

# EFFECTS OF CROSSFIT TRAINING ON BODY FUNCTION AND MOVEMENT PERFORMANCE OF AEROBIC ATHLETES



ORIGINAL ARTICLE  
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EFEITOS DO TREINO DE CROSSFIT SOBRE A FUNÇÃO CORPORAL E NO DESEMPENHO DO MOVIMENTO DOS ATLETAS DE AERÓBICA

EFFECTOS DEL ENTRENAMIENTO DE CROSSFIT EN LA FUNCIÓN CORPORAL Y EN EL RENDIMIENTO DEL MOVIMIENTO DE LOS ATLETAS DE AERÓBICA

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## ABSTRACT

**Introduction:** Physical fitness is the athletic ability to perform physical activities safely, avoiding the risk of injuries or performance-related complications on the field. CrossFit has been an effective training method for its natural movements and integration of aerobic and anaerobic exercises. It is believed that these characteristics may benefit the physical fitness of aerobic gym athletes. **Objective:** Evaluate the effects of CrossFit training on the physical fitness of aerobic gymnastics athletes. **Methods:** A controlled experimental study involving 24 aerobic gymnastics athletes was run for 9 weeks. The athletes were divided into an experimental group with CrossFit-based training, the control group received no additional training intervention. The indices of physical fitness, motor function, and movement performance were analyzed before and after the intervention. The results of the statistical analyses were discussed. **Results:** Considerable variation was obtained in fitness indices in distinct groups of muscle activities: in abdominal crunches from  $37.66 \pm 6.12$  to  $50.11 \pm 3.01$ ; medical ball lateral throw from  $8.04 \pm 1.00$  to  $10.80 \pm 2.21$ ; lateral bridge from  $72.60 \pm 11.40$  to  $113.69 \pm 14.47$ ; the flexion in sitting position from  $22.52 \pm 2.51$  to  $26.46 \pm 1.33$ ; and rope climbing from  $32.32 \pm 7.28$  to  $25.97 \pm 7.08$ . In functional terms, the movement response time to music was optimized from  $15.38 \pm 0.36$  to  $13.08 \pm 0.21$ ; and the movement performance score was increased from  $72.56 \pm 2.25$  to  $80.91 \pm 1.02$ . There were no significant changes in the control group. **Conclusion:** CrossFit training was shown to improve the physical conditioning of aerobic gym athletes and the functional movement performance of its practitioners. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Endurance Training; Athletes; Physical Fitness.

## RESUMO

**Introdução:** A aptidão física é a capacidade atlética de praticar atividades físicas em segurança, evitando o risco de sofrer lesões ou complicações relacionadas ao desempenho em campo. O CrossFit vem se destacando como um método de treinamento eficaz pelos seus movimentos naturais e integração de exercícios aeróbicos e anaeróbicos. Acredita-se que essas características possam beneficiar a aptidão física dos atletas de ginástica aeróbica. **Objetivo:** Avaliar os efeitos do treino de CrossFit sobre a aptidão física dos atletas de ginástica aeróbica. **Métodos:** Um estudo experimental controlado envolvendo 24 atletas de ginástica aeróbica foi executado por 9 semanas. Os atletas foram divididos em grupo experimental, com treinamento baseado no CrossFit, o grupo de controle não recebeu nenhuma intervenção de treinamento adicional. Os índices de aptidão física, função motora e o desempenho do movimento foram analisados antes e após a intervenção. Os resultados das análises estatísticas foram discutidos. **Resultados:** Obteve-se variação considerável nos índices de aptidão física em distintos grupos de atividades musculares: em abdominais de  $37,66 \pm 6,12$  para  $50,11 \pm 3,01$ ; lançamento lateral da bola medicinal de  $8,04 \pm 1,00$  para  $10,80 \pm 2,21$ ; ponte lateral de  $72,60 \pm 11,40$  para  $113,69 \pm 14,47$ ; a flexão em posição sentada de  $22,52 \pm 2,51$  para  $26,46 \pm 1,33$ ; e escalada por corda de  $32,32 \pm 7,28$  para  $25,97 \pm 7,08$ . Em termos funcionais, o tempo de resposta ao movimento pela música foi otimizado de  $15,38 \pm 0,36$  para  $13,08 \pm 0,21$ ; e a pontuação da performance no desempenho de movimento foi incrementada de  $72,56 \pm 2,25$  para  $80,91 \pm 1,02$ . Não houveram alterações significativas no grupo controle. **Conclusão:** O treino de CrossFit demonstrou aprimorar o condicionamento físico dos atletas de ginástica aeróbica, bem como o desempenho de movimento funcional de seus praticantes. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Treino Aeróbico; Atletas; Aptidão Física.

