THE POWER PLAYERS IN TERMS OF TRAINING AND COMPETITIVE ACTIVITY

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ABSTRACT
Rational balanced nutrition, including the necessary complex of vitamins and minerals, will increase the effectiveness of both training and competitive activities of football players. Given researches can be used in the training activity of young and highly skilled sportsmen, in the work of trainers and doctors, that, undoubtedly, should raise the efficiency of preparation of football players. The results of the work can also be used by sportsmen for individual correction of feeding.

Good nutrition can't guarantee either high sports results or good health, but without it the potential of the athlete will be revealed insufficiently. It can't be expected, that the sportsman will be healthy.

Keywords: football, nutrition, physical exertion, training activity, athletes, competitive activities, sports training.

INTRODUCTION

In the modern system of sports training, nutrition is considered as one of the leading factors, which determines the possibility of a sportsman to achieve high performance, and to recover efficiently after intense muscular activity (24).

The nutrition of athletes is characterized by some features, associated with a high degree of physical and mental stresses, occurring in the process of training and competitions, which in turn, cause an increased need for the body in energy and in certain nutrients.

The modern science of nutrition, and in particular nutrition in sports, is based on the concept of nutrition balance, according to which, the provision of normal life, the increase in physical efficiency and the acceleration of recovery processes are possible on the condition of intake of proteins, fats, carbohydrates, vitamins, mineral substances and water,at the rates, necessary for the organism.

The issues of nutrition and pharmacological support are of particular importance for football player training. Intensive muscular activity causes a significant activation of metabolic processes in the body, thatis connected with the increase energy resources, enhancement of oxidative and anaerobic synthesis of energy-rich phosphorus compounds, the increase of biosynthesis of contractile muscle proteins and enzymes, improvement of metabolismregulation.

METHODS

Rational balanced nutrition, including the consideration of necessary set of vitamins and minerals, will increase the effectiveness of both training and competitive activities of football players. Given researches can be used in the training activity of young and highly skilled sportsmen, in the work of trainers and doctors, that undoubtedly, should raise the efficiency of preparation of football players. The results of the work can also be used by sportsmen for individual correction of feeding.

As a result of football training and competitions, the need for energy increases, that entails an increase in energy consumption to support physical capabilities and to maintain an ideal body weight. For elite players, the average efficiency is about 70% of the maximum absorbed oxygen. This corresponds to the spent energy of about 1000-15000 kcal (4000-6000 kJ), on a player, weighing 70 kg. Anaerobic energy

Submit Date: 01.09.2017, Acceptance Date: 15.11.2017, DOI NO: 10.7456/1070DSE/164

system is also strongly affected during the periods of the match. Repeated periods of efforts during competitions and training exhaust the muscles and glycogen stores of the liver.

Carbohydrate depletion contributes to fatigue and reduces physical abilities during the match. Football players, taking part in intense competitions and training, should use a diet with relatively high carbohydrate content (at least 55% for all consumed energy). If energy consumption is low, or if the need for carbohydrates is high (like the period of intensive training and competition), it is necessary to increase or even favor the consumption of carbohydrates. In practice, football players have difficulties in using a diet with sufficient intake of carbohydrates. This should be supplemented by the consumption of various simple and complex products, containing carbohydrates in liquid or solid form, during preparation for training or competitions, as well as for recovery after them.

High level of release of exchange heat during football training and competitions leads to a significant reduce in sugar content. Dehydration leads to inferior results of exercises and can lead to diseases, associated with heat exchange. Consumption of liquid before and during the game will reduce the degree of dehydration and can also give more carbohydrates to replenish the body's limited carbohydrate stores; in addition, the inclusion of electrolytes. Football players have high demands for both endurance and muscular power.The daily consumption of proteins by football players should be about 1.4-1.7 g/kg of body weight. Most players, who have free access to a wide range of products in sufficient quantities, can easily follow this recommendation,in order to restore the daily energy expenditures,without the need for additions.

