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The role of diet in the proper formation of physical indicators: literature review

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Abstract--Physical development is a complex process of various quantitative and qualitative changes in all indicators of the human body in the course of its life, that is, the dynamics of the process. Anthropologists and specialists in sports medicine understand physical development as “a complex of morphological and functional properties of an organism, which determines the reserve of its physical strength.

Keywords--environmental factors, heterochronous dysplasia, irrational nutrition.

Introduction

Physical development according to biological laws reflects the general patterns of growth and development, depends on a large number of factors, demonstrating not only a hereditary predisposition, but also the influence on the body of all environmental factors, to which the child's body reacts most sharply. External factors are understood as unfavorable intrauterine development, social conditions, irrational nutrition, sedentary lifestyle, bad habits, work and rest regimen, environmental factors. Internal are due to heredity. Features of physical development are programmed at the genetic level, so children look like their parents. The hereditary program is passed down from generation to generation, and in some people it does not change, while in others it improves. The delay in the processes of gene switching, associated with the influence of harmful environmental factors, leads to heterochrony in the development of individual organs or physiological systems. This effect manifests itself in the form of heterochronous dysplasia, when the differentiation of tissue structures lags behind the chronological age, the tissues contain cells of the embryonic type. Such a condition, often hidden, was discovered back in the 30s by V.G. Shtefko and continued by the work of his followers on the detection of heterochronous dysplasia of the brain, kidneys, lungs, etc. . As a result, the intensity of growth of children and adolescents may undergo significant changes [3, 7]. The genetic program provides the entire life cycle of individual development, including the

sequence of switching and derepression of genes that control the change of periods of development in the corresponding conditions of the child's life. Due to the changing mutual influence of gene and neuroendocrine regulation, each period of a child's development is characterized by special rates of physical growth, age-related physiological and behavioral reactions. Physical development largely depends on the social and natural environment, so it is the most objective indicator of the health of the population [4, 14].

The processes of growth and development constitute the main characteristic of childhood. The study of the laws of development, the creation of methods for its practical control, the protection and provision of normal development, or, more precisely, the optimal development of children, is one of the main components of both pediatric science and the practice of a pediatrician [5]. Physical development, along with fertility, morbidity and mortality, is one of the indicators of the level of health of the population [6].

The concept of "physical development" does not have a clear definition. In a broad sense, the term means a complex of morphofunctional indicators that characterize human activity in biological terms. Some Russian scientists [7, 45] define physical development as a complex of morphofunctional features that characterize the age level of a child. Theoretically, any of the morphological and functional indicators of a person's life can be used as an indicator of his physical development. To do this, first of all, it is necessary to differentiate the concepts of growth and development, bearing in mind that growth is a quantitative increase in body biomass; development is a qualitative and quantitative transformation in the body, providing a change in its functions. [eight]. Human life is a continuous process of development, in which the following stages pass sequentially: maturation, mature age, aging. Growth and development are two interconnected and interdependent sides of the same process, which proceed unevenly and obey the laws of growth [9].

Age is a stage of biological maturation of an organism, determined by genetic determinants [10]. The age at which growth spurts occur is considered a critical period of development. There are critical periods in the development of individual body systems: nervous, endocrine and immune, which increase the risk of health disorders and the development of serious diseases [11]. The alternation of the processes of growth and differentiation is a natural biological marker of age development, each of which has its own specific features that never occur in the same combination at any of the other stages.

Analyzing the above data, we came to the conclusion that physical development is a dynamic process that characterizes the processes of growth and development of the child at the present time (at the moment), which are considered as one of the main and informative criteria of health child population. This criterion is the leading criterion for the health of the younger generation and the future of the nation and requires systematic monitoring, including in the field of social and hygienic monitoring. Historical aspects of the study of physical development. The foundations of modern anthropometric research methods were laid in the 19th century, when the patterns of variability of anthropometric indicators were described.

Anthropometry is a term recommended in the middle of the 19th century. Belgian scientist Adolf Quetelet as a way to measure body parts to identify criminals and others. It was used by the police of many countries from 1888 until the invention of fingerprinting. It is also called (by the name of Bertillon, who improved anthropometry) "Bertillon-press". The development and standardization of anthropometric research methods in our country began in the mid-1920s. In 1923, under the People's Commissariat of Health of the RSFSR, an interdepartmental commission was established to study the physical development of the country's population, headed by V.V. Bunak. The Central Anthropometric Bureau was organized, where, with the participation of well-known anthropologists and physicians V.V. Bunak, L.A. Syrkina, V.G. data, tools for examination were created, the scientific provisions of the doctrine of the physical development of a person were theoretically substantiated. The generalizing result of this enormous work was the fundamental manual "Anthropometry", which was published in early 1941 and has not lost its significance today. At the end of the 80s of the XIX century, the first data were obtained on the influence of the social and hygienic situation on the physical development of children. In the post-war years at the Institute. N.A. Semashko under the leadership of L.A. Syrkina studied the physical development of the population [12].

