

IMPACTS OF ABDOMINAL CORE STRENGTHENING ON FITNESS IN AEROBIC GYMNASTICS

IMPACTOS DO FORTALECIMENTO DO CENTRO ABDOMINAL SOBRE A APTIDÃO FÍSICA NA GINÁSTICA AERÓBICA

IMPACTO DEL FORTALECIMIENTO DEL NÚCLEO ABDOMINAL EN LA APTITUD FÍSICA EN GIMNASIA AERÓBICA



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ABSTRACT

Introduction: The requirements for physical and strength quality of athletes are getting higher and higher, following the advances in the development of modern competitive aerobics. The strengthening of the abdominal center in current exercises is focused only on the superficial musculature, and it is believed that specific strengthening training can impact the fitness of gymnasts. **Objective:** Analyze the impacts of strengthening the abdominal core on the physical fitness of aerobic gymnasts. **Methods:** Using the controlled experiment method, abdominal core strength training was added to the traditional training of aerobic gymnastics students, while the control group remained with traditional training methods. The assessment was performed before and after the intervention, and the fitness results were compared and discussed statistically. **Results:** The mean index of the leaning back activity score in the experimental group increased from 37.750 to 41.582; the index in the bridge activity in the experimental group increased from 6.421 to 16.053; the index in the hanging bridge activity in the experimental group increased from 7.484 to 12.474; the mean overall stability score of the students before and after the experiment increased from 93.090 to 98.148; the mean hip lift index was also changed from 7.046 to 9.676. **Conclusion:** It was observed that the need for mastery of abdominal core strength to complete aerobic movements of high complexity, where abdominal core strengthening has an important role in stabilizing the center of gravity, force distribution, and preventing fatigue after exercise. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Resistance Training; Abdominal Core; Gymnastics; Physical Fitness.

RESUMO

Introdução: Os requisitos sobre qualidade física e de força dos atletas estão ficando cada vez mais altos, acompanhando os avanços no desenvolvimento da aeróbica competitiva moderna. O fortalecimento do centro abdominal nos exercícios atuais está focado apenas na musculatura superficial e acredita-se que um treino de fortalecimento específico possa impactar na aptidão física dos ginastas. **Objetivo:** Analisar os impactos do fortalecimento do centro abdominal sobre a aptidão física dos ginastas aeróbicos. **Métodos:** Usando o método de experiência controlada, o treinamento de força do centro abdominal foi adicionado ao treinamento tradicional dos alunos de ginástica aeróbica, enquanto o grupo de controle permaneceu com os métodos tradicionais de treinamento. A avaliação foi efetuada antes e após a intervenção e os resultados da aptidão física foram comparados e discutidos estatisticamente. **Resultados:** O índice médio da pontuação da atividade de costas inclinadas no grupo experimental aumentou de 37.750 para 41.582; o índice na atividade de ponte no grupo experimental aumentou de 6.421 para 16.053; o índice na atividade de ponte suspensa no grupo experimental aumentou de 7.484 para 12.474; a pontuação média de estabilidade geral dos estudantes antes e depois do experimento elevou-se de 93.090 para 98.148; o índice médio de elevação do quadril também foi alterado de 7.046 para 9.676. **Conclusão:** Observou-se a necessidade de domínio sobre a força do centro abdominal para completar os movimentos aeróbicos de alta complexidade, onde o fortalecimento do centro abdominal tem um papel importante na estabilização do centro de gravidade, distribuição de força e prevenção de fadiga após o exercício. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Treinamento de Força; Centro Abdominal; Ginástica; Aptidão Física.

RESUMEN

Introducción: Las exigencias sobre la calidad física y de fuerza de los atletas son cada vez mayores, tras los avances en el desarrollo del ejercicio aeróbico de competición moderno. El fortalecimiento del núcleo abdominal en los ejercicios actuales se centra sólo en la musculatura superficial y se cree que un entrenamiento específico de fortalecimiento puede repercutir en la aptitud física de los gimnastas. **Objetivo:** Analizar las repercusiones del fortalecimiento del núcleo abdominal en la aptitud física de los gimnastas aeróbicos. **Métodos:** Utilizando el método de experimento controlado, se añadió el entrenamiento de fuerza del núcleo abdominal al entrenamiento tradicional de los alumnos de gimnasia aeróbica, mientras que el grupo de control permaneció con los métodos de entrenamiento tradicionales. La evaluación se realizó antes y después de la intervención y los resultados de la aptitud se compararon y analizaron