To maintain a consistent balance between energy, consumed by the elements of nutrition and the demanded requirements, the players must receive daily advice for nutrition from qualified professionals, with the purpose to protect themselves throughout the phases of the year, and not just during the competition season.

The amount of energy, expended by the athlete, depends on the age, length and weight of the body, body composition, kind of sport, training level, peculiarities of clothes and the environment, as well as the frequency of intensity and duration of training or competitions.

Simultaneously with the increase in energy expenditure, the fuel value of the athlete's diets should also change. The basis for development such a diet is scientifically based dietary recommendations, which in different countries have their own characteristics. For example, nutritional recommendations, containing dietary norms in the United States (Table 1), are designed for people with low or moderate levels of activity. They are calculated on the basis of the equations, recommended by the World Health Organization (WHO),which allow to determinethe energy expenditure at rest, and multiplied by the activity factor (10).

Table 1. Recommendationsforenergyconsumption

Categories	Age, years	Bodyweight, kg	Bodylength, cm	Energyconsumption (kcal-day^{-1})	Averageenergynorms	
					Per kg of body weight	Per day
Infants	0,0-0,5	6	60	320	108	650
	0,5-1,0	9	71	500	98	850

Submit Date: 01.09.2017, Acceptance Date: 15.11.2017, DOI NO: 10.7456/1070DSE/164

Children	1-3	13	90	740	102	1300
	4-6	20	112	950	90	1800
	7-10	28	132	1130	70	2000
Men	11-14	45	157	1440	55	2500
	15-18	66	176	1760	45	3000
	19-24	72	177	1780	40	2900
	25-50	79	176	1800	37	2900
	51+	77	173	1530	30	2300
Women	11-14	46	157	1310	47	2200
	15-18	55	163	1370	40	2200
	19-24	58	164	1350	38	2200
	25-50	63	163	1380	36	2200
	51+	65	160	1280	30	1900

On average, for a man, 19-24 years-old, with a body weight of 74 kg, the consumption of energy in food is 2900 kcal-day^{-1} (or 40 kcal-kg^{-1}–day^{-1}). For women of the same age with a body weight of 58 kgthe consumption of energy in food is 2200 kcal-day^{-1} (or 38 kcal-kg^{-1} – day^{-1}). For people with higher motor activity and with a different body weight, a corresponding correction should be made (Table 2).

Many researchers agree that the basic dietary principles are the same for most athletes, and they are able to ensure the achievement of the maximum level of physical fitness. Taking this into consideration, general recommendations were developed for all groups of athletes, according to which protein intake should be 10-15% of the total caloric content of consumed food, and carbohydrates intake - 50-60%. The studies on determining the risk of heart diseases and malignant tumors have established that consumption of fat should be limited to 30% of the total consumed calories. For athletes,having long and intense training and competitive loads, aimed at development of endurance, the ratio of specific food products in the diet can be changed towards increasing the amount of carbohydrates, which would provide the total energy consumptionfor 60-70%.

RESULTS AND DISCUSSION

Thus, the presented data indicate a significant variability in the indicators of energy consumption, expressed as a percentage, due to proteins, carbohydrates and fats. In addition, it was found, that the diet

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of some athletes was close to the recommendations, ensuring the health support, while the diet of other athletes did not provide this (3,5,7,10).

The ideal diet is still an unresolved problem. For all athletes, the main recommendations for the consumption of proteins, carbohydrates and fats were developed. But the data, which served as the basis for these recommendations,in most cases was obtained in the process of examination of athletes, training in those sports,which required endurance. So, for daily training athletes with the purpose to replenish glycogen reserves, it was recommended to consume at least 8-10 g of carbohydrates-kg^{-1} – day^{-1}, and in case of intense physical exertions - 12-13 g of carbohydrates-kg^{-1} – day^{-1} (19). It is not yet determined, whether food, containing 5-8 g of carbohydrates-kg^{-1} – day^{-1}, causes a decrease in physical performance. Dietary recommendations for short-term muscle activity have not yet been developed.