## RESUMEN

**Introducción:** La condición física es la capacidad atlética para practicar actividades físicas con seguridad, evitando el riesgo de sufrir lesiones o complicaciones relacionadas con el rendimiento en el campo. El CrossFit se viene destacando como un método de entrenamiento eficaz por sus movimientos naturales y la integración de ejercicios aeróbicos y anaeróbicos. Se cree que estas características pueden beneficiar la aptitud física de los atletas de gimnasia aeróbica. **Objetivo:** Evaluar los efectos del entrenamiento CrossFit en la aptitud física de atletas de gimnasia aeróbica.



**Métodos:** Se realizó un estudio experimental controlado en el que participaron 24 atletas de gimnasia aeróbica durante 9 semanas. Los atletas se dividieron en un grupo experimental con entrenamiento basado en CrossFit, el grupo de control no recibió ninguna intervención de entrenamiento adicional. Se analizaron los índices de aptitud física, función motora y rendimiento del movimiento antes y después de la intervención. Se discutieron los resultados de los análisis estadísticos. **Resultados:** Se obtuvo una variación considerable en los índices de aptitud física en distintos grupos de actividades musculares: en abdominales de  $37,66 \pm 6,12$  a  $50,11 \pm 3,01$ ; lanzamiento lateral de balón medicinal de  $8,04 \pm 1,00$  a  $10,80 \pm 2,21$ ; puente lateral de  $72,60 \pm 11,40$  a  $113,69 \pm 14,47$ ; la flexión en posición sentada de  $22,52 \pm 2,51$  a  $26,46 \pm 1,33$ ; y trepar por cuerda de  $32,32 \pm 7,28$  a  $25,97 \pm 7,08$ . En términos funcionales, el tiempo de respuesta del movimiento a la música se optimizó de  $15,38 \pm 0,36$  a  $13,08 \pm 0,21$ ; y la puntuación del rendimiento del movimiento se incrementó de  $72,56 \pm 2,25$  a  $80,91 \pm 1,02$ . No hubo cambios significativos en el grupo de control. **Conclusión:** Se ha demostrado que el entrenamiento CrossFit mejora el acondicionamiento físico de los atletas de gimnasia aeróbica, así como el rendimiento del movimiento funcional de sus practicantes. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptor:** Entrenamiento Aeróbico; Atletas; Aptitud Física.

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## INTRODUCTION

The training process of aerobics needs to be adjusted according to the physical quality of all athletes and the differences of individual sports.<sup>1</sup> The individual exercise load also needs to be adjusted according to the collective exercise load. Aerobics training can not only improve the function of athletes' skeletal muscles, but also have a certain effect and influence on the human respiratory circulation and nervous system.<sup>2</sup> The respiratory system of athletes needs to be stimulated by muscle movement to produce better results, so the muscle fibers of aerobics trainers can become stronger and stronger. The body sports ability of aerobics needs to be better developed in the competitive process, and the function and physical fitness of aerobics athletes should also be determined according to the physical quality and shape development during training.<sup>3</sup> Athletes' physical function, body shape and development level are independent of each other and have a certain influence and close relationship with each level of sports. The overall physical development level of each athlete has a certain relationship with physical function.<sup>4</sup>

