

у м. Києві у 2014 році. Мета дослідження – аналіз особливостей тілесних ушкоджень, отриманих протестувальниками Майдану 18-20 лютого 2014 р. Матеріалом дослідження були архівні матеріали («Висновки спеціаліста») кафедри судової медицини Національної медичної академії післядипломної освіти з результатами дослідження тілесних ушкоджень 322 потерпілих протестувальників 18-20 лютого 2014 р. у м. Києві. Використовувались методи дослідження: антропометричний, морфометричний; фотографічний і статистичний. Найбільшу кількість серед потерпілих складали чоловіки з вогнепальними ушкодженнями, заподіяними еластичними кулями і картеччю, свинцевим шротом і картеччю, 12 мм металевою кулею типу «Блондо»; термічні, хімічні опіки; контузії, втрати зору і слуху, травматичні ампутації пальців рук від розриву світло-шумових гранат. Мали місце ушкодження, заподіяні мільцієвськими кийками, палками, кулаками і ногами. Характер, об'єм та переважна локалізація ушкоджень (нижні кінцівки і голова) свідчать про те, що світло-шумові гранати умисно і штучно були укомплектовані додатковими вражаючими компонентами. За ступенем тяжкості переважали легкі тілесні ушкодження. Серед тілесних ушкоджень 322 потерпілих протестувальників Майдану під час подій 18-20 лютого 2014 р. найбільшу кількість складали прояви вогнепальної травми: садна, крововиливи, рани, спричинені еластичними кулями і картеччю до «нелетальної» зброї та свинцевим шротом і картеччю, 12 мм металевою кулею типу «Блондо»; термічні, хімічні опіки, контузії, втрати зору і слуху, травматичні ампутації пальців рук від розриву світло-шумових гранат.

Ключові слова: судова медицина, тілесні ушкодження, вогнепальні ушкодження.

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году. Цель исследования – анализ особенностей телесных повреждений, полученных протестующими Майдана 18-20 февраля 2014 года. Материалом исследования были архивные материалы («Заключение специалиста») кафедры судебной медицины Национальной медицинской академии последипломного образования с результатами исследования телесных повреждений 322 пострадавших протестующих 18-20 февраля 2014 г. в Киеве. Использовались методы исследования: антропометрический, морфометрический; фотографический и статистический. Наибольшее количество среди пострадавших составляли мужчины с огнестрельными повреждениями, причиненными эластичными пулями и картечью, свинцовой дробью и картечью, 12 мм металлической пулей типа «Блондо»; термические, химические ожоги; контузии, потери зрения и слуха, травматические ампутации пальцев рук от разрыва световых гранат. Имели место повреждения, причиненные милицейскими дубинками, палками, кулаками и ногами. Характер, объем и преимущественная локализация повреждений (нижние конечности и голова) свидетельствуют о том, что световые гранаты умышленно и искусственно были укомплектованы дополнительными поражающими компонентами. По степени тяжести преобладали легкие телесные повреждения. Среди телесных повреждений 322 пострадавших протестующих на Майдане во время событий 18-20 февраля 2014 года наибольшее количество составляли проявления огнестрельной травмы: садины, кровоизлияния, раны, вызванные эластичными пулями и картечью к «не летальному» оружию и свинцовой дробью и картечью, 12 мм металлической пулей типа «Блондо»; термические, химические ожоги, контузии, потери зрения и слуха, травматические ампутации пальцев рук от разрыва световых гранат.

Ключевые слова: судебная медицина, телесные повреждения, огнестрельные повреждения.

