JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
GERMAN INTERNATIONAL JOURNALS COMPANY
ISSN: 2751-4390
IMPACT FACTOR (RESEARCH BIB) : 9,08. Academic research index

FEATURES OF ENERGY METABOLISM IN THE BODY DURING MUSCLE ACTIVITY IN CHILDREN AND ADOLESCENTS ENGAGED IN SPORTS

Sarsenbaev Gamzat Azatbay uli
2nd year master's student of KSU in the specialty "Theory and Methodology of Physical Culture and Sports Training"

Annotation: This article notes that the problem of planning adequate nutrition and energy expenditure in modern sports is one of the main tasks in the system of training young athletes. The article presents, based on literature analysis, modern approaches to providing nutritional support for young athletes engaged in cyclic sports. These sports require a lot of energy, and the work is performed with great tension and intensity.
Accordingly, in athletes engaged in endurance, the ratio of essential nutrients is shifted to carbohydrates, which should satisfy a high need for physical activity depending on the stage of the training process and the volume of the load. It was studied that the use of high-fat diets to ensure energy function is not justified, therefore, such a nutritional approach was abandoned: the amount of fats in the diet of athletes should be about 25% of the total caloric value of the diet.
Keyword: development, sport, lifestyle, athletes, energy expenditure, physical education, system, physical exercises, muscle, activity, strength.

The formation of a healthy lifestyle in society, the prevention of diseases, the regular exercise of a wide range of the population, especially young people, in physical culture and sports, as well as the physical development of a person, are among the main pressing issues of today. The physical development and level of physical fitness of athletes are different and have their own individual characteristics. It was noted that the development of physical qualities in athletes of the same age and physical development is different [1].

Therefore, in the process of physical education, it is of great importance to compile individual programs, develop a set of exercises, and approach each group individually during the training process to cultivate physical qualities in athletes with varying physical development. Fulfilling the requirements of physical education programs, determining the level of physical fitness of athletes, is one of the main tasks of coaches. Because physical exercises can affect the athlete's organ system differently.

Regular physical education and sports activities have a positive effect on the human body and increase its ability to resist fatigue. As a result, diseases of the body are prevented, and labor productivity increases. Therefore, physical culture and sports have great social significance in strengthening the health of our people and increasing their work capacity. A person who has been involved in sports since youth has a strong sense of striving for perfection [2].

The main criterion for the normal functioning of the organism is its ability to use its biological potential in high demands. At the same time, the body must respond to loads, quickly and adequately restoring its activity level without pathology, and quickly return to the initial level of regulation [3]. This determines the stability of the body, the daily reserve of strength, that is, the level of human health, which, in turn, determines the reserve of productive forces of society and has great social significance. Therefore, regularly engaging in general developmental exercises has a positive effect on the activity of a number of body systems (nervous system, circulatory system, digestive system, respiratory system, as well as muscle development),

increasing the body's immunity, which in turn increases the body's resistance to various external influences.

Every organism in the process of daily life, that is, at home, in production, during physical education and sports, performs a wide variety of motor actions. An exercise is a set of continuous, interconnected actions aimed at achieving a certain goal [4].

The large number of physical exercises, including sports exercises, necessitates their classification. Physiological classification combines physical exercises with similar functional classifications into the same groups. On the one hand, these are such physical exercises, for the performance of which, to a certain extent, similar regimes, means, and methods of physical education can be applied. On the other hand, such physical exercises that can be applied equally in the physical education system are combined into one group. The purpose of this is to increase the functional capabilities of the same physiological organs, systems, and mechanisms, that is, the same physical qualities. For example, the capabilities of the cardiovascular and respiratory systems, which determine the indicator of endurance development, can significantly increase when using the same group of different physical exercises (long running, cycling, swimming, skiing).

Strength exercises are exercises in which the main muscles experience maximum or almost maximum tension in a static or dynamic state during low-speed movements. The maximum duration of exercises with maximum manifestation of strength is measured in seconds. Strength is the main motor quality that determines the normal execution of strength exercises [5].

