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Features Power ectomorphs athletes are engaged in bodybuilding in transition training

Abstract. Purpose: to develop and study the diet of athletes engaged in bodybuilding ectomorphs in transition training considering the restoration of lean body mass and functional state of an athlete **Material and Methods:** the study involved 18 athletes engaged in bodybuilding ectomorphs included in the national team in the Kharkiv region bodybuilding. Methods were used: the theoretical method and summarize the literature, pedagogical supervision, pedagogical experiment, methods of mathematical statistics. **Results:** comparative characteristics of the diet have been developed for athletes ectomorphs engaged on bodybuilding to increase muscle weight. It was divided the athletes into two experimental groups: the first EG used a balanced diet that made protein 2 grams per 1 kilogram of body weight and carbohydrates 4–5 g·kg⁻¹ in the second EG was protein 3 grams per 1 kilogram of body weight, and carbohydrate 6 grams kg. Second EG diet consists of 6 single meal and is about 2800–3500 calories per day. **Conclusions:** on the basis of research by the author offered the optimal diet for athletes ektomorfiv second experimental group engaged in bodybuilding.

Keywords: features of the diet, athletes ectomorphs, training process, transition, optimal diet microcycle.

Introduction. For this time in Ukraine the popularity of bodybuilding among different stratum of the population, and first of all among youth grows that is caused by availability of classes and their efficiency in the development of the main physical qualities.

Specifics of bodybuilding consists in that meal has a prime value in this sport, not in view of different type of a constitution as a factor which provides an optimum muscle gain and power indicators [1–5; 8; 9].

Many scientists devoted their researches to a question of interrelation between different somatic types and sports abilities (O. O. Borysova, V. A. Druz, V. M. Platonov, D. Weider) [1; 6; 10; 12; 13]. It is established that representatives of different types of a constitution have unequal opportunities in the development of physical qualities. Outstanding achievements in certain sports usually coincide with concrete morphological features.

As for bodybuilders, anthropometrical indicators not only of different kind are considered, but additional coordinates are entered, in particular, a rate of individual development undertakes to attention at reference of a sportsman to this or that type of a constitution. In many cases such signs as weight and length of a body, a circumference of a thorax, longitudinal and circle sizes of the lower and top extremities (a hip, a shin, a shoulder, and so forth), trunks are considered when determining a constitution of a body of a sportsman.

A constitution of a body is one of the main features of physical development. According to researches of the leading scientists of the sports branch (V. A. Druz; V. M. Platonov; D. Weider) [6; 7; 10; 12], representatives of different somatic types have different abilities that is important at a choice of sports specialization. At the same time it is possible to use features of a constitution as advantage at the correct approach in the training process. Relying on a practical experience and generalizing data of special literature, it is possible to allocate such types of a constitution of a body:

A sportsman of *endomorph* (*hypersthenic*) type differs in a dense structure of a body, short extremities and wide bones. Ectomorphs have a big tendency to accumulation of excess fatty deposits therefore they should approaching questions of food especially attentively. Despite of it, endomorphs have high power endurance and renew quickly after loadings.

A sportsman of *mezomorph* (*normosthenic*) type of a constitution differs in a wide skeleton, and a shape of a torso reminds a turned triangle. Sportsmen who treat it like a constitution, gain weight much quicker, than ectomorphs. It is safely possible to call them born sportsmen because there are all prerequisites to the development of muscles. Such sportsmen differ in power and aerobic endurance and perfectly renew after long loadings. This type perfectly proves almost in all sports, and especially in bodybuilding.

A sportsman of *ectomorph* (*asthenic*) type has more developed abilities to speed and dexterity. He is still called slowly growing. At sportsmen who treat this type, bones are thin, a body is thin, extremities are long, and a torso is short. The process of metabolism at them is very fast therefore it is rather difficult to them to gain weight. They have a beautiful reaction and they are very vigorous, but as for power endurance, it very small. So, the process of renewal after long loading goes slowly, though aerobic endurance is rather high at such sportsmen.

Receiving high sports results in many respects depends on the existence of the individualized system of preparation which has to be based on an optimum creation of the training process of sportsmen of different types of a constitution who are engaged in bodybuilding. [10–12].