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V.M. Moroz, O.P. Khapitska, L.A. Sarafinyuk, S.Y. Iaremyn, O.V. Androshechuk
National Pirogov Memorial Medical University, Vinnytsya

CORRELATION OF THIGH RHEOVASOGRAPHIC INDICES WITH CONSTITUTIONAL CHARACTERISTICS IN VOLLEYBALL PLAYERS OF ECTO-MESOMORPHIC SOMATOTYPE

e-mail: lsarafinyuk@gmail.com

It has been established that volleyball players with ecto- mesomorphic somatotype have numerous statistically significant correlations between the parameters of the thigh rheovasogram and anthropometric and somatotypological indices. The most numerous and strongest correlations has been found between the indices of the external composition of the body, in particular, longitudinal, transverse, circumferential dimensions, thickness of the skin and fat folds, somatotypological characteristics and temporal, amplitude parameters of the rheogram, hemodynamic indices and arterial tone indices, with predominant direct moderate and strong correlations.

Keywords: correlation, thigh rheovasography, anthropometry, somatotyping, ecto-mesomorphic somatotype, volleyball players.

The work is a fragment of the research project "Features of the hemodynamic rates according to the parameters of body composition in athletes of various sports", state registration No.0115U004045.

Currently, the somatotypological approach is widely used during sports selection, which is relevant in identifying prognostic signs of prospectivity for achievements in various sports [8, 11]. In this case, a certain set of local constitutional features is traditionally taken into account, which is determined by the external morphological component of the constitution [7, 14]. It is known that representatives of some constitutional types differ not only in the external composition of the body, but also by the features of the cardiovascular, nervous, endocrine system [4]. It has been proved that morphofunctional features of the

central and peripheral hemodynamics can be an important factor that can hamper significant sports achievements [6, 10]. Therefore, the issue on identification of the factors that determine the variability of hemodynamic parameters, especially indices of the peripheral hemodynamics in representatives of different sports is relevant. The rheographic parameters of athletes with different muscular activities are correlated with the factors of hemodynamics, in particular, with the volume and rate of cardiac output, the frequency of cardiac contractions and the state of the bloodstream [12]. However, little studies on the relationships between the regional blood flow with indices of the external body composition have been found to date [3].

The purpose of the work was to study the relationships between the parameters of thigh rheogram with anthropometric and somatotypological indices in volleyball players of the ecto-mesomorphic somatotype.

Materials and methods. We have conducted a comprehensive anthropometric study of the male volleyball players which had high sports categories (from the first adult to the masters of sports), using the method suggested by Bunak [2]. The calendar age of all athletes was from 17 to 21 years, which corresponded to the youth period of ontogenesis. Matejko method was used to determine the component composition of the body mass [4]. The score assessment of the somatotype components was made according to the estimated modification of the Heath-Carter method [9]. It has been found that 29 volleyball players had an ecto-mesomorphic constitutional type, which belongs to intermediate somatotypes and is characterized by the big longitudinal body dimensions, a good muscle development, as evidenced by the circumferential dimensions of the body, the massiveness of the limb bones, as indicated by the width of their distal epiphyses. Rheovasographic parameters of the thigh were measured on a computer diagnostic complex using tetrapolar rheocardiography. The estimation of quantitative parameters was carried out according to temporal, amplitude and integral indices by the method of Ronkin and Ivanov [13]. The analysis of the findings was carried out in the STATISTICA 5.5 software (AXXR910A374605FA). The correlation analysis was performed using the Spearman nonparametric statistical method.

Results of the study and their discussion. The correlation analysis carried out between the indices of the regional hemodynamics of the thigh and the anthropometric and somatotypological characteristics of the volleyball players of the ecto-mesomorphic somatotype made it possible to find that the duration of the rheographic wave had direct correlations with the mass ($r = 0.431$, $p < 0.05$) and the area of the body surface ($r = 0.334$, $p = 0.063$), width of the shoulders ($r = 0.545$, $p < 0.01$), overwhelming majority of the circumferential dimensions of the shoulder ($r = 0.461$, $p < 0.05$), forearm ($r = 0.482$, $p < 0.05$), thigh ($r = 0.365$, $p = 0.053$), shin in the lower third ($r = 0.563$, $p < 0.01$), neck ($r = 0.476$, $p < 0.05$), waist ($r = 0.723$, $p < 0.001$), thighs ($r = 0.447$, $p < 0.05$), hand ($r = 0.473$, $p < 0.05$), foot ($r = 0.664$, $p < 0.001$) and muscle body mass ($r = 0.332$, $p = 0.071$); and the reverse relationships were detected with the thickness of the skin-and-fat fold on the shin ($r = -0.345$, $p = 0.060$) and the value of the ectomorphic component of the somatotype ($r = -0.584$, $p = 0.001$).

