

# ENHANCEMENT BY DIET AND AEROBIC EXERCISE IN PROFESSIONAL ATHLETES

APERFEIÇOAMENTO POR DIETA E PRÁTICA DO EXERCÍCIO AERÓBICO EM ATLETAS PROFISSIONAIS

MEJORA MEDIANTE LA DIETA Y LA PRÁCTICA DE EJERCICIO AERÓBICO EN ATLETAS PROFESIONALES



ORIGINAL ARTICLE  
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## ABSTRACT

**Introduction:** Body weight regulation in sports competitions is an essential factor affecting the physical capacity of athletes. Especially in high-level events, the role of weight loss is significant in improving the competitive status. Weightlifters have high anaerobic capacity, high aerobic capacity, high flexibility, and less body fat. In all regular competitions, weightlifters compete against competitors of the same weight class. **Objective:** This paper investigates the effect of moderate aerobic exercise on weight loss in athletes and the effects of related biochemical parameters. **Methods:** Twenty weightlifters were randomly selected to conduct a questionnaire survey. The athletes performed aerobic exercises for eight weeks. The collection method and mathematical statistics were used to study body shape and constitution, blood indices, and other relevant data about weightlifters in China. **Results:** The effect of aerobic exercise on improving the athletes' physical fitness is discussed. The results showed that body weight, waist circumference, hip circumference, and body mass index decreased the most ( $P < 0.05$ ). Waist-to-hip ratio, waist-to-height ratio, hip-to-height ratio, and BMI significantly decreased ( $P < 0.05$ ). There was no significant change in height and fat index ( $P > 0.05$ ). **Conclusion:** 8 weeks of aerobic exercise and an appropriate diet can significantly improve the body shape index, physical index, and biochemical index of athletes. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Exercise Program, Weight-Lifting; Athletes; Endurance Training; Weight Loss.

## RESUMO

**Introdução:** A regulamentação do peso corporal nas competições esportivas é um fator essencial que afeta a capacidade física dos atletas. Especialmente em eventos de alto nível, o papel do emagrecimento é significativo para melhorar o estado competitivo. Os halterofilistas têm a alta capacidade anaeróbica, alta capacidade aeróbica, alta flexibilidade e menos gordura corporal. Em todas as competições regulares, os halterofilistas competem contra concorrentes da mesma classe de peso. **Objetivo:** Este artigo investiga o efeito do exercício aeróbico moderado na perda de peso em atletas e os efeitos dos parâmetros bioquímicos relacionados. **Métodos:** Selecionou-se aleatoriamente 20 halterofilistas para conduzir uma pesquisa por questionário. Os atletas realizaram um exercício aeróbico durante oito semanas. Utilizou-se o método de coleta e estatística matemática para estudar a forma e constituição corporal, índices sanguíneos e outros dados relevantes sobre os halterofilistas na China. **Resultados:** Discute-se o efeito do exercício aeróbico na melhoria da aptidão física dos atletas. Os resultados mostraram que o peso corporal, a circunferência da cintura, a circunferência do quadril e o índice de massa corporal foram os que mais diminuíram ( $P < 0,05$ ). A relação cintura/quadril, relação cintura/altura, relação quadril/altura e IMC também foram significativamente diminuídos ( $P < 0,05$ ). Não houve mudança significativa na altura e no índice de gordura ( $P > 0,05$ ). **Conclusão:** 8 semanas de exercícios aeróbicos e uma dieta apropriada podem melhorar significativamente o índice de forma corporal, o índice físico e o índice bioquímico dos atletas. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Programa de Fortalecimento por Levantamento de Peso; Atletas; Treino Aeróbico; Gordura corporal; Redução de Peso.