However still there are no evidence-based techniques of meal for sportsmen-ectomorphs in native sport who are engaged in bodybuilding in the transition period of preparation. Therefore trainers and sportsmen should gather a practical experience by trials and errors. The increased requirement of bodybuilders needs studying of condition of a problem and development of the effective principles of a diet in an evidence-based technique of meal in the transition period of preparation [14–17]. Therefore the author developed two variants of meal for sportsmen-ectomorphs and reasonably efficiency of food in the transition period of preparation.

In bodybuilding the transition period of preparation lasts 4 weeks, that is four restoration microcycles. During this period bodybuilders of different types of a constitution renew a body weight and try to fulfill a technique of training exercises maximum as much as possible. At the end of each microcycle the condition of the sportsman is estimated by the trainer, and amendments are introduced in the plan of meal [8–11].

Communication of the research with scientific programs, plans, subjects. The scientific research is executed by a subject of the Built plan of the research work in the sphere of physical culture and sport for 2011-2015 by a subject 3.7 "Methodological and organizationally-methodical bases of definition of individual norm of a physical condition of a person" (number of the state registration is 0111U000192).

The objective of the research: to prove a allowance of meal of sportsmen-ectomorphs who are engaged in bodybuilding in the transition period of preparation taking into account a renewal of a muscular body weight and a functional condition of a sportsman.

Material and methods of the research. In the research the following methods were used: theoretical method and generalization of literature, pedagogical supervision, pedagogical experiment, method of mathematical statistics.

Members of a national team of the Kharkov area and Ukraine took part in this research. Before the experiment 18 qualified bodybuilders with a constitution type ectomorph were attracted from whom 4 CMS, 14 – the I category at the age of 20–26 years old. Participants were distributed by a sports qualification on two experimental groups. Participants of the experiment trained 4 times for a week and ate 5–6 times per day.

Results of the research and their discussion. At the beginning of the experiment we conducted the research concerning the analysis like a constitution for the qualified sportsmen who specialize in bodybuilding. Among sports clubs ("Feromon", "Tetra", "Chornyi Bizon", "Forma", CYSS No. 9 in Kharkov), and also between students of Kharkov state academy of physical culture of the specialization weightlifting, we selected 30 qualified sportsmen from 20 till 26 years old (CMS and the I category) who specialize in bodybuilding and agreed to take part in the research. All selected qualified bodybuilders had the average height 170,9, the minimum and maximum indicators of growth made 160 and 181 sm at sportsmen. We chose the index by which, in our opinion, it is possible to define a type of a constitution of qualified bodybuilders most precisely.

The index of Solovyov is a definition like a constitution of sportsmen by a hand grasp (bone thickness). By the criteria of Solovyov a mezomorph (normosthenic) has hand grasp parameters not less than 18 sm and not more than 20 sm, endomorph (hypersthenic) has parameters 20 sm and more and ectomorph (asthenic) – less than 18 sm.

At the beginning of the experiment all sportsmen were divided on different indicators of a constitution. Due to the index of Solovyov we defined that 18 sportsmen – ectomorphs, 2 sportsmen – endomorphs and 10 – sportsmen- mezomorphs.

In our opinion, the most problem type of a constitution in classes by bodybuilding – is an ectomorph (pic. 1). Among the qualified bodybuilders which have different types of a constitution, we selected 18 sportsmen - ectomorphs.

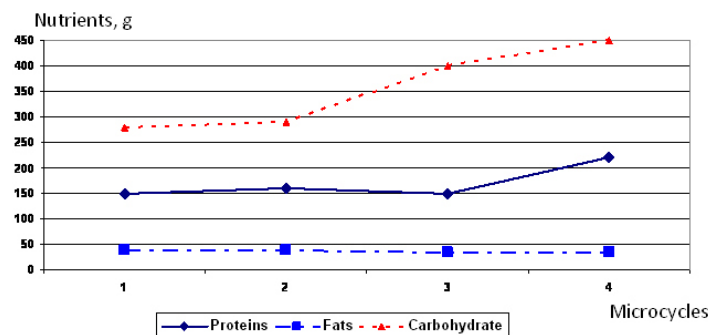


Pic. 1. Ectomorphic (asthenic) type of a constitution

Two experimental diets on renewal of a muscular body weight after long loadings was developed.