Due to the fact that an individual assessment of physical development is a fairly reliable tool for intra-group characteristics of the children's team, under the guidance and with the direct participation of S.M. Grombakh on numerically significant material (more than 6 thousand children at the age of 3-7 years) some theoretical and practical aspects of its application were considered. With regard to regression scales, it has been undeniably proven that they are adequate for assessing physical development in mass studies, being a kind of screening test (a term that appeared later), informative enough to identify groups of children with major deviations in physical development, and -meet the requirements of WHO. In the works of Yu.A. Yampolskaya [13, 28], it was shown that the assessment by modification regression scales can be successfully used to characterize large groups, while centile grids can be used exclusively for individual diagnostics of the growth process. Colleagues from Poland and the GDR highly appreciated the regression scale modified by Yu.A. Yampolskaya.

It is generally recognized that the physical development of children is one of the informative indicators of the level of health of the population, however, there is still no single approach to the method of its assessment [14]. The formation of ideas about the individual assessment of the physical development of children began with the use of various indices [15]. The scientific direction, in which the modeling of growth and shaping processes is based on thematic approaches, has become widespread [16]. Parabolic equations and exponential equations were proposed to describe the dynamics of body length and mass indicators. In the 90s of the twentieth century, domestic researchers increasingly used normative non-parametric (centile) tables to assess individual physical development, which made it possible to unify the methodology for assessing the most important anthropometric indicators [7]. The basis for this was the research of V.G. Vlastovsky, V.P. Chtetsov, A.I. Kliorin and others, who stated that for indicators of length and body weight, a lognormal distribution with the presence of right asymmetry is characteristic. Centile tables are easier to work with, allow

assessing the rate of individual development of a child in ontogeny and can be used to assess the harmony of the physical development of children and adolescents [18].

Until then, there has been a discussion about the standards for the physical development of children. Along with the opinion about the need to create regional tables [19], a number of researchers insist on the viability and efficiency of using interregional standards [20]. Supporters of regional standards [21] argue that physical development is subject to fluctuations depending on geographical, ethnic, climatic, social, environmental factors and the level of urbanization. Therefore, the standards of physical development of children require regular (at least once every 5-10 years) update [22]. The mutual influence of the biological characteristics of the *Homo sapiens* species, heredity (genetic control), natural environment, social, economic and cultural environment leads to the fact that the development of each child proceeds according to a special, individual scenario [22].

According to Yu.A. Yampolskaya, the vastness of our country with different climatic and geographical conditions, the peculiarity of economic activity and the life of the population in different territories dictate the need for a regional approach to studying the physical development of the younger generation. The significance of this approach is evidenced by the materials of the conference "Regional Features of the Health of Children in Russia" (2004), where the importance of regional features was emphasized. To assess the indicators of physical development, special tables are used - standards, or standards of physical development. When evaluating physical development, it is important to evaluate not only the region of residence, but also the type of settlement (city, village). As standards, the results of anthropometric measurements of large (at least 100-150 people), homogeneous in sex, age and other characteristics of population groups are used. The standards of physical development are always regional in nature, and within the regions inhabited by different ethnic groups, one should use the standards developed for these groups.

The unevenness of the increase in body size inherent in individual development is even more enhanced depending on seasonal factors (natural - the length of daylight hours, the intensity of solar and ultraviolet radiation, as well as microsocial ones associated with training loads, nutrition, rest, etc.). In this regard, they usually try to evaluate the indicators of physical development in the same periods of the calendar year, which makes it easier to identify a trend towards a delay or negative shifts in the characteristics of physical development, which may indicate a health disorder [3].

At the same time, E.A. Shaposhnikov, when analyzing a large amount of material, came to the conclusion that the average weight indicators derived in relation to body length are the same for different age, national, territorial and social groups of the child population up to 14 years and almost do not change with the change of generations, and therefore regional standards are not required [4]. A similar opinion is shared by other authors who have found confirmation of the above in their studies [5]. The most important tools for primary control of the health status of children and adolescents are anthropometry data obtained during the

examination of homogeneous groups of children and being representative for the construction of regional standards (norms) of physical development [7].

Mass anthropometric examinations of children in our country are carried out in a planned manner, starting with newborns and children of the first year of life. The works of recent years indicate the features of the physical development of the population under the influence of the anthropogenic factor, and in particular the increase in the number of children with disharmonious development, a decrease in functional indicators [7].

