MQEW_{rel.}$	-0.280	p < 0.01	-0.124	p > 0.05	-0.203	p < 0.05	-0.144	p > 0.05
$WAnT_{30}$	0.140	p > 0.05	0.116	p > 0.05	0.046	p > 0.05	0.382	p < 0.001
$WAnT_{30\,rel.}$	-0.201	p < 0.05	-0.074	p > 0.05	-0.223	p < 0.05	0.272	p < 0.01
$WAnT_{10}$	0.161	p > 0.05	0.120	p > 0.05	0.151	p > 0.05	0.348	p < 0.001
$WAnT_{10\,rel.}$	-0.292	p < 0.01	-0.016	p > 0.05	-0.198	p < 0.05	0.193	p > 0.05

Note: r is the correlation coefficient; p is the significance level

Source: compiled by the authors of this study

Table 4. The correlation between anaerobic alactic power indicators and body composition in females of different somatotypes from lowland districts of Transcarpathia (n = 118)

Indicators	Fat component		Muscle component		Visceral fat		Body mass index	
	r	p	r	p	r	p	r	P
ectomorphic somatotype (n = 12)								
$WAn_{T1}0$	-0.203	p >0.05	0.163	p>0.05	-0.300	p >0.05	0.789	p < 0.01
$WAnT_{10\,rel}$	-0.310	p >0.05	0.202	p>0.05	-0.297	p >0.05	0.373	p > 0.05
endomorphic somatotype (n = 16)								
$WAnT_{10}$	-0.280	p >0.05	0.367	p>0.05	0.112	p >0.05	0.498	p < 0.05
$WAnT_{10\,rel}$	-0.399	p >0.05	-0.055	p>0.05	-0.407	p > 0.05	0.175	p > 0.05
endomesomorphic somatotype (n = 38)								
$WAnT_{10}$	-0.067	p> 0.05	0.209	p>0.05	-0.125	p > 0.05	0.226	p > 0.05
$WAnT_{10\,rel}$	-0.341	p< 0.05	0.008	p>0.05	-0.329	p < 0.05	0.046	p > 0.05
balanced somatotype (n = 41)								
$WAnT_{10}$	0.059	p >0.05	0.280	p>0.05	0.074	p > 0.05	0.787	p < 0.001
$WAnT_{10\,rel}$	-0.369	p <0.05	0.204	p>0.05	-0.333	p < 0.05	-0.481	p > 0.05
mesoectomorphic somatotype (n = 11)								
$WAnT_{10}$	-0.255	p >0.05	0.204	p>0.05	-0.300	p >0.05	0.460	p>0.05
$WAnT_{10\,rel}$	-0.336	p >0.05	0.157	p>0.05	-0.287	p>0.05	0.220	p>0.05

Note: r is the correlation coefficient; p is the significance level

Source: compiled by the authors of this study

productivity. At the same time, the correlation with the indicators of $MQEW_{rel.}$, $WAnT_{30\ rel.}$ and $WAnT_{10\ rel.}$ is characterized as weak, which indicates a slight negative impact of the fat component on the anaerobic productivity of females living in the lowland districts of Transcarpathia (Table 3).

The percentage of muscle content does not have any significant correlation with any of the indicators of anaerobic productivity (Table 3).

Body mass index has a moderate direct correlation with absolute indicators of anaerobic alactic and lactic productivity ($WAnT_{10}$ and $WAnT_{30}$) and a weak direct correlation with the relative $WAnT_{30}$ indicator (Table 3).

Correlation analysis of the body composition, BMI with indicators of anaerobic alactic productivity of females from lowland districts of different somatotypes revealed the absence of correlation between the percentage of body fat and the absolute indicator of $WAnT_{10}$ in representatives of all somatotypes ($p > 0.05$) (Table 4). The correlation of fat percentage with the relative indicator of $WAnT_{10}$ in females of endomesomorphic and balanced somatotypes is characterized as a moderate inverse correlation. There is no correlation in representatives of other somatotypes.

