Methods for Selecting Junior and Cadets Athletes by Morphofunctional Criteria

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Abstract: For more than a decade in our country and abroad, a lot of attention has been paid to the search for sports talents. But since sports selection is a multicomponent, multidisciplinary system that includes biomedical, pedagogical, psychological and sociological methods, it is rather difficult to develop unified scientifically based criteria on the basis of which it would be possible to predict the success of a particular athlete with a certain degree of confidence. Moreover, there are several stages of sports selection, for each of which model characteristics characteristic for this stage must be developed. In some sports, the characteristic phenotypic signs, components of physical fitness were determined.

Key words: anthropometric phenotypes and psychophysiological characteristics, polymorphism of genes responsible for metabolism, molecular genetic diagnostics, selection criteria..

Introduction. Among the many indicators of the individual characteristics of the body of athletes, anthropomorphological signs are of great interest, since they can determine the manifestation of strength, speed, endurance, etc. [20]. Anthropometric measurements make it possible to obtain objective data on important morphological parameters of the body - length, mass, chest circumference, etc. They are the basis of somatometric methods for studying human physical development [22]. The data of many studies in various countries of the world show that height, body weight and other morphological indicators play an important role in human physiology, and his health directly depends on these indicators [7, 17, 18]. So, the low growth of a number of peoples in tropical countries is a consequence of a lack of protein in food. Being overweight significantly reduces life expectancy. In children and adolescents in high mountains, the processes of growth and puberty are greatly slowed down in comparison with residents of lowland and low mountain regions. Geographic conditions of any region leave their mark on the body of athletes [1, 19, 21]. Now there is still no single point of view on the cause of morphological differences, both among representatives of different sports, and among athletes of the same type, but with different sports qualifications.

Most of the leading anthropologists share the latter point of view. The study of the changes occurring during exercise at the cellular and molecular levels led to the development of a new field in sports science known as genetic medicine, which deals with the genetic basis of the sports phenotype [8, 9, 13, 15]. Understanding the 21 genetic architecture of athletic ability is an important step in the
development of talent identification methods in sports.

Genetics and interaction with the environment determine an individual's athletic ability. About 66% of variations in the status of an athlete are explained by genetic indicators, the rest is a consequence of other indicators such as: preparation, nutrition, equipment, motivation, sleep and epigenetics [6, 10, 11, 12]. Research on molecular genetic predictors has identified many potentially important markers - DNA polymorphisms - that contribute to the propensity for success in certain types of sports. Over the past two decades, at least 155 genetic markers (located on almost all chromosomes and mtDNA) have been associated with the elite status of an athlete (93 genetic markers - with endurance and 62 markers - with power / strength) [3, 14]. At the same time, the number of identified genetic markers associated with sports activity grew exponentially: in 1997 - 5 genes; in 2000 - 24 genes; in 2004 - 101 genes.

To improve the performance of sports genetics, first of all, an analysis based on detailed phenotyping will be required [2, 4, 5].

**Purpose of the research** – increasing the efficiency of the selection system for young athletes on the basis of morphological, functional and genetic criteria at the initial stage of training and at the stage of sports improvement. Research objectives

1. To reveal the most significant anthropometric indicators at the stage of initial sports training and the stage of sports improvement;
2. To determine the somatotypological characteristics of young football players at the stages of initial sports training and the stage of sports improvement;
3. Assess the functional state of young athletes;
4. To determine the molecular genetic markers of predisposition to exercise;
5. Reveal the relationship between the criteria of pedagogical and biomedical selection;
6. To develop selection criteria for young football players based on morphological functional and molecular genetic characteristics of athletes.

**Research methodology and methods.** The objects of the study were children who were selected for a specialized children's and youth sports school, aged 12 to 17, who underwent a medical examination and received a medical report on their health and physical development.

Selection criteria. Young athletes were selected according to the criteria:

1. Availability of a medical certificate on the state of health from a children's clinic (form 086 / y), which allows sports;
2. Age from 12 to 17 years old
3. Work experience at least 1 year
4. Children who have passed the selection to the children's and youth sports school
5. Voluntary participation in the research

In total, 76 athletes aged 12-17 years, who were involved in sports such as swimming, cycling and athletics, were examined, anthropometry was carried out (the girth of the upper and lower extremities, linear body dimensions were measured), hand dynamometry was carried out, pedagogical testing and genetic examination were carried out. In parallel with the examination of children, a genetic examination of 76 athletes was carried out, whose genotypic characteristics became "model characteristics" and a genetic examination of 25 children aged 12 to 17 years of the control group (schoolchildren). For further in-depth examination, including pedagogical testing, anthropometry, somatotyping, determination of physical performance, autonomic tone.
The assessment of the morphometric profile of athletes aged 12-17 years who are involved in sports such as swimming, cycling and athletics was carried out using the metric system of somatotyping of children and adolescents proposed by R.N. Dorokhov (1976, 1980, 1985), improved together with V.G. Petrukhin (1991). The authors distinguish the following somatotypes: 5 main ones - megalosomal (MegS), macrosomal (MaS), mesosomal (MeS), microsomal (MiS), nanosomal (NaS), 4 transitional - micromesosomal (MiMes), mesomacrosomal (MeMaS). The Harvard step test was used to determine the level of physical performance. Physical performance is assessed according to the value of the Harvard Step Test (HST) index and is based on the rate of heart rate recovery after climbing a step. Assessment of the indicators of the vegetative status of athletes included the calculation of the Kerdo index. Intersystem (cardiorespiratory) relationships were calculated using the Hildebrant coefficient - the ratio of the number of heart contractions (HR) to the respiratory rate [Wayne AM, 1991]. To assess the level of health, the index of functional changes (IFI) of the circulatory system, or adaptive potential (AP), was used (Baevsky R.M., 1979). AP is calculated without carrying out stress tests and allows you to give a preliminary quantitative assessment of the health level of the subjects. To assess speed-strength qualities and coordination activity, the following tests were used: running 15 meters, running 30 meters, standing long jump, test for general coordination "Boomerang".

For molecular genetic analysis, we used DNA samples of the test subjects, isolated by the sorbent method, in accordance with the attached instructions for use to the set of reagents for DNA isolation "Proba-PK" ("DNA-Technology", Moscow). Genomic DNA was isolated from whole peripheral venous blood. Blood sampling was performed using a vacuum system containing K2-EDTA as an anticoagulant. DNA isolation was performed in accordance with the instructions of the DNA / RNA isolation kit (Ribot-prep, Interlabservice, Russia)

Research results and discussion. When determining the somatotype of young athletes at the stage of initial sports training, it was revealed (Figure 1) that the predominant somatotype is the microsomatic type, in addition, there is a complete absence in athletes aged 12-17 years involved in sports such as swimming, cycling and athletics of the macrosomatic type.

The distribution of the somatotype at the stage of sports improvement is as follows: the predominant somatotype is the microsomatotype, however, it should be noted that during the dropout, the largest percentage of those who left were microsomatics. Next in terms of frequency of occurrence are mesosomatics and micromesosomatics, which are a transitional somatotype and can be attributed to mesosomatics. The smallest percentage were young athletes of the macro-somatic type.

Conclusion. Based on the data obtained in the study, standards of somatotypological, morphofunctional and genetic characteristics have been developed, which can be recommended in practice, as normative for the selection of athletes aged 12-17 years involved in sports such as swimming, cycling and athletics at the stages of initial sports training and sports improvement. ... It is advisable to use the obtained data in the process of staged medical selection for children involved in...
athletes involved in sports such as swimming, cycling and athletics, which will facilitate the task of their effective training.

REFERENCES


