PREDICTING SPORTS ABILITIES BASED ON MORPHOLOGICAL AND GENETIC APPROACHES

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Abstract: The article presents data on the influence of specific genetic loci, particularly the HLA genetic system, on the development of morphological characteristics in the human body. Specifically, it focuses on the formation of certain somatotype categories in athletes specializing in strength and speed sports. The antigenic composition of the HLA genetic system, characteristic of certain groups of sports specializations, has been established, which can be considered as genetic markers that have prognostic significance in the manifestation and development of physical qualities such as strength, and speed. The facts we obtained serve as confirmation of the judgment about the significant influence of heredity not only on the development of certain categories of somatotypes, but also on the manifestation of certain physical qualities.

Conclusion: The article presents information on the influence of certain genetic loci, in particular, the HLA genetic system, on the development of morphological characteristics of the body, in particular, on the formation of a certain category of somatotypes of athletes specializing in strong and fast sports. The antigenic composition of the HLA genetic system has been established, which is characteristic of certain groups of sports specialties and can be considered as genetic markers of predictive value in the manifestation and development of physical qualities such as strength, speed and speed. The facts we received serve to confirm the information that heredity has a significant influence not only on the development of certain categories of somatotypes, but also on the manifestation of certain physical qualities.

Relevance: The significance of genetics for the development of physical culture and sports becomes undeniable, since the use of the achievements of sports genetics - the science of the patterns of heredity and variability of traits - is of great importance in the conditions of sports practice. Since the formation and functioning of specific structures of the body is carried out and controlled by a certain set of genetic material, it becomes obvious that not every individual has the genetic potential that meets the needs of a particular sports specialization. In sports, achieving high sports results depends not only on external environmental factors, in particular, on the organization and conduct of the training process, the qualifications of the coach, the level of physical, functional and psychological preparedness, moral and volitional qualities, it is obvious that "sports talent" for the chosen sport is also necessary (Шварц В.Б., 1991, Коган О.С., 2003, Ковальчук Г.И., 2003) Without appropriate genetically determined characteristics for sports activity, not only high sports results are impossible, but also the training activity itself.

Degree of knowledge of the problem: This position considers the problem of selection not only for mass physical culture, but also for elite sports. No less significant is the other side associated with increasing the effectiveness of physical education and sports

through medical and genetic support, the use of a scientifically based individual approach to those involved in physical education and sports. The main areas of application of genetic approaches in physical culture and sports are:

-Selection of individuals with the so-called innate "sports talent" - timely orientation to sports for children and adolescents with athletic abilities.

-Prediction of sports achievements based on hereditary characteristics identified on the basis of morphogenetic research methods.

According to modern genetic hypotheses, the development of morphological characteristics of an organism is influenced by certain genetic loci, (Ахметов И.И. др., 2007, Золоторева А.Д., О.С. Глотов, М.В.Асеев, и др. 2017, Сафарова Д.Д., 2021). There is evidence indicating the influence of the genetic component on the development of athletic abilities (Б.А.Никитюк, 1996, В.А.Рогозкин и др., 2000, 2001, Г.И.Ковальчук, 2003, Бакулев С. Е., 2012, Д.Д.Сафарова,, 1991, 2023).

The above allows us to believe that the morphogenetic approach to studying the level of development of certain physical qualities in athletes of various specializations is an effective and most objective means for sports forecasting and selection.

The purpose of the study is to predict the sports abilities of athletes based on the use of morphogenetic approaches.

Research methods: The object of the study were members of the national team of Uzbekistan, athletes representing high-speed sports, in particular, sprinters specializing in swimming and athletics - 76 people; as well as in strength sports, athletes, in particular, in various types of wrestling and weightlifting - 117 people.

1. Body type was determined using the modified Heath-Carter method [159; 256p]. This is the most unified technique, recognized in many countries of the world, as it makes it possible to make a correct comparison between the somatotypes of athletes of different specializations, qualifications, age and gender using precise measurement characteristics. Initially, standard anthropometric measurements were carried out on 7 dimensional characteristics: body length, weight, diameter of the distal part of the shoulder in a tense state, calf circumference were determined, and the thickness of the skin-fat folds in 4 regions of the body was measured using a caliper. The somatotype was diagnosed in quantitative terms of three somatic components: I. F - fatty component - endomorphy; II. M – muscle component – mesomorphy; III. The weight and height indicator was determined by the formula - L⊡3P. The components were calculated using special formulas, on the basis of which not only the composition of body weight was identified in scoring calculations, but also the somatotype was diagnosed using the somatogram proposed by Heath-Carter [159; 256p]

2. Genetic testing methods: HLA typing was carried out according to the method of Zaretskaya Yu.M., Abramova V.Yu., 1986. Typing for HLA complex antigens was carried out in 76 athletes who specialized in speed sports and showed high speed results, as well as in athletes specializing in strength sports (117 people). Identification of HLA antigens was carried out in a lymphocytotoxic test with antisera obtained from the Republican Center for Immunological Tissue Typing at the St. Petersburg Research Institute of Hematology and Blood Transfusion. The frequency of HLA antigen loci was calculated using the formula $f = N/n$, where n is the number of individuals having a given antigen, N is the total sample size. Antigen frequencies were determined using the formula $p = I - \ddot{O} I - A$; where p is the allele frequency, A is the frequency of the corresponding antigen. The x^2 value was calculated using

the formula x2 = (f - f1)2: f1. 2. The results obtained were processed by methods of mathematical statistics.

