Effect of Nano Selenium on Improvement and Recovery of Body Function after Aerobics Training

Hefei Wan[*]

Department of Physical Education, China Foreign Affairs University, Beijing, 100037, China

[*]*corresponding author*

Abstract: Aerobics is a kind of sports that integrates fitness performance and artistic creation. Through the use of body shape, music, dance, music rhythm and other performance means, the body shape, movement, temperament, spirit and other comprehensive performances of bodybuilders can be displayed, so as to achieve the goal of improving the health level and strengthening the body. This paper aimed to explore the effect of nano selenium on the improvement and recovery of body function after aerobics training. In this paper, Euclidean distance, Markov distance and chi square test were proposed. Based on this study, the effects of nano selenium on body function after aerobics training were analyzed. The experimental results in this paper showed that compared with the placebo group, the nano selenium group had significant differences 3 minutes after exercise, and the blood lactic acid concentration showed a downward trend after exercise. During exercise, the blood glucose concentration decreased, and increased 3 and 6 minutes after exercise. As for the nano selenium group, the subjective physical sensation (RPE) value of 60 min after taking nano selenium was significantly lower than that before taking nano selenium. Moreover, there was no significant difference in RPE values between 30 min and 45 min of exercise compared with 15 min. Before taking the medicine, there was a significant difference in heart rate between the groups 3 min and 6 min after exercise, but there was no difference on the whole. In the placebo group, the heart rate decreased significantly at 3 min and 6 min after exercise compared with that before administration. Moreover, through the research and analysis of the effects of nano selenium on the function of tissues and organs and physiological indicators after aerobics training, it can be found that nano selenium has a significant improvement effect on the myocardial injury after aerobics training.

1. Introduction

Selenium is a nutrient element, which exists widely in nature. Selenium has many effects on human health. For example, selenium can reduce the content of cholesterol in serum, reduce

oxidative stress and protect the body from free radical damage, resist radiation and prevent thrombosis, regulate blood lipids, and fight viruses. When the human body is overloaded, the body produces inflammatory reaction and lipid peroxidation damage. Overload training leads to the decline of immunity, muscle damage, joint deformation, cardiopulmonary function decline and other consequences. In calisthenics training, because the strength of human skeletal muscle is very strong, it requires the gymnast to have good physical coordination, as well as strong muscle endurance and strength. Selenium participates in the process of energy metabolism during exercise, which can improve the energy level and nutritional status of the body. Aerobics rich in selenium can effectively improve the exercise ability and physical function recovery level of aerobics athletes. In addition, it also plays an important role in improving the performance and disease resistance of aerobics athletes.

In view of the current research status of aerobics, different researchers have conducted relevant collaborative research. Based on artificial intelligence, Jia L developed a set of intelligent based core training system of aerobics specific strength quality [1]. Symonik A V aimed to explore the influence of physical aerobics on the physique and functional quality of girls aged 18~19 [2]. Barova I aimed to explore the attitude of college students when they engaged in mixed aerobics. It had laid a foundation for the teaching mode of mixed aerobics in colleges and universities [3]. However, these scholars lacked some technical argumentation on the exploration of body function recovery after aerobics training. It was found that nano selenium has a certain effect on the recovery of this aspect. In this regard, the relevant literature on nano selenium was consulted.

Some scholars also have some research on nano selenium. Considering the antioxidant effect of nano selenium particles and exercise training, Chekachak S aimed to check the effect of aerobic intermittent exercise training and oral nano selenium supplementation on cachexia status of mice suffering from bread cancer [4]. Fodor J described the beneficial effects of selenium supplementation on sarcoplasmic reticulum calcium release and muscle strength in the elderly, and pointed out that with age, the increase of muscle mass did not improve physical performance [5]. However, these scholars did not discuss the impact of nano selenium on the improvement and recovery of physical function after aerobics training, but only unilaterally discussed its significance.