The use of meal as a compound preparation, caused the application of two options of a diet which differed in a ratio of the main nutrients (proteins, fats and carbohydrates). The assessment is carried out by means of diaries of meal in which the quantity and types of foodstuff were specified which were used during a day. Contents of the main nutrients decided on the help of reference tables of a chemical composition of foodstuff.

We will consider the first scheme for sportsmen - ectomorphs of the first experimental group who are engaged in bodybuilding, pic. 2.



Pic. 2. Dynamics of the main nutrients of a diet of sportsmen - ectomorphs of the first experimental group in the transition period who are engaged in bodybuilding

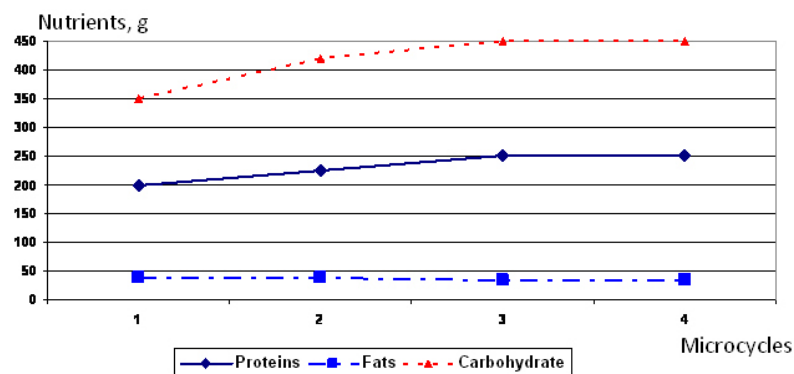
During the first microcycle the first experimental group of sportsmen used 1,5–1,7 g of proteins per 1 kilogram of a body weight and 3–4 g of carbohydrates per 1 kilogram of a body weight. In the second the amount of proteins and carbohydrates grew on 10 grams, in the third microcycle the amount of proteins reduced on 10 grams, and carbohydrates increased on 100 g and at the beginning of the fourth microcycle made –2,5 grams of proteins per 1 kilogram of a body weight and carbohydrates of 4-5 g·kg⁻¹. So, it isn't necessary to forget that the day norm of water makes 3 liters for a bodybuilder of an ectomorphic type of a constitution.

The approximate list of products which was used during a day, and its caloric content in the first experimental group. Averages results are taken:

1. First meal:
 - 2 eggs;
 - 100 g of meat, poultry meat or fish;
 - 200 g (1 glass) of milk, kefir or low-fat yogurt;
 - 1 piece of black bread (this is all is about 50 g of protein).
2. Second meal:
 - A plate of porridge (100 g) (not instant);
 - 200 g of milk, kefir, low-fat yogurt or juice (15–20 g of protein).
3. Third meal:
 - A plate of soup;
 - 100 g of meat, poultry meat or fishes;
 - 1–2 pieces of black bread (42–45 g of protein).
4. Fourth meal:
 - 100–150 g of cheese;
 - 1–2 tablespoons of honey;
 - 1 piece of black bread (20 g of protein);
5. Fifth meal:
 - 100 g of muesli with milk (15 g of protein).

At such frequent use of meal and high dispensing of protein for normal functioning of a digestive tract it is recommended to include products which contain cellulose in a diet. Salad with raw vegetables (cabbage, beet and so forth) are the most suitable for bodybuilders.

To shortcomings of this diet it is possible to carry low contents of carbohydrates because ectomorphs by their structure of body have no a rather big body weight (fatty). Therefore, in our opinion, the amount of carbohydrates per 1 kilogram of a body weight should be raised. Sportsmen of the second experimental group ate at the following scheme (pic. 3).



Pic. 3. Dynamics of the main nutrients of a diet of sportsmen-ectomorphs of the second experimental group in the transition period who are engaged in bodybuilding

Unlike the first technique which has (more balanced meal) that sportsmen of the first experimental group use, the technique of the second experimental group was more expressed in the high use of carbohydrates for the increase in body weight of sportsmen-ectomorphs.

