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DEPARTMENT OF GENERAL HYGIENE
AND PHYSICAL CULTURE

Optimal motor regime and rational nutrition of people of different ages

Educational-methodical manual
on the organization of independent work and study of the disciplines "Physical culture and sports" and "Elective course in physical culture and sports" of the main professional educational program of higher education – specialty program in the specialty 31.05.03 Dentistry (partially implemented in English)

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This manual is intended to help to understand more deeply the problem of how to maintain reliability in the operation of all body systems. Recommended forms and means of physical culture for people of different ages (physical exercises, active motor regime, balanced nutrition, etc.) are true allies of health. These funds will help maintain health, restore and strengthen it, prolong life, make it full. However, the best way to maintain health is to prevent, prevent the development of diseases. That is why prevention is so important.

The educational–methodical manual for students "Optimal motor regime and rational nutrition of people of different ages" is intended for conducting methodological lessons in physical culture with students of the main and special medical groups studying in the specialty "General Medicine", "Dentistry", "Pediatrics", " Preventive medicine ",“ Pharmacy ”. Compiled in accordance with the curriculum. The presented materials meet the requirements of the educational standard for medical students.

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PURPOSE OF THE LESSON: to form the concepts of "optimal motor regime" and "rational nutrition" among students of a medical university.

A STUDENT SHOULD KNOW:

- the effect of exercise on the human body;
- the concept of "basic exchange";
- daily energy requirement of the human body;
- recurrent features of the motor regime and rational nutrition.

A STUDENT SHOULD BE ABLE TO:

- use approximate optimal motor complex for practice

QUESTIONS TO BE SURRENDED:

- physical culture as an important element of the modern lifestyle a person;
- the effect of exercise on the human body;
- the concept of "basic exchange"; daily energy requirement;
- age–related features of the motor regime;
- age features of a balanced diet;
- approximate optimal motor complex.

RECOMMENDED LITERATURE

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1. Physical culture as an important element of lifestyle modern man

Physical education – a part of culture, which is a set of values and knowledge created and used by society for the purpose of physical and intellectual development of a person's abilities, improvement of his physical activity and the formation of a healthy lifestyle, social adaptation through physical education, physical training and physical development (in accordance with the Federal by the law of the Russian Federation of December 42007 year... 329–FZ "On physical culture and sports in the Russian Federation").

A healthy lifestyle, being the most important component of culture, contributes to the formation of the health of a future specialist. Its essential aspect is the harmonious manifestation of the physical and spiritual capabilities of students associated with social and psychophysical activity in educational, labor, social and other spheres of activity. The conditions that determine the preservation of health, undoubtedly, should include physical culture.

Physical culture is a special, independent part of the general culture of the people. Culture in a broad sense is understood as all the aggregate activity of a person to create material and spiritual values and their use in the process of social and historical practice of people. And physical culture as part of the general culture of society is a combination of achievements and material resources that form a person with the harmonious development of physical, spiritual strength and good health.

Physical culture is an extensive social phenomenon. Its structure is made up of organizational forms (components): physical education, sports, physical recreation, motor rehabilitation. At the same time, each form performs its functions: physical education – development, sport – improvement, physical recreation – preservation, motor rehabilitation – restoration of physical and spiritual conditions of a person. Therefore, it is necessary to distinguish between two concepts: "physical culture" is a part of the general culture of society, and "cultural activities" (more correctly – "physical exercises") is only a form of human motor activity.

Physical education is an educational system that gives a person knowledge about his body, the means of purposeful influence on the physical condition, the preservation and strengthening of health, as well as the need for physical improvement in him, in active physical exercises and sports. In different age periods of a person's life, physical education has its own tasks and characteristics. In the general education system, physical education makes the main contribution to improving the physical development of a person. The state program on physical education at the university establishes that its goal is to form the student's physical culture. This goal is achieved through solving educational, educational and health problems.

2. The effect of exercise on the body

It is known that movement stimulates the vital activity of the human body, activates physiological processes and helps restore disturbed functions in humans. Under the influence of training:

- the nervous system is improving

Being engaged in physical education, we acquire the motor skills necessary in everyday life and in work. Agility, speed and strength of movements of our body develops. The control of movements, which is carried out by the central nervous system, is being improved. During physical exercises, more and more conditioned reflexes are formed, which are fixed and formed in long successive rows. Thanks to this, the body acquires the ability to better and better adapt to greater and more complex physical exertion, thanks to which we can carry out movements more and more economically – our body, as they say, trains.