estadísticamente. Resultados: El índice medio de la puntuación de la actividad de inclinarse hacia atrás en el grupo experimental aumentó de 37,750 a 41,582; el índice en la actividad de puente en el grupo experimental aumentó de 6,421 a 16,053; el índice en la actividad de puente colgante en el grupo experimental aumentó de 7,484 a 12,474; la puntuación media de estabilidad general de los alumnos antes y después del experimento aumentó de 93,090 a 98,148; el índice medio de elevación de cadera también se modificó de 7,046 a 9,676. Conclusión: Se observó la necesidad de dominio de la fuerza del núcleo abdominal para completar movimientos aeróbicos de alta complejidad, donde el fortalecimiento del núcleo abdominal tiene un papel importante en la estabilización del centro de gravedad, la distribución de la fuerza y la prevención de la fatiga después del ejercicio. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptor: Entrenamiento de Fuerza; Núcleo Abdominal; Gimnasia; Aptitud Física.

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INTRODUCTION

In the current regulations of competitive aerobics competition, competitive aerobics should complete a set of movements within the specified time, which is about one minute and thirty seconds.¹ It is the most important to successfully and completely complete a set of difficult movements. When completing difficult movements, the athletes should have good physical strength and a stable core, so as to ensure stability in the process of constantly changing movements.² The control of the core stability of the body and the strong strength of the body are the necessary basic conditions for completing a whole set of movements. These two are also the most important basic tasks for competitive aerobics to complete a whole set of movements.³ As far as the current situation is concerned, the training of athletes' core strength has become very common and has become one of the necessary training in competitive events. The original training on core strength is mainly focused on the waist and abdomen.⁴ This kind of training can only stimulate the surface muscles, but it is difficult to stimulate the deep muscle tissue. These muscles that are not stimulated are also important components to complete difficult movements and control the stability of the body.⁵ Therefore, the existing core strength training is a good substitute for the original single waist and abdomen training. Put aside the shortcomings of the original training methods, and retain its outstanding places.⁶ This core strength training can improve the stability and improve the overall physical development of competitive athletes.

METHOD

Research object

Research object: whether core strength training is a necessary condition to improve the quality of aerobics movement. Subjects: In this paper, 16 female freshmen in a university were taken as the experimental subjects. The study and all the participants were reviewed and approved by Ethics Committee of South China Normal University (NO.STHCNU18-SD).

Experimental methods

From May 3, 2022 to June 26, 2022, 16 freshmen of a university were selected as the experimental subjects, and 16 students were randomly divided into two groups, namely, the experimental group and the control group. The total number of people with experimental research is 16. The basic information of the subjects is shown in Table 1. It can be seen from Table 1 that the average age of girls in the experimental group is 20.479 years old, with a standard deviation of 0.151; The average age of the control group was 20.557 years, with a standard deviation of 0.166; The average age of girls in the control group was 20.557 years, with a standard deviation of 0.166; The average height of the experimental group was 167.859 cm, with a standard deviation of 1.409; The average height of the control group was 171.727cm, and the standard deviation

Table 1. Basic information of the research object.

Option	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
Age (age)	20.479	0.151	20.557	0.166
Height (cm)	167.859	1.409	171.727	1.254
Weight (kg)	54.674	1.248	55.065	1.816

was 1.254. The average weight of the experimental group was 54.674kg, with a standard deviation of 1.248; The average weight of the control group was 55.065kg, and the standard deviation was 1.816.

Experimental content

The experimental group combines aerobics with core strength training. The content of aerobics (60 minutes) is the exercise of basic steps and arm movements, the use of the third set of secondary routines in the Chinese Mass Training Standards for Aerobics, and the creation, editing, design and arrangement of formation; As the main content of core strength training intervention (30min), instrument assisted or unarmed training is mainly divided into static exercise and dynamic exercise.

Experimental control

First of all, with the approval of the school, the subjects were divided into two groups: the experimental group and the control group. The single blind experiment was conducted without the students' knowledge. Secondly, the subjects filled in the self-control scale and carried out dynamic balance test at the same place at a fixed time. Next, we will give lectures to the experimental subjects in the form of a specially assigned person. Students who are familiar with the school stadium will be selected as the experimental locations, and the time will be fixed to ensure that they can attend classes on time.