In speed-strength exercises, the leading muscles contract simultaneously with relatively large force and speed, i.e., they produce greater energy. Maximum muscle contraction power is achieved under conditions of maximum muscle activity of about 30% of the maximum contraction rate for an unloaded muscle. The maximum strength of muscles increases under the influence of external resistance (load), which constitutes 30-50% of their maximum (static) strength. The maximum duration of exercises in which muscle contractions are performed with great energy is within the range of 3-5 seconds to 1-3 minutes, i.e., muscle contraction is inversely proportional to its energy. In speed-strength exercises, energy plays an important role.

Endurance exercises are exercises that develop relatively small muscle contractions in terms of strength and speed during execution. But at the same time, muscles are able to maintain these contractions or reproduce them for a long time - from several minutes to several hours. For this group of exercises, endurance is the main physical quality.

During muscle activity, the increase in intracellular calcium concentration leads to its contraction and increased ATP breakdown. At the same time, the rate of muscle metabolism increases 100-1000 times. According to the first law of thermodynamics (the law of conservation of energy), the chemical energy released in a muscle must be equal to the sum of mechanical energy (muscle work) and heat production [6, 7].

The energy unit is an important classification of exercises. To determine the energy unit of a physical exercise, two indicators are used: energy power and total energy expenditure.

Energy capacity is the amount of energy expended on average per unit of time when performing a specific exercise. It is usually measured in physical units - watts, kcal/min, kilojoules/min, as well as in physiological units - oxygen consumption rate (ml O2/min) and is measured in MET. MET - metabolic equivalent, i.e., the amount of oxygen consumed by a person in 1 minute per 1 kg of body weight while lying down, in a state of complete rest (1 MET = 3.5 ml O2/kg×min).

Total energy expenditure is the amount of energy expended during the entire exercise. The total energy expenditure is determined - the product of the average energy power over the exercise time.

The total energy expenditure for covering a distance during running does not depend on the speed of movement. With increasing speed, the travel time for this distance decreases, and with decreasing speed, on the contrary, it increases. Therefore, the product of energy power and time, i.e., the total energy consumption, remains unchanged. The total energy unit of one distance run is relatively high during running. During running, an average of 0.72 kcal/kg of weight is spent

per kilogram of body weight in women and 0.68 kcal/kg in men, and during running - 1.08 and 0.98 kcal/kg, respectively, per kilogram of body weight.
According to the indicators of energy capacity, physical work is divided into light, medium, heavy, and especially heavy (Table 1).

1-table.

Classification of physical exercises by energy expenditure (kcal/min) in men and women of different ages

Gender and age	**Exercise**			
	light	**average**	**heavy**	**very heavy**
Male				
20-29	4,2	4,3-8,3	8,4-12,5	>12,5
30-39	3,9	4,0-7,8	7,9-11,7	>11,7
40-49	3,7	3,8-7,1	7,2-10,7	>10,7
50-59	3,2	3,3-6,3	6,4-9,5	>9,5
60-69	2,5	2,6-5,0	5,1-7,5	>7,5
Women				
20-29	3,2	3,3-5,1	5,2-7,0	>7,0
30-39	2,9	3,0-4,2	4,3-6,5	>6,5
40-49	2,7	2,8-4,0	4,1-6,0	>6,0
50-59	2,2	2,3-3,8	3,9-5,5	>5,5
60-69	1,9	2,0-3,5	3,6-5,0	>5,0

When assessing the intensity of exercises, their energy indicators, it is necessary to consider a number of other factors: the type of work performed (static or dynamic); the volume of active muscle mass (local, regional, or global); body weight, age, gender, the level of training (physical preparedness) of the person performing a certain exercise, external conditions during the exercise. If extremely heavy local work is performed for several seconds, the rate of energy consumption by the body does not exceed 1.2 kcal/min. (2-table).

2-table.