This paper drew the following conclusions by studying and analyzing the influence of nano selenium on the body function after aerobics training. Nano selenium has obvious effect on the function and recovery of the body after fitness activities,. It can also increase the resistance and immunity of the body, so that it has a healthy physique. At the same time, nano selenium can significantly improve the myocardial damage after exercise.

2. Methods of Improving Physical Function after Aerobics Training with Nano Selenium

2.1. Nano Selenium

Nano selenium is a new kind of trace element. Its appearance and application have greatly improved the living standard of human beings. However, the application of nano selenium in food industry is very limited [6]. Nanometer selenium is a kind of nano particle distributed at the molecular level on the spatial scale of small molecules or micro nanometers. Its diameter is generally smaller than that of nano particles (less than 100 nm), and it has stronger biological activity. Nano selenium has biological activity, anti-oxidation, anti-tumor and other effects. It is the most widely used natural antioxidant in the food industry. By studying the mechanism and action mechanism of nano selenium promoting the formation of various bioactive substances such as protein and nucleic acid metabolism, it is found that the existence of nano selenium has good biological activity, so it is widely used in the field of food industry. However, at present, the depolymerization of nano selenium is weak and its safety to humans and animals is not high.

Moreover, nano selenium has no biological activity in the body, so nano selenium is a natural antioxidant widely used in the food industry. However, nano selenium is seldom used in food industry. The biological activity of nano selenium is relatively good, which is seldom used in human body [7]. Nano selenium has good biological activity. Its physiological activity mainly depends on the amount and biological activity required by the human body to synthesize and metabolize trace elements. However, current research shows that there are two ways for human body to synthesize nano selenium. First, it is directly added to food. Second, it is indirectly applied through injection to human body [8], as shown in Figure 1.
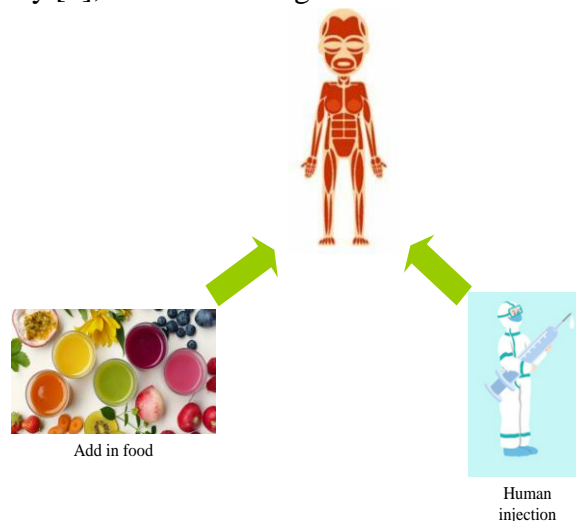

Add in food

Human injection

Figure 1. Human body synthesis of nano selenium

In vivo, nano selenium combines with oxygen to form an unstable selenide, which can protect vascular endothelial cells from free radical damage and biofilm degradation reaction. It can also prevent various oxidative stress reactions so as to improve the permeability of blood vessels, enhance the adhesion and repair ability of vascular endothelial cells, and thus enhance the immunity of the body. It prevents cardiovascular diseases such as arteriosclerosis and hypertension. In addition, nano selenium can prevent cell membrane degradation. In animals, nano selenium can promote protein synthesis, participate in biofilm formation, cytoplasmic formation and mitochondrial function [9]. In addition, scientists have tested various biological functions and found that nano selenium can promote antibody formation and enhance the function of the immune system. When the human body synthesizes nano selenium and releases it into the blood, it can reduce the content of some components in the human plasma related to human blood viscosity and blood viscosity. Moreover, it can inhibit the growth of tumor cells [10].

