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ANTHROPOMETRIC PHENOTYPE AND PSYCHOPHYSIOLOGICAL CHARACTERISTICS OF JUNIOR AND CADET ATHLETES

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Resume: The success of athletes in high-level sport competitions is an important component of the country's international prestige. In this regard, the situation regarding the importance of the health of athletes for their achievement of high sports results has acquired particular relevance [4; 17; 19]. The results of scientific research have proven that the optimal health indicators of athletes are based on the state of dynamic balance between the functional reserves of the body and the factors affecting it [1; 9; 22; 23]. At the same time, the magnitude of the influence of the factors that are inherent in the modern system of training athletes on the body of those involved increases in proportion to the stages of their professional development, which requires not just optimal health indicators, but the presence of an appropriate level of reserves of functions of its components [7; 12; 26]. The value of the latter is the basis of the athlete's reliability - an indicator that is characterized by high performance of actions and its stability in extreme conditions of activity [5].
Key words: Sport medicine, sports genetics, predicting the capabilities of athletes, selection of athletes.

In the classical practice of sports medicine, it is generally accepted that all preventive, therapeutic and rehabilitation measures should be carried out on the basis of data from an in-depth medical examination of athletes, the resulting component of which is a conclusion on the admission of the examined to training activities [5; 15; 24]. The admission is carried out according to the following criteria: "healthy", "practically healthy", "requires a limitation (full or partial) of training activity." But it follows from practical experience that the data obtained are sufficient for carrying out therapeutic and rehabilitation measures for a specific athlete, but not enough to substantiate the organizational and methodological foundations of the system of measures aimed at protecting the health of a vast contingent of athletes, especially during critical periods of ontogenesis.

Thus, it becomes clear that, from the point of view of health savings, it is of particular interest to study not just the health status of young athletes, but a comprehensive level-by-level screening of the functional state of those involved. This type of layer-by-layer "screening" will allow to determine the corrected risk factors for the development of somatic pathology in athletes within the framework of uncorrected factors (determinants), in this case it is sports specialization and a stage in the process of many years of training.

According to the research by Svetlana Lyugailo (Results of studying the health status of young athletes: the first level of screening studies) _ using classical approaches to assessing the health status of young athletes, on the basis of the existing criteria for their admission to sports, the previously determined trends in the influence of ontogenetic risk factors for the emergence and development of somatic pathology in the age aspect and in the aspect of professional development. At the same time, a number of negative points were established:

- firstly, despite the presence of diseases and dysfunctional disorders in the somatic systems, athletes continue the training process, which indicates insufficient control over the functional state of the trainers by the coaching staff and medical workers, who provide the process of training young athletes directly at the place of training;

- secondly, despite the comprehensive examination provided for by the algorithm for conducting an in-depth medical examination, the information received regarding the health status of athletes is not sufficient to formulate a rehabilitation diagnosis, since it is impossible to draw a true conclusion about the adaptive capabilities of the body of a young athlete to physical activity from the data obtained, to obtain quantitative characteristics of the parameters that form the adaptation reserve and, moreover, to predict the occurrence of dysfunctional disorders in various systems of the body of athletes.

The above organizational miscalculations in the development of the structural components of the concept of physical rehabilitation for dysfunctional disorders of the somatic systems of the body of young athletes (somatic diseases) will be taken into account in the group of exogenous corrected risk factors for diseases in athletes.

