GENERAL PHYSIOLOGICAL PRINCIPLES OF PHYSICAL EDUCATION AND SPORTS

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Abstract: The specificity principle of the exercise effect when choosing exercises to train, when it comes to achieving high sports results and high savings in the exercise performance, which depends more on the movement skills improvement (its performance techniques) should play a leading role. The greatest effect of exercise on movement skills (sports technique) is achieved by performing the exercises that are considered to be the main training.

Keywords: physical education, sports, loading, adaptation, training, technique, exercise, result, physiological.

Introduction

Systematic physical activity or sports stimulates the body to adapt to physical activity. At the center of this adaptation lie the morphological, metabolic, and functional changes that occur in various organs and tissues as a exercise result, and the functions cellular control improvement at the nervous, hormonal, and autonomic levels. All these changes determine the training effectiveness. They are manifested in the various functions improvement of the body that provide certain (exercised) muscle activity, and, consequently, in the physical fitness level improvement (exercise) of the trainee, in the sports results growth. In the factors analysis determining the exercise effectiveness, the following physiological laws are distinguished:

1) basic functional exercise effects;

2) threshold loads for the exercise effects occurrence;

3) exercise results specificity;

4) exercise results return;

5) the ability to exercise that determines the exercise effects magnitude.

There are two main functional exercise effects and the systematic performance of a exercise particular type (training) produces two main positive functional effects:

1) to strengthen the whole body and its maximum functional capacity, the leading systems that provide exercise;

2) to increase the whole organism efficiency (economy) and its organs and systems activity during the type performance of muscle activity being exercised.

The first effect is indicated by the increase in the maximum values that can be observed during the limit, maximum tests (exercises) performance. These parameters are reflected in the current maximum functional body capacity, which is important for this type of muscle activity. For example, the training endurance effectiveness is measured by the increase in the body's maximum aerobic capacity - maximum aerobic capacity and maximum aerobic capacity.

The second effect is the functional shifts reduction in the various leading organs and systems activity of the body during the standard non-maximum load performance. For example, when performing a uniform load, there are fewer functional shifts (according to this, pulmonary ventilation, amount and level of skeletal muscle contraction activity, body temperature, concentration of lactate,

catecholamines and other hormones in the blood, sympathetic nerve activity, etc.) after a certain period of exercise than when not exercising, or in the same person, and a decrease in energy expenditure (e.g., oxygen consumption) during this exercise.

Exercise threshold loads any systemic physical activity is not considered an exercise. This is because the increase in the functional capacity of the whole organism and its individual organs and systems, that is, the exercise effect occurs only when the systemic functional exercise loads must reach or exceed a certain threshold load. Such a threshold exercise load should be greater than the usual load (in daily life or habitual exercise).

Therefore, the threshold overload principle is often defined as the progressive overload principle.

The most important rule when choosing threshold exercise loads is that they should be in some way compatible with the current functional person capabilities (the systems that lead him or her to exercise). For example, a single exercise load can be a threshold or over-the-counter (exercise) load for someone who exercises less, and a lower than the threshold for someone who exercises at a higher level, and because of this, it can be ineffective. Hence, the pedagogical individualization principle is to a large extent based on the physiological principles of threshold loads.

When determining the exercise load, the educator (coach) must have a sufficient understanding of the physiological (functional) capabilities of physical education and sports.

The pedagogical principle of gradual (gradual) increase in load is also, in essence, a consequence of the physiological principle of threshold loads, because the exercise threshold load is gradually increased as the functional capacity of the exerciser increases. To solve different exercise tasks (increase physical fitness, increase sports results, improve health, restore the ability to work after illness and injury, etc.) and for people of different ages, genders and levels of functional training (exercise) downloads are required. The relative and absolute threshold loads used by athletes to improve athletic performance are much higher than those used by those who engage in physical activity to improve their health. Different threshold loads are used in the same situation to increase functional capacity (physical fitness) and in other cases to keep them at the achieved level.

The main physical loads parameters are their intensity, duration and frequency, and together they determine the load amount. Although each of these parameters plays an independent role in determining the exercise effect magnitude, their interaction is so complex that it is not yet possible to distinguish the relative role of each and the substitution degree. The role of each physical activity parameter depends much more on the indicators choice on which to think about the exercise effectiveness.

The relative importance of threshold physical activity parameters also depends on the exercise type (strength, speed-strength, endurance, technical or game) and the nature (continuous cyclic or repetitive interval).