Nano selenium has been extensively studied in the world, which can be used in many fields such as sports rehabilitation, health care, weight loss, and treatment. Among them, nano selenium is known as the "medicine of life", which has the functions of reducing sports injury, improving human immunity and anti-aging. It has good effects on exercise rehabilitation, weight loss and anti-aging [11]. Therefore, the research and utilization of nano selenium is of great significance to the improvement and recovery of body function after aerobics training.

2.2. Aerobics Action Recognition

There are two main links in action recognition of aerobics. First, after completing the corresponding actions, the corresponding actions are used to recognize the actions of the body muscles [12]. The second is to compare, identify and remember actions by some means. These two

links are indispensable. There are many different stages and types of aerobics movements in aerobics events, which correspond to different action recognition models [13-14]. In this paper, a dynamic time warping algorithm (DTW) is proposed to recognize human motion.

DTW is a nonlinear dynamic rule method that combines distance measurement with time rule, which has been widely used in speech recognition for the first time [15]. Similar to speech recognition, there is a difference in the time of each person's action in behavior recognition. This difference results in different frames of fixed actions in the template sequence to be tested, which leads to unsuccessful matching with the authentication template, as shown in Figure 2. In human behavior recognition based on DTW algorithm, it is necessary to find the minimum distortion distance of the two motion tracks of the template to be tested and the template to be certified [16].
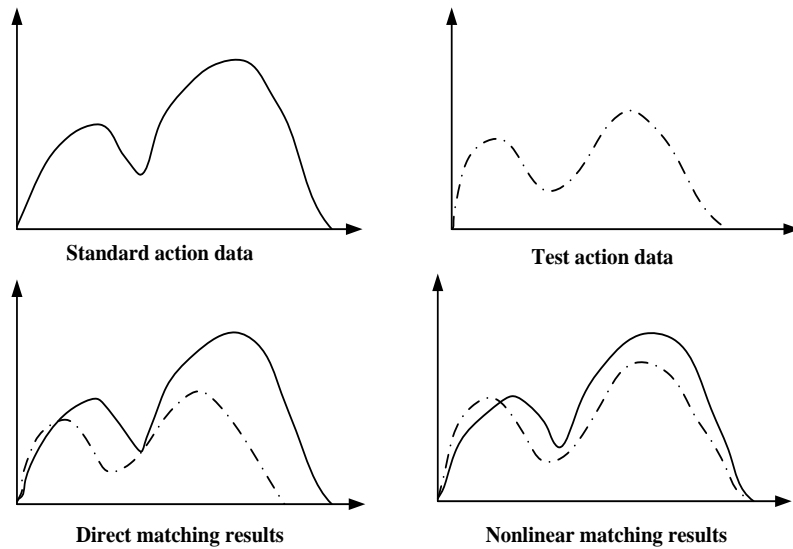

Figure 2. Comparison of algorithm matching results

Supposing two action templates with different lengths, test sample template $Y = (Y_1, Y_2, \cdots, Y_m)$ and standard sample template $T = (T_1, T_2, \cdots, T_m)$, a matrix F of $z * m$ for the two templates is built. This matrix maps two templates [17].

In F, the set including matrix elements is defined as regular path E in the following form.

$$E = \{e_1, e_2, e_3 \cdots e_l\} \quad \max(z, m) \leq l \leq z + m - 1 \qquad (1)$$

Constraints to be satisfied by regular path E are as follows:

Continuity: two adjacent elements in E must be adjacent elements in matrix F, including diagonal [18].

Monotonicity: if e_o is f_{sn} and e_{o-1} is $f_{s`n`}$, then $s - s` \geq 0$ and $n - n` \geq 0$.

