INFLUENCE IN CORE TRAINING ON PHYSICAL FITNESS OF COLLEGE ATHLETES

INFLUÊNCIA DO TREINAMENTO DO CORE NA APTIDÃO FÍSICA DE ATLETAS UNIVERSITÁRIOS

INFLUENCIA DEL ENTRENAMIENTO DEL CORE EN LA APTITUD FÍSICA DE LOS DEPORTISTAS UNIVERSITARIOS

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ABSTRACT

Introduction: Recent research shows the CORE is the central link in the kinetic chain of aerobic gymnastics. The athlete's synchronized performances depend not only on strength but also on the balance and precision of the movements that start from this area. Although the importance of this muscle group is recognized, there is no consensus about the most effective protocol to increase performance in aerobic gymnastics athletes. Objective: Develop and verify the influence of a protocol for CORE training on the aerobic gymnasts' balance. Methods: This paper selects high-level aerobic gymnastics athletes and randomly divides them into experimental and control groups. The experiment was conducted over eight weeks. The experimental group adopted systematic core strength training methods, and the control group continued with traditional conventional strength training methods. Volunteers were tested for physical fitness before and after the experiment. Results: Aerobic gymnastics athletes' physical fitness and athletic abilities were significantly improved after training. Conclusion: The CORE training protocol in aerobic gymnastics athletes increased the execution quality in complex movements. ***Evidence Level II; Therapeutic Studies - Investigating the result.***

Keywords: Resistance Training; Gymnastics; Athletes; Exercise.

RESUMO

Introdução: Pesquisas recentes demonstram que o CORE é o elo central na cadeia cinética da ginástica aeróbica. As apresentações sincronizadas dos atletas dependem não só da força quanto também do equilíbrio e precisão dos movimentos que partem dessa área. Embora reconheça-se a importância desse grupo muscular, não há um consenso sobre o protocolo mais eficaz para aumentar o desempenho em atletas de ginástica aeróbica. Objetivo: Desenvolver um protocolo de treinamento do CORE e verificar sua influência sobre o equilíbrio dos atletas em ginástica aeróbica. Métodos: Este artigo seleciona atletas de ginástica aeróbica de alto nível e os divide aleatoriamente em grupos experimentais e de controle. A experiência foi conduzida em 8 semanas. O grupo experimental adotou métodos sistemáticos de treinamento de força central, e o grupo de controle continuou com os métodos tradicionais de treinamento de força convencional. Os voluntários foram testados quanto à aptidão física antes e depois do experimento. Resultados: A aptidão física e as habilidades atléticas dos atletas de ginástica aeróbica foram significativamente aprimoradas após o treinamento. Conclusão: O protocolo de treinamento do CORE em atletas de ginástica aeróbica elevou a qualidade de execução nos movimentos complexos. ***Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.***

Descritores: *Treinamento de força; Ginástica; Atletas; Exercício físico.*

RESUMEN

Introducción: Investigaciones recientes demuestran que el CORE es el eslabón central de la cadena cinética de la gimnasia aeróbica. Las presentaciones sincronizadas de las atletas dependen no sólo de la fuerza sino también del equilibrio y la precisión de los movimientos que parten de esta zona. Aunque se reconoce la importancia de este grupo muscular, no hay consenso sobre el protocolo más eficaz para aumentar el rendimiento de las gimnastas aeróbicas. Objetivo: Desarrollar un protocolo de entrenamiento del CORE y comprobar su influencia en el equilibrio de los atletas en la gimnasia aeróbica. Métodos: Este trabajo selecciona a atletas de gimnasia aeróbica de alto nivel y los divide aleatoriamente en grupos experimental y de control. El experimento se realizó durante 8 semanas. El grupo experimental adoptó métodos sistemáticos de entrenamiento de la fuerza central, y el grupo de control continuó con los métodos tradicionales de entrenamiento de la fuerza convencional. Los voluntarios fueron sometidos a pruebas de aptitud física antes y después del experimento. Resultados: La aptitud física y las capacidades atléticas de los atletas de gimnasia aeróbica mejoraron significativamente después del entrenamiento. Conclusión: El protocolo de entrenamiento CORE en atletas de gimnasia aeróbica elevó la calidad de ejecución en movimientos complejos. ***Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.***

Descriptores: *Entrenamiento de Fuerza; Gimnasia; Atletas; Ejercicio Físico.*

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INTRODUCTION

The core strength is the middle link of the physical movement chain. According to the characteristics of human body structure, we can regard the area from the middle of the chest to the root of the thigh as the core link of the human body's movement chain.[1] Therefore, core strength training for athletes is very important. The performance of competitive aerobics is that the athletes will present the complete competitive aerobics movement within a specified time under the accompaniment of music. Competitive gymnastics is a comprehensive, accurate, and artistic completion of a series of difficult and complex movements. The competitive process of competitive aerobics has extremely high requirements on the difficulty of ground movements and aerial movements. Whether it is ground action or air action, there is an important connection with core power. In the training of competitive aerobics athletes, strength training adopts core strength training. It is of great significance to enhance the core strength of competitive aerobics athletes. Especially the C group's difficult movements of competitive aerobics. Core strength training plays an important role in improving the complete quality of the C group difficult movements of competitive aerobics athletes.[2] Core strength training can improve the athlete's own balance control ability and coordination ability and effectively avoid the occurrence of sports injuries.