Consumption of 1.0-1.5 g of protein-kg^{-1} – day^{-1} is recommended for most athletes. This level can be provided by a mixed diet: 12-15% of the caloric content is protein, under the conditions of adequate energy consumption. For athletes, who constantly control body weight (for example, wrestlers, figure skaters, gymnasts), also for vegetarians, the diet may have more proteins.

The results of the research showed, that during the match the players run an average 10-12 km, including sprint with high intensity and lasting running at the average speed (4). This running is combined with rapid changes in speed and direction of movement, fighting for the ball, performing a number of maneuvers. Thus, football can be considered as a sport, which includes periods of high-intensity physical activity, the average intensity of physical activity can reach 65-80% of the maximum oxygen consumption (MOC) (3,6,9). Depletion of glycogen stores in muscle fibers of types I and II (3,6,9) is a potential factor of fatigue during a football match, which can limit the players' ability to maintain a high level of performance, especially at the end of the match (Table 2).

Table 2 shows the distance, run by a group of players (5 people), who started the match with relatively normal levels of glycogen content, and by a group of players (4 people), who had reduced levels of glycogen before the start of the match. If the adequate reserves of glycogen in the liver become more complicated, as a result of intense football match, the blood glucose levels will be close to the levels, observed at rest, or slightly higher.At the same time, the concentration of 3.8 mmol-$l^{-1}$was often observed, and in some players even 3 mmol-l^{-1} (6). The concentration of dictate in the blood of 10-12 mol-l^{-1} during the game confirms the intensity of football matches. The results of the research indicate that the energy needs of football players are mainly provided by endogenous reserves of carbohydrates.

Taking into account the relatively limited reserves of glycogen in muscles and liver, and the high demands, placed on these endogenous carbohydrate reserves by the training and competitive activity of players, it is necessary to pay special attention to the enough consumption of carbohydrates by the players of football clubs. The studies, conducted with the participation of the strongest football players in Sweden, have identified potential difficulties in achieving optimal glycogen levels in muscles before matches. Low levels of glycogen in the study were due to inadequate intake of carbohydrates - an average of 596 + 33 g-day^{-1}, or 47 ± 1% of total energy consumption (9).

Table 2he content of glycogen in muscle fibers

Group	The content of glycogen mmol– kg^{-1}			Distance, m	
	Before the match	Mid-game	After the match	The 1st half	The 2nd half
5 people	96	32	9	6100	5900

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4people	45	6	0	5600	4100

A similar picture was observed in a study, conducted with the participation of Danish football players: 426 g-day^{-1} and 46% (3).

Loads during a common football match, in which field players run 9-11 km, at a heart rate of about 160 beats per min, and the concentration of lactate in the blood reaches 6-10 mmol-l^{-1}, are sufficient to cause significant oxidation of amino acids. In addition, it is known, that oxidation of amino acids is inversely proportional to the presence of glycogen. Consequently, after physical exertion, and also due to sufficient intake of carbohydrates, glycogen reserves during the match can be significantly depleted.

How does the lack of protein intake affect the players' body? As a result of increased oxidation of amino acids, the latter are completely eliminated from the body. If the supply of amino acids is not replenished with food, the normal process of protein synthesis is disrupted, that leads to a decrease in the protein content in the body (6), and to a decrease in muscle power.

The data of recent research shows that for the athletes, involved in sports,which require endurance,it is necessary to consume 1.2-1.4 g-kg^{-1} - day^{-1} protein (2), and since the component of cyclic nature is inherent to a football match, we can assume, that the body needs of the football playersin proteins are the same.

Laboratory studies of athletes, engaged in strength sports, show that the intake of proteins in excess of the recommended dose, combined with intense training, contributes to an increase in muscle power and mass. This, undoubtedly, is important for football players, as it allows to limitthe potential reduction of power abilities, due to the increased oxidation of amino acids, caused by a component of a cyclic nature.

It should be noted, that the degree of strength increase was the same in both groups (Table 3).