## RESUMEN

**Introducción:** La regulación del peso corporal en las competiciones deportivas es un factor esencial que afecta a la capacidad física de los atletas. Especialmente en los eventos de alto nivel, el papel de la pérdida de peso es significativo para mejorar el estado competitivo. Los levantadores de pesas tienen una alta capacidad anaeróbica, una alta capacidad aeróbica, una alta flexibilidad y menos grasa corporal. En todas las competiciones regulares, los levantadores de pesas compiten contra competidores de la misma categoría de peso. **Objetivo:** Este trabajo investiga el efecto del ejercicio aeróbico moderado sobre la pérdida de peso en atletas y los efectos de los parámetros bioquímicos relacionados. **Métodos:** Se seleccionaron aleatoriamente veinte levantadores de pesas para realizar una encuesta por cuestionario. Los atletas realizaron un ejercicio aeróbico durante ocho semanas. Se utilizó el método de recogida y la estadística matemática para estudiar la forma y la constitución del cuerpo, los índices sanguíneos y otros datos relevantes sobre los levantadores de pesas en China. **Resultados:** Se analiza el efecto del ejercicio aeróbico en la mejora de la condición física de los deportistas. Los resultados mostraron que el peso corporal, el perímetro de la cintura, el perímetro de la cadera y el índice de masa corporal fueron los que más disminuyeron ( $P < 0,05$ ). La relación cintura-cadera, la relación cintura-talla, la relación cadera-talla y



el IMC también disminuyeron significativamente ( $P < 0,05$ ). No hubo cambios significativos en la altura y el índice de grasa ( $P > 0,05$ ). Conclusión: 8 semanas de ejercicio aeróbico y una dieta adecuada pueden mejorar significativamente el índice de forma corporal, el índice físico y el índice bioquímico en los atletas. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptor:** Programa de Fortalecimiento Levantando Peso; Atletas; Entrenamiento Aeróbico; Pérdida de Peso.

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## INTRODUCTION

The composition of the body is mainly composed of human fat, muscle, and bone, as well as water, protein, inorganic substances, and so on. The composition of the human body includes two aspects: one is fat weight, and the other is muscle weight. But in competitive sports, we tend to pay more attention to the strength of the movement. In addition, in different sports activities, the body composition of athletes is also different. The body fat content of weightlifters varies with competition level. Athletes should increase their body fat percentage appropriately.<sup>1</sup> Athletes should not blindly pursue low body fat. Those who are tall and high-ranking candidates are likely to lose weight if they measure their weight by 5% body fat. The body fat percentage of high-level athletes should be above 10%, and the lower limit of body fat percentage for intermediate-level athletes is considered optimal. This percentage can be reduced to less than 8% for lower-level athletes.

A more scientific control method is to control the time of the body before the game. Several studies have shown that recovery training between 3 and 6 hours after rapid weight loss in athletes can promote functional recovery. After rapid weight control, although the body function has been damaged to a certain extent, after 3-6 hours, the physical energy has been close to the normal state. A high-load hypoxic state can also basically fully recover. This shortened time for weight control allows players to feel the adverse effects of rapid weight control during competition. Aerobic exercise can be promoted in athletes as judged by the effect of aerobic exercise on reducing body fat. This paper proposes moderate-load aerobic training for an extended period to achieve a short-term weight loss effect for athletes.

## METHOD

### Research objects

This article uses 20 weightlifters as a research sample. Age is 18 to 25 years old. Athletes should undergo a physical examination to determine the presence of congenital heart and cardiovascular diseases before undergoing sports interventional therapy.<sup>2</sup> All participants have signed knowingly. Table 1 below shows the prior health status of the 20 participants.

### Method of Investigation

All participants underwent physical function tests one week before exercise and one week after the activity. Physical parameters of the human body include height, weight, chest circumference, waist circumference, hip circumference, vital capacity, sitting forward flexion, and grip strength.<sup>3</sup> Physical fitness tests include skipping rope for 1 minute, 2000m/2400m, 50m, 800m/1000m, push-ups, standing long jumps, and sit-ups. Mainly the body mass index contains body fat percentage, basal metabolism, blood pressure, heart rate, etc. Biochemically monitored items include blood glucose, total

cholesterol, triglycerides, HDL, and low-density lipoproteins. Aerobic exercise intervention circuit three times a week for approximately 90 minutes.