As a result of training, the work and structure of all organs of our body and, above all, the higher parts of the central nervous system, improve. The mobility of the nervous processes of excitation and inhibition in the cerebral cortex and in other parts of the nervous system increases, that is, the process of excitation passes more easily into the process of inhibition and vice versa. The body therefore reacts more quickly to all kinds of external and internal stimuli, including stimuli that go to the brain from contracting muscles, as a result of which body movements become faster and dexterous.

In trained people, the nervous system more easily adapts to new movements and new conditions of the motor apparatus:

- increased strength and volume of muscles.

With physical exercise, the strength of the processes of excitation and inhibition in the cerebral cortex increases, as a result of which muscle tension increases during their contractions. In this regard, the structure of muscle fibers changes – they become thicker, volume muscle increases. By systematically engaging in so–called strength exercises, for example with kettlebells, you can dramatically increase the volume and strength of muscles in 6–8 months.

This is because the nutrition of the working muscles is significantly improved. In muscles at rest, most of the blood capillaries surrounding the muscle fibers are closed to blood flow and blood does not flow through them. During work, when the muscle contracts, all capillaries open, so the blood flow to the muscle increases more than 30 times. During training, new blood capillaries form in the muscles.

Under the influence of training, the chemical composition of the muscle also changes. In it, the amount of so–called energetic substances increases, that is, substances, the decay of which releases a lot of energy.

In trained muscles, glycogen and phosphorus compounds that break down during muscle fiber contractions are restored faster, and oxidative processes (processes of combining with oxygen) are more intense, muscle tissue absorbs and uses oxygen better:

- maintains a slender posture.

Training is beneficial not only for the muscles. The entire musculoskeletal system is also strengthened, bones, ligaments, tendons become stronger. Systematic physical exercises noticeably affect the external shape of the body, contribute to its proportional development in childhood and adolescence, and in adulthood and old age allow you to preserve beauty and harmony for a long time.

On the contrary, a sedentary, sedentary lifestyle ages a person prematurely. He becomes flabby, his stomach sags, posture deteriorates sharply. Usually, a person who is not engaged in physical labor and sports slouches, his head is tilted forward, his back is humped, his lower back is excessively bent, his chest is sunken, and his stomach is protruded forward due to weakness of the abdominal muscles, even if there is no obesity (and it very often develops in those who move little and do not engage in physical education).

Exercise that strengthens the muscles (especially the muscles of the trunk) can improve posture. For this purpose, it is useful to do gymnastics and swim – best of all with the breaststroke style; the correct posture is promoted by the horizontal position of the body and the even exercise of numerous muscle groups.

Specially selected physical exercises can eliminate the lateral curvature of the spine at the initial stage of development, strengthen the abdominal muscles weakened by inaction or prolonged illness, strengthen and restore the arches of the foot with flat feet. Vigorous exercise and diet can be successful in combating obesity, disfiguring a person:

- heart function improves.

A trained person becomes more resilient, he can make more intense movements and do heavy muscle work for a long time. This largely depends on the fact that his circulatory, respiratory and excretory organs are working better. Their ability to sharply enhance their work and adapt it to the conditions that are created in the body with increased physical exertion significantly increases.

Hard working muscles need more oxygen and nutrients, as well as faster elimination of metabolic products. Both are achieved due to the fact that more blood flows into the muscles and the rate of blood flow in the blood vessels increases. In addition, the blood in the lungs is more oxygenated. All this is possible only because the work of the heart and lungs is significantly increased.

When we are at rest, the heart releases about 5 liters of blood into the aorta within a minute. With intense physical exertion, for example, while running, when

overcoming an obstacle course, the heart rate increases from 60–70 to 120–200 beats per minute, the amount of blood ejected by the heart per minute increases to 10–20 and even up to 40 liters. The blood pressure in the arteries increases from 120 to 200 mm Hg.

In trained people, the heart adapts more easily to new working conditions, and after the end of physical exercises it quickly returns to normal activity. The number of contractions of the trained heart is less, and, therefore, the pulse is less frequent, but with each contraction, the heart throws more blood into the arteries.

With more rare contractions of the heart, more favorable conditions are created for the rest of the heart muscle. The work of the heart and blood vessels as a result of training becomes more economical and better regulated by the nervous system:

- breathing becomes deeper.