The minimum distortion distance of DTW is obtained from E, as follows:

$$DWT(Y, T) = \min\left\{\left(\sum_{l=1}^{l} e_l\right)/l\right\} \qquad (2)$$

The cumulative distance $\delta(o, k)$ can be obtained through the dynamic programming idea as follows:

$$\delta(o, k) = f(Y_o, T_k) + \min\{\delta(o - 1, k - 1), \delta(o - 1, k), \ \delta(o, k - 1)\} \qquad (3)$$

(1) Euclidean distance

Euclidean distance, also known as Euclidean geometric length, is a classical distance formula widely used in various fields [19]. The Euclidean distance of these two z-dimensional vectors c and

u is defined as follows:

$$f_{c,u} = \sqrt{\sum_{l=1}^{z}(c_l - u_l)^2} \tag{4}$$

Here, c_l and u_l are the l-dimensional vectors of vector c and vector u. The Euclidean distance between two points $s(c_1, u_1)$ and $n(c_2, u_2)$ can be expressed by the following formula:

$$f_{sn} = \sqrt{(c_1 - c_2)^2 + (u_1 - u_2)^2} \tag{5}$$

The advantages of European distance are simple and widely used.

(2) Markov distance

Markov distance represents the covariance distance of data.

The formula of Markov distance of vectors C_o and U_k is as follows:

$$f_{c,u} = \sqrt{(C_o - U_k)^Y D^{-1}(C_o - U_k)} \tag{6}$$

The covariance matrix is recorded as D.

The advantage of Markov distance is that it is not affected by dimension.

(3) Chi square test

The chi square test is usually applied to the analysis of counting data. The statistic obtained by dividing the square of the difference between the actual observation times g_p and the theoretical times g_r by the theoretical times approximately follows the chi square distribution, as shown in the following formula:

$$c^2 = \sum \frac{(g_p - g_r)^2}{g_r} \tag{7}$$

The bigger the g_r, the better the approximation. Obviously, the greater the difference between g_p and g_r, the greater the chi square value. The chi square test similarity formula is as follows:

$$f_{c,u} = \sum_{o=1}^{z} \frac{(c_o - u_o)^2}{c_o + u_o} \tag{8}$$

For chi square coefficient f, it is 0 when matching perfectly. The higher the coefficient, the greater the difference between the two vectors.

3. Experimental Results of the Influence of Nano Selenium on Physical Function after Aerobics Training

3.1. Test Objects and Methods

After written confirmation (signed the Informed Consent Form), 20 aerobics athletes from the School of Competitive Sports of Sport University volunteered to participate in this experiment. The subjects met the following conditions: non-smokers, 18-22 years old, normal weight, no history of metabolic diseases, participated in special training courses (5 times/week, 1-1.5 hours) as required, and were able to complete exercise tests as required by the experiment. Table 1 is the general information of the subjects.

Table 1. General information of subjects

Number of subjects	20
Age (year)	19.58
Height (cm)	178.25
Weight (kg)	68.12

The nano selenium in this experiment was provided by Suzhou Enke Biotechnology Co., Ltd. A randomized, single blind, crossover experimental design was used. The subjects were randomly divided into two groups: A and B, nano selenium group (group A) and placebo group (group B).

After the first training, the results of the first training were divided into two copies: one is a general training record, and the other is a sports record. SPSS22.0 software was used for statistical analysis of aerobics events. The results of aerobics were described by statistical methods. The amount of exercise was measured with 20 training times of each group and repeated 3 times. This experimental study has obtained good data on the athletic ability of aerobics athletes. The two experimental items have a high similarity. All athletes repeated the same action 10 minutes after completing the same action. In addition, each experimental class has also set up test items at different levels, in which 10 times/day is the standard for low and intermediate levels. Statistical analysis was conducted by random number table method, and the results were analyzed by SPSS19.0 software.

3.2. Work Done in Timing Test

It can be seen from Table 2 that there is no significant difference in the work done by the subjects of the two groups before and after administration. Compared with before administration, the work amount of group B had a downward trend.

