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ASSESSMENT OF THE NUTRITIONAL STATUS OF HIGHLY QUALIFIED

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Abstract: This article discusses the issues of personalized nutrition based on the results of nutrigenetic testing . According to the genetic predisposition to a certain type of diet (balanced, low-carbohydrate, low-fat), an experimental study was conducted, where athletes were divided into four groups (traditional nutrition and nutrition based on a nutrigenetic test) . Based on the data obtained, a comparative assessment of the nutritional status of athletes was given.

Keywords: highly qualified athletes; nutrigenetic test; balanced, low-carb, low-fat diet; nutrient status.

Introduction. Building a personalized diet for a highly qualified athlete is still an unresolved issue [3], the main requirement of which is the need to take into account the training process with an emphasis on annual training in macro- and microcycles [7]. The special physiological conditions in which athletes involved in various sports are found lead to the appearance of additional needs for certain nutrients that adequately reflect the characteristics of the metabolism of this sport [2,4]. Features of nutrition are typical for each sport and are associated with the specifics of physical activity [1]. To substantiate the main recommendations on individualized nutrition in a particular sport, knowledge of the nutritional status of athletes is required [5,6], which is based on the general principles of abalanced diet, but there are also specific features that lie in the genetic predisposition of the balance of the three main macronutrients (proteins, fats and carbohydrates). So far, there are questions about the search for informative indicators for assessing the nutritional status of athletes [2] with an emphasis on sports qualifications and specialization in order to be able to select an individualized menu that will serve as the basis for increasing sports achievements and improving health [7]. At present, domestic scientists continue a number of scientific studies in the direction of nutrition of athletes [5]. The problem of nutrition of promising athletes is still relevant, since the scientific foundations identified in different countries in terms of nutrition of athletes are successfully used in these countries, but for the Republic of Uzbekistan it is necessary to study the characteristic features of our population, mentality, traditions and economic level. According to the provisions of the consensus on the nutrition of athletes, at the current level of development of sports, it is necessary to organize the control of nutritional status, individual selection of nutrition, as well as improve the awareness of athletes, coaches and dietitians in the field of modern scientific ideas about nutrition [4]. This methodological recommendation addresses the issues of assessing the nutritional status of highly qualified athletes in management sports and martial arts. Nutritional status is a reflection of energy-consuming constant training sessions; a large amount of aerobic and anaerobic work; periodic or regular power loads; . great psycho-emotional load; improvement of speed-strength qualities, endurance, etc.; control and maintenance of body weight necessary for a high level of functional fitness; maintaining high stamina. The experience of studying the nutrition of athletes in world practice has made it possible to make significant progress in issues related to nutritional support in various sports. Recently, more and more attention of sports nutrition specialists has been paid to

an individual approach to nutrition based on nutrigenetic testing. This methodological recommendation addresses the issues of assessing the nutritional status of highly qualified athletes with an emphasis on the genetic predisposition of certain types of diets, namely, athletes with a certain set of FABP2, PPARG and ADRB2 gene genotypes (rs1042714) are predisposed to a certain individual menu (balanced, low carbohydrate or low fat). The main principles of adequate nutrition for an athlete are the preparation of a nutrition program based on the nutritional status assessment algorithm. Personalized selection of the diet should be based on the individual data of the athlete, such as the genotypic and phenotypic characteristics of the individual's body, as well as nutrition depends on the stage of training of athletes.