The cross fit training method is closer to nature and has more advantages than other training methods. In order to enable the training method to carry out all aspects of training, the trainers need to constantly intersperse aerobic training and anaerobic training.<sup>5</sup> In order to make the physical function of the trainer reach a certain quality, it is necessary to carry out endurance and explosive training for all athletes to have obvious effects. Each cross fit training method is deeply loved by athletes.<sup>6</sup>

## METHOD

### Research object

In this paper, 24 professional aerobics athletes were selected for a 9-week experiment before the start of the experiment. The subjects selected in this experiment had passed the physical fitness and physical fitness test before the beginning of the experiment, and all met the physical fitness standards required by the experiment. The study and all the participants were reviewed and approved by Ethics Committee of Beijing sport university (NO.BJSUYF205S). The age distribution of the subjects in this experiment is between 19 and 20 years old, the average height is 171cm, and the weight is about 66kg, as shown in Table 1, which is the specific physical condition of the 24 aerobics athletes participating in this experiment. In the selection of experimental objects, the overall physical quality and exercise load capacity of the experimental objects are taken as the specified criteria, in order to minimize the differences of the experimental objects and avoid errors in the experimental results, and in order to make the training process more convenient for management,

**Table 1.** Physical condition of aerobics athletes.

Group	Experience group	Control group
Number of people	12	12
Age	19.543±0.623	20.105±0.315
Height	172.831±2.557	170.972±1.323
Weight	64.834±3.208	68.066±4.694

the selected aerobics athletes are trained for more than 4 years, so as to reduce unnecessary waste of time. During the experiment, each aerobics athlete kept the same work and rest time as usual training, and did not make too much adjustment in diet, and the aerobics athletes participating in the experiment were not allowed to participate in the training on an empty stomach.

### Experimental method

Before the start of the experiment, 24 professional aerobics athletes were randomly divided into groups by drawing lots. The athletes with single number were members of the experimental group, and the athletes with double number were members of the control group. During the 9-week experiment, 12 professional aerobics athletes in the experimental group received cross fit training, while the members in the control group only received normal aerobics training. Before and after the experiment, the relevant indexes of the physical function and movement performance of the two groups of members were measured and recorded professionally to study the effect of cross fit training on the physical function and movement performance of aerobics athletes. Among them, the measurement indicators of physical function include the number of sit-ups in one minute, the distance of side throwing medicine ball, the time of plate support, the distance of sitting body forward bending, the length of side bridge, the distance of transverse fork, the distance of left longitudinal fork and the distance of right longitudinal fork, while the performance indicators of aerobics athletes include the time of athletes' response to music and the performance score of the overall movement of aerobics athletes.

In addition, in the process of the experiment, we should also pay attention to the overall sweat emission of the experimental subjects, and supplement the sports drinks for the aerobics athletes participating in the experiment to ensure that the athletes can fully maintain their body balance during the training process. At the same time, in order to ensure that the body of aerobics athletes can digest and absorb normally, each exercise should be carried out at least 1.5 hours after the meal, and should not eat immediately after the exercise, but at least 45 minutes after the exercise.

## Test location

The experimental site of this study is selected in the idle aerobics training classroom to avoid interference to other aerobics athletes who are normally trained. Before the experiment, according to the needs of this experiment, the equipment in the idle training classroom was supplemented and repaired, and a series of safety performance tests were carried out on all experimental equipment to avoid unnecessary sports injuries to the aerobics athletes participating in the experiment due to equipment loosening and other reasons. After testing, the safety performance data of all equipment met the normal safety test standards.

## RESULTS

### Effect of cross fit training on physical function of aerobics athletes

As shown in Table 2, the indexes of physical functions of the aerobics athletes in the experimental group before and after participating in the cross fit training. There are many physical function indicators of aerobics athletes. This experiment selects eight indicators to measure and record, namely, the number of sit-ups in one minute, the distance of side throwing medicine ball, the time of flat support, the distance of forward bending of the sitting body, the length of side bridge, the distance of transverse fork, the distance of left longitudinal fork and the distance of right longitudinal fork.