Table 2. Work done in timing test during endurance test before and after taking nano selenium (KJ)

Group	Group a	Group b
Number of cases (n)	10	10
Before taking	121.6	139
After taking	120.7	126.1

3.3. Changes of Blood Lactic Acid

It can be seen from Figure 3 that the overall blood lactic acid value of the two groups has a highly significant difference with time factors, in which Figure 3 (a) is before taking, and Figure 3 (b) is after taking. The maximum value was reached 3 or 6 minutes after exercise (two points were significant). Compared with before taking, the blood lactic acid value of subjects in both groups decreased significantly immediately after exercise, 3 minutes after exercise, and 6 minutes after exercise. Compared with group B, group A had a significant difference 3 minutes after exercise, and had a downward trend immediately after exercise.
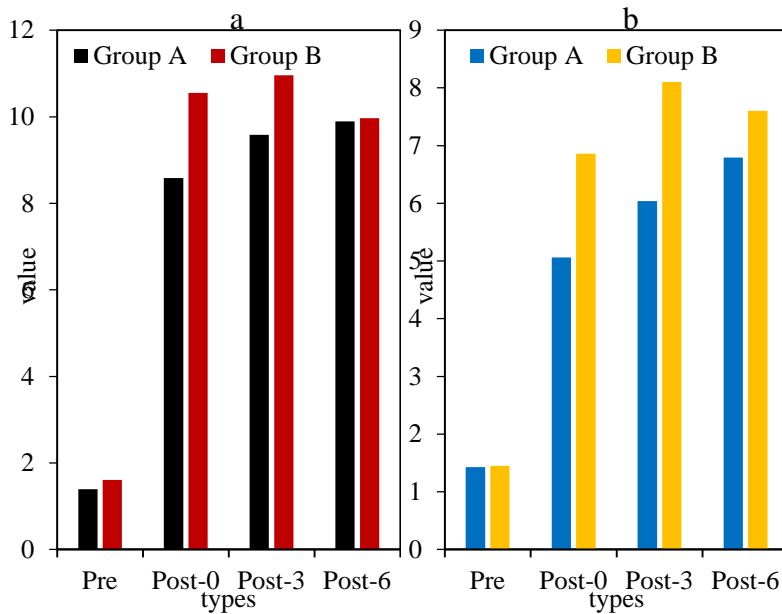
Figure 3. Change of blood lactic acid level during endurance test before and after taking nano selenium (mmol/l)

3.4. Changes in Blood Glucose

As shown in Figure 4, Figure 4 (a) is before administration and Figure 4 (b) is after administration. There was no significant difference in the total blood glucose values of the two groups with time factors immediately after exercise compared with 3 minutes after exercise, 6 minutes after exercise and before exercise. During the exercise, the blood glucose level decreased, and increased at 3 and 6 minutes after the exercise.
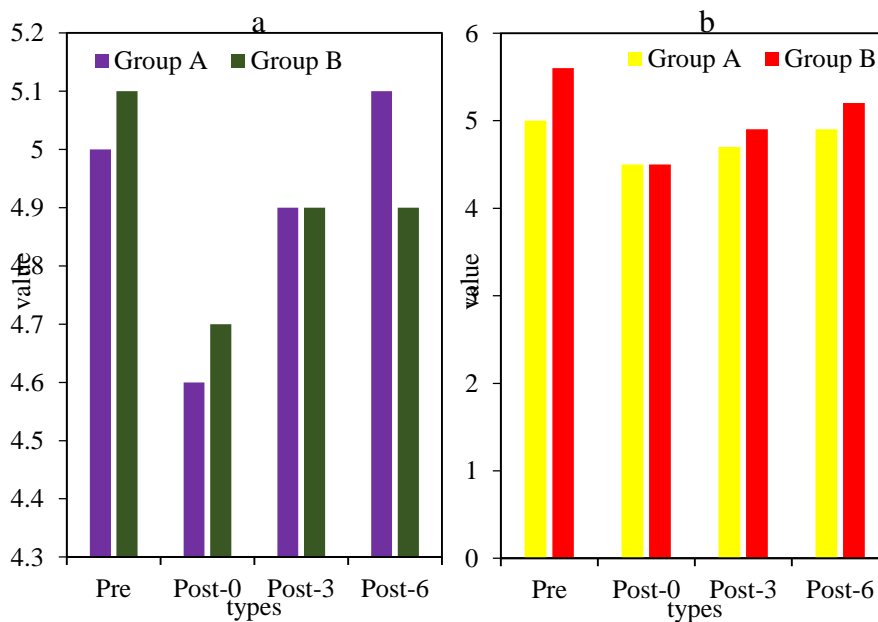