One of the rapidly developing areas of modern genetics is the development of molecular genetic approaches to determine a person's predisposition to various types of activity. So, in particular, in recent years, a search has been carried out for molecular genetic markers that determine a person's ability to perform high sports loads (Montgomery, 2000; Rogozkin, 2004), which is determined by the need to substantiate a system for selecting people for sports and correcting the training process. This approach is the most promising, since it allows you to determine the genetic predisposition to high physical activity and to carry out a targeted differentiated selection of children for sports at the earliest stages of their sports activity. It should be noted that in 2000 a human genetic map was created, in which genes were introduced, which in at least one study revealed associations with physical indicators and / or influenced human health (Rankinen, Bray et al, 2006). In the early 2000 version, the map included 29 genes. The 2005 version, 6th - amended, includes 165 autosomal genes, 5 - located on the X chromosome, as well as 17 mitochondrial genes. To date, work of this kind is carried out only in five countries: the USA, Great Britain, Australia, Russia (Scientific Research Institute of Physical Culture - under the leadership of Doctor of Biological Sciences, Professor Rogozkin V.A.; laboratory of molecular genetic research of the Department of Genetics at the Bashkir State Pedagogical University - under the leadership of Doctor of Biological Sciences, Professor Gorbunova V.Yu.) and Kazakhstan. On the site 4 www.genoterra.ru - the register of leading scientific institutions, the laboratory of molecular genetic research of the Department of Genetics of the Belarusian State Pedagogical University is included in the list of groups engaged in the search for genetic markers that determine people's predisposition to sports activities.

Currently, predictive medicine is actively developing, the purpose of which is to identify possible diseases in a particular patient by the DNA structure, as well as to develop a set of preventive or health-improving measures based on these studies. Such preventive measures are also important in sports, which is why sports genetics can achieve high results using scientific methods.

A lot of data, including the results of recent studies, confirm the influence of polymorphism of some genes on the physical characteristics of the athlete and, as a result, on the predisposition of the athlete's body to strength loads or endurance training.

It is necessary to take into account that the development and manifestation of a person's physical qualities depends on both genetic and environmental factors. The more genetic factors influence physical qualities (high degree of heritability), the less successfully these qualities are trained, and vice versa [1].

Sports genetics allows you to calculate the limit for each person to perform any type of exercise, depending not only on the nature of the task, but also on the genetic components. The human genotype largely determines such important characteristics for athletes as strength, endurance,

muscle fiber composition and muscle mass, flexibility, neuromuscular coordination, and reaction speed [2, 8].

Over the past few decades, certain hereditary factors have been identified that are responsible for the development of the above qualities in humans. Therefore, sports genetics provides useful information on how to improve the performance of performances, which athletes to select for competitions and which of them will be able to cope with the task at hand. The selection of young, promising in their hereditary qualities athletes (at the same time the minimum risk of intense physical activity for their health) is an important issue in sports medicine, which can be solved by modern methods of genetics.

The introduction and active use of molecular genetic technologies allows you to create an optimal training program specifically for each athlete, in which the body's energy resources will be used as efficiently as possible, which will allow achieving high sports results.

I would also like to note that in connection with the active development of genetics as a science and methods of its study, genetic research is becoming more and more accessible. At the moment, sports genetics is present not only in elite sports, but also in amateur sports. Fitness is an important part of a healthy lifestyle, and you should approach the issue of its correct organization responsibly. In this case, on the basis of genetic research, a geneticist can recommend a specific diet, diet, exercise regimen, as well as the nature of the exercises, taking into account the individual characteristics of the organism. In addition, sports genetics makes it possible to identify diseases to which a person is genetically predisposed (for example, cardiovascular diseases, bronchial asthma, obesity). Based on the data obtained, it is possible to recommend preventive measures to prevent these diseases for each individual person.

Sports genetics is a young science. Its proclamation as a branch of knowledge took place at the Olympic Scientific Congress "Sport in Modern Society", which was held in Tbilisi in 1980. The International Scientific Society for Sports Genetics and Somatology was also established there.

In 1983, Claude Bouchard first coined the term genetics of fitness and physical performance. Then he published two reviews in one issue of the journal "Exercise and Sport Science Reviews", where he presented generalizing facts, firstly, about individual differences in response to physical activity, and secondly, about the heritability of many qualities involved in the process of physical activity [3, 10].

1995 was marked by the beginning of the international project HERITAGE (HEalth, RIsk Factors, Exercise Training And GEnetics) led by Claude Bouchard. The project involved several research centers and more than 800 volunteers who were subjected to physical activity for several weeks. K. Bouchard and his colleagues searched for polymorphic loci associated with physical activity, and published hundreds of works on the topic of heritability of physical factors in humans. The progress in understanding this issue has been significant.