### Simulation of Cardiac and Pulmonary Endurance in Aerobic Training

The most common form of exercise today is aerobic exercise. Aerobic exercise can improve the function of the heart.<sup>4</sup> The following is a detailed analysis of this: aerobic exercise is also called metabolic exercise. It is primarily an activity with inhalation and exhalation as the primary goal.

$$\lambda_i = \frac{\sqrt{(1-O_i)(1+O_i)}}{\sum_{i=1}^m (1-O_i)} \quad (1)$$

In the equation  $O_i$  is the action cycle,  $i$  is the  $i$  object, and  $m$  is the breathing rate. From the above formula, it can be seen that the body's demand for blood and oxygen will increase with the body's metabolism, and the heartbeat will also speed up.

$$q(k) = \frac{\lambda_i g W_i (L + H)}{n} \quad (2)$$

In the formula,  $W_i$  represents the consumption rate of unit energy.  $(L + H)$  stands for maximum oxygen.  $n$  represents the respiratory index of the lung. Aerobic exercise can improve heart function.<sup>5</sup> The process improves the strength of the body through breathing and circulation, and below is the connection between the different frequencies and muscles.

$$O_z = \frac{W_i (L + H)}{1 - O_i} \quad (3)$$

The essential characteristics of aerobic fitness are low intensity, uninterrupted rhythm, and persistence.<sup>6</sup> The most common are jogging, cycling, etc. The regular exercise of the human body cannot be called aerobic exercise. Contents such as taking a walk, doing housework, etc. Some more strenuous exercises, such as boxing, weightlifting, etc. Because the body's oxygen in the body cannot fully meet the body's needs during intense activities, the body will experience hypoxia.

### Statistics of data

This paper uses SPSS13.0 to carry out statistical processing on the experimental objects, and at the same time, this paper conducts relevant

**Table 1.** Overall training received.

Gender	N	Height (cm)	Age	Weight (kg)	Body fat percentage (%)	BMI (kg/m <sup>2</sup> )
Male	10	161.99 ± 7.67	18.86 ± 0.59	87.26 ± 13.5	37.27 ± 3.81	28.61 ± 3.36
Female	10	155.25 ± 6.79	18.11 ± 0.54	75.92 ± 9.89	36.55 ± 2.88	28.33 ± 2.58

data statistics and t-tests. All measurements are expressed as mean  $\pm$  standard deviation.  $P < 0.05$  indicates that there is a significant difference, and  $p < 0.01$  indicates that the difference is not significant.

## ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Zhejiang Yuexiu University of Foreign Languages following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

## RESULTS

After aerobic exercise, athletes perform 1 minute of sit-ups, 1 minute of rope skipping, standing long jump, sitting forward bend, 50 meters, 1000 meters for boys, 800 meters for girls, 2400 meters for boys, 2000 meters for girls, lung capacity and other physical fitness.<sup>7</sup> The judgment indicators showed a clear upward trend. (Table 2)

All BMIs tended to rise eight weeks after exercise intervention, and there were significant differences ( $P < 0.01$ ). In addition, the aerobic capacity of the heart, lungs, and physique was increased by the athletes under the influence of the tested weight loss. This promotes the comprehensive quality of all aspects of the human body.<sup>8</sup> After eight weeks of exercise, the body weight, bust, waist, hip ratio, waist-to-height ratio, BMI, and body fat percentage of male and female athletes increased significantly. (Table 3)

Table 4 shows that after eight weeks of exercise, both men and women tended to increase HDL-C, while LDL-C decreased, and the ratio of HDL-C to HDL-C was significantly higher than that of HDL-C. Exercise can alleviate the occurrence of dyslipidemia, hypertension, type 2 diabetes, and other diseases.