Figure 4. Change of blood glucose level during endurance test before and after taking nano selenium (mmol/l)

3.5. Changes in RPE

As shown in Figure 5, Figure 5 (a) is before administration and Figure 5 (b) is after administration. Compared with 30 min, 45 min, 60 min of exercise and 15 min of exercise, the overall RPE value of the two groups changed significantly with time factors. The maximum value was reached immediately after exercise. Compared with other times, it was highly significant, and there was no significant between groups. As for the nano selenium group, the value of 60 min exercise after taking was significantly lower than that before taking. In addition, there was no significant difference in RPE values between 30 min and 45 min of exercise and 15 min.
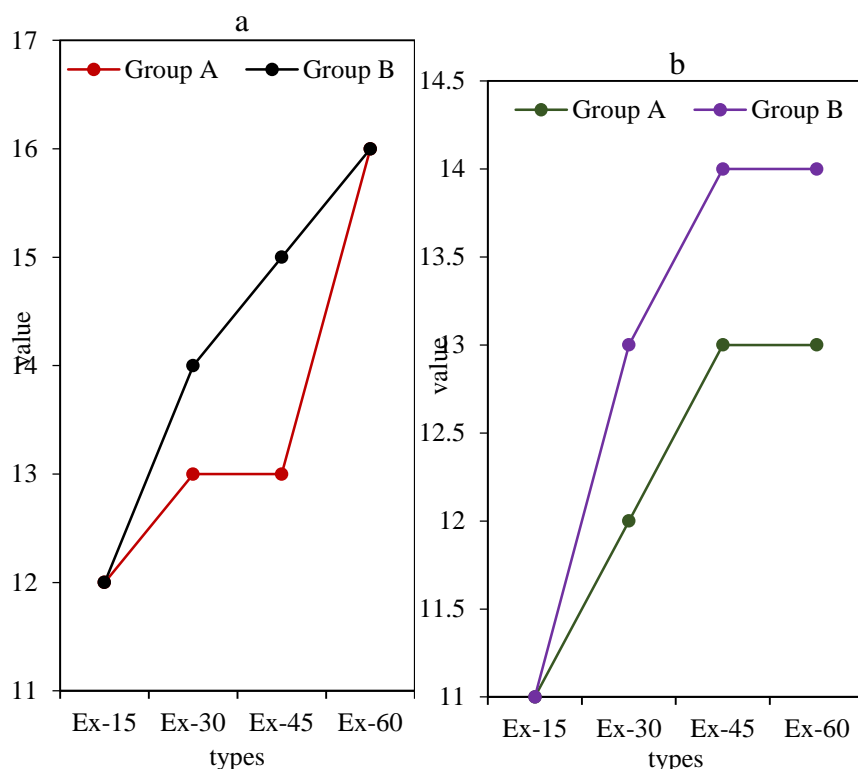

Figure 5. RPE level changes during endurance test before and after taking nano selenium