Intensity of exercise loads. There are several physiological ways to determine the intensity of loads when performing global cyclic exercises during endurance training. The direct method of measurement is to measure the rate of oxygen consumption in absolute (l/min) or relative (% TOC) or metabolic equivalent units (MEU). All other methods are indirect. They are based on a certain relationship between the aerobic exercise intensity and the physiological parameters during its performance. The most commonly used such indicators are heart rate reduction frequency and anaerobic threshold. Due to its simplicity, it is often used in conjunction with heart rate reduction frequency.

Determining the exercise intensity loads according to heart rate reduction frequency. The basis for determining the exercise intensity loads by heart rate reduction frequency is the direct relationship between them: aerobic cyclic loading. When determining exercise loads for healthy young women and young men engaged in physical activity. For example, in adolescents with a maximum 200 beats/min heart rate reduction frequency, the threshold, peak, and average exercise heart rate reduction frequency are 150 beats/min (200 to 75%), 190 beats/min(200 to 95%), respectively and 170-190 beats/min (200 to 85-95%).

The lower the functional training level, the lower the intensity (absolute and relative) of the exercise load: training should take place at relatively low oxygen consumption rate levels (% TOC) and heart rate reduction frequency (%heart rate reduction frequency max or heart rate reduction frequency nio).

It is recommended to start running when the TOC is 50-60% or heart rate reduction frequency max is 60-70%. In this case, the simple formula for determining the exercise load on heart rate reduction frequency is: 180 - age (years). As the level of exercise increases, the relative intensity of the load should gradually increase to TOC 80-85% (up to 95% heart rate reduction frequency max).

Another pulsed exercise measure load intensity is the sum of heart rate reduction frequency th and heart rate reduction frequency.

In this case, the heart rate reduction frequency exercise calculation is performed as follows. In a young person, heart rate reduction frequency should be 70 beats/min, heart rate reduction frequency maks is 200 beats/min, heart rate reduction frequency zax is 130 beats/min (200-70).

Recommended weight for heart rate reduction frequency exercise is 60%. Therefore, the absolute working growth of heart rate reduction frequency should be 62 beats/min (130 to 60%), which the recommended exercise heart rate reduction frequency should be: heart rate reduction frequency + heart rate reduction frequency, i.e. 132 beats/min (70 + 62).

Exercise intensity determination by anaerobic threshold (AB). When determining the load intensity on the heart rate reduction frequency, it is possible to get the voltage idea applied mainly to the cardiovascular system (primarily the heart), and AB is more closely related to the metabolism in the working muscles. Therefore, there is not always a quantitative correlation between these indicators. However, on average, AB4 (4 mmol/l) is 70-90% of the maximum and the relative oxygen consumption rate is around 70% of the TOC. Therefore, during an AB-level exercise load, the heart rate reduction frequency should be slightly higher than 85% of the heart rate reduction frequency max, or heart rate reduction frequency 80%, or TOC 70%.

Duration of exercise loads. In order to call for an exercise effect, the exercise load must last long enough. This applies to individual training sessions, the training session itself, and the duration of the overall training cycle. On the one hand, the relationship between the intensity and duration of exercise loads and, on the other hand, the relationship with exercise efficiency is very complex.

The threshold duration of a training load depends on its intensity: at lower intensities, the load should be longer.

The total threshold duration of physical activity, which gives a significant effect of exercise, is 10-16 weeks for aerobic exercise (endurance) and 8-10 weeks for anaerobic exercise (speed). In beginners, after 2-3 months of training, the TOC increases by 5–25% (depending on the initial level), and after 2–3 years, the TOC may increase by 40% (from 45 to 65 ml/kg·min). It is now possible to think about the optimal duration of training to achieve the highest functional performance by comparing them in different groups, ie those who do not play sports for several months to several years, and well-known athletes. However, such a comparison does not allow us to determine the extent to which the

difference is determined by the duration of the exercise (and the regimen) and to what extent it is hereditary. Frequency of exercise loads. The frequency of exercise loads is also complexly correlated with other parameters of exercise load, and different contingents of trainers are not the same for each exercise goal. The same results can be achieved with relatively short daily physical activity and long-term (but much lower-intensity) exercise 2-3 times a week. Increasing the frequency of physical activity to more than 3 times a week does not have the effect of additional exercise in relation to the increase in TOC.

