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Individual features of the physical development and the onset of biological maturity of morphological and functional structures of the body

Abstract. Objective: to justify the observed features of physical development of the individual and the nature of the flow pattern of biological maturity of morphological and functional structures of the body other than the population norm of behavior trends of these processes. **Materials and methods:** analysis of scientific literature on the research, the use of survey data contingent of children of preschool and primary school age, the use of attributive semantic spaces, method of similarity and dimensions, the method of analogy, the method of slowly varying amplitudes. **Results:** The nature of occurrence of the individual characteristics of the physical development and the onset of biological maturity of morphological and functional structures of the whole organism. Substantiates the nature of occurrence of the individual variation of these processes. **Conclusions:** The existing differences in the individual development of physical and somatotype shaping involve a violation of the synchronization of interdependent relations system. This reduces the potential viability and is expressed in the constitution somatotype features that can be used for preclinical diagnosis.

Keywords: synchronization of interdependent relationships, individual rate, semantic feature space, similarity theory, prenosological forecast.

Introduction. Developing innovative approaches to shape health technologies in school physical education to the fore puts the task into account specific features of physical development of each student. This task involves setting the age peculiarities of physical development, and within each age determination of its individual features of the flow of biological maturation of morphological and functional structures of the body.

Investigation private matters will certainly lead to the need to study the general provisions, knowledge of which is exempt from ignorance of the particulars. Allocation of general provisions allowing you to see different in the same and different at the same, thereby introducing a measure of comparison, the mapped phenomena or processes. Implementation of this type of comparison and recognition of different general and based on compliance with the general principle to “remove different - to select the general”, “remove the total - to select different”. It is necessary to take into account the number of comparable characteristics and accuracy of measurement that determines the possible complexity of the problem. Compliance with the required measurement accuracy and completeness of the compared parameters of their submission are necessary conditions for the review and implementation of any scientific problem solving.

Consistency multi interdependent relationship determines their measure of synchronization, reflecting the vitality of the system components presented. The synchronization phenomenon serves the common property of the objects of various nature and shape of ordered relationships. Deterministic conditioned by the principle of stochastic behavior of the organization. Stochastic principle of organization behavior manifests itself in a wide range of parameters, starting with the third order, creating a stable synchronization system with a very large number of similar objects. [1] Further development of the provision found in the theorem proved V.N. Samsonkin the external display internal properties in the process of developing self-organizing systems [2].

The general principle of dynamic systems equilibration follows as a consequence of the integral criterion of stability of synchronous motions [3]. The synchronization phenomenon is that the natural or man-made objects in the absence of interaction oscillates at different frequencies in the presence of weak interactions begin to move with the same, or comparable multiple frequencies, which establish certain phase relationship between these vibrations.

Communication Studies with academic programs, plans, themes.

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Purpose of the study: to justify the observed features of physical development of the individual and the nature of the flow pattern of biological maturity of morphological and functional structures of the body, different from the trend of population norms of behavior of these processes.

Objectives of the study:

1. Expand the essence of the reasons that determine the manifestation of the individual characteristics of physical development and maturation of the biological occurrence of morphological and functional structures are distinct from the general rate of these processes.
2. To develop a method of predicting the trend of physical development of the individual rules that allow for the forecast prenosological deviations.
3. To present the fundamentals and principles of the rules of interdependent relationships and the dynamics of its development.

Materials and methods: analysis of the scientific literature on the issue of research, the use of survey data contingent of children of preschool and primary school age, are held at HDAFK and NIIOZDP. Using attributive semantic spaces introduced a single measure to treat the symptoms, allowing to set the qualitative structure of the objects being compared. The method of similarity and dimensions, the method of analogy, the method of slowly varying amplitudes.