At rest, a person produces about 16 breathing movements per minute. With each breath, about 500 cm3 of air enters the lungs.

During muscular work, the amount of absorbed oxygen increases, but within certain limits. The maximum amount of oxygen absorption, the so–called oxygen ceiling, is not so great in untrained people, it is equal to 2–3.5 liters, and in well trained people, the body can receive 5–5.5 liters of oxygen per minute through the lungs. Therefore, during physical work, trained people do not develop an "oxygen debt" so quickly (this is the name of the difference between the need for oxygen and its actual consumption) and they better mobilize the adaptive capabilities of respiration and blood circulation:

- improves blood composition and increases the bodys defenses.

In trained people, the number of erythrocytes (red blood cells) increases from 4.5–5 million in 1 mm3 of blood to 6 million. Erythrocytes are oxygen carriers, so with an increase in their amount, blood can receive more oxygen in the lungs and deliver more oxygen to the tissues, mainly the muscles.

In trained people, the number of lymphocytes – white blood cells – also increases. Lymphocytes produce substances that neutralize various poisons that enter the body or are formed in the body. The increase in the number of lymphocytes is one of the proofs that exercise increases the body's defenses and increases the body's resistance to infection. People who systematically engage in physical exercise and sports are less likely to get sick, and if they get sick, then in most cases infectious diseases are more easily tolerated. In trained people, blood sugar levels become more stable. It is known that with prolonged and hard work of the muscles, the amount of sugar in the blood decreases. In trained people, this decrease is not as sharp as in untrained people. In people, who are not accustomed to physical labor, with increased muscular work, urine excretion is sometimes

disturbed. In trained ones, the kidney function better adapts to the changed conditions, and the metabolic products formed with increased physical activity in greater quantities are promptly removed from the body.

Thus, we see that physical culture and sports have a beneficial effect not only on the muscles, but also on other organs, improving and improving their work.

3. The concept of "basic exchange". Daily energy requirement

Basic metabolism is understood as the minimum level of energy consumption necessary to maintain the vital activity of the organism in conditions of relatively complete physical, emotional and mental rest. In a state of relative rest, energy is spent on the implementation of the functions of the nervous system, the constant synthesis of substances, the operation of ion pumps, the maintenance of body temperature, the activity of the respiratory muscles, smooth muscles, the work of the heart and kidneys.

The bodys energy consumption increases with physical and mental work, psycho–emotional stress, after eating, with a decrease in the temperature of the environment. In order to exclude the influence of these factors on the amount of energy consumption, the determination of the basal metabolism is carried out under standard strictly controlled conditions: in the morning, in the supine position, with maximum muscle relaxation, in a state of wakefulness, in conditions of temperature comfort (about 22 ° C), on an empty stomach (12–14 hours after eating). The basal metabolic rates obtained under such conditions characterize the initial “basal” level of the body's energy consumption. For an adult, the average basal metabolic rate is 1 kcal / kg / h (4.19 kJ). Therefore, for an adult man weighing 70 kg, the energy consumption is about 1700 kcal / day (7117 kJ), for women – about 1500 kcal / day. The intensity of the basal metabolism is closely related to the size of the body surface, which is due to the direct dependence of the amount of heat transfer on the surface area of the body. The basal metabolic rates obtained under such conditions characterize the initial “basal” level of the body's energy consumption. For an adult, the average basal metabolic rate is 1 kcal / kg / h (4.19 kJ). Therefore, for an adult man weighing 70 kg, the energy consumption is about 1700 kcal / day (7117 kJ), for women – about 1500 kcal / day. The intensity of the basal metabolism is closely related to the size of the body surface, which is due to the direct dependence of the amount of heat transfer on the surface area of the body. The basal metabolic rates obtained under such conditions characterize the initial “basal” level of the body's energy consumption. For an adult, the average basal metabolic rate is 1 kcal / kg / h (4.19 kJ). Therefore, for an adult man weighing 70 kg, the energy consumption is about 1700 kcal / day (7117 kJ), for

women – about 1500 kcal / day. The intensity of the basal metabolism is closely related to the size of the body surface, which is due to the direct dependence of the amount of heat transfer on the surface area of the body.