Throughout the first microcycle the second experimental group of sportsmen used 2,3 g of proteins per 1 kilogram of a body weight and 4 g of carbohydrates per 1 kilogram of a body weight. In the second – the amount of protein of 3 g and carbohydrates grew till 5 g per 1 kilogram, the amount of proteins grows in the third microcycle till 3,5 g, and carbohydrates increased till 6 g per 1 kilogram of a body weight and during the fourth microcycle made – proteins of 3 g per 1 kg of a body weight and carbohydrates of 6 g per 1 kg. So, it isn't necessary to forget that the day norm of water makes 3–4 liters for a bodybuilder of an ectomorphic type of a constitution.

If a weight is about 80-90 kg, this program of meal will suit. The diet consists from 6-times of meal and makes about 2800-3500 calories per day.

The approximate list of products which was used during a day, and its caloric content in the second experimental group.

Average results are taken:

1. First meal:
 - Oat flakes 100 g (dry weight);
 - Milk of 0,5% 250 ml;

- Raisin 50 g;
- Olive oil 5 g
- 2. Second meal:
 - Chicken breasts (fillet) 250 g;
 - Buckwheat 150 g (dry weight);
 - Olive oil 15 ml.
- 3. Third meal:
 - Macaroni 150 g (dry weight);
 - Chicken breasts (fillet) 200 g;
 - Chicken egg-white – 10 pieces
- 4. Fourth meal:
 - Geyner 50 g (powder) divorced with water.
- 5. Fifth meal:
 - Rice – 70 g (dry weight);
 - Chicken breasts (fillet) – 100 g
- 6. Sixth meal:
 - Cottage cheese (cottage cheese) – 130 g;
 - Olive oil – 10 g.

A day meal – 2800 kkal, but the feature like a constitution of ectomorph predetermines an addition of kkal depending on an individual type of ectomorph, so a day norm of kkal (carbohydrates) can make till 3500 kkal.

Before the experiment the test weighing of both groups was carried out, and also anthropometrical intentions by means of which we could find the best result in a gain of indicators. The devices a skin scales and a centimetric tape were used for carrying out the weighing (tab. 1, 2)

Table 1

Average indicators of anthropometrical data of sportsmen-ectomorphs of both experimental groups at the beginning of the transition period who are engaged in bodybuilding, (n1=n2=9)

Indicators	EG № 1		EG № 2		t	P
	$\bar{X}_1 \pm m_1$	V, %	$\bar{X}_2 \pm m_2$	V, %		
Body weight, kg	82,50±4,05	14,72	89,00±3,98	13,41	0,94	>0,05
Circumstance of a neck, sm	41,28±1,35	9,79	40,78±1,28	9,44	0,22	>0,05
Circumstance of a breast (breath), sm	111,88±2,00	5,36	115,38±2,70	7,01	0,85	>0,05
Circumstance of a breast (exhalation), sm	103,33±2,07	6,02	104,72±2,27	6,50	0,37	>0,05
Circumstance of a biceps, sm	42,00±1,87	13,32	42,62±1,75	12,30	0,20	>0,05
Circumstance of a waist, sm	77,28±2,28	8,84	79,28±2,42	9,15	0,49	>0,05
Circumstance of a hip, sm	77,38±1,82	7,04	77,22±1,88	7,32	0,05	>0,05
Circumstance of a shin, sm	39,45±1,32	10,03	39,62±1,24	9,41	0,08	>0,05
Circumstance of a forearm, sm	37,00±1,35	10,91	38,42±1,67	13,03	0,54	>0,05

The divergences were doubtful at the beginning of the transition period of preparation of the qualified bodybuilders: in a body weight (№ 1 EG – 82,50 kg, № 2 EG – 89,00 kg; $P < 0,05$); a hip circumference (respectively – 77,38 sm, 77,22 sm; $P < 0,05$); a waist circumference (respectively – 77,28 sm, 79,28 sm; $P < 0,05$); a neck circumference (respectively – 41,28 sm, 40,78 sm; $P < 0,05$); a breast circumference on a breath (respectively – 111,88 sm, 115,38 sm; $P < 0,05$) and on an exhalation (respectively – 103,33 sm, 104,72 sm; $P < 0,05$) and a shin circumference (respectively – 39,45 sm, 39,62 sm; $P < 0,05$).