The results of the study and discussion. The process of development and self-organization of the body takes place under strict laws defining specific terms of its formation. Compliance with specific timing of this process characterizes

it as normal. However, in practice, there is a vast variation of it, carries the significant differences regarding the most characteristic of its course. The reasons for this phenomenon have tried to explain in ancient times, which made it possible to accumulate a large, enough material on matters relating to the development of the concept of standards and norms in general. Despite the fact that even Hippocrates and Aristotle in the interpretation of the features of individual development invested equity ratio of first principles and consider these factors affect different body types and special features of the metabolic processes and, consequently, different resistance to the environment, the rationale of the concept of individual standards has been achieved in the eighties of the twentieth century. [4] The concept of norms and standards development has been developed by Hegel. [5] In the early twentieth century, Sheldon, M.J. Breitman introduces the concept of standards and provide a biological explanation for the structure of the existing variability somatotypes. However, the concept of individual standards remained unsolved.

Introduction of statistical criteria for evaluating the results of observations conducted led to the understanding of the rules as the most frequent characteristics in population surveys monitored parameters. Such criteria are established as regulatory characteristics [6]. The gradual accumulation of contradictions in the application of established norms in assessing the health status of persons living in different climatic regions of nature, led to the need of introducing the concept of regional standards of physical development. Installed different individual tolerability residence when moving to different climatic regions has led to the need to recognize the existence of the individual standards of physical development and physical condition. This was due to the fact that the return of such persons to their old homes restored their former normal health and vitality. Emerging violations can not be attributed to pathological phenomena, although the observed process flow is fully consistent with their development. It was obvious that some factors in the new environment of the host cause a violation of the established timing consistency interdependent relations systems. The observed results suggest that the adaptive capacity of these individuals do not have in their arsenal of mechanisms to ensure the necessary amendments to the required synchronization of violations in the interdependent relationship "organism - environment". Since synchronization is a general law establishing the consistency of multicomponent systems of any nature, it is natural to assume that the adaptive mechanisms that provide the necessary synchronization of relations should also be based on the general principles of its course and is isomorphic invariative and the nature of its manifestations. Adaptive processes as are reflections of synchronization mechanism of relations equally with her peculiar as the inanimate and animate nature, to the existing rights, inherent to man and society. Adaptation is a necessary condition for the development of matter, generating new forms of it, together with the appearance of which changes only form of manifestation of the adaptation process. Human adaptation is only one of these forms, which is based on a single pattern of organization. Different forms of a general law can be defined quantitative composition of a multicomponent structure of the object (its complexity); quality of its organization, which is reflected in the structure of the constituent components of the following measures and their expression in the presence of his share in the structure. The nature of this difference is explained by "an integral criterion of stability" (extremely property) of synchronous motions, which corresponds to the minimum points of a function phases, called "potential function," playing the role of the potential energy in the equilibrium problem of mechanical systems [1]. The potential function is equal to the value of the Lagrange function of the oscillatory system. In the manifestation of behavioral changes play an important role so-called "small parameters" or the method of slowly varying amplitudes [7].

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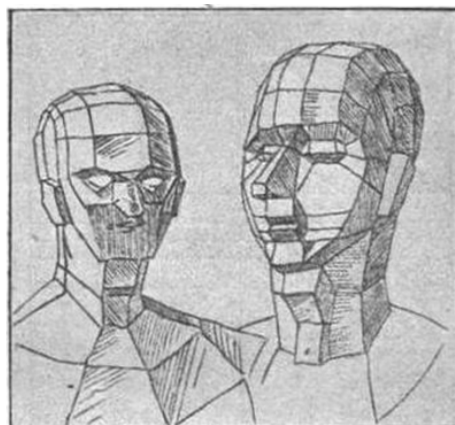
This fact points to the fact that the change in the characteristic path norms of individual development relative to the norm of population development, due to the behavior of "small parameter" with constant coefficients in the laws describing the dynamics of the flow of individual standards of physical development in comparison with the dynamics of population norms of physical development, where the coefficients remain constant [8]. This led to the need for prolonged monitoring of the biological maturation of the observed population of children of preschool and early school age. This period of physical development of children selected in connection with the typical dynamics of the flow rate of the process that allows you to set the behavior of the method of slowly varying amplitudes behavior of "small parameters." To evaluate the biological age, and especially its flow characteristics were selected, reflecting the process of physical growth and development. Adequacy of these characteristics in previous publications substantiated the journal [5, 8, 9]. They are the body weight and length. In the first approximation, the ratio of these characteristics to determine the biological age and physique feature

of the formation on the proposal of distribution of body weight per unit of growth. Based on these characteristics, you can build a variety of indicative semantic space allows you to organize occurring body types and determine the nature of the trend movement relative to the normal physical development of the population. The rate of physical development in this case formed on the basis of average growth characteristics-weight ratios derived from monitoring data survey of school children and preschoolers NIOZDP and prolonged surveys conducted among school, students of HDAFK, city and region. The main objective of the research was to establish the trajectory of the trend rate of movement of individual development and direction of somatotype shaping the distribution of body weight per unit of growth in body length. The main essence of the solution of the problem was to establish a way to certification of individual trajectory of body shapes and the possibility of predicting the course of his physical development.