The time of the ascending part of the thigh rheogram directly correlated with all total dimensions: mass ($r = 0.376$, $p < 0.05$), length ($r = 0.536$, $p < 0.01$), body surface area ($r = 0.453$, $p < 0.05$); the heights of the anthropometric points: suprasternal ($r = 0.602$, $p < 0.001$), pubic ($r = 0.604$, $p < 0.001$), brachial ($r = 0.574$, $p < 0.01$), digital ($r = 0.434$, $p < 0.05$) and acetabular ($r = 0.526$, $p < 0.01$); width of the distal thigh epiphyses ($r = 0.584$, $p = 0.001$) and shin ($r = 0.393$, $p = 0.037$); circumferential dimensions of the shoulder, forearm, thigh, thighs ($r = 0.43 - 0.46$, $p < 0.05$); transversal mean ($r = 0.482$, $p = 0.01$) and substernal ($r = 0.557$, $p < 0.01$) diameters; interspinal ($r = 0.484$, $p < 0.01$) and interacetabular ($r = 0.426$, $p < 0.05$) distances of the pelvis; muscle body mass ($r = 0.524$, $p < 0.01$). Correlations were inversely proportional only with the thickness of skin and fat folds on the thigh ($r = -0.433$, $p < 0.05$), the shin ($r = -0.555$, $p < 0.01$) and under the scapula ($r = -0.493$, $p < 0.05$).

The time of the descending part of the rheovasogram had reverse relationships of the moderate strength with the width of the distal thigh epiphyses ($r = -0.242$, $p < 0.05$), an ectomorphic component of the somatotype ($r = -0.572$, $p < 0.01$); direct correlations were detected with circumferences of the shin in the lower third ($r = 0.504$, $p < 0.01$), neck ($r = 0.367$, $p < 0.05$), waist ($r = 0.534$, $p < 0.01$), hand ($r = 0.454$, $p < 0.05$), foot ($r = 0.556$, $p < 0.01$).

The time of the fast blood filling had only direct correlations with: the sagittal arc of the head ($r = 0.686$, $p < 0.001$) and body weight ($r = 0.376$, $p < 0.05$); width of thigh epiphyses ($r = 0.454$, $p < 0.05$) and shin ($r = 0.374$, $p < 0.05$); circumferences of the shoulder ($r = 0.394$, $p < 0.05$), forearm ($r = 0.335$, $p = 0.072$), thigh ($r = 0.492$, $p < 0.01$), neck ($r = 0.394$, $p < 0.05$), thighs ($r = 0.665$, $p < 0.001$); the thickness of skin and fat folds in

the anterior ($r=0.343$, $p=0.068$) and posterior ($r=0.492$, $p<0.01$) surfaces of the shoulder, abdomen ($r=0.404$, $p<0.05$), side ($r=0.556$, $p<0.01$); transverse substernal size ($r=0.594$, $p<0.001$); endomorphic ($r=0.448$, $p=0.011$) and mesomorphic ($r=0.372$, $p=0.051$) components of the somatotype and muscle body mass ($r=0.344$, $p=0.068$).