Target. Conduct a comparative analysis of data on the nutritional status of athletes of various specialization _

Material and research methods:

The study analyzed the data obtained from 67 highly qualified athletes from candidates for master of sports, master of sports to master of sports of international class specializing in wrestling (freestyle wrestling, judo, taekwondo, boxing) and management sports (academic rowing and kayaking and canoe). Among the surveyed, 100% of male athletes. All examined athletes were at the stage of precompetitive preparation for the XXXIII Olympic Games in Tokyo. Determination of the nutrient status of highly skilled athletes was carried out by different methods. The method for determining anthropometric status included weight and height indicators for calculating body mass index (BMI). The method of functional examination included the properties of the external respiration function of athletes, obtained using the BTL-08 Spiro spirometer .All participants in the study at the beginning of the observation underwent laboratory tests (clinical and biochemical blood tests, standard urinalysis). To assess the effectiveness of the work performed, tests used in specialized martial arts and managerial sports based on the analysis of the athlete's physical fitness indicators using pedagogical testing methods were used. Analysis of the range of variations in the ADRB2, ADRB3, PPARAG2, FABP2 genes in the studied groups of athletes, as well as determining the type of nutrition, was carried out by a laboratory method, determining DNA polymorphisms, highlighting the allelic- genotypic variants of the data of the studied geno panel in (Fig. 1).

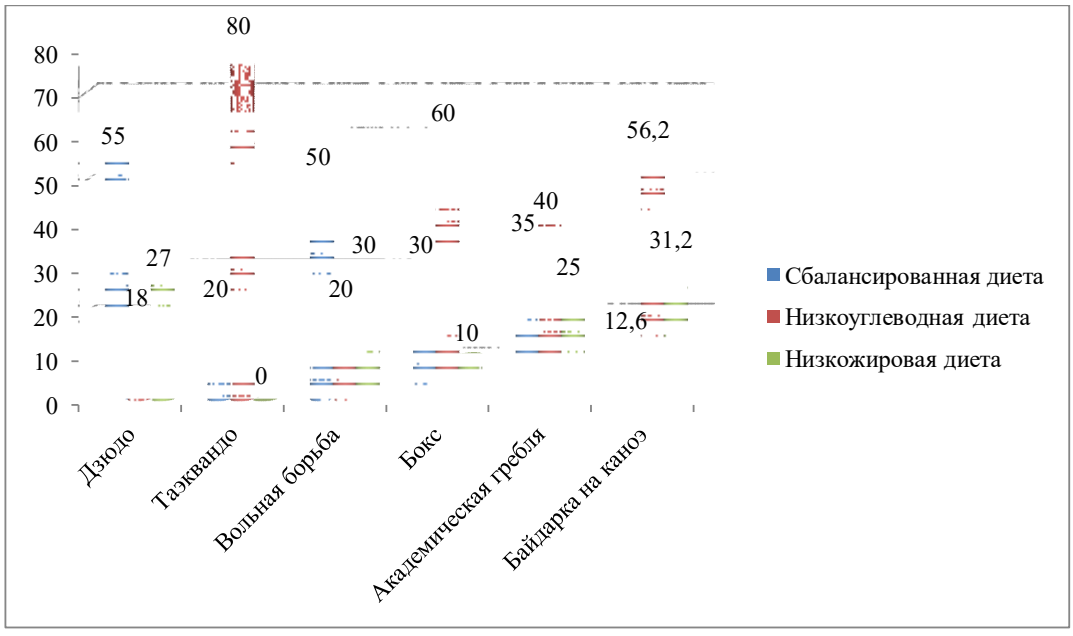

Figure 1. Determination of diet in highly qualified athletes, based on nutrigenetic tests, %.

First stage. Distribution of highly qualified athletes into study groups based on nutrition menu

Table 1

Kinds of sports	Traditional menu		Balanced menu _		Low carb menu		Low fat menu	
	Abs .	%	Abs .	%	Abs .	%	Abs .	%
Managerial, n= 31	14	20.9	3	4.6	8	11.9	6	8.9
Fighters, n =36	9	13.4	5	7.5	12	17.9	10	14.9
Total, n =67	23	34.3	8	12	20	29.8	16	23.8

As can be seen from Table 1, all athletes were divided into two groups (management types - 53.7% and combatants 46.3%). According to the analysis of conducted nutrigenetic In testing , the athletes of the two study groups (executives and combatants) were divided into subgroups based on recommended diets (balanced , low-carbohydrate, and low-fat). Separately, those athletes who remained on a traditional diet (excluding the nutrigenetic test) were singled out into a subgroup.