It is imminent to further systematically and deeply study the influence of core strength training on the completion quality of the difficult movements of competitive aerobics athletes in Group C. The purpose of this research is to more significantly improve the completion quality of group C difficult movements of competitive aerobics athletes.[3] At the same time, we introduced core strength training into competitive aerobics' special strength training program and verified the methods and methods of core strength training in practice. This enables a more scientific core strength training system. In this way, the goal of significantly improving the completion quality of the C group difficult movements of competitive aerobics athletes is achieved.

METHOD

Establish a training system for group C difficulty movements of competitive aerobics athletes

Based on the analysis of the current situation of the difficult exercise training of competitive aerobics athletes in Group C, the training content of difficulty in Group C can be divided into three major components. (1) Basic training: basic posture training, strength training, sports endurance training, flexibility, and coordination training. (2) Special strength training: special basic strength training, special strength training. (3) Special technical training: take-off technique training, control basic training, landing technique training.

Experimental design

According to the training content of the C group difficult movement of competitive aerobics athletes, core strength training is added, and the test content is developed.

Test object

We selected 30 competitive aerobics athletes from local sports colleges as the subjects of this experiment. Thirty competitive aerobics athletes have no history of sports injuries.

Test method

First, determine the measurement index of the core strength level of the competitive aerobics' athletes and the evaluation index of the core strength training effect. Based on athletes' physical training guidance and other related materials, the core strength indicators are finally determined as four items: swivel sit-ups, prone back-ups, sitting pull-downs, and kicks. These four core strength measurement indicators can effectively prevent athletes from grasping the movements correctly.[4] The measurement of these four indicators has strong operability. Determine the evaluation index of the core strength training result: According to the content of the C group difficulty movement, two representative movements of the C group difficulty movement are selected as the index for evaluating the effect of the athlete's core strength training in this experiment. The scissor transformation in group C difficulty moves and jumps 180° to land into a push-up. The rotation of 180° Kosak in group C difficulty moves then turns 180° into a vertical split.

Group test

We divided the 30 competitive aerobics athletes in this study into a control group and a test group.[5] In this experiment, the average age of the competitive aerobics athletes in the control group was 21.5±1.5 years, the average height was 177.5±4.6cm, and the average weight was 67.5±3.0kg. The average age of the competitive aerobics athletes in the experimental group was 20.5±1.5 years, the average height was 178.5±4.0cm, and the average weight was 68.5±3.2kg. Before the test, the two groups of athletes were tested on the core stability and the completion degree of the competitive aerobics C group difficult movements. There was no significant difference in the results.

The formulation of core strength training programs for competitive aerobics athletes

All athletes undergo 8 weeks of training. The control group performed traditional strength training based on group C's difficulty exercise training. Athletes in the experimental group added core strength training based on group C difficulty movement training and traditional strength training.[6] The training can be divided into two stages, from simple to complex: the first stage is the basic training stage, and the second stage is the consolidation and improvement stage.

Test result test

Stability test

We use the 8-point star offset to test and evaluate the stability of the competitive aerobics' athletes in this experiment. The athlete stands in the center of the 8-point star chart. The athlete uses non-supporting legs to extend in place in 8 directions.[7] We record the athlete's reach and evaluate the ratio of the recorded value to the length of the athlete's lower limbs. The ratio is the evaluation result of the athlete's core stability test.

Determination of athlete's core strength

We test the number of athletes who complete the twisted sit-ups in 1 minute and the number of prone back-ups in 1 minute. It takes 5 sittings to pull down 30kg and 5 kicks to test 120kg.

Competitive Aerobics Group C Difficulty Action Test

A test for group C difficulty movements of competitive aerobics athletes. We disrupted all the athletes in this trial.[8] In this way, the judges are not biased in evaluating the completion quality of the difficult actions in Group C. Each group C difficulty movement test 3 times. Take the average of the 3 measurements as the evaluation score for the complete quality of the athletes' competitive aerobics C group difficult movements.