The time of slow blood filling had a significant direct correlations with the body length ($r=0.478$, $p<0.05$), the height of the suprasternal ($r=0.584$, $p=0.001$), pubic ($r=0.586$, $p<0.001$), brachial ($r=0.575$, $p<0.001$), digital ($r=0.338$, $p=0.045$), and acetabular ($r=0.446$, $p<0.05$) anthropometric points, transverse mesothoracic diameter ($r=0.374$, $p<0.05$) and interspinal distance ($r=0.566$, $p<0.001$), ectomorphic component of the somatotype ($r=0.325$, $p=0.078$) and muscle body mass ($r=0.353$, $p=0.061$); inverse correlations were with the thickness of the folds on the thigh ($r=-0.514$, $p<0.05$) and the shin ($r=-0.626$, $p<0.001$).

All amplitude indices of the thigh rheogram in the volleyball players of the ecto-mesomorphic somatotype correlated with the indices of the external composition of the body. The value of the base impedance had few significant direct relationships with the smallest head width ($r=0.747$, $p<0.001$), shoulder circumference ($r=0.365$, $p<0.05$), intercrest ($r=0.566$, $p=0.002$) and interacetabular ($r=0.344$, $p=0.068$) pelvic distances, the thickness of skin and fat folds on the thigh ($r=0.434$, $p<0.05$) and bone mass of the body ($r=0.393$, $p<0.05$).

The amplitude of the systolic wave is correlated with the width of all distal epiphyses: shoulder ($r=0.435$, $p<0.05$), forearm ($r=0.492$, $p<0.01$), thigh ($r=0.466$, $p<0.05$), shin ($r=0.736$, $p<0.001$), circumferential dimensions of the forearm ($r=0.502$, $p<0.01$) and the shin ($r=0.563$, $p<0.01$) in the lower thirds, neck ($r=0.502$, $p<0.01$), interspinal pelvic distance ($r=0.501$, $p<0.01$), mesomorphic component of the somatotype ($r=0.492$, $p<0.01$).

The amplitude of incisura was inversely proportional to the inspiratory circumference of the chest ($r=-0.553$, $p<0.01$), the height of all anthropometric points: suprasternal ($r=-0.374$, $p<0.05$), pubic ($r=-0.534$, $p<0.01$), brachial ($r=-0.535$, $p<0.01$), digital ($r=-0.446$, $p<0.05$), acetabular ($r=-0.580$, $p=0.010$) and the value of the ectomorphic component of the somatotype ($r=-0.317$, $p=0.008$); and the direct correlations with the width of the distal epiphyses of the shin ($r=0.465$, $p<0.05$), transverse substernal size ($r=0.492$, $p<0.01$), folds under the scapula ($r=0.454$, $p<0.05$), on the side ($r=0.685$, $p<0.001$) and thigh ($r=0.324$, $p=0.073$), endomorphic ($r=0.565$, $p<0.01$) and mesomorphic ($r=0.436$, $p<0.05$) components of the somatotype, the fat body mass ($r=0.433$, $p<0.05$).

The amplitude of the diastolic wave, which reflects the ratio of the arterial and venous component of the blood circulation [1], correlated directly with the circumferential dimensions of the head ($r=0.384$, $p<0.05$), forearm in the lower third ($r=0.686$, $p<0.001$), shin in the upper ($r=0.317$, $p=0.081$) and the lower ($r=0.794$, $p<0.001$) third, neck ($r=0.702$, $p<0.001$), waist ($r=0.434$, $p<0.05$), foot ($r=0.427$, $p<0.05$); inverse correlations were with the height of the brachial ($r=-0.336$, $p=0.068$) and digital ($r=-0.366$, $p<0.05$) points, the ectomorphic component of the somatotype ($r=-0.504$, $p<0.01$).