The World Health Organization (WHO) has derived the daily energy requirement for men and women of different ages (Table 1)

Table 1. Daily energy requirement of men and women

Groups of different intensity of work	Age	Daily requirement for basic physical activity (kcal)	Daily requirement with additional physical activity (kcal)
Men			
Persons whose profession is related to mental work	18–40	2800–3000	3100–3300
	40–60	2600–2800	2800–3000
People whose profession is associated with little physical effort (service industry, etc.)	18–40	3000–3200	3300–3500
	40–60	2800–3000	3000–3200
People whose profession is associated with significant physical effort	18–40	3700–3900	4010–4200
	40–60	3400–3600	3600–3800
Retirees	60–70	2350–2500	2500–2650
	over 70	2200	
Women			
Persons whose profession is related to mental work	18–40	2400–2600	2650–2850
	40–60	2200–2400	2350–2550
People whose profession is associated with little physical effort (service industry, etc.)	18–40	2550–2750	2800–3000
	40–60	2350–2550	2500–2700
People whose profession is associated with significant physical effort	18–40	3150–3350	3400–3600
	40–60	2900–3100	3050–3250
Retirees	60–70	2100–2200	2200–2500
	over 70	2000	

4. Age features of the motor regime and rational nutrition

The most effective stimulator of all physiological functions is physical activity. It increases the adaptive capabilities of a person at any age. Physical exercise allows not only to slow down the aging process and prolong life, but also to prolong the creative activity of a person.

Adolescence (up to 20 years for girls, up to 21 years for boys) – this is the age of maturity, when the functional capabilities of the organism are approaching sufficiently high indicators, when, in the context of talking about health, a person must be physically prepared for solving basic social problems. The physical education of young men and women must now have a clear gender differentiation, due to their biological and social differences. Therefore, it is hardly advisable to recommend to a girl those types of physical exercises that, to one degree or another, may adversely affect her fertility. First of all, this should include purely strength exercises, the negative effect of which for the female body is obvious: an increase in hormones in the body – androgens and corticosteroids, an increase in intra–abdominal pressure, a decrease in the elasticity of soft tissues, etc.

The biological purpose of a man also determines some specific approaches to the choice of means of physical culture for young men. In many ways, predetermining the perfect functioning of the life support systems of the body, a number of exercises can be recommended to him. First of all, these are gymnastic, which include two types:

- power and speed–power;
- flexibility.

A prominent place in physical education should be played by games that educate agility, accuracy of movements, an eye, a sense of camaraderie and collectivism – all those qualities that a man needs in realizing his everyday, social and personal destiny.

*Age period from 25 to 35 years*accompanied by a sedentary lifestyle. Muscle tissue is replaced by adipose tissue. There is an increase in body weight with all the sad consequences. The regulation of all functions undergoes significant changes. Clinical practice shows that it is at this time that the first signs of aging are revealed, in particular, the rudiments of atherosclerosis. The ability to absorb oxygen from the air, for example, is reduced by 1% annually. Note that systematic training increases physical and emotional tone, immunological reactivity, being a means of prevention diseases. In addition, exercise can delay the onset of many of the symptoms of aging. Cardiologists emphasize the important role of physical activity in the prevention of coronary insufficiency, atherosclerosis and their complications. If a person who has stepped over the 30–year mark, will daily exercise all body systems, then, as proven by practice, the beginning of his old age can be postponed by 10 or more years.

To promote health, wellness activities should consist of three main elements: exercises to develop general endurance, muscle strength and flexibility (mobility in the joints and the spinal column).

For older people effective and acceptable physical exercise can be recommended:

1. Low–intensity cyclic exercises (walking, running, swimming, skiing, etc.). Performed in an aerobic mode (with a heart rate of 120–140 per minute), these exercises are easily technically feasible and accessible to a wide range of older people and, with rare exceptions, have no contraindications. Such exercises help to increase the performance of all oxygen transport systems of the body, train thermoregulation, normalize metabolism, etc. The peculiarities of the methodology and planning of classes with these types of physical exercises should be attributed, on the one hand, a gradual increase in load due to the time of their implementation without changing the intensity (aerobic regimen), and on the other, it is gradual.

2. Gymnastic exercises for the joints of the spine, shoulder, hip and ankle. These exercises should be performed without weights, preferably under conditions of unloading the corresponding joints, but with multiple repetitions.

3. Hygienic gymnastics, which older people can do 2–3 times during the day, lasting 7–10 minutes. Each session of hygienic gymnastics can be devoted to one or more groups of exercises.