The correlation of visceral fat content with anaerobic alactic power has similar tendency. Thus, the correlation of visceral fat content with the absolute indicator of $WAnT_{10}$ is insignificant; the correlation with the relative indicator of $WAnT_{10}$ in representatives of endomesomorphic and balanced somatotypes is characterized as moderate inverse, and in representatives of other somatotypes as insignificant (Table 4).

Table 5. The correlation between anaerobic lactic power indicators and body composition in females of different somatotypes from lowland districts of Transcarpathia (n = 118)

Indicators	Fat component		Muscle component		Visceral fat		Body mass index	
	r	p	r	p	r	p	r	P
ectomorphic somatotype (n = 12)								
$WAn_{T3}0$	0.107	p > 0.05	0.201	p > 0.05	0.135	p > 0.05	0.792	p < 0.01
$WAnT_{30\ rel}$	-0.239	p > 0.05	0.384	p > 0.05	-0.207	p > 0.05	0.118	p > 0.05
endomorphic somatotype (n = 16)								
$WAnT_{30}$	0.142	p > 0.05	0.036	p > 0.05	-0.179	p > 0.05	0.220	p > 0.05
$WAnT_{30\ rel}$	-0.322	p > 0.05	0.456	p > 0.05	-0.290	p > 0.05	0.025	p > 0.05
endomesomorphic somatotype (n = 38)								
$WAnT_{30}$	0.125	p > 0.05	0.075	p > 0.05	0.115	p > 0.05	0.026	p > 0.05
$WAnT_{30\ rel}$	-0.338	p < 0.05	0.228	p > 0.05	-0.241	p > 0.05	0.277	p >0.05
balanced somatotype (n = 41)								
$WAnT_{30}$	0.267	p > 0.05	0.285	p > 0.05	0.062	p > 0.05	0.722	p < 0.001
$WAnT_{30\ rel}$	-0.258	p > 0.05	0.276	p > 0.05	-0.177	p > 0.05	-0.015	p > 0.05
mesoectomorphic somatotype (n = 11)								
$WAnT_{30}$	0.078	p > 0.05	0.233	p > 0.05	-0.111	p > 0.05	0.624	p < 0.05
$WAnT_{30\ rel}$	-0.248	p > 0.05	0.115	p > 0.05	-0.164	p > 0.05	-0.100	p > 0.05

Note: r is the correlation coefficient; p is the significance level
Source: compiled by the authors of this study

Analysis of the correlation between the percentage of muscle component with anaerobic alactic productivity of females of different somatotypes did not reveal a significant correlation with either absolute or relative indicators of $WAnT_{10}$ (Table 4).

A strong direct correlation was established between BMI and the absolute indicator of $WAnT_{10}$ in representatives of ectomorphic and balanced somatotypes; a moderate direct correlation was established in representatives of the endomorphic somatotype; however, no correlation was established in representatives of other somatotypes. There is no correlation between BMI and the relative index of $WAnT_{10}$ in representatives of all somatotypes ($p > 0.05$) (Table 4).

The results of the correlation analysis between body composition, body mass index and absolute and relative indicators of anaerobic lactic power of females of different somatotypes living in the lowland districts of Transcarpathia are shown in Table 5.

The obtained data indicate that the percentage of body fat does not correlate with the absolute indicator of $WAnT_{30}$ in representatives of all somatotypes ($p > 0.05$). Analysis of the correlation of fat percentage with the relative indicator of $WAnT_{30}$ revealed a moderate inverse correlation in representatives of the endomesomorphic somatotype, and an insignificant correlation in representatives of other somatotypes (Table 5).

The level of visceral fat does not correlate with either absolute or relative indicators of $WAnT_{30}$ in females of all somatotypes (Table 5).

The muscle percentage in the body does not affect the anaerobic lactic power of females of different somatotypes from lowland districts, as indicated by the absence of a significant correlation with absolute and relative indicators of $WAnT_{30}$ in representatives of all somatotypes (Table 5).

Body mass index has a strong direct correlation with the absolute $WAnT_{30}$ index in females of ectomorphic and balanced somatotypes, and a noticeable direct correlation in females of mesoectomorphic somatotype. The correlation of BMI with the relative $WAnT_{30}$ index is insignificant in representatives of all somatotypes (Table 5).