The trial used eight weeks of intervention in athletes with physical activity. Various measurements were taken one week before the intervention and one week after the activity. The results showed that the HDL-C/LDL-C ratio was significantly increased and LDL decreased.<sup>9</sup> This suggests that exercise therapy can reduce the risk of dyslipidemia, hypertension, and type 2 diabetes. The basal metabolic rate refers to the minimum amount of energy required by the body in inactive conditions at average temperatures. BMI is proportional to the 0.75th power of body mass. In this test, the BMR of the subjects decreased and remained at normal levels. Athletes can do some intense exercise to increase their basal metabolic rate while losing weight. After eight weeks of physical activity, the physical fitness, body shape, and biochemical indicators of weightlifters have been significantly improved.

## DISCUSSION

The trial used eight weeks to train the athletes. In the 8-week physical training, each training includes different aerobic endurance training such as fast running, jogging, and hill-climbing. The training process resulted in significant improvements in participants' running motion, pace, and breathing steps.<sup>10</sup> The athlete's lung capacity, explosive power, and aerobic endurance all improve during physical training. The performance of athletes in various sports activities, such as 50 meters, 800/1000 meters, 2000/2400 meters, and lung capacity, has improved.

Long-term aerobic exercise can improve the physical fitness of athletes. The results showed that the body weight, waist circumference, hip circumference, and body mass index of the study subjects decreased the most. Indicators such as waist circumference, weight ratio, and body mass index also tended to decrease significantly.<sup>11</sup> There was

**Table 2.** Comparative analysis of physical fitness indicators before and after aerobic training.

Index	Male		Female	
	Before intervention	After intervention	Before intervention	After intervention
1 minute sit-ups	46.3 $\pm$ 14.58	56.59 $\pm$ 13.57	41.86 $\pm$ 11.76	54 $\pm$ 9.74
1-minute skipping rope	130.64 $\pm$ 37.6	157.24 $\pm$ 39.05	129.3 $\pm$ 40.69	153.9 $\pm$ 38.22
Standing long jump	2.05 $\pm$ 0.9	2.14 $\pm$ 0.68	1.9 $\pm$ 0.97	1.98 $\pm$ 0.17
Sitting forward bend	12.25 $\pm$ 7.21	14.3 $\pm$ 5.57	18.19 $\pm$ 6.58	20.56 $\pm$ 5.65
50m	7.09 $\pm$ 0.6	6.55 $\pm$ 0.56	8.61 $\pm$ 0.6	8.15 $\pm$ 0.5
800/1000m	4.4 $\pm$ 0.66	4.06 $\pm$ 0.59	4.24 $\pm$ 0.57	3.91 $\pm$ 0.37
2000/2400m	15.82 $\pm$ 1.07	14.71 $\pm$ 1.05	12.15 $\pm$ 1.39	11.07 $\pm$ 0.91
Lung capacity (ml)	3576.05 $\pm$ 566.04	4106.4 $\pm$ 574.86	3561 $\pm$ 539.33	26.93 $\pm$ 589.8