Analysis of the physical development of various children and adolescents was carried out using regional regression scales and was considered the simplest and most reliable method for population monitoring of physical development in the 1990s [8]. A unified scheme for an individual assessment of physical development has been developed, which formed the basis of tables of the "screening test" type, proposed for practical healthcare. With the help of these tables in the children's team, children are identified whose physical development corresponds to the norm, as well as children with developmental deviations (insufficient or overweight, short stature). The data of the Research Institute of Hygiene and Health Protection of Children and Adolescents testify to the rather high resolution of the considered method for assessing physical development in terms of social classification of the child population, identifying its most socially unprotected groups. One of the directions of research should be the detection of shifts that occur in the state of physical development of children and adolescents from decade to decade, making it possible to distinguish one generation from another.

Basic laws of children's growth [9]

1. Growth is a reflection of the systemic development process.
2. Deceleration of growth rate with age.
3. Uneven changes in growth rate.
4. Craniocaudal growth gradient.
5. Alternation of directions of growth.
6. Gender specificity of the growth rate.
7. Growth asymmetry.

Thus, a retrospective analysis of literature data on physical development testifies to the prescription of the study of the issue and its relevance at the present time. In our opinion, the most correct decision is the adoption of regional standards and their correction within the regulated time frame, since the continuously occurring processes of metabolism and energy in the human body determine the individual characteristics of its development, depend on regional characteristics and are subject to chronometric influence.

Methods for assessing physical development. Methods that study the physical development of children include: measuring the size and weight of the body (anthropometry, or pedometry), examining and describing signs of physique and appearance (somatoscopy), dynamometry, studying physical performance using step -test or bicycle ergometry. Sometimes this complex includes some physiometric indicators (vital capacity of the lungs, ECG data, etc.) [20]. The

greater the number of features included in the assessment of physical development, the more accurate the assessment itself will be.

A methodology has been developed for approaches to assessing the health of children during mass screening examinations. The use of somatometric indicators is the basis for assessing the physical development of children, both in the practice of clinical examination of the child population, and in population studies. With all the variety of methods and techniques for assessing physical development, those that are identified, unified and comparable are of historical importance [3].

Any deviations from the norm in physical development indicate a relative unfavorable state of health and should be taken into account. The range of variation of a feature or the range of distribution is divided into certain sections, which are the basis for constructing rating scales. There are many ways of such breakdowns, but in practice two are mainly used - parametric, or signal and non-parametric - centile. I.M. Vorontsov suggested using the "stenia index" for somatotyping and a centile scale for its assessment.

The pace of physical development is an important characteristic for a qualitative assessment of the state of health of a particular child. The individual diversity of the pace of physical development is quite large, but if it falls within the boundaries of the norm, then the conditions of life and activity of the child correspond to the capabilities and needs of his body [10]. According to the dynamics of growth and development of children, one can judge their health, physical and mental well-being [3]. A moderate acceleration or deceleration of it may depend on many reasons, but it should always be taken into account by a doctor, a teacher, and a psychologist. The growth of an organism is an uneven process. Normal growth dynamics is disrupted by chronic or long-term diseases, endocrine disorders, genetically determined diseases and conditions, the influence of chronic stress (which, in turn, causes disturbances in the work of the endocrine glands that "lead" the work of the whole organism), insufficient or unbalanced diet. The physical development of the child is combined with the mental - hence the problem of "school maturity" of children of various ethnic groups and regions of the country. Solving such problems requires the participation of not only teachers, pediatricians, psychologists, but also anthropologists [14]. The mixing of different population groups with varying intensity has occurred throughout the history of mankind. This is a normal process necessary for the existence of any biological species. But in the modern world, changes in the general political or economic situation can stimulate the movement of large masses of people in a very short time, which leads to a change in the demographic situation. The periods of maximum growth rate of body length and weight in school-age children of various groups of the indigenous population of the northern regions of the Russian Federation are delayed by about a year compared with Russian peers living in central Russia. At the same time, the growth and development rates of children in the Russian North are very close to their Canadian northern peers.

The assessment of the harmony of physical development is an integral non-parametric indicator. The conclusion about the harmonious development of the

child is given according to the results of anthropometric measurements and centile corridors in centile tables. The variability of the functional systems of a growing organism contributes to rapid adaptation to a wide range of the most diverse environmental influences. To assess physical development, the indicators of various tests of a particular individual are compared with the statistical values of the corresponding age group [4]. There are several methods for comparing an individual's test results with the averages of his age group. For example, the standard deviation method. If the values do not differ from the sample mean by more than 1 standard deviation (standard deviation, 1 sigma), it is said that "physical development is appropriate for age." If the value differs from the average by more than 1 sigma, they speak of "accelerated or retarded physical development", more than 2 sigma - a statistically significant deviation in physical development [1].

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