The results of the study of the relationship between body composition, BMI and the capacity of anaerobic lactic productivity of females of different somatotypes from lowland districts are presented in Table 6.

The percentage of body fat does not have a significant effect on the level of the absolute index of MQEW in representatives of all somatotypes. A moderate inverse correlation was found between the fat component and the relative index of MQEW in females of the endomesomorphic and balanced somatotypes. No correlation between the percentage of body fat and the relative index of MQEW was found in representatives of other somatotypes ($p > 0.05$) (Table 6).

The percntage of visceral fat does not affect anaerobic lactic capacity, as indicated by the absence of a

Table 6. The correlation between anaerobic lactic capacity indicators and body composition in females of different somatotypes from lowland districts of Transcarpathia (n = 118)

Indicators	Fat component		Muscle component		Visceral fat		Body mass index	
	r	p	r	p	r	p	r	P
ectomorphic somatotype (n = 12)								
MQEW	-0.237	p > 0.05	0.324	p > 0.05	0.173	p > 0.05	-0.353	p > 0.05
$MQEW_{rel.}$	-0.206	p > 0.05	0.291	p > 0.05	-0.138	p > 0.05	0.319	p > 0.05
endomorphic somatotype (n = 16)								
MQEW	0.154	p > 0.05	0.084	p > 0.05	-0.167	p > 0.05	0.546	p < 0.05
$MQEW_{rel.}$	-0.239	p > 0.05	0.276	p > 0.05	-0.063	p > 0.05	0.113	p > 0.05
endomesomorphic somatotype (n = 38)								
MQEW	-0.283	p > 0.05	0.139	p > 0.05	-0.156	p > 0.05	0.449	p < 0.01
$MQEW_{rel.}$	-0.331	p < 0.05	0.007	p > 0.05	-0.141	p > 0.05	-0.111	p > 0.05
balanced somatotype (n = 41)								
MQEW	0.136	p > 0.05	0.300	p > 005	0.035	p > 0.05	0.523	p < 0.001
$MQEW_{rel.}$	-0.349	p < 0.05	0.017	p > 0.05	-0.261	p > 0.05	0.108	p > 0.05
mesoectomorphic somatotype (n = 11)								
MQEW	-0.117	p > 0.05	0.371	p > 0.05	-0.394	p > 0.05	0.277	p > 0.05
$MQEW_{rel.}$	-0.301	p > 0.05	0.223	p > 0.05	-0.115	p > 0.05	0.161	p > 0.05

Note: r is the correlation coefficient; p is the significance level
Source: compiled by the authors of this study

significant correlation with both absolute and relative indicators of MQEW in representatives of all somatotypes (Table 6).

The percentage of muscle in the body also has no significant correlation with the absolute and relative indicators of MQEW in representatives of all somatotypes ($p > 0.05$) (Table 6).

BMI has a noticeable direct correlation with the absolute indicator of MQEW in females of endomorphic and balanced somatotypes and a moderate direct correlation in females of endomesomorphic somatotype. The correlation of BMI with the relative indicator of MQEW is insignificant ($p > 0.05$) in representatives of all somatotypes.

DISCUSSION

Thus, the study has found that in females of different somatotypes living in the lowland districts of Transcarpathia, body composition affects the aerobic and anaerobic capabilities of the body in different ways. Such data are consistent with studies conducted among females in the first period of adulthood, which also established significant differences in representatives of different somatotypes, both in terms of aerobic [3] and anaerobic [10] productivity, as well as with studies conducted among females aged 17-19, residents of the Podillia region of Ukraine [4, 7].