By observing the measured data of various physical function indicators of aerobics athletes in the experimental group before and after the experiment, as well as the difference standard of P value, it can be seen that the cross fit training has a more obvious impact on the physical function of aerobics athletes, especially in the three aspects of the number of supine sit-ups in one minute, the time of plate support and the length of side bridge. Cross fit training has the greatest impact on the length of flat plate support, followed by the length of bridge test, and has less impact on the other five physical function indicators than the first three, but there are also differences, including the distance of side throwing medicine ball, the forward bending distance of sitting body, the transverse fork distance, the left longitudinal fork distance and the right longitudinal fork distance. Therefore, we can draw the conclusion that cross fit training is beneficial to improve various physical function indexes of aerobics athletes to a certain extent.

In the experiment, the members of the control group who did not participate in the cross fit training were measured with physical function indicators before and after the experiment. The results and comparison of specific data indicators are shown in Table 3.

**Table 2.** Effect of cross fit training on body function of aerobics athletes.

Experience group	1 minute Sit-ups (each)	Side throw medicine ball (m)	Plate support (seconds)	Forward flexion in sitting position (cm)
Before experiment	37.662±6.128	8.043±1.008	72.608±11.406	22.527±2.512
After experiment	50.115±3.014	10.802±2.212	113.697±14.474	26.463±1.337
T	-2.2101	-2.0195	-2.0926	-0.2251
P	0.0263	0.0263	0.0321	0.0198
Experience group	Side bridge (seconds)	Transverse fork (cm)	Left longitudinal fork (cm)	Right longitudinal fork (cm)
Before experiment	52.808±9.324	32.321±7.283	32.794±5.438	33.283±6.037
After experiment	71.296±4.450	25.973±7.087	27.540±4.530	27.631±5.439
T	-1.4714	-1.0790	0.1114	0.0489
P	0.0383	0.0283	0.0350	0.0258

According to the comparison of various data of the control group before and after the experiment, it can be seen that routine training has no very obvious effect on improving the physical function level of aerobics athletes, and various physical indicators of athletes still have a trend of reduction after routine training, such as the horizontal fork distance, the left longitudinal fork distance and the right longitudinal fork distance. Routine training has certain effect on improving the number of sit-ups in one minute, the time of plate support and the length of side bridge of aerobics athletes, but the overall trend of change is not obvious.

Therefore, we can compare the changes of various physical function indicators of aerobics athletes who have undergone cross fit training and routine training, and the results show that the changes of physical function indicators of a group of aerobics athletes who have undergone cross fit training are more significant. So we can conclude that cross fit training can effectively improve the physical function level of aerobics athletes.

The effect of cross fit training on the performance of aerobics athletes

As shown in Table 4, the performance of aerobics athletes participating in cross fit training before and after the experiment was recorded. The results showed that the music reaction time of the experimental group members was  $15.382 \pm 0.364$ s before the cross fit training, and after the experiment, the time changed to  $13.084 \pm 0.214$ s, while the score of movement performance changed from  $72.564 \pm 2.251$  to  $80.919 \pm 1.026$ .

According to the standard of significant difference in P value < 0.05, the music response time and movement performance score of aerobics athletes have significant changes before and after the experiment. It can be seen that cross fit training has a great effect on the performance ability of aerobics athletes.

In addition, the experiment also measured and recorded the performance indicators of the control group members before and after participating in the experiment, as shown in Table 5. Before the routine training, the music reaction time of the experimental group members was  $14.599 \pm 0.492$ s, after the experiment, the time changed to  $13.296 \pm 0.553$ s, and the score of movement performance changed from  $73.173 \pm 2.855$  to  $72.281 \pm 1.686$ .