**Table 3.** Summary of body shape changes before and after fitness training.

Index	Male		Female	
	Before intervention	After intervention	Before intervention	After intervention
Height (cm)	172.06 $\pm$ 8.26	172.05 $\pm$ 7.93	161.79 $\pm$ 7.08	162.07 $\pm$ 7.06
Weight (kg)	91.15 $\pm$ 11.75	86.36 $\pm$ 10.87	79.12 $\pm$ 10.31	74.98 $\pm$ 9.47
Bust (cm)	112.08 $\pm$ 7.38	110.8 $\pm$ 7.25	99.99 $\pm$ 6.67	98.94 $\pm$ 6.47
Waist (cm)	108.22 $\pm$ 9.79	103.12 $\pm$ 9.63	93.44 $\pm$ 8.93	87.5 $\pm$ 8.1
Hips (cm)	112.6 $\pm$ 7.06	109.76 $\pm$ 6.91	107.17 $\pm$ 6.62	104.63 $\pm$ 6.05
Waist to hip ratio	0.95 $\pm$ 0.06	0.92 $\pm$ 0.06	0.86 $\pm$ 0.06	0.83 $\pm$ 0.06
Waist to height ratio	0.62 $\pm$ 0.05	0.59 $\pm$ 0.05	0.57 $\pm$ 0.05	0.53 $\pm$ 0.05
Hip to height ratio	0.64 $\pm$ 0.04	0.63 $\pm$ 0.04	0.65 $\pm$ 0.04	0.63 $\pm$ 0.04
BMI	24.38 $\pm$ 2.25	23.1 $\pm$ 2.26	23.86 $\pm$ 2.18	22.45 $\pm$ 2.21
Body fat percentage (%)	27.42 $\pm$ 2.57	27.18 $\pm$ 2.55	30.78 $\pm$ 2.42	30.66 $\pm$ 2.69

**Table 4.** Comparative analysis of blood lipid levels before and after aerobic exercise training.

Index	Male		Female	
	Before intervention	After intervention	Before intervention	After intervention
Blood pressure (mmHg)	112.47 ± 9.44	108.41 ± 7.58	115.37 ± 9.42	109.78 ± 7.4
ampoules (bpm)	82.91 ± 11.67	79.38 ± 12.46	79.98 ± 9.82	77.55 ± 14.48
Basal metabolic rate (kcal/d)	1872.96 ± 183.75	1802.37 ± 169.74	1647.36 ± 182.16	1578.96 ± 165.76
Total cholesterol (mol/L)	4.86 ± 0.87	4.76 ± 0.85	4.8 ± 0.89	4.73 ± 0.79
Triglyceride TG (mol/L)	1.31 ± 88.35	1.13 ± 0.47	1.29 ± 0.86	1.17 ± 0.49
High-density lipoprotein HDL (mol/L)	1.24 ± 0.26	1.39 ± 0.27	1.27 ± 0.25	1.39 ± 0.26
Low-density lipoprotein LDL (mol/L)	2.65 ± 70.3	2.22 ± 0.54	2.69 ± 0.71	2.23 ± 0.52
HDL/LDL	0.44 ± 0.02	0.59 ± 0.16	0.48 ± 0.17	0.62 ± 18.05
BMI	24.38 ± 2.25	23.1 ± 2.26	23.86 ± 2.18	22.45 ± 2.21
Body fat percentage (%)	27.42 ± 2.57	27.18 ± 2.55	30.78 ± 2.42	30.66 ± 2.69

no significant decrease in height and fat ratio. BMI showed the most significant variation of all body shape parameters. Waist to hip ratio refers to the ratio of waist to hip circumference. This is to reflect the distribution of fat in the waist and buttocks.

Obesity is closely related to dyslipidemia, hypertension, and diabetes. The incidence of dyslipidemia, hypertension and type 2 diabetes also increases with the degree of obesity. It is associated with dyslipidemia, hypertension, and diabetes. Athletes who are overweight will accumulate fat in their bodies due to ingesting more than they consume, causing the subjects' blood sugar to rise.

## CONCLUSION

After eight weeks of aerobic exercise intervention, the athletes' physical performance and lung capacity were significantly improved. After eight weeks of aerobic exercise intervention, the athletes' body weight, measurements, BMI, body fat rate, and other body shape items have been significantly improved. After eight weeks of exercise, blood pressure, ampulla, HDL, LDL, and other indicators have been significantly improved.

The author declares no potential conflict of interest related to this article.

**AUTHORS' CONTRIBUTIONS:** The author made significant contributions to this manuscript. Chunfang Wang: writing, data analysis, article review and intellectual concept of the article.

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