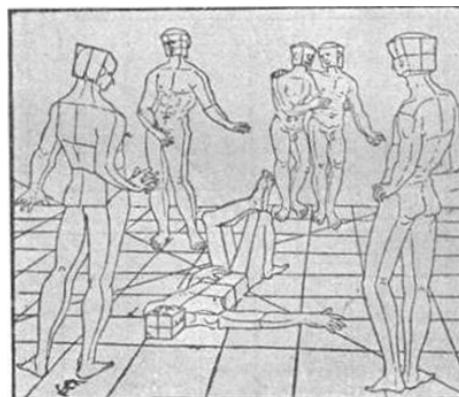
It is now believed that in childhood predict the development of body type is not possible. This is due to the fact that children in the same area of dispersion density distribution may be a year or several years to move to a completely different area, acquiring a completely different somatotype. The main reason for such errors the conclusion is that the monitoring is not carried out an approximation of the trend curve reflects the individual physical development, and take into account the movement of the point taken in a particular sector dispersion of the observed characteristics in different individuals presented at this point, in the other zones. In fact, this point is the intersection of the trajectories of individual curves of the rate of development. Depending on the age, which is "cut" the density distribution of the individual characteristics of the growth-weight ratios, and their number varies according to well-defined laws. This phenomenon is a general pattern of conduct organizes processes established by French scientists Zh.Perren and P.Lanzheven (1908) [3]. With increasing age, the density of the trajectories of the trend significantly decreases and becomes asymptotic movement that can uniquely identify an individual somatotype.

Using Rostov-weight characteristics, the so-called indicative characteristics, and shows the structure of the body as a box having a certain area in the form of a rectangular base, the volume of the body can be expressed as the product of the height of the area. Since it introduced a discrete measurement of the body up to one cubic centimeter, the section of the box with an interval of one centimeter possible to express Rostov-weight relationship in dimensionless units, where the ratio of the area is taken, consisting of the number of cubic centimeters, falling a height of one cubic centimeter. Cross-sectional area can have a variation in its "anteroposterior" and "longitudinal and transverse" direction, but subject to a number of cubic centimeters available in this section.

For simplicity, geometric constructions that do not violate the manifestation of the aforementioned rule, the distribution of variability of body types observed in the same amount the body can be represented with a given degree of accuracy of any observed structure of the body, which in its time was introduced in Cubist drawings by Durer and E.Shon (1542) [10, 11].



a)



b)

Fig. 1. Distribution of the variability of body types observed in the same volume of the body: a) Cubist drawing by Durer; b) Cubist drawing Sean E. (1542) [10]

When commensurability growth-weight relationships of individuals, expressed in dimensionless units, their variability manifestations will be presented to the points in the ellipse of dispersion with a density defined by the law of normal distribution. In turn, the points of concentration density per unit area of the ellipse of dispersion will decrease in accordance with increase of its area while maintaining the number of initial points. In this case, the dispersion can be considered to present a uniform indicative of a semantic space in which all areas of the measurement is a common measure of the "elementary volume" - a cubic centimeter. It is the smallest unit of measurement adopted by the considered volume of the body. If you want to measure more accurately used "elementary" unit can be reduced in size to satisfy the required accuracy of the task. This unit of measurement can be given any name, but in the feature space on the characteristics of any of its terms will be presented only the coordinates of the abscissa, ordinate and applicate. This allows you to regard any body with the establishment of its variations in the structure of the structure for a given volume. For ease of presentation of the results, and without loss of generality conducted reasoning, revealing a community organization dynamics of the phenomenon, it is enough representation in two dimensions, leaving only the axis of ordinate and abscissa. In this representation space, viewed the body will be characterized by its length and width.