The amplitude of the fast blood filling had only direct correlations, in particular with the greatest head width ($r=0.504$, $p<0.01$), width of the forearm epiphyses ($r=0.386$, $p<0.05$), thigh ($r=0.447$, $p<0.05$) and shin ($r=0.706$, $p<0.001$), circumferences of the shoulder ($r=0.394$, $p<0.05$), forearm in the lower third ($r=0.392$, $p<0.05$), thigh ($r=0.424$, $p<0.05$), shin in the upper ($r=0.356$, $p=0.056$) and lower ($r=0.403$, $p<0.05$) third, neck ($r=0.663$, $p<0.001$), thighs ($r=0.581$, $p=0.001$) and hand ($r=0.435$, $p<0.05$), interspinal ($r=0.327$, $p=0.078$) and interacetabular ($r=0.483$, $p=0.011$) pelvic distances, thickness of folds on the posterior ($r=0.424$, $p<0.05$) and the anterior ($r=0.318$, $p=0.079$) shoulder surfaces, side ($r=0.448$, $p<0.05$) and thigh ($r=0.374$, $p<0.05$), endomorphic ($r=0.582$, $p=0.001$) and mesomorphic ($r=0.734$, $p<0.001$) components of the somatotype, muscle ($r=0.345$, $p=0.063$) and fat ($r=0.535$, $p<0.05$) body weight.

The dicrotic index had a significant reverse correlations with the width of the mandible ($r=-0.566$, $p<0.01$), height of the suprasternal ($r=-0.462$, $p<0.05$), pubic ($r=-0.636$, $p<0.001$), brachial ($r=-0.583$, $p<0.001$), digital ($r=-0.535$, $p<0.01$), acetabular ($r=-0.545$, $p<0.01$) anthropometric points, width of the distal epiphysis of the shoulder ($r=-0.394$, $p<0.05$), circumference of the hand ($r=-0.404$, $p<0.05$) and inspiratory circumference of the chest ($r=-0.454$, $p<0.05$), the value of the ectomorphic component of the somatotype ($r=-0.467$, $p<0.05$) and the bone body mass ($r=-0.383$, $p<0.05$), and direct correlations with the thickness of skin-fat folds under the scapula ($r=0.363$, $p<0.05$), on the anterior brachial surface ($r=0.367$, $p<0.05$), forearm ($r=0.503$, $p<0.01$), side ($r=0.745$, $p<0.001$), thigh ($r=0.334$, $p=0.065$) and shin ($r=0.310$, $p=0.085$) and fat body mass ($r=0.426$, $p<0.05$).

The diastolic index had a reliable reverse correlation with the greatest length of the head and width of the mandible ($r=-0.374$, $p<0.05$), height of the brachial ($r=-0.525$, $p<0.01$) and digital ($r=-0.396$,

$p < 0.05$) anthropometric points, the width of the distal thigh epiphysis ($r = -0.505$, $p < 0.01$), the interacetabular distance ($r = -0.376$, $p < 0.05$), the value of the ectomorphic component of the somatotype ($r = -0.793$, $p < 0.001$) and the bone body mass ($r = -0.646$, $p < 0.001$). The direct correlations between the diastolic index and the body weight ($r = 0.313$, $p = 0.082$), the circumferential dimensions of the forearm ($r = 0.341$, $p = 0.068$), shin ($r = 0.352$, $p = 0.060$), neck ($r = 0.482$, $p = 0.010$), waist ($r = 0.695$, $p < 0.001$), foot ($r = 0.443$, $p < 0.05$) and resting chest ($r = 0.394$, $p < 0.05$), anteroposterior mesothoracic size ($r = 0.378$, $p < 0.05$), fold on the shin ($r = 0.368$, $p < 0.05$), endomorphic component of the somatotype ($r = 0.334$, $p = 0.068$) have been defined.

The mean rate of the fast blood filling correlated directly with the smallest head width ($r = 0.614$, $p < 0.001$), width of the distal epiphyses of the shoulder ($r = 0.324$, $p = 0.077$), forearm ($r = 0.736$, $p < 0.001$) and shin ($r = 0.345$, $p = 0.066$), circumferences of the forearm in the lower part ($r = 0.515$, $p < 0.01$) and the shin in the upper part ($r = 0.402$, $p < 0.05$) and the hand ($r = 0.394$, $p < 0.05$), the fold under the scapula ($r = 0.435$, $p < 0.05$), the mesomorphic component of the somatotype ($r = 0.464$, $p < 0.05$) and the bone body mass ($r = 0.376$, $p < 0.05$).