Comparative analysis of morphofunctional data of highly qualified athletes on traditional diet

Table 2

Index	Management sport, n= 14		Fighters, n= 9		t	p
age	23.50	1.04	24.78	0.72	1.01	0.323
weight	85.34	2.39	75.29	5.12	1.78	0.090
standing height	185.00	2.31	173.56	2.59	**3.30**	0.003
BMI	24.93	0.52	24.77	1.05	0.14	0.893
Pulse	66.57	2.52	60.33	2.22	1.86	0.078
HELL	110.00	1.82	112.22	3.64	0.55	0.591
	70.00	1.05	73.33	2.89	1.09	0.290
BH	18.43	0.42	17.33	0.44	1.81	0.085
PWC170	1954.00	80.84	1960.78	110.88	0.05	0.961
IPC	5416.43	196.34	5384.22	243.95	0.10	0.919
maxQ	182.79	7.18	181.56	8.85	0.11	0.915
HV	1111.21	18.95	1109.56	24.12	0.05	0.957
FR	3.64	0.13	3.11	0.31	1.58	0.129

When comparing the data of athletes between the two study groups for all indicators (Table 2), there are no significant differences. According to the growth index (t = 3.30), significantly significant differences were identified between the groups.

Comparative analysis of morphofunctional data of highly qualified athletes on a balanced diet

Table 3

Index	Management sport, n= 3		Fighters, n= 5		t	p
age	24.67	2.96	24.80	1.24	0.04	0.968
weight	94.43	7.25	84.40	8.38	0.91	0.400
standing height	192.67	8.01	177.80	3.12	1.73	0.134
BMI	25.41	0.78	26.45	1.90	0.50	0.632
Pulse	62.00	5.29	61.80	4.69	0.03	0.978
HELL	106.67	3.33	116.00	4.00	1.79	0.123
	63.33	3.33	70.00	3.16	1.45	0.197
BH	18.33	0.33	16.80	0.58	**2.28**	0.063
PWC170	2129.33	210.99	1838.00	140.62	1.15	0.294
IPC	5755.33	464.15	5114.20	309.52	1.15	0.294
maxQ	195.00	16.86	162.60	8.98	1.70	0.141
HV	1138.33	30.28	1060.60	38.48	1.59	0.163
FR	3.67	0.33	3.00	0.45	1.20	0.277

After analyzing the obtained data of athletes who are on a balanced diet in terms of RR at the level of t = 2.28, significant differences between managers and martial artists were determined. The rest of the groups did not differ from each other in any way.

Comparative analysis of morphofunctional data of highly qualified athletes on a low-carbohydrate diet

Table 4

Index	Management sport, n= 8		Fighters, n= 12		t	p
age	27.63	1.60	23.58	1.12	**2.06**	0.054
weight	85.41	2.62	90.98	5.45	0.92	0.370
standing height	182.44	2.30	185.79	2.34	1.02	0.321
BMI	25.69	0.80	26.38	1.35	0.44	0.666
Pulse	66.75	3.58	60.75	1.83	1.49	0.154
HELL	111.25	4.41	110.00	3.48	0.22	0.826
	70.00	3.27	70.83	2.88	0.19	0.850
BH	18.25	0.56	17.67	0.41	0.84	0.413
PWC 170	1771.13	91.96	1991.83	220.57	0.92	0.368
IPC	4910.00	180.08	5452.50	485.28	1.05	0.308
Max Q	163.75	6.57	181.58	18.12	0.93	0.367
HV	1068.00	24.53	1015.00	49.59	0.96	0.351
FR	2.88	0.23	2.83	0.32	0.11	0.917

In the subgroup of athletes on a low-carbohydrate diet, the significance of the difference was noted only in terms of age (t = 2.06). For other indicators, the groups did not differ from each other.