In these areas, the entire volume of the target population has always distinguished the maximum and minimum variation of characteristics of length and width within a range which is the entire volume of the population. Since the frequency of expression of each characteristic is described by a normal distribution, the maximum distribution density of the total volume of dispersion is selected the center of the structure of representation on the basis of variations in body length body width body.

In the relations "body length - the width of the body" will be variations in body space within the zone of dispersion characteristics in the range of «min - max» length and «min - max» to the width of the body. Taking the length of the range of a conventional unit can construct a "unit" square, in which the axes' length - width "and conducted a diagonal joining the vertices « min; min »; «Max; max »and« max; min »; «Min; max »entire space is divided into eight sectors, and entering into a zone (9). This area has the highest density of dispersion within a radius of one sigma from the intersection of the axes and diagonals. The central point of the zone (9) is correct relationships of attributive characteristics (length, width) in the body structure in the surveyed population of individuals of a particular volume of chronological age. The zone within a radius of one sigma from the norm is the optimum functional area, reflecting variations in the observed fluctuations manifestations share the characteristic values in the structure of the body relative to the norm of the state of their relations in all eight areas of their classification.

Diagonal «min; min »; «Max; max »or (2, 6) out of line of conservation identical proportions observed in the rate of these relations at various values of" length - width "of the body. It reflects the potential for the system or measure pronounced intensity of interdependent relationships. Orthogonal she diagonal (4, 8) shows the range of possible quality deviations in the structure of the body, possible at the same potential level to ensure the redistribution of it at different ratios of "length - width" in the structure of the body structure.

Such a construction of feature semantic space is presented in the form of two rectangular coordinates, which are relative to each other deployed to 45°. One of them is a system of coordinates defining characteristics, and the second derivative of their relationships that make up the axis of the reflection level of potential, and the second reflects the boundaries of the body shaping ripple variation in the parameters "length - width" of each value of the potential opportunities. Presentation of the feature space is given in Fig. 2.

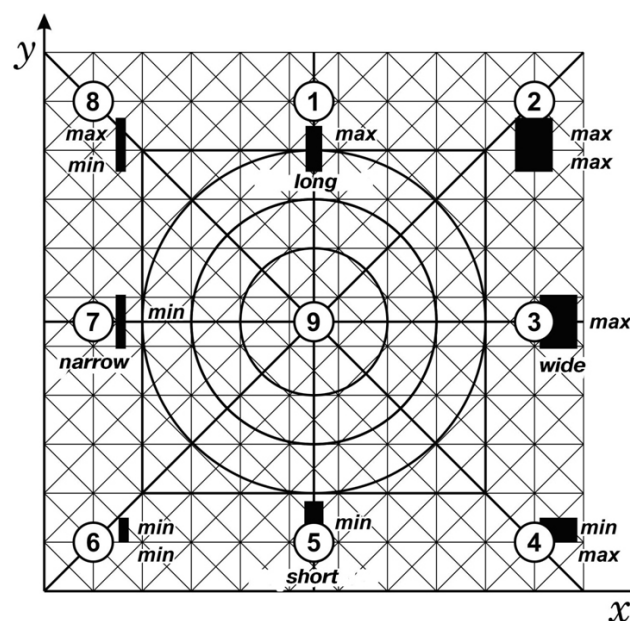


Fig. 2. Nomogram distribution potential forming the body structure between the two signs of the body length and its width.

The variety of body types is associated with a change in the coefficients of self-reliance among the elements of the structural organization different from the norm, leading to the breakdown of synchronization mechanism of adaptation

options to ensure equilibrium relationship “organism - environment”. This factor is not just a number, but a function of the conditions that favor a single measure of the optimum ratio [7]. In a normal relationship, they must be equal to unity, but their observed fluctuations around this value, both in frequency and amplitude, which causes the effect of the beats are reflected in the reduction of adaptive capacity and violation of timing mechanism. Fluctuations in consistency coefficients close to unity are the natural course of operating the process of adaptation to fluctuations in the environment. The boundaries of the reversibility of these oscillations are the optimum functional area and could not go beyond the zone of sigma abnormal state. A continuous process of growth and proceeding with the process of formation of morphological and functional structures of the body is accompanied by a change in the dynamics of age norms. Under all conditions of conservation norms of relations structural organization of the body, the ratio as a function of the growth conditions, expressed by an exponential dependence. If you imagine a line movement (transgression) of standards (in Figure 2 is the point 9) in time, it will have the following graphic display (Figure 3)