The mean rate of the slow blood filling, which characterizes the blood filling of the arteries of the medium and small diameter, correlated directly with the circumferential dimensions of the forearm in the lower third ($r = 0.625$, $p < 0.001$), shin in the lower third ($r = 0.525$, $p < 0.01$), the neck ($r = 0.534$, $p < 0.01$) and the hand ($r = 0.604$, $p < 0.001$), the thickness of the folds on the posterior surface of the shoulder ($r = 0.365$, $p < 0.05$), thigh ($r = 0.334$, $p < 0.069$), shin ($r = 0.581$, $p = 0.001$), under the scapula ($r = 0.366$, $p < 0.05$), endomorphic component of the somatotype ($r = 0.384$, $p < 0.05$).

The tone of arteries of the large diameter had only direct significant correlations, in particular with the sagittal arc of the head ($r = 0.603$, $p < 0.001$), the width of the distal epiphyses of the thigh ($r = 0.513$, $p < 0.05$) and shin ($r = 0.376$, $p < 0.05$), transverse substernal diameter ($r = 0.665$, $p < 0.001$), thigh circumference ($r = 0.478$, $p < 0.05$), folds on the posterior ($r = 0.526$, $p < 0.01$) and anterior ($r = 0.424$, $p < 0.05$) surfaces of the shoulder, on the abdomen ($r = 0.486$, $p = 0.015$) and side ($r = 0.566$, $p < 0.01$), fat components of the somatotype ($r = 0.505$, $p < 0.01$) and body mass ($r = 0.457$, $p < 0.05$).

The tone of the arteries of medium and small diameter had direct correlation with the width of the distal epiphysis of the thigh ($r = 0.422$, $p < 0.05$), interspinal distance ($r = 0.366$, $p < 0.05$), ectomorphic component of the somatotype ($r = 0.447$, $p < 0.05$); reverse statistically significant correlations were detected with the forearm circumferences in the lower third ($r = -0.481$, $p = 0.010$), neck ($r = -0.536$, $p < 0.01$), waist ($r = -0.386$, $p < 0.05$), the hand ($r = -0.613$, $p < 0.001$) and the foot ($r = -0.625$, $p < 0.001$), the thickness of the folds on the thigh ($r = -0.325$, $p = 0.075$) and the shin ($r = -0.403$, $p < 0.05$).

The index of the femoral arteries tones' ratio was inversely proportional to the height of the pubic ($r = -0.308$, $p = 0.086$) and brachial ($r = -0.326$, $p = 0.071$) anthropometric points and the ectomorphic component of the somatotype ($r = -0.375$, $p < 0.05$); the indices characterize the relative linearity of the human body. Direct correlations were established between the given rheovasographic index and the sagittal arc ($r = 0.536$, $p < 0.01$) and the largest head width ($r = 0.356$, $p = 0.056$), body weight ($r = 0.319$, $p = 0.076$), circumferences of the neck ($r = 0.527$, $p < 0.01$) and thighs ($r = 0.443$, $p < 0.05$), lower transverse diameter of the chest ($r = 0.366$, $p = 0.051$), fold thickness on the posterior ($r = 0.514$, $p < 0.01$) and the anterior ($r = 0.455$, $p < 0.05$) surfaces of the shoulder, on the abdomen ($r = 0.325$, $p = 0.071$), side ($r = 0.726$, $p < 0.001$), thigh ($r = 0.346$, $p = 0.066$) and the shin ($r = 0.465$, $p < 0.05$), fat body mass ($r = 0.526$, $p < 0.01$), endomorphic component of the somatotype ($r = 0.636$, $p < 0.001$).