Comparative analysis of morphofunctional data of highly qualified athletes on a low-fat diet

Table 5

Index	Management sport, n= 6		Fighters, n= 10		t	p
age	22.00	1.00	26.10	0.77	**3.25**	0.006
weight	80.73	2.76	71.82	4.15	1.79	0.095
Height	183.08	1.90	171.10	3.08	**3.31**	0.005
BMI	24.06	0.60	24.50	0.68	0.48	0.639
Pulse	64.67	3.29	68.80	3.56	0.85	0.408
HELL	113.33	2.11	109.00	3.48	1.07	0.305
	73.33	2.11	71.00	2.77	0.67	0.513
BH	18.33	0.33	16.90	0.31	**3.13**	0.007
PWC170	1943.50	335.49	1885.40	233.72	0.14	0.889
IPC	5347.50	737.79	5218.40	514.08	0.14	0.888
maxQ	180.33	27.23	175.20	18.69	0.16	0.879
HV	999.50	38.74	1002.80	41.66	0.06	0.955
FR	3.17	0.31	2.60	0.34	1.24	0.237

When comparing martial artists and athletes of management sports who are on a low-fat diet in terms of age (t 3.25), height (t = 3.31) and RR- (t = 3.13), significant differences were noted, for other parameters of the group there were homogeneous.

Comparative analysis of the content of microelements in the blood of highly qualified athletes who are on a traditional diet

Table 6

Index	Management sport, n= 14		Fighters, n= 9		t	p
Magnesium	0.82	0.01	0.84	0.01	0.83	0.417
Iron	25.55	0.94	21.30	2.28	1.72	0.101
ferritin	262.21	72.86	170.14	42.64	1.09	0.289
Calcium	2.28	0.02	2.12	0.05	**2.95**	0.008
Vit D	40.25	2.28	28.12	1.58	**4.37**	0.000

When comparing two groups of athletes who are on a traditional diet, significant differences were determined by the levels of calcium in the blood (t = 2.95) and vitamin D (t = 4.37).

Comparative analysis of the content of trace elements in the blood of highly qualified athletes on a balanced diet

Table 7

Index	Management sport, n= 3		Fighters, n= 5		t	p
Magnesium	0.79	0.01	0.87	0.03	**2.25**	0.074
Iron	21.67	4.29	18.05	1.97	0.77	0.478
ferritin	1577.15	307.15	121.18	39.43	**4.70**	0.009
Calcium	2.28	0.03	2.26	0.02	0.54	0.620
Vit D	43.86	3.37	27.37	3.94	**3.18**	0.025

When comparing athletes on a balanced diet, significant differences were determined by the level of magnesium (t =2.25), blood ferritin (t =4.70) and vitamin D (t =3.18).

Comparative analysis of the content of trace elements in the blood of highly qualified athletes on a low-carbohydrate diet

Table 8

Index	Management sport, n= 8		Fighters, n= 12		t	p
Magnesium	0.82	0.01	0.88	0.02	**2.70**	0.015
Iron	26.31	1.71	18.97	1.87	**2.89**	0.010
ferritin	558.53	210.59	127.97	18.95	**2.04**	0.057
Calcium	2.28	0.02	2.18	0.04	**2.04**	0.057
Vit D	38.11	4.43	24.27	2.57	**2.70**	0.015

Athletes who were on a low-carbohydrate diet had significant differences in the content of all indicators of microelements in the blood.

Comparative analysis of the content of trace elements in the blood of highly qualified athletes on a low-fat diet

Table 9

Index	Management sport, n= 6		Fighters, n= 10		t	p
Magnesium	0.80	0.00	0.85	0.02	**2.49**	0.027
Iron	26.94	1.79	16.61	2.08	**3.76**	0.002
ferritin	225.25	43.04	162.51	19.32	1.33	0.206
Calcium	2.26	0.02	2.26	0.05	0.18	0.857
Vit D	41.31	1.49	28.48	3.34	**3.51**	0.004

A comparative analysis of the content of microelements in the blood of athletes showed significant differences between the two study groups in vitamin D at the level of t = 3.51 ; iron (t 3.70) and magnesium (t = 2.49).