3.6. Heart Rate Changes

As shown in Figure 6, Figure 6 (a) is before administration and Figure 6 (b) is after administration. Compared with that before exercise, the total heart rate of the two groups changed significantly with time factors at 15 min, 30 min, 45 min, 60 min, 3 min and 6 min after exercise. The maximum value was reached after 60 minutes of exercise. It was highly significant compared with other times, and the difference between groups was not significant. The difference between groups was highly significant before taking the medicine and at 3 and 6 minutes after exercise. However, there was no difference. As for the placebo group, the heart rate at 3 min and 6 min after exercise was significantly lower than before.
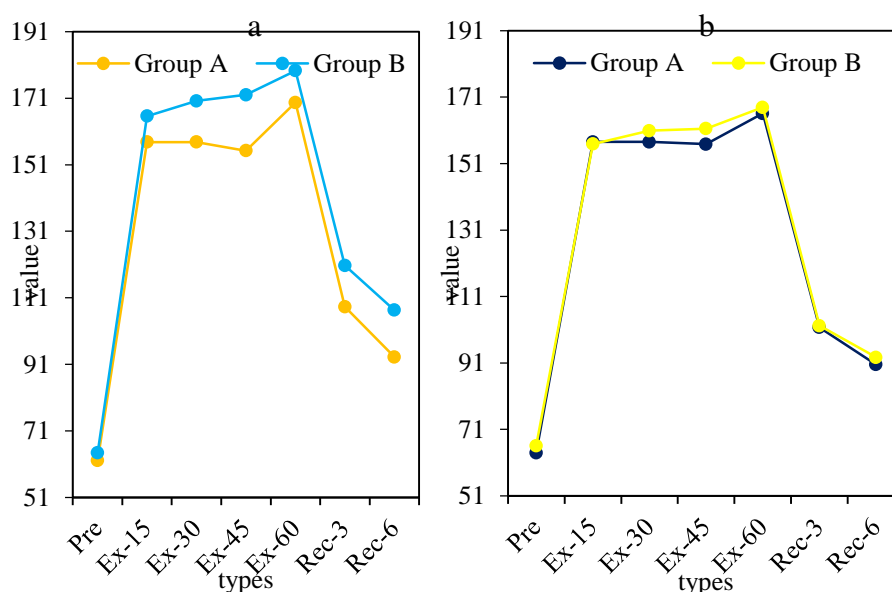
Figure 6. Heart rate change during endurance test before and after taking nano selenium (best/min)

At the same time, through the research on the effects of nano selenium on the functions of tissues and organs and physiological indicators after aerobics training, it was found that nano selenium could significantly improve the incidence of myocardial function damage after aerobics training. The improvement of cardiopulmonary function is an important role of nano selenium. By stimulating the oxygen supply of the body, the blood supply of the body's myocardium is effectively promoted. The conduction of the ECG signal pathway to the central and diastolic directions is promoted, thus improving the blood pumping function of the heart. This can improve myocardial contractility and pump blood volume, reduce myocardial oxygen consumption and total myocardial oxygen consumption, thus promoting two-way feedback of ECG signal pathway. Therefore, nano selenium has good physiological and biochemical effects on myocardium.

4. Conclusion

People's demand for sports nutrition is increasing. The energy consumption of the human body mainly depends on the food and medicine taken in. Most of the nutrients cannot be completely absorbed by the human body. In this context, it is very necessary to develop and produce nano selenium as a nutritional supplement and apply it to aerobics training. The nano selenium ingested in the process of aerobics training can not only promote the growth of muscles but also promote the metabolism of fat, reduce the occurrence of obesity, so as to improve the physiological function of the human body. It also plays a role in enhancing human immunity, especially in improving human immunity and reducing the damage of harmful substances in the body to blood vessels, liver, kidneys, bones and nerves. After exercise, most of the nutrients in the human body are consumed in the process of body metabolism. Therefore it is a very important step to supplement exercise nutrition. In this step, to ensure that the nutrients in food are not wasted by the human body, it is necessary to take an appropriate amount of selenium as a supplement. The results of this study show that nano selenium can improve the function and recovery of various organs after aerobics training. At the same time, it can enhance the human body's resistance and immunity, which also has a certain role in promoting sports health.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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