Thus, the temporal indices of the rheogram of the thigh were directly proportional to the total, longitudinal, transverse dimensions of the body and individual components of the somatotype. The time of the ascending part is the most stable indicator of the rheogram, and it has been proved that, first, it is dependent on the tone of the arterioles and capillaries, i.e., the so-called resistance vessels [13]. The established direct correlations between the given time rheographic index and the majority of anthropometric body dimensions indicate that with the increase of the total, longitudinal, transverse and circumferential body dimensions in the volleyball players of the ecto- mesomorphic somatotype, the rate of the regional blood flow will be slowed down. The established correlations with the indices of the external body composition and the time of the descending part of the rheovasogram, which depends on the frequency of heart contractions and indirectly reflects the elasticity of the vascular wall [1], can be the evidence that the more is a decrease in the relative lengthening of the body and the massiveness of the thigh and simultaneous increase of the circumferential dimensions of the distal segments of the limbs, neck, waist the more is an increase in the time index and better contractile capacity of the vascular wall. The peculiarities of time correlations of the fast blood filling, which are due to the elasticity and tone of the

vascular wall of the large femoral arteries and the contractile function of the cardiac myocardium [7], may indicate that an increase in the body weight, especially its muscular and fat component, leads to an increase in the rheovasographic index in volleyball players of the ecto-mesomorphic somatotype. We have found that with an increase in the longitudinal dimensions of the body and mass of muscle tissue and the reduction of subcutaneous fat, the time of slow blood filling is extended, which is determined by the tonic properties of the arteries of the thigh of small and medium diameters [13].

We have established that with the increase of anthropometric indices of the limbs in the volleyball players of the ecto-mesomorphic somatotype, the amplitude of the systolic wave, which is mainly determined by the pulse blood filling, increases, that is, the larger the volume of the muscle tissue blood filling per unit time, the greater the increase of amplitude [12]. The key factor determining the amplitude of incisura is the rigidity of the wall of the smallest arteries and arterioles, which determines the value of the peripheral resistance [12, 13]. Therefore, an increase in longitudinal body dimensions and a decrease in the overall development of the fat tissue lead to a decrease in the amplitude of incisura, which can be considered as the positive adaptive-compensatory changes in the rates of regional circulation of the thigh, as determined primarily by the high degree of elasticity of the arteries. We have found that with increasing the longitudinal, and reducing the circumferential body dimensions of the volleyball players, the amplitude of the diastolic wave has fewer values, which is a functionally positive moment, which indicates the enhanced venous outflow. The amplitude of the fast blood filling has the most numerous and strongest (medium and strong) correlations with transverse and circumferential body dimensions, the thickness of skin and fat folds, fat and muscle components of the somatotype and body mass. Notably, all detected correlations are direct, indicating that the growth of this complex of anthropological and somatotypological indices leads to an increase in the amplitude of the fast blood filling, and hence to a lesser dilatation of the vascular walls. Summarizing the relationships between the amplitude characteristics of the rheovasogram, it should be noted that they had direct correlations with transverse and circumferential body dimensions, fat and muscle components of the somatotype and body mass and inverse ones with the longitudinal dimensions and the ectomorphic component of the somatotype.

The integral rheovasographic indices had the most numerous correlations with the parameters of the external body composition. We have established that the decrease in the longitudinal dimensions of the body, the bone component of the somatotype and the body mass, and the increase in indices of adipopexis leads to an increase in the value of the dicrotic index, which is primarily due to peripheral vascular resistance in small vessels (arterioles), and therefore leads to deterioration of the microcirculation and occurrence of signs of the venous stasis [13]. The diastolic index, which is due to the tonic indices of the venous femoral vessels, in volleyball players of the ecto-mesomorphic somatotype with a decrease in the signs of lengthening of the body, and an increase in its mass, circumferential body dimensions and indices of subcutaneous fat has increased, which means that it leads to an improvement in the outflow of blood from the arterial to venous bed. The peculiarities of the established correlations with the mean rate of the fast blood filling, which reflects the bloodfilling of the large femoral arteries, show that with the increase of the circumferential and transverse dimensions of the segments of the limbs, the mesomorphic component of the somatotype and bone body mass, the velocity parameters of the regional blood circulation are improved due to reducing the tone of the corresponding arteries [1, 12].