Threshold frequency for endurance training - 3-5 times a week, for speed-strength training - 3 times a week. There is a certain correlation between the frequency and duration of exercise loads, in particular with respect to TOC increase (see Figure 8.1, C).

The volume of exercise loads. As mentioned above, the intensity, duration, and frequency of exercise loads together determine its size. If the intensity reaches or exceeds the threshold, then the total volume is an important factor in increasing the effectiveness of the exercise.

In general, the more frequent and long the training sessions (load capacity), the more effective they will be. This is especially true for endurance training. In people who are physically active, the increase in physical fitness is similar during the two exercise regimes (if the total energy resources are the same) - at low intensity for a long time and at high intensity for a slightly longer duration. When the total energy value is the same (when the energy expenditure is the same), the results of the exercise are less dependent on the cyclic exercises used (running, walking, swimming, etc.). The increase in TOC, in particular, is directly related to the intensity, frequency, and duration of exercise loads, i.e., their total volume, and averages 5 to 25% during different regimens.

The exercise effectiveness depends on the training regime:

A is an increase in four groups activity approximately the same, with different exercise loads (on a bicycle ergometer); B is the combined frequency effect and exercise duration loads on the physiological exercise effects; C is the effect of the frequency and duration of exercise loads on the TOC; D - Dependence of TOC growth on exercise intensity (determined in% of TOC) (Ya. M. Kots).

However, there is no linear relationship between exercise load and exercise efficiency. For example, a total of 2 hours of exercise per week can increase the TOC by 0.4 l / min. Increasing the total load to 4 hours per week increases the TOC not by two times (0.8 l/min), but only by 0.5-0.6 l/min.

Specificity of exercise results.

Systematic performance of a single exercise (training) calls for a specific body adaptation, which provides a significant improvement in the exercise performance under training. This adaptation is reflected in the specific exercise results - the maximum increase in the exercise (sports results) and its economical performance effectiveness. Therefore, exercise programs should be designed in such a way that they develop the specific physiological ability required to perform this exercise or the same physical (sports) activity type (the exercise specificity principle).

The exercise effect specificity is largely due to the threshold loading principle. The fact is that the exercise effects are manifested only in the organs, systems and mechanisms that lead to this exercise performance. Accordingly, the exercise results specificity is observed in the predominance or dependence only on the leading physical (movement) qualities, leading energy systems, increasing the participation level in improving the coordination, composition and the muscle activity level groups involved in the exercise.

Among the strenuous exercises, we can distinguish similar exercises in terms of their functional requirements nature - leading movement and energy system qualities, movements' coordination, the muscle groups composition involved. In this case, the similar exercises use (in one way or another) as training-wise, can lead to similar general exercise results. However, the higher the functional requirements for the body, the greater the physiological reactions specificity and their specific adaptation to exercise. Therefore, in health-improving physical education and in the early sports training stages, similar exercises varieties that create the general exercise effect (general developmental exercises) can be widely used. As functional requirements (functional training) increase to further enhance athletic performance, the specific exercise principle needs to be taken into account to a greater extent. The greatest training effect at the high sportsmanship level is achieved during the sports training, which is the main for this sport (competition).

Exercise results specificity in relation to movement skills (sports technique). Performing any exercise type is characterized by the specific muscle activity characteristics - their specific set, activity level, the time sequence of joining and stopping. All these features are determined by a specific implementation of central nervous system of action control. This program is gradually improved during the exercise process, and it helps to maintain a high level of technique (results and savings) in the exercise being trained.

When it comes to achieving high athletic performance and high efficiency in exercise, which depends more on the movement skills improvement (performance techniques), when choosing the exercises to be trained, head exercise should play the principle effect specificity. The greatest exercise effect on movement skills (sports technique) is achieved by performing the exercises that are considered to be the main training. Exercise results specificity in relation to the leading physical (movement) quality. The most obvious example of this is the fact that muscle strength training has little effect on endurance, while endurance training usually does not change muscle strength. Speed-strength training greatly increases an athlete's speed-strength capabilities, and systems that help to show endurance develop little or no mechanisms development. Endurance training, on the other hand, causes an increase in endurance with little effect on the systems responsible for the muscle strength display. To develop a certain physical (movement) quality, it is necessary to use specific training exercises and regimens that are responsible for the exercise quality development level and, consequently, load the highest level of physiological systems and mechanisms that contribute to its most effective development. In particular, the exercises performance uses the three main energy systems of the working muscles to varying degrees and loads them in flexion.

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