Table 3he influence of additional protein intake during the 12-week program of strength training

Group	Thigh muscle area, cm^2	Creatine, g-cm^{-1}	Maximumrepetition, kg
Control	+ 6.1 $\pm$ 2.4	- 0.05 $\pm$ 0.07	+ 19.0 $\pm$ 2.9
Experimental	+ 14.6 $\pm$ 1.5	+ 0.16 $\pm$ 0.05	+ 20.2 $\pm$ 2.1

Recent investigations show that the synthesis of proteins in athletes, engaged in strength sports,enhances with an increase in protein intake from 0.86 to 1.4 g-kg^{-1}. It is noteworthy, that the consumption of 2.4 g-kg^{-1}- day^{-1}did not contribute to a further increase in protein synthesis, but led to a significant increase in the oxidation of amino acids.

SUMMARY

The results of these studies have confirmed that strength training increases the need for proteins to 1.4-1.7 g-kg^{-1} – day$^{-1.}$

Recommendations for food consumption before a football match can be borrowed from the results of the research, involving cyclists:consumption of 200 g of food with a high glycemic index (bread, cereals and fruits) 3-4 hours before the competition, as well as sweet stick, containing 43 g of sucrose, 5 min before the competition, according to experts (4), increases power by 22%. Football players are recommended to

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eat relatively hearty (over 200 grams) carbohydrate meal to improve performance during physical exertion. An hour before the start of the competition, football players are recommended to eat some food or drink a beverage,containing carbohydrates (30-60 grams).

The main causes of fatigue during a high-intensity physical load of intermittent nature are depletion of muscle glycogen reserves and dehydration. The consumption of carbohydrates was already considered.As for the needs of the football player's body for liquid, the athletes should consume water, diluted fruit juices, "sports" and other drinks, in order to prevent dehydration of the body.

In addition, football players can be recommended to monitor the needs of their body for the liquid, weighing before and after training and competitions. Practical recommendation for football players is to consume liquid after training, in order to compensate the loss of body weight, until the color of urine becomes pale yellow (5).

Based on the data of literature sources, the diet of the football team of the Youth Athletic Center was developed in conditions of training camps, also in the middle altitude, during the competitive activities.

Every week, the diet was adjusted, also individually.

The tolerability of physical exertions, taking into account the nutrition, was recorded in a special journal.The data was analyzed together with the trainers for correction the nutrition, depending on the amount and intensity of the training loads.

Athletes, having the specific nutritional problems, due to various natural and cultural factors, may require additional nutrition and information support. Among the microelements, calcium and iron are the most important in the diet of athletes. The above is also true for adolescents and women,engaged in sports, where endurance is required, and weight and fat reserves should be reduced.

Excessive fatigue, connected with training, is manifested in a constant feeling of tiredness, a decrease in sports results;it is accompanied by an increase in nervous tension and becomes increasingly permanent. One of the reasons for this may be improper feeding with a lowcontent of carbohydrate. Nervous exhaustion can develop as a result of sports loads. A carbohydrate-rich diet can have a beneficial effect in this case, as well as it can promote metabolism in muscles.

Even a slight dehydration of the body affects sports results. Significant loss of water can be hazardous to health. Athletes, training in hot and humid climate, must have the acclimatization period before the competition. They should drink more. It is good to drink beverages, containing 6-8% of carbohydrates, as well as drinks-electrolytes, rich in sodium. The above is especially important for children and adolescents, who are more sensitive to the lack of water.

CONCLUSIONS

1. It is necessary to keep a balanced diet, which provides additional body needs, related to training.

2. The diet of football players should include a small amount of fat, and a lot of carbohydrates, as well as the necessary amount of protein food.

3. The athletes with specific feeding problems may require additional nutrition and information support.

4. The causes of fatigue during theintense physical load (especially in the conditions of middle altitude) are the depletion of muscle glycogen reserves and dehydration.

5. Practical recommendations were proposed, taking into account the above information.

ACKNOWLEDGEMENTS

Submit Date: 01.09.2017, Acceptance Date: 15.11.2017, DOI NO: 10.7456/1070DSE/164

The work is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University.

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