Analysis of the correlation of body composition with aerobic performance in females of different somatotypes from the lowland districts of Transcarpathia revealed the strongest correlation with body mass index. At the same time, inverse correlation was established with the relative $VO_{2\ max}$ indicator, and direct correlation with the absolute indicator. The degree of such correlation in representatives of different somatotypes is different (strong in representatives of the endomorphic somatotype, noticeable in representatives of the endomesomorphic somatotype, and moderate or the correlation is insignificant in representatives of other somatotypes). Such data are consistent with the findings of V. Miroshnichenko et al. [3], who revealed similar tendencies in females in the first period of adulthood. It should be noted that in the scientific literature, information on the correlation of the body composition with aerobic performance in individuals of different somatotypes is available only concerning certain age and gender categories. Thus, S. Hasmyati at al. [19] claim that BMI is a reliable predictor of aerobic capacity in females aged 20-32 years, provided that it is within the values that correspond to the norm. However, the opinion of J.R. Alkandari, B. Nieto [20] about the negative impact of the fat component on the ability to demonstrate aerobic capacity was not confirmed by our study. It should be noted that the above authors studied Kuwaiti women whose region differs significantly from Ukraine in geographical, climatic and social characteristics. Therefore, these factors may account for the differences.

The relationship between body composition and anaerobic performance indicators in females of different somatotypes from the lowland districts of Transcarpathia is characterized by a strong direct correlation of BMI with absolute indicators of $WAnT_{10}$ and $WAnT_{30}$ in representatives of ectomorphic and balanced somatotypes. The correlation of fat and muscle components with indicators of $WAnT_{10}$ and $WAnT_{30}$ indicates the absence of their significant influence on the anaerobic capabilities of the females. Such data are consistent with the findings of V. Miroshnichenko et al. [21], which confirm a strong correlation between BMI and indicators of $WAnT_{10}$ and $WAnT_{30}$ in females aged 25-35 of certain somatotypes, and the absence of a significant influence of fat and muscle components on anaerobic performance in representatives of all somatotypes. N. Kucukkubas et al. [22] found that there was no correlation between body fat percentage and anaerobic performance test results in female athletes specializing in Zumba, cross-country running, basketball, football, tennis and volleyball. However, some studies do not align with our data. For example, M. Kale, E. Akdoğan [23] believe that endomorphism (relative fatness) has a negative effect on anaerobic performance of handball players. Pei Yang et al. [24] obtained somewhat contradictory results, indicating a strong direct correlation between visceral fat content and hand strength and an inverse correlation with body fat content. Such correlation can be conditionally extrapolated to the anaerobic alactic performance, since strength is determined precisely by the development of the anaerobic alactic energy supply system for muscle activity. Therefore, the data on the influence of fat component on the power of anaerobic energy supply processes are contradictory.

There is also no consensus on the influence of the muscle component on the anaerobic capabilities of females. Our studies prove the absence of a significant correlation between the percentage of muscle and anaerobic performance according to the $WAnT_{10}$, $WAnT_{30}$ tests, and the MQEW. This is indicated by the correlation that does not exceed a moderate level, or its insignificance. To some extent, these results are consistent with the data obtained by M. Kale, E. Akdoğan [23], who established the absence of a significant correlation between fat-free body mass and performance in anaerobic tests. No correlation was found between the percentage of muscle in the body and performance in anaerobic tests $WAnT_{10}$, $WAnT_{30}$, and MQEW in females aged 25-35 who did not do sports [21]. On the other hand, J. Zera et al. [25] proves that muscle percentage in males and females can be a predictor of higher levels of anaerobic performance, determined by the $WAnT_{30}$ test.

CONCLUSIONS

Fat and muscle components, as well as visceral fat, do not have a significant impact on the ability to demonstrate aerobic and anaerobic capabilities of the body in females from the lowland districts of Transcarpathia, regardless of somatotype, and in representatives of all studied somatotypes. The greatest impact on the aerobic and anaerobic capabilities is exerted by body mass index. In representatives of the endomorphic somatotype, higher values of body mass index determine lower values of the relative $VO_{2\,max}$ indicator. In representatives of the ectomorphic and balanced somatotypes, higher values of body mass index determine higher values of the absolute indicators $WAnT_{10}$ and $WAnT_{30}$. Data from the scientific literature on the impact of fat and muscle components on the anaerobic capabilities of the body are contradictory and require clarification.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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