The comparison of the strength and the number of correlations between the rheographic parameters of the thigh and the indices of the external composition of the body has shown that it was precisely in the group of volleyball players of the ecto-mesomorphic somatotype that the greatest number of significant correlations with different groups of anthropo-somatotypological parameters were revealed as well as their greatest strength compared to volleyball players of the general group (without division into somatotypes) [6] and volleyball players of mesomorphic constitutional type [5].

Conclusion

Numerous significant correlations have been established between the hemodynamic parameters of the thigh and body dimensions and components of the somatotype and body mass in the youth volleyball players of the ecto- mesomorphic somatotype. The temporal indices of the thigh rheogram were predominantly direct correlations of the moderate strength with the total, longitudinal, transverse body dimensions and individual somatotypological parameters. The amplitude values of the rheovasogram had moderate (closer to strong) and strong correlations, and the direct ones with transverse and circumferential body dimensions, fat and muscle components of the somatotype and body mass; reversible correlations

were with longitudinal dimensions and ectomorphic component of the somatotype. The integral rheovasographic indices had the most numerous correlations with the parameters of the external composition of the body.

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Реферати

КОРЕЛЯЦІЯ РЕОВАЗОГРАФІЧНИХ ПОКАЗНИКІВ СТЕГНА З КОНСТИТУЦІОНАЛЬНИМИ ХАРАКТЕРИСТИКАМИ У ВОЛЕЙБОЛІСТІВ ЕКТО-МЕЗОМОРФНОГО СОМАТОТИПУ
Мороз В.М., Хапіцька О.П., Сарафінюк Л.А., Яремін С.Ю., Андрощук О.В.

Встановлено, що у волейболістів, які належать до екто- мезоморфному соматотипу, є численні статистично значущі зв'язки між параметрами реовазограми стегна й антропометричними та соматотипологічними показниками. Виявлено більшу кількість і силу кореляцій між показниками зовнішньої будови тіла, зокрема, поздовжніми, поперечними, обхватними розмірами тіла, товщиною шкірно-жирових складок, соматотипологічними характеристиками і часовими, амплітудними параметрами реограми, гемодинамічними індексами і показниками тону артерій, де переважають прямі середньої сили і сильні взаємозв'язки.

Ключові слова: кореляція, реовазографія стегна, антропометрія, соматотипування, екто-мезоморфний соматотип, волейболісти.

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КОРЕЛЯЦИЯ РЕОВАЗОГРАФИЧЕСКИХ ПОКАЗАТЕЛЕЙ БЕДРА С КОНСТИТУЦИОНАЛЬНЫМИ ХАРАКТЕРИСТИКАМИ У ВОЛЕЙБОЛИСТОВ ЭКТО-МЕЗОМОРФНОГО СОМАТОТИПА
Мороз В.М., Хапицкая О.П., Сарафинюк Л.А., Яремин С.Ю., Андрощук О.В.

Установлено, что у волейболистов, которые принадлежат к экто- мезоморфному соматотипу, имеются многочисленные статистически значимые связи между параметрами реовазограммы бедра и антропометрическими и соматотипологическими показателями. Выведено большее количество и силу корреляций между показателями внешнего строения тела, в частности, продольными, поперечными, охватными размерами тела, толщиной кожно-жировых складок, соматотипологическими характеристиками и временными, амплитудными параметрами реограммы, гемодинамическими индексами и показателями тону артерий, где преобладают прямые средней силы и сильные взаимосвязи.

Ключевые слова: корреляция, реовазография бедра, антропометрия, соматотипирование, экто-мезоморфный соматотип, волейболисты.

Рецензент Єрошенко Г.А.