Method for Assessing Body Composition and Neurophysiological Characteristics of Junior Athletes and Cadets, Taking into Account the Polymorphism of Genes Responsible for Metabolizim

Introduction. Currently, the sports development of children and adolescents is a priority direction of the state policy of our Republic. In order to achieve high results, athletes from an early age are forced to train often and for a long time. Many winners of youth championships do not reach the level of national teams, end their sports careers, this explains the irreparable loss of talented athletes[1, 2].

Effective adaptation to specific the loads of a particular sport are conditioned by the peculiarities of the age-related development of the organism. Significant individual fluctuations in the rate of biological maturation are possible, early puberty and the associated intensive growth of the body, muscle mass, internal organs, as a rule, leads to rapid progress in sports. [3, 4]. The size of the components of the body composition is determined by the species and qualifications of athletes. Athletes involved in strength sports are distinguished by the maximum amount of muscle mass; endurance sports — less muscle and less fat; persons engaged in playing sports are characterized by the differentiation of the values of muscle and fat mass in accordance with the playing role. Previous studies [5; 9] generally demonstrate that people do not choose the most suitable sport for themselves. This is due in part to the fact that each individual begins training sessions with certain inclinations. Some features of the structure and function of the human body are not subject to human influence. In other words, humans are limited by their genetic potential. The ratio of type I and type II fibers narrows the possibilities of hypertrophy and determines the indicators of speed and endurance. Gender determines the features of the functioning of the endocrine system, imposing an additional framework on hypertrophy, and hence, to increase strength. Age limits the available muscle the mass and speed of the course of nervous processes, which in general does not only the magnitude of the efforts being developed, but also the speed of movements. The coach is not in able to create a program that will allow the athlete to...
step over genetically predetermined limits of its capabilities. [6,7,8]. At the same time the study of the genetic capabilities of athletes in weightlifting sports can take into account individual genetic capabilities and significantly improve the indicators of physical fitness of athletes. In professional sports, high sports achievements are largely dependent on the coordinated work of the neuromotor system and biological energy. To achieve certain results, it is necessary to have innate qualities that are the key to success, but these qualities need to be developed through training, programs that are currently developed at a scientific level, while you need to constantly be monitored so as not to accidentally get injured, and also to lead taking into account the progress of their results. Every year the number of scientific studies devoted to the development of strength increases In recent years, unknown scientific data on the limiting factors in the development of strength abilities of athletes have been revealed [10] and new approaches to planning the training of highly qualified athletes [16]. The most significant aspects of the development of strength abilities include innovative ways of assessing training loads in various types sports, adaptive changes in the body of athletes that associated with the impact of training means [12], dependence competitive results from the genetic characteristics of the organism athletes [11; 13; 19] the influence of information technologies on the effectiveness of training and competitive activity management Thus, in each sport, a specific morphological body model is formed, the correspondence of which is the basic advantage for success and professional longevity.

Knowledge of the hereditary genetic characteristics of fitness and genetic markers important for sports specialization is a prerequisite for sports success. Due to the poor development of this issue in sports science, the selected scientific direction is becoming very relevant. The practice of training athletes shows that the insufficient development of the problems of sports selection and orientation of children is the reason that slows down the development of many sports, including athletics, including volleyball and swimming. At the same time, improving the training of athletes in the above sports should be based on increasing the effectiveness of sports selection, which evaluates the characteristics, reserves and genetic inclinations of future athletes.

ADRB2 gene Beta-2 adrenergic receptor is produced in fat cells. Participates in the regulation of the process of converting fat into energy under the influence of catecholamines (adrenaline, norepinephrine and dopamine). The ADRB2 gene, as a lipolytic receptor in human adipose cells, is associated with lipid mobilization. Human ADRB2 is located on chromosome 5 (5q31-q32). ADRB2 polymorphisms have been extensively studied, but data from such studies are inconsistent. The implications of such studies may be due to statistical error, depending on sample sizes, which may be too small to detect an association between ADRB2 and overweight.

Purpose of the research : Study and assessment of indicators of body composition, types of the nervous system of junior and cadet athletes, revealing their relationship with allelic-genotypic variants of ADRB2 genes.

In connection with this goal, we solved the following tasks:
1. collection of biological material and DNA extraction;
2. analysis of allele and genotype frequencies of ADRB2 (Beta-2 adrenergic receptor) rs1042713 A>G (Arg16Gly) genes in cadets and young athletes;
3. a comprehensive assessment of the contribution of the studied genes to the predisposition to engage in various sports.