In 1998, the journal "Nature" published a scientific article "Human gene for physical performance" by a young British scientist Hugh Montgomery. He presented the results of his work with a team of authors (19 people) on the study of the role of the ACE gene (angiotensin converting enzyme) in sports activities. H. Montgomery and his colleagues investigated a group of alpine climbers [4, 9, 11.]. The size of the article is only one page, which says that one of the polymorphic alleles of the ACE gene - allele I provides endurance, and allele D - the speed-strength qualities of an athlete. The conclusion was based on the fact that in athletes who are successful in sports requiring endurance, the frequency of allele I is higher than in the control group, and in athletes of high-speed types, allele D predominates [5].

This publication attracted the attention of the entire scientific community and society as a whole. The world media reported on the discovery of the “sport gene” (ACE gene), thanks to which it

was now possible to identify a predisposition to a particular sport or physical activity in any person.

Among domestic scientists, it should be noted Eduard Georgievich Martirosov, who created on the basis of Russian Research Institute of Physical Culture and Sports in 1972 the Laboratory of Sports Anthropology (later called the Laboratory of Sports Anthropology, Morphology and Genetics) [6, 29].

Later, research in the field of sports genetics was started in the laboratory of prenatal diagnostics of the Research Institute of Obstetrics and Gynecology. D.O. Otta (St. Petersburg), , as well as in the laboratories of the Institute of Biochemistry. A.N. Bach of the Russian Academy of Sciences (Moscow), the All-Russian Scientific Research Institute of Physical Culture (Moscow), the Scientific Research Institute of Transplantology and Artificial Organs (Moscow) and the Russian State University of Physical Culture (Moscow) [7,30]. Now such laboratories are located not only in Moscow and St. Petersburg, but also in other large scientific centers in Russia.

Sports genetics is developing quite rapidly, since the number of new studied genes that characterize the physical qualities of a person is growing exponentially: in 1997 - 5 genes; in 2000 - 24 genes; B 2004 - 101 genes [8, 27]. To date, about 200 genetic markers (DNA polymorphisms) associated with the development and manifestation of physical qualities are known [9 ,21, 25].

In sports, in order to achieve the highest performance, talented athletes must be selected correctly and in a timely manner, and then included in long-term, planned training programs [10, 20, 28].

Today, due to the fact that investments in sports and individual athletes reach significant amounts, the issue of effective selection of athletes is more relevant than ever [10, 14, 16].

Each of us is individual, we carry unique genetic information. And our uniqueness can be studied with the help of DNA diagnostics methods, which shows the characteristics of metabolism, the state of organ systems, the properties of the psyche.

It is impractical and irrational to perform DNA typing for all possible genes responsible for the athletic characteristics of a person. The information obtained must be correctly interpreted and conclusions drawn in relation to each individual case. Moreover, the analysis of one gene is not informative enough.

Genetic analysis provides information about the hereditary predisposition to a particular sport. For example, skeletal muscle is made up of two distinct types of muscle fibers: fast and slow. Slow fibers are characterized by a small force of contraction, but low fatigue, they are involved in the performance of low-intensity strength work for a long time. Fast fibers, on the contrary, are distinguished by a greater force of contraction and high fatigue; they are used when performing short high-intensity strength work [11,13,18,31]. For muscles, which are dominated by slow fibers, aerobic exercise will be the most effective. These sports include swimming, rowing, tennis, long-distance running, cycling, and walking. And for muscles, which are dominated by fast muscle fibers, anaerobic loads (strength training) are most effective. Wrestling, sprint running, powerlifting, arm wrestling, rock climbing are examples of physical activity based on anaerobic muscle metabolism.

The type of muscle fibers prevailing in our body is genetically determined (this is associated with the ACE gene polymorphism). Thus, the results of a distance runner (long-distance runner) in a 2000-meter run negatively correlate with his own results in a 100-meter run.

When the type of physical activity matches the hereditary predisposition, the person can achieve the best results and get the most from the training in the shortest possible time.

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