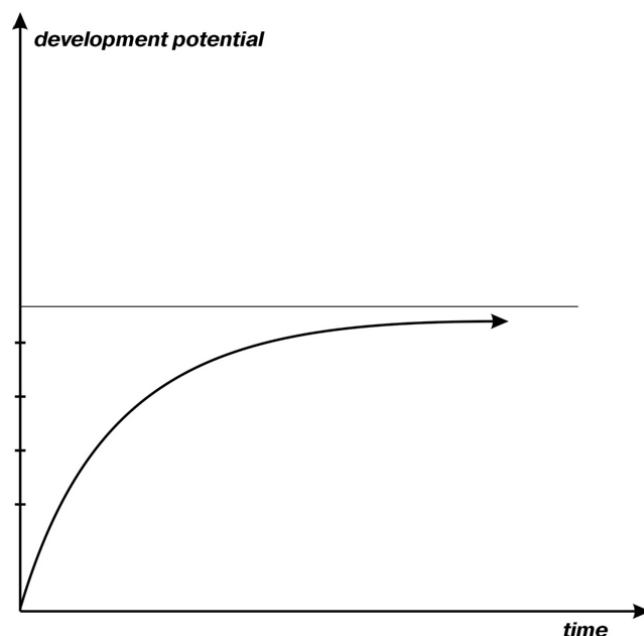


Fig. 3. Age-related changes of morphological and functional changes building standards developing body systems while maintaining the synchronization mechanism of their relationship

Measure the distance from the variability of body type point 9 (Fig. 2) corresponding to the normal relations of morphological and functional structures of the body corresponds to a drop in their timing, resulting in lower adaptive capacity and level of achievement of its ultimate potential sustainable relationship with the environment stay. If, in accordance with the method of J. Perry and P.Lanzheven all the initial points of the curves reflecting the achievement of its ultimate potential life support coming from different zones of dissipation, reduced to a single point, the corresponding asymptotic lines, which are a reflection of the time maintaining the level of stability of the relationship with the environment, then these curves will be presented to a strictly defined function, which is reflected in Figure 3. [12, 13].

Reflections depending jitter relations morphofunctional structures of the body, are equivalent in nature of the process of exhaustion of the whole organism with different intensity of exercise. The remoteness of the variation of morphological and functional deviations from normal structures of the equilibrium level of intensity of exercise is equivalent to the level of intensity of physical activity. The farther into shares sigma deviation from the normal state of relations (Figure 2 point 9), the more intense the load is spent to maintain an effective equilibrium states in their relations with the media host, which naturally leads to the depletion of the overall capacity of an integrated system of opportunities and, consequently, and the duration of its life cycle. Such analytical dependence, reflecting age-related changes of morphological and functional changes building standards developing organ systems characteristic of any individual.

Individual difference is only in the initial correlation coefficients in the interdependence of morphological and functional structures of the body and the direction of their future changes. Defining these characteristics is only possible if there is a prolonged screening monitoring of physical development on the basis of the method of clinical anthropometry is the most accessible method of control. Minimally sufficient parameters to determine the biological age and the quality orientation of its flow are indications of growth, body weight and length correlated to the rate of their population age changes, obtained by carrying out systematic monitoring of the observed population of children. The most accessible for the organization of observations and informative in this regard is early childhood and early school age. Knowledge of the laws of the controlled process and the availability of empirical data flow allows it to set individual orientation of physical development. This, in turn, using additional signs of physical development, allows a fairly complete preclinical diagnosis of specific features of physical development and the development of innovative approaches shape health technology in preschool and school physical education, taking into account not only the age, but also individual norms of motor activity necessary for of full physical development.