Coefficients of variation of all main anthropometrical indicators practically didn't exceed the general initial level separately for the first experimental and second experimental groups. For example, it made $V = 14,72\%$ for the second experimental, $V = 13,41\%$ for the mass of the first experimental group.

So, at the end of the transition period body weight at sportsmen-ectomorphs who are engaged in bodybuilding, is (№ 1 EG – 11,67 kg, № 2 EG – 5,33 kg; $t = 4,87$; $P < 0,01$), a waist circumference (№ 1 EG – 5,17 sm, № 2 EG – 2,00 sm; $t = 7,89$; $P < 0,01$), it increased more in EG № 1, and a circumference of two-headed muscle of a shoulder (biceps) (№ 1 EG – 2,33 sm, № 2 EG – 3,17 sm; $t = 7,15$; $P < 0,01$), a shin circumference (№ 1 EG – 1,00 sm, № 2 EG – 2,50 sm; $t = 6,70$; $P < 0,01$), a breast circumference on a breath (№ 1 EG – 2,00 sm, № 2 EG – 3,00 sm; $t = 1,53$; $P < 0,05$) – in № 2 EG.

The divergences in a gain of other indicators are doubtful ($P > 0,05$).

Conclusions. Thus, two meal allowances were developed for sportsmen-ectomorphs who are engaged in bodybuilding.

Table 2

Indicators of a gain of average anthropometrical data of sportsmen - ectomorphs of both experimental groups at the end of the transition period who are engaged in bodybuilding, (n1=n2=9)

Indicators	EG № 1	EG № 2	t	P
	$\bar{X}_1 \pm m_1$	V, %		
Body weight, kg	11,67±0,96	5,33±0,46	4,87	<0,01
Circumstance of a neck, sm	2,33±0,17	2,50±0,28	2,9	<0,05
Circumstance of a breast (breath), sm	2,00±0,21	3,00±0,21	2,73	<0,05
Circumstance of a breast (exhalation), sm	2,00±0,21	2,83±0,39	1,53	>0,05
Circumstance of a biceps, sm	2,33±0,17	3,17±0,23	7,15	<0,01
Circumstance of a waist, sm	5,17±0,25	2,00±0,21	7,89	<0,01
Circumstance of a hip, sm	3,83±0,33	4,00±0,11	0,39	>0,05
Circumstance of a shin, sm	1,00±0,00	2,50±0,18	6,70	<0,05
Circumstance of a forearm, sm	0,33±0,17	1,00±0,30	1,58	>0,05

The feature of a diet in the first EG consisted in the allowed balanced meal. However the first EG of sportsmen didn't receive desirable results concerning the increase in a muscular body weight.

The second EG used more frequent and high-calorie meal which included 3–4 grams of proteins per kilogram of a body weight and 5–6 grams of carbohydrates per 1 kg of a body weight. Such meal promoted more a performance of the put task – to the increase in muscular body weight for sportsmen-ectomorphs that was proved authentically, the second experimental group showed a bigger gain in a body weight (t=4,87; P<0,001), a neck circumference (t=2,90; P<0,05), a breast circumference on a breath (t=2,73; P<0,05), a biceps circumference (t=7,15; P<0,001), a waist circumference (t=7,89; P<0,001) and a shin circumference (t=6,70; P<0,001), than the first experimental group did.

The developed techniques for sportsmen-ectomorphs can be estimated as optimum in preparation for the accumulation of a muscular body weight in the transition period of preparation.

The feature of techniques of meal for sportsmen-ectomorphs who are engaged in bodybuilding, can be recommended for preparation, for observance of requirements of sports and medical control, for ensuring effective and high-quality renewal in the transition period of preparation.

The subsequent researches have to contain the development and justification of a technique of meal for sportsmen-ectomorphs who are engaged in bodybuilding in the transition period of preparation.

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