For the first time, the role of allelic-genotypic variants of ADRB2 genes was studied in juniors and cadets engaged in various sports. The scientific significance of the results of the work made it possible to expand the level of theoretical knowledge about the interconnection of the component body
composition, types of the nervous system of junior and cadet athletes, revealing their relationship with allelic-genotypic variants of ADRB2 genes. During the study, 101 biological samples were analyzed to determine the genetic polymorphism of the ADRB2 allele genotype (beta-2-adrenergic receptor) rs1042713 A> G (Arg16Gly).

**Research methods and materials**

To conduct this study, collecting blood samples from cadets and young athletes from sports schools in the Bukhara city. Data about each participant in the experiment were collected by means of a survey and entered into a specially developed formalized card (FC) - a questionnaire. The questionnaire was filled out individually for each participant in the study. Venous blood sampling was performed by a certified nurse. Participation in the study was voluntary, the subjects and their parents were fully informed about all aspects of their participation in the study. The survey was conducted on the basis of sports schools in the Bukhara city. It was attended by 76 athletes aged 12-17 years, engaged in swimming, athletics, cycling and 25 students from schools who were not involved in any kind of sport. The subjects were divided into 4 groups, children involved in swimming (group C), athletics (group E), cycling (group B) and control (group K) groups. Samples were taken from a vein into 5 ml tubes containing 5% K2-EDTA for blood hemostasis testing and stored in a refrigerator at -20 °C.

Extraction of DNA / RNA from all biological blood samples was performed using the Ribot-prep kit (Interlabservice, Russia). To identify polymorphism of the genotype of DNA samples consisting of alleles ADRB2 (beta-2 adrenergic receptor) rs1042713 A> G (Arg16Gly), the manufacturer recognized the manufacturer's leaflet.

**Results.** Analysis of the results of genodiagnostics of athletes of various sports made it possible to establish a relationship between genotypes and the average level of competitive achievements for the ADRB2 gene (Beta-2 adrenergic receptor) rs1042713 A> G (Arg16Gly). For genotyping DNA samples, 96 DNA samples were examined by real-time polymerase chain reaction (real-time PCR). To this end, the automated 48-element Dtlite4 Real-TimePCR amplifier was optimized using the following software: initial denaturation once at 180 s at 94 ° C, denaturation of the main current at 20 s at 94 ° C up to 20 s at 58 ° C primer placement and 30 sec 61 We performed these indicated steps 40 times to allow the true PCR to proceed at ° C. The allele-specific detectors JOE and FAM correspond to alleles 1 and 2 of the gene in the DNA samples, respectively. The ROX detector in the software has been set up for internal control to determine if the response is correct or incorrect. The results obtained were formalized in the prescribed manner (table 1).

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ADRB2 (Beta-2 adrenergic receptor) rs1042713 A>G(Arg16Gly)

The frequency of the rs1042713 A> G (Arg16Gly) allele in the group of athletes significantly differed from the control sample (7.2% versus 4.9%; P = 0.0009). The distribution of athletes into 4 groups showed that in groups I, II, III, which include sports that develop both endurance and speed-strength qualities, the frequency of ADRB2 (Beta-2 adrenergic receptor) rs1042713 A> G (Arg16Gly allele is significant higher than in the control group (7.1%, 7.2%, 7.9% and 7.1%, respectively, versus 4.9%; P <0.05). When assessing the distribution of allele frequencies depending on sports qualifications It was found that in all groups of athletes the frequency of ADRB2 (Beta-2 adrenergic receptor) rs1042713 A> G (Arg16Gly increases significantly with increasing qualifications. This is especially clearly presented in III (0% (grade + CCM) → 8.3% (MS ) → 14.7% (MSMK + ZMS); P = 0.0017) and combined (IV: 6.5% (category + CMR) → 6.8% (MS) → 10.2% (MSMK + ZMS); P <0.0001) groups. Thus, the carriage of ADRB2 (Beta-2 adrenergic receptor) rs1042713 A> G (Arg16Gly allele may favor sports aimed at developing both endurance and speed-strength qualities.

**Conclusion.** Thus, based on the results of this work, they open up new opportunities in the development of an innovative system of medical and genetic support for physical culture and sports. The new system based on modern DNA technologies will help coaches and sports doctors 1) determine the predisposition of children and adolescents to a specific type of motor activity; 2) in increasing the growth of sports indicators by optimizing and correcting the training process; 3) in the prevention of various diseases associated with the professional activities of athletes. The proposed methodology for searching for genetic markers of physical performance and assessing their significance can be applied in the framework of scientific research on the genetics of physical activity.

**REFERENCES**


15. Jalolova V.Z., Rakhmatova M.R., Anthropometric indicators of juniors and cadets in sport medicine // Electronic scientific journal "Biology and Integrative Medicine" No. 4 - July-August (44) 2020– P.5-16