In organizing physical exercises with older people, some peculiarities should be taken into account. Due to the slow adaptation of their body to motor activity, the process itself penetration should be lengthened, that is, you should start at a low intensity and slowly increase it. Usually, the maximum intensity should be reached in the middle of the second half of the session (that is, with a 45–minute session – at 25–35 minutes). Likewise, the reduction in load should be gradual. The recovery of functional indicators after physical work in older people occurs slowly, therefore, the repeated load should be somewhat postponed in time. The main criteria for choosing a load in terms of intensity, repetition and volume should be the well–being of the student and such indicators as pulse, sleep, appetite, desire to exercise, etc.

*The basic principle of good nutrition*is its balance and correct regime. For the proper organization of nutrition, it is necessary to determine the value for a person of individual nutrients and to clearly understand the need for them, depending on the age of the profession, climate and social conditions.

For normal functioning, the body needs seven basic nutrients. Long–term absence of even one of them can lead to serious health problems. Let's arrange them according to their importance for the body:

1. Water.

According to various theories, we need from 1.5 to 3 liters of water per day. Do not forget that by weight we are mainly composed of water, so for normal life we need a lot of water.

2. Protein.

It is the main building material for our body. Fish, skinless chicken or turkey, dry beans and peas are high in protein and not too much fat.

3. Carbohydrates.

It is the main fuel for normal life. The body does not store carbohydrates. Bread, cereals and pasta contain a whole complex of carbohydrates (and this is an important source of energy), vitamins, minerals and plant fibers. Starchy foods are believed to add weight. However, the danger is not in them, but in the additives that are common for these dishes containing a large amount of fat – butter on a sandwich, gravy for pasta. Avoid foods that contain a lot of butter and sugar, and therefore a large excess of carbohydrates – rolls and cakes. Give preference to bran bread – it is rich in healthy plant fibers.

4. Fats.

Fat is a very important element in our diet. They function as a building material in the body and store energy. Food cannot be considered healthy without some fat. However, all fat in food is a mixture of three types of fatty acids: saturated, monounsaturated, and polyunsaturated. Saturated fat is found in meat, dairy products, coconut, and palm oil. It should be limited to 10% of calories (which is about a third of your fat intake) or less. Too much of it increases cholesterol and the risk of heart disease. Monounsaturated fats (in olive and peanut oil) and polyunsaturated fats (mainly in vegetables, corn, soy, and some fish) are much healthier.

5. Fiber.

It is not absorbed directly by the body and does not participate in metabolic processes. But it performs vital functions in the body. This diet is chronically deficient in fiber. It is advisable to consume 30–40 grams of fiber per day.

6. Vitamins and minerals.

Vitamins and trace elements are vital elements for the body. World statistics claim that 70% of deaths occur for three main reasons: cardiovascular disease, cancer and strokes. 50% of the causes of these diseases are directly related to nutrition. In our normal diet there is an excess of substances harmful to our body, and on the other hand, we lack many essential nutrients.

Excess	Disadvantage
animal proteins (meat)	vitamins
fats	minerals
carbohydrates	proteins, essential amino acids
salt	vegetable fiber
sugar	water
carcinogens	polyunsaturated fatty acids

The following rules of rational nutrition have been developed by many years of practice.

1. *Freshness.* Fresh plants are most useful. Do not leave cooked food even for several hours. The processes of fermentation and decay begin to take place in it. Therefore, it must be eaten immediately.

2. *Raw food diet.* It has long been believed that raw plants contain the greatest life–giving force.

3. *Variety of food:* the more different foods are included in the diet, the more physiologically active substances enter the body. This is especially important due to the fact that with mental stress, the need for them increases, and appetite is often reduced.

4. *Certain alternation of products.* It follows from the previous one and indicates that one and the same dish or product cannot be used for a long time.

5. *Seasonality of food.* Increase the amount of plant foods in the spring and summer. In cold weather, add foods rich in proteins and fats to the diet.

6. *Restriction in food.* Studies show that those who eat a lot are less efficient, more susceptible to fatigue.

7. *Maximum pleasure from food.* To do this, first of all, you need to give up rushing, at least for the time of eating. You should forever abandon the habit of sorting things out over food, as well as reading.

8. *Specific product combinations.* There are incompatible dishes and this must be taken into account. With unfavorable food combinations in the intestines, increased fermentation and decay of food develop, and poisoning occurs with the resulting harmful substances.