For assessment of individual trajectories age physical development necessary to carry out a prolonged control of each individual observed. However, the degree of deviation with respect to its development of biological age requires the

mandatory presence of the trajectory of the dynamics of population norms age development, which includes the individual in question. It should be noted that the basis for the construction of structures of the body corresponding to the rate of its development are strict geometric patterns that define the proportions of the body [15]. Installed proportion of the male body, which are listed in the "Tables of proportions" Geller, are not based on any theoretical canons and on a set of photographs and measurements collected by Ploss - Bartels, Shprats, Thompson Shadov et al., But fully agree rectangles associated with the symmetry of the five regular polyhedra, which Hembidzh found in the study of the dynamic symmetry of the structure of human and plant life. This pattern is observed in the structure of the Harvard skeleton structure and an average aspect ratio of the male body. (Fig. 4) The dynamics of the relation of body proportions from birth to 20 years was set M.J. Breytman and refer to his work in 1924, 1926. [16, 17, 18].

A comparison of the relationship of such standards allows you to set the deviation of the rate constants of biological maturation of morphological and functional structures of the body and receiving sound mathematical prediction of preclinical diagnosis indicating the reasons for generating and development [19, 20].

Conclusions:

1. Specific features of physical development and occurrence of morphological and functional maturation of the biological structures of the body consists in the fact that each individual process has different initial conditions, which relate to the speed of the biological maturation of the compared entities, and possible differences in the synchronicity of their occurrence. Depending on the characteristics of the synchronization of interdependent relationships developing morphological and functional structures, the trajectory of the trend rate of an individual can be held at an angle to the trajectory of the trend rate of a population that can not be set for monitoring the physical development of students. This provision does not allow for the forecast of formation somatotype.

2. Determination of the trajectory of the trend rate of physical development of the individual requires prolonged monitoring of the dynamics of change in Rostov-weight ratios. Based on the systematic accumulation of empirical data Rostov-weight ratios, the resulting movement of the line of physical development of the individual rules should be approximated by an exponential curve. Knowing in advance the well-known curve approximation is reduced to the determination of its constant coefficients that is performed with the help of available tables for this function, or computer programs that provide definition of curvature of its asymptote and direction of the line of intersection in the plane in which it is located to the plane perpendicular to it of feature semantic space.

3. The population rate of physical development includes a complete set of rules of the individual variation of physical development. In its structure stands out two determining factors of physical development: growth and its weight in shaping appropriate structure somatotype. The distribution of body mass that is characteristic for a particular chronological age, has a density distribution of the frequency of its occurrence in a range from a minimum value to its maximum, is described by a normal distribution. At the same time, the value of the expectation of this distribution in this chronological age corresponds to the value of biological age. The direction of movement of the age norm increases in weight and can talk about the growth of advanced and retarded its change. A measure of the deviation measured in fractions of sigma distance from the chronological age of the expectation value of it. In this respect to the line rate of the physical development of the population observed constancy of growth rate and weight somatotype shaping relationship that allows us to speak about the same structure of relations at different values of body weight. The perpendicular line drawn to the line rate of development is shaping variability of the same amount of body mass. Measure the distance in the direction of the individual rules on the value of population norm for growth-weights indicates the extent of violations in sync morph functional I interdependent entities in the current norm, which reduces the viability of such a structure of interdependent relationships. Asymptotic line level limiting individual rate of the age of physical development relative to its population norm, reflects the level of reduction of the viability of this kind of structure somatotype. The qualitative reason for this phenomenon is determined by the direction of the line rate of the physical development of the individual.

References:

1. Blekhman I. I. *Sinkhronizatsiya v prirode i tekhnike [Synchronization in nature and technology]*, Moscow, 1981, 352 p. (rus)
2. Samsonkin V. N., Druz V. A. *Modelirovaniye v samoorganizuyushchikhsya sistemakh [Modeling in self-organizing systems]*, Donetsk, 2010, 104 p. (rus)
3. Shvanitskiy G. R. *Ritmy razvivayushchikhsya slozhnykh system [Rhythms of developing complex systems]*, Moascow, № 9, 1988, 48 p. (rus)
4. Bekova D. B. *Individualnaya anatomicheskaya izmenchivost organov, sistem i formy tela cheloveka [Individual anatomical variability of organs, systems and forms of the human body]*, Kiyev, 1988, 224 p. (rus)
5. Azhippo A. Yu., Dorofeyeva T. I., Puhach Ya. I., Artemyeva G. P., Nechitaylo M. V., Druz V. A. *Slobozans'kij nauk.-sport. visn. [Slobzhanskyi science and sport bulletin]*, Kharkiv, 2015, № 5 (49), p. 13–23. (rus)
6. Volkenshteyn M. V. *Obshchaya biofizika [General biophysics]*, Moscow, 1978, p. 408–418. (rus)
7. Gorban A. N. *Demon Darvina, ideya optimalnosti i yestestvennyy otbor [The Demon Darwin, the idea of optimality and natural selection]*, Moscow, 1988, 208 p. (rus)
8. Azhippo A. Yu., Puhach Ya. I., Druz V. A., Zhernovnikova Ya. V. *Slobozans'kij nauk.-sport. visn. [Slobzhanskyi science and sport bulletin]*, Kharkiv, 2015, № 4 (48), p. 7–14. (rus)
9. Azhippo A. Yu., Puhach Ya. I., Zhernovnikova Ya. V. *Slobozans'kij nauk.-sport. visn. [Slobzhanskyi science and sport bulletin]*, Kharkiv, 2015, № 3 (47), p. 7–12. (rus)
10. Gika M. *Estetika proporsiy v prirode i iskusstve [Aesthetics proportions in nature and art]*, Moscow, 1936, p. 163, 284, 285.
11. D-r H. V. Heller. *Proportionstalekm der Menschlichen Gestalt*, Vena, Izdaniye A. Shrolllya, 1937. (rus)
12. Puhach Ya. I. *Materialy 9-y mezhdunarodnoy nauchnoy prakticheskoy konferentsii «Bdeshcheto vprosi ot sveta na naukata», 2013, tom 39, Fizicheska kultura i sport [Proceedings of the 9th International Scientific and Practical Conference "Future issues of the world of science", 2013b, Volume 39, Physical Culture and Sport]*, Sofiya, p. 5–14. (rus)
13. Ashanin V. S., Puhach Ya. I. *Postroyeniye semanticheskikh prostranstv dlya opisaniya psikhologicheskoy deyatelnosti cheloveka v ekstremalnykh usloviyakh [Building a semantic space to describe the psychological human activities in extreme conditions]*, Kharkov, 2014, 88 p. (rus)
14. Puhach Ya. I. *Ekstremalnaya deyatelnost cheloveka: teoriya i praktika prikladnykh i ekstremalnykh vidov sporta [Extreme human*

activity: the theory and practice of applied and extreme sports], Moskva, 2013, № 3, p. 8–10. (rus)

15. Balsevich V. K. *Ocherki po vozrastnoy kineziologii cheloveka [Essays on Human Kinesiology age]*, Moscow, 2009, 220 p. (rus)

16. Breytman M. Ya. *Tablitsy dlya klinicheskoy antropometrii [Tables for Clinical anthropometry]*, Leningrad, 1926, 82 p. (rus)

17. Breytman M. Ya. *Klinicheskaya semiotika i differentsialnaya diagnostika endokrinykh zabolevaniy [Clinical Semiotics and differential diagnosis of endocrine diseases]*, Leningrad, 1949, 586 p. (rus)

18. Shustov S. B., Khalimov Yu. Sh., Trufanov G. Ye. *Funktsionalnaya i topicheskaya diagnostika v endokrinologii [Functional and topical diagnostics in endocrinology]*, Sankt-Peterburg, 2010, 296 p. (rus)

19. Biryukova Z. I. (Kolarovoy) *Fiziologiya rebenka rannego vozrasta [The physiology of a young child]*, Sofiya, 1970, 406 p. (rus)

20. Podrigalo L. V., Danilenko G. N. *Donozologicheskiye sostoyaniya u detey, podrostkov i molodezhi: diagnostika, prognoz i gigiyenicheskaya korrektsiya [Prenosological condition in children, adolescents and young adults: diagnosis, prognosis and hygienic correction]*, Kiyev, 2014, 200 p. (rus)

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