According to the data comparison results and P > 0.05, there is no significant difference. It can be seen that routine training can not significantly improve the performance ability of aerobics athletes. Through

**Table 3.** The influence of routine training on the physical function of aerobics athletes.

Control group	1 minute Sit-ups (each)	Side throw medicine ball (m)	Plate support (seconds)	Forward flexion in sitting position (cm)
Before experiment	36.898±3.949	7.773±1.175	69.749±12.394	22.719±2.423
After experiment	43.133±2.774	8.618±1.077	93.439±14.149	24.777±1.742
T	-3.0034	-2.6485	-2.0096	1.6543
P	0.0293	0.0137	0.0421	0.0428
Control group	Side bridge (seconds)	Transverse fork (cm)	Left longitudinal fork (cm)	Right longitudinal fork (cm)
Before experiment	50.894±7.807	35.095±8.125	32.596±5.139	33.202±5.044
After experiment	61.025±3.862	33.450±8.565	31.460±3.939	31.183±4.994
T	-2.2598	-7.6647	-3.9199	-3.4848
P	0.0343	0.0129	0.0299	0.0482

**Table 4.** Cross fit training improves the performance of aerobics athletes.

Experience group	Music response time (s)	Movement performance score (points)
Before experiment	15.382±0.364	72.564±2.251
After experiment	13.084±0.214	80.919±1.026
T	2.5626	0.6331
P	0.0010	0.0010

**Table 5.** The improvement of the performance of aerobics athletes by routine training.

Control group	Music response time (s)	Movement performance score (points)
Before experiment	14.599±0.492	73.173±2.855
After experiment	13.296±0.553	72.281±1.686
T	3.6488	0.8843
P	0.1337	0.1457

further comparison of the data in the two tables, it can also be seen that cross fit training can improve the physical function and performance of aerobics athletes more than routine training.

## DISCUSSION

In the process of aerobics training, in order to improve the sensitivity of athletes' nerves, it is necessary to carry out high-intensity training on all movements. Body function refers to the system function of various organs of the body. In order to improve the function level, the accuracy and requirements of the trainer's vision, hearing and other aspects are also particularly high. In order to make the physical quality and function of athletes reach a certain level, it is necessary to make the technical factors of all trainers meet the requirements. The better the body coordination and beauty of aerobics athletes, the more carefully designed each movement is. In normal training, if the operation and performance of athletes are affected, it is necessary to strengthen the body flexibility and coordination ability of all athletes, so as to enhance the overall beauty.

Cross fit training can deeply study and combine the movements of all track and field athletes and gymnasts, and can combine all training systems. During the training process, all athletes need to practice without rest. If the principles and actions of training are different, then it is

necessary to complete more tasks as quickly as possible in the specified time with a little interval. Or to put it another way is to complete certain tasks in as little time as possible, and ensure quality and quantity. For all trainers, in order to improve the performance of their functions, it is necessary to carry out high-intensity exercises on the whole body to make the appearance of muscles have obvious effects. Through the cross fit exercise method, the muscle appearance exercise and training rhythm are similar to physical training. In cross fit training, each kind of physical training has certain similarities with the training methods of football players. In order to make each training more practical, it is necessary to strengthen the comprehensive training methods so as to awaken the coordination and foundation of the training athletes. However, for normal aerobics athletes, each cross fit training can have a certain effect on the trainer's fat reduction, and can also improve the cardiopulmonary capacity. From the above aspects, the cross fit training method has certain advantages over other training methods.

## CONCLUSION

From the research data in this paper, we can see that cross fit training is a very necessary training for aerobics athletes. It can not only improve the physical function level of aerobics athletes, but also effectively improve the overall performance ability of aerobics athletes. As we all know, the ability of movement performance and body function are very important for aerobics athletes. Having good body function and excellent ability of movement performance can help aerobics athletes achieve higher results in training and competition. Therefore, it is necessary to add some cross fit training to the daily training of aerobics athletes.

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**AUTHORS' CONTRIBUTIONS:** The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Zhu Yimeng: writing and execution.

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