9. *Avoid dietary stress* (abrupt changes in diet, causing significant stress of adaptation mechanisms). Those. you can’t eat from hand to mouth one day, and the next day to eat.

5. An approximate complex of the optimal motor regime

1. Posture exercise

Stand with your back to the wall. Straighten fully. The walls only touch the back of the head, shoulders, pelvis and heels. Seen from the side, you should look like one line: the ear and shoulder, thigh and ankle are in the same line. In this position, take deep breaths and exhales for half a minute. After completing the exercise, move away from the wall in the same straightened state. Do this exercise several times a day to create correct posture.

2. Walking in place

There is no simpler exercise. Stand shoulder–width apart. Straighten your back and begin to lift your right leg, bending it at the knee at an angle of 90 °. Lower your leg and repeat the same with your left leg. Add arm swings to the exercise.

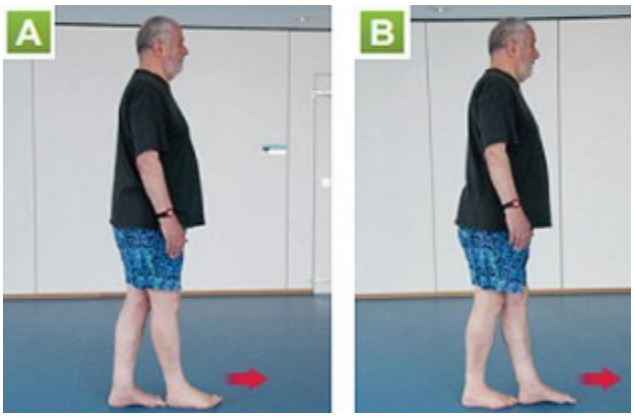
3. Side slopes with touching the floor

Stand straight with feet shoulder–width apart. Begin to bend smoothly to the left, touching the floor with your left hand, then straighten up. Next, do the same, leaning to the right side. Repeat several times for each side.

4. Steps to the side

Stand up straight. Begin to take a wide step with your right leg to the side, and then pull your left leg towards it. Take 10 steps one way and 10 the other. For a change, you can turn your head to the side while taking a step. To facilitate the exercise, you can touch with your hands some support, such as a wall.

5. Walking the tightrope



Dont be alarmed, the exercise is just like walking on a tightrope. When walking, place your foot in front of the other. Walk forward a few meters and then take similar steps backwards. You can also try moving with your eyes closed to train the vestibular apparatus.

6. Exercise "snake"

Place some chips or, for example, plastic cups on one line a meter apart from each other. From one end of the line, start to go around the obstacles with a snake without touching them. To complicate the exercise, you can reduce the distance between the chips and speed up the movement.

7. Walking on toes and heels

The goal of the workout is to develop the lower legs. Walk for a few minutes, first on your toes and then on your heels. For a change, you can alternate between heel and toe. To complicate things, you can turn your head from side to side while walking. Exercise perfectly develops motor functions not only for older people, but for all people in general.

CONTROL AND TRAINING TESTS:

1. **The largest amount of oxygen uptake in untrained of people:**
   a) 3–4.5 liters;
   b) 2–3.5 liters;
   c) 5–5.5 liters
2. **The daily energy requirement with the main physical workload amongmen aged 40–60 years of profession, which are associated with mental labor:**
   a) 2000–2500 kcal;
   b) 3000–3500 kcal;
   c) 2600–2800 kcal
3. **The daily energy requirement during the main physical activity in women aged 18–40 years of occupation, which are associated with significant physical effort:**
   a) 3000–3500 kcal;
   b) 3500–3700 kcal;
   c) 3700–3900 kcal
4. **The daily energy requirement for basic physical activity in men over the age of 70:**
   a) 1000 kcal;
   b) 2000 kcal;
   c) 2200 kcal
5. **Low–intensity cyclic exercises are:**
   a) gymnastic exercises;
   b) walking, running, swimming, skiing;
   c) wrestling, barbell, volleyball
6. **Foods containing protein:**
   a) bread, cereals, pasta;
   b) fish, chicken, legumes;
   c) dairy products
7. **The bodys daily need for fiber is:**
   a) 20–30 g;
   b) 30–40 g;
   c) 40–50 g
8. **Substances that are deficient in the human body:**
   a) salt;
   b) carcinogens;
   c) vitamins.