Simulation Research on Fast Recognition of Aerobics Athlete's Footprint Images

We apply the Gaussian function to the denoising processing of human footprint images in aerobics. We convolve the initial image

$u_0(x)$ and Gaussian function of the human footprint image in the aerobics exercise $G(x, t)$ to obtain the human footprint image $u(x, t)$ under the different limits of the visual space of different aerobics exercises.[9] Use formula (1) to express:

$$u(x,t) = u_0 * G(x,t), x \in R^n, t \in (0,\infty) \quad (1)$$

In

$$G(x,t) = (4\pi t)^{\frac{-n-|x|^2}{2^e 4t}} \quad (2)$$

The visual limit space operator T_t of aerobics has Euclidean invariance. The image blocks u and v of any footprint image in the visual limit space of aerobics meet

$$T_t(au + b\upsilon) = aT_t(u) + bT_t(\upsilon) \quad (3)$$

a and b respectively represent the length and width of the human footprint image. We use the Gaussian function to identify human footprint images in the visual space of aerobics.[10] The article carries on the human footprint image feature points with the same limit and angle as the salient feature points. Use formula (4) to define the limit space of the image of human footprint in aerobics:

$$L(x,y,\sigma) = G(x,y,\sigma) * I(x,y) \quad (4)$$

$*$ represents the convolution operation performed on the human footprint image. $I(x, y)$ represents the original image of the human footprint image in the visual space of aerobics:

$$G(x,y,\sigma) = \frac{1}{2\pi\sigma^2} * e^{\frac{-(x^2+y^2)}{2\sigma^2}} \quad (5)$$

$$DOG(x,y,\sigma) = (G(x,y,k\sigma) - G(x,y,\sigma)) * I(x,y) = L(x,y,k\sigma) - L(x,y,\sigma) \quad 6)$$

σ represents the standard mean square error and k is a constant. $\nabla^2 G$ represents the prominent point in the image space of human footprints in aerobics.[11] We decompose $\nabla^2 G$ into two aerobics, x and y, to perform filtering on the visual-spatial angle. Use formula (7) to construct a filtering matrix of prominent points in the human footprint image space

$$\nabla^2 G(x,y,\sigma) = \frac{\partial^2 G}{\partial x^2} + \frac{\partial^2 G}{\partial y^2} = \frac{1}{\pi\sigma^4}\left(\frac{(x^2+y^2)}{2\sigma^2} - 1\right)\exp\left(-\frac{1}{2\sigma^2}(x^2+y^2)\right) \quad (7)$$

In the formula, x represents the position of the prominent point of the human footprint image. We use equation (8) to express

$$\frac{\partial D}{\partial \sigma} = \frac{D_{k+1}^{ij} - D_{k-1}^{ij}}{2} \quad (8)$$

∂D represents the symmetrical point in the x direction of the human footprint image. Use equation (9) to give the limit of the salient points of the human footprint image

$$D(x,y) = D + \frac{1}{2}\frac{\partial D^T}{\partial x}\sigma * xy \quad (9)$$

$\sigma * xy$ represents the angle of each feature point of the human footprint image in aerobics.

Statistical analysis

The data in this experiment were analyzed and processed by statistical software SPSS15.0. Then we analyzed and compared the measurement results of the two groups of test subjects.

RESULTS

There are significant differences in the determination results of the stability and core strength of the two groups of athletes. The stability and core strength of the athletes in the experimental group were significantly better than those in the control group.[12] Therefore, core strength training can effectively improve the complete quality of the difficult movements of the competitive aerobics' athletes in Group C. Core strength training has a positive role in promoting.

DISCUSSION

From the data in Table 1, it can be concluded that the stability of competitive aerobics athletes in the test group is better than that of the control group. From the data in Table 2, it can be concluded that the core strength indexes of the competitive aerobics athletes in the test group are better than those of the control group athletes. This shows that core strength training is implemented for competitive aerobics athletes. It can improve its stability and core strength. Core strength can help competitive aerobics athletes complete Group C difficult movements with high quality.

Table 1. Test results of stability of two groups of competitive aerobics athletes (m).

Group	Test group	Control group
Reach forward	0.87±0.02	0.82±0.00
Back stretch	0.98±0.04	0.90±0.05
Left stretch	0.77±0.01	0.71±0.03
Right stretch	0.88±0.05	0.81±0.01
Left forward	0.86±0.04	0.80±0.01
Left backward	0.94±0.03	0.86±0.03
Right forward	0.95±0.07	0.88±0.01
Right back stretch	0.96±0.06	0.83±0.02

Table 2. Test results of various indexes of the core strength of two groups of competitive aerobics athletes.

Group	Test group	Control group
Swivel sit-ups/time	62.71±6.50	50.55±3.24
Prone back up/time	118.32±6.58	100.21±5.78
Seat pull down/s	10.55±1.34	8.45±2.46
Kick/s	7.21±0.85	6.78±0.46

CONCLUSION

Core strength training plays an active role in improving the completion quality of group C difficult movements of competitive aerobics athletes. It helps to improve the athlete's quality, stability, core strength, and so on. Coaches need to strengthen core strength training in future strength training.

All authors declare no potential conflict of interest related to this article

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