Classification of local, regional, and global training loads based on energy consumption (kcal/min)

Type of work	**Exercise**		
	light	**average**	**heavy**
Local palm	0,3-0,6	0,6-0,9	0,9-1,2
One-handed regional	0,7-1,2	1,2-1,7	1,7-2,2
With two hands	1,5-2,0	2,0-2,5	2,5-3,0
Global	2,5-4,0	4,0-10,0	10,0-15,0

Such a rate of energy expenditure is characteristic of both regional work of medium gravity, performed in several tens of minutes, and global, but extremely light work, performed in several days (slow walking on level ground). Heavy global work, which for women aged 50-59 can last for tens of seconds with an energy expenditure of more than 5.5 kcal/min, is average for men aged 20-29 and can be performed by them in a few hours.
In conclusion, we can say that regular physical education and sports activities have a positive effect on the human body and increase its ability to resist fatigue. As a result, diseases of the body are prevented, and labor productivity increases. Therefore, physical culture and sports have great social significance in strengthening the health of our people and increasing their work

capacity. A person who has been involved in sports since youth has a strong sense of striving for perfection.

Physical exercises and sports play an important role in the enormous adaptive capabilities of the human body - long-term adaptation, restoration of the body at the central, intersystem, systemic, organ, tissue, cellular, and molecular levels. The quality of a tempered organism's biological norms is determined by certain morphological and functional characteristics. The nature and degree of these changes are determined by the direction of classes, their frequency, speed, duration, and interrelation, the level of preparedness, individual characteristics, and a number of other factors.

Muscle structure - skeletal muscles are composed of striated fibers and are capable of contracting. Each muscle has a body of the contractile part and two ends, that is, a beginning and a connective (nervous) part. Muscle fibers are connected to each other by a soft connective tissue, and from above they are surrounded by a connective tissue membrane (fascia), which contributes to their separate contraction. Fasciae separate one muscle from the other seven. Fasciae usually surround stratified muscles. For this reason, they are divided into deep, medium, and upper or subcutaneous fasciae according to their location.

When muscles contract, one end approaches the other, resulting in this part of the body beginning to move, meaning muscles perform work. The absolute value of average light and average speed varies for different muscles. In the process of sports training, a person's functional capabilities increase. This increases muscle strength. Accordingly, the absolute volume of optimal loads also increases. The lability and speed of movement of the neuromuscular apparatus increase, and accordingly, the optimal speed of muscle contraction also increases. By contracting, muscles maintain a certain position of the body. Muscle performance depends on the size of its cross-section.

References:

1. Almquist J., Valovich T., Cavanna A., Jenkinson D., Andrew E., Keith L. Summary Statement Appropriate Medical Care for the Secondary School-Aged Athlete. *J. Athletic Training*. 2008. 43 (4): 416–427.

2. Purcell L. K. Sport nutrition for young athletes. *Paediatr. Child. Health.* 2013; 18 (4): 200–202.

3. Питание спортсменов. Под ред. К. А. Розенблюм. *Киев*. 2006. 535 с.

4. Гольберг Н. Д., Дондуковская Р. Р. Питание юных спортсменов. Принципы построения рациона. *М.: Советский спорт.* 2007. 236 с.

5. Jaksimbaevich , U. J., & Jengisovich, A. I. (2024). Features of Professional and Applied Physical Training of Students. *Excellencia: International Multi-Disciplinary Journal of Education (2994-9521)*, *2*(9), 565-568. https://doi.org/10.5281/

6. Zh.Zh.Utegenov. (2022). FEATURES OF PHYSICAL EDUCATION AND HEALTH-IMPROVING ACTIVITIES WITH STUDENTS. *Archive of Conferences*, 4-6. Retrieved from https://conferencepublication.com/index.php/aoc/article/view/1854

7. Tipton K. D., Elliott T. A., Ferrando A. A., Aarsland A. A., Wolfe R. R. Stimulation of muscle anabolism by resistance exercise and ingestion of leucine plus protein. *Appl. Physiol. Nutr. Metabolism*. 2009; 34: 151–161.