Results of the study and their discussion By comparing the anthropometric indicators of the strongest sprinters in the world with the indicators of the surveyed sample of athletes, it was revealed that in terms of the level of physical development, sprint athletes of the Uzbek population belong to the "average" type, and with a decrease in the level of sportsmanship, there is a tendency to minimize anthropometric indicators. This is confirmed by the results of somatotyping, which made it possible to establish the presence of 4 types of somatotypes among the examined athletes. Body composition was expressed in points. Thus, among track and field athletes they were 2.4: 2.6: 2.9, i.e. 53.9% of them belong to the ectomesomorphic type. The rest of the track and field athletes are endo-mesomorphs, ecto-mesomorphs, and meso-ectomorphs. Athletes of endomorphic body types with insufficient development of the mesomorphic component seem to be unpromising and have unpreferable characteristics for elite sports.

In the considered sample of swimmers specializing in short distances, the average indicators of the component composition are expressed in points as 3.2: 3.7: 2.8. 55.6% of swimmers by somatotype belong to the category of ecto-mesomorphic type. There is evidence in the literature that in terms of the level of physical development in female swimmers, the muscle component is developed below average, and the fat component has an average degree of development. Compared to track and field athletes and swimmers, cyclists are characterized by greater body weight, and a significant difference is revealed by the degree of development of the muscle component. Thus, the component composition of cyclists is 3.1:5.8:2.8, which suggests that their increase in body weight is due to an increase in muscle mass. Our data on higher rates of morphological development of cyclists are confirmed by studies conducted by A), which show that highly qualified cyclists are individuals of the ecto-mesomorphic type. Moreover, in the process of growing sportsmanship, somatotypes with elements of insufficient development of the muscular and skeletal systems were practically not encountered.

In an intergroup comparison of frequencies of registration of the antigenic composition of HLA in athletes specializing in power sports (wrestlers and weightlifters), the B7 content is significantly higher and significant at X2 = 6.645. The results obtained indicate that HLA-B7 can be considered as a genetic marker that determines the development of strength qualities. The frequency of occurrence of genes and antigens of the HLA system in athletes specializing in high-speed sports was analyzed. Regarding strength athletes, athletes specializing in speed sports practically did not encounter the HLA-Cw6 antigen, which can be considered as a negative marker predicting an increased level of speed qualities. To more reliably clarify the role of HLA antigens in the individual development program, associations of subloci A, B, Cw, Dr with somatotype as an integral characteristic of the morphological organization of an athlete were studied. From the indicated forms of manifestation of physique variability in the surveyed sample of athletes, 2 polar or extreme forms of somatic topological body types were identified - ectomesomorphy and endomesomorphy. Then the associations of subloci A, B, C of the HLA complex with the indicated types of somatotypes were studied. The most common somatotype for the surveyed sample is the ectomesomorphic constitution, which is dominant and most relevant to the needs of these specializations. There were endo-ectomorphic, intermediate types, as well as a balanced or balanced type. Static significant differences in the

association of diagnosed ectomesomorphic somatotypes with antigens of the Cw sublocus were revealed, in particular for Cw5 at $x2 = 7.013$. For endo-mesomorphic somatotypes, static reliable specific associations with antigens HLA - A3, A9, A11, HLA B35 sublocus, as well as with HLA - Cw4, Cw6 were also revealed. When comparing the antigenic composition of the HLA system in the diagnosed forms of somatotypes - ectomesomorphic and endomesomorphic types, x2 differences were revealed in the following subloci: A3 with $x2=10.421$, A19 with $x2=4.855$, B8 with $x2=6.696$, Cw3 with $x2=5.113$, Cw6 with $x2=5.113$. Conclusion. The facts we have obtained indicate the connection of antigens of the HLA genetic system with the peculiarities of the formation of body types, serve as confirmation of the judgment about the significant influence of heredity on the formation of a somatic type in the process of individual development of the organism. Dominant somatotypes have been established in athletes specializing in high-speed sports that have reliable relationships with certain subloci A, B, C, CW of the HLA system. Static significant differences in the association of diagnosed ectomesmorphic somatotypes with antigens of the Cw sublocus were revealed, in particular for Cw5 at $x2 = 7.013$. For endo-mesomorphic somatotypes, static reliable specific associations with antigens HLA - A3, A9, A11, sublocus B35, as well as with HLA - Cw4, Cw6 were also revealed. The use of genetic markers will significantly increase the efficiency of not only early sports selection, but also the timely orientation of children and adolescents with a predisposition to the development of hereditarily determined physical qualities.

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