Comparative analysis of physical fitness of highly qualified athletes who are on a traditional diet

Table 10

Index	Management sport, n= 14		Fighters, n= 9		t	p
Flexibility	-	-	4.50	0.50	-	-
Rapidity	3.07	0.32	4.00	0.00	**2.88**	0.010
Coordination	-	-	4.75	0.25	-	1,000
Endurance	4.29	0.24	4.14	0.14	0.50	0.619
Force	4.07	0.30	4.43	0.30	0.84	0.412
Strength Endurance	-	-	4.60	0.24	-	1,000
Speed-strength	3.93	0.29	4.00	0.41	0.14	0.888

As can be seen from Table 10, significant differences between athletes of management sports and martial artists were determined by the indicator of physical fitness "quickness" at the level of t = 2.88.

Comparative analysis of the physical fitness of highly qualified athletes on a balanced diet

Table 11

Index	Management sport, n= 3		Fighters, n= 5		t	p
Flexibility	-	-	3.67	0.67	-	1,000
Rapidity	4.00	0.58	5.00	0.00	1.73	0.182
Coordination	-	-	4.60	0.24	-	1,000
Endurance	3.33	0.33	5.00	0.00	-	1,000
Force	4.00	1.00	4.33	0.33	0.32	0.768
Speed-strength	5.00	0.00	4.60	0.24	1.63	0.154

Among the athletes of the two study groups who were on a balanced diet, there were no significant differences in terms of general and special physical fitness.

Comparative analysis of the physical fitness of highly qualified athletes on a low-carbohydrate diet

Table 11

Index	Management sport, n= 8		Fighters, n= 12		t	p
Flexibility	-	-	4.50	0.34	**13.17**	0.000
Rapidity	3.25	0.53	4.17	0.31	1.50	0.158
Coordination	-	-	3.75	0.53	**7.13**	0.000
Endurance	2.63	0.42	4.00	0.37	**2.47**	0.029
Force	4.38	0.42	4.20	0.33	0.33	0.746
Speed-strength	4.25	0.53	4.25	0.31	0.00	1,000

As can be seen from Table 11, between managers and wrestlers on a low-carbohydrate diet, significant differences were determined in terms of flexibility (t = 13.17), coordination (t = 7.13), and endurance (2.4).

Comparative analysis of the physical fitness of highly qualified athletes on a low-fat diet

Table 12

Index	Management sport, n= 6		Fighters, n= 10		t	p
Flexibility	-	-	4.20	0.37	**11.22**	0.002
Rapidity	3.17	0.60	4.40	0.24	1.90	0.090
Coordination	-	-	4.56	0.24	**18.81**	0.000
Endurance	3.67	0.61	4.80	0.20	1.75	0.113
Force	3.17	0.48	4.33	0.33	**2.00**	0.073
Speed-strength	4.33	0.33	4.56	0.34	0.47	0.647

Athletes who were on a low-fat diet when compared with each other had significant differences in terms of "flexibility" at the level of t = 11.22, " endurance " - t = 18.81 and "strength" - t = 2.00. This suggests that athletes of different qualifications who are on the same diet (low fat) react differently to physical activity during training sessions.

Conclusion. Thus, the assessment of the nutritional status of athletes makes it possible to individualize nutrition, as well as to constantly monitor the health status of an athlete . A detailed assessment of the nutritional status of an athlete is necessary for the subsequent determination of the basic diet, its qualitative and quantitative parameters and time characteristics. When determining the diet and type of nutrition, it is necessary to monitor the energy balance (energy intake and expenditure) based on weight control of the overall health and fitness of the athlete. Determine the intake of nutrients according to the specifics of physical activity, energy orientation and intensity of training sessions; control changes in the basic diet when needs and consumption do not match; identify deficits and correct them.

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