RESULTS

It can be seen from Table 2 that core strength training has a certain impact on the explosive force of sports. The average number of both sides of the experimental group increased from 35.199 before the experiment to 40.998 after the experiment, and the standard deviation decreased from 3.413 before the experiment to 2.325 after the experiment. In the experimental group, the average number of prone backs increased from 37.750 before the experiment to 41.582 after the experiment, and the standard deviation increased from 1.751 before the experiment to 2.626 after the experiment. In the experimental group, the average number of left lateral lumbar protrusions increased from 25.702 before the experiment to 28.756 after the experiment, which means that the standard deviation increased from 1.363 before the experiment to 4.505 after the experiment. Obviously, this increase is huge. The average number of right side lumbar rise in the experimental group increased

Table 2. The Influence of Core Strength Training on the Explosive Power of Aerobics.

Before experiment	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
From both ends	35.199	3.413	34.995	6.826
Prone back	37.750	1.751	35.940	3.229
Left side waist up	25.702	1.363	25.547	1.089
Right side waist up	22.603	5.958	23.081	0.778
After experiment	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
From both ends	40.998	2.325	37.795	6.026
Prone back	41.582	2.626	38.528	4.159
Left side waist up	28.756	4.505	27.469	2.341
Right side waist up	26.802	1.655	24.578	1.317

from 22.603 before the experiment to 26.802 after the experiment, and the standard deviation decreased from 5.958 before the experiment to 1.655 after the experiment.

In the control group, the average number of starts from both ends changed from 34.995 before the experiment to 37.795 after the experiment, and the standard deviation decreased from 6.826 before the experiment to 6.026 after the experiment. In the control group, the average number of prone backs increased from 35.940 before the experiment to 38.528 after the experiment, and the standard deviation increased from 3.229 before the experiment to 4.159 after the experiment. In the control group, the average number of left lateral lumbar protrusions changed from 25.547 before the experiment to 27.469 after the experiment, which means that the standard deviation increased from 1.089 before the experiment to 2.341 after the experiment. In the control group, the average number of right side lumbar rise increased from 23.081 before the experiment to 24.578 after the experiment, and the standard deviation increased from 0.778 before the experiment to 1.317 after the experiment. To sum up, we can see that after the basic strength training, the students who participate in the core strength training have greatly improved in the explosive force of aerobics movements, while the students who participate in aerobics movements use conventional training methods to achieve poor results.

It can be seen from Table 3 that core strength training has a certain impact on the stability of aerobics. The average number of bent bridges in the experimental group increased from 6.421 group before the experiment to 16.053 group after the experiment, which can clearly show the change of this group. The standard deviation increased from 1.407 group before the experiment to 5.808 group after the experiment. The average number of overhead bridges in the experimental group increased from 7.484 before the experiment to 12.474 after the experiment, and the standard deviation slightly increased from 2.107 before the experiment to 2.718 after the experiment. The average number of left bridges in the experimental group increased significantly from 5.476 before the experiment to 11.584 after the experiment, and the standard deviation changed from 0.514 before the experiment to 3.250 after the experiment. The average number of right bridge groups in the experimental group was 7.785 before the experiment, and increased to 12.349 after the experiment. The standard deviation increased from 2.350 before the experiment to 2.728 after the experiment.

Table 4 shows the balance score of students' aerobics. From the results of the experimental group, the average forward stability score of students before the experiment was 56.389, the standard deviation was 4.361, and the average forward stability score after the experiment was 59.452, the standard deviation was 4.301. Before the experiment, the average stability score of the middle back side of the students was

Table 3. The Influence of Core Strength Training on the Stability of Aerobics.

Before experiment	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
Bent bridge (group)	6.421	1.407	7.125	1.828
Inverted bridge (group)	7.484	2.107	7.162	2.361
Left bridge (group)	5.476	0.514	5.109	0.947
Right bridge (group)	7.785	2.350	7.484	2.066
After experiment	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
Bent bridge (group)	16.053	5.808	8.784	3.211
Inverted bridge (group)	12.474	2.718	7.903	2.187
Left bridge (group)	11.584	3.250	6.775	2.168
Right bridge (group)	12.349	2.728	8.992	4.161

Table 4. The Influence of Core Strength Training on the Balance of Aerobics.

Before experiment	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
Forward	56.389	4.361	57.929	4.169
Rear middle side	93.264	7.105	90.027	5.447
Posterolateral	92.914	6.846	91.143	6.667
Comprehensive score	93.090	7.317	94.451	7.145
After experiment	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
Forward	59.452	4.301	58.102	4.712
Rear middle side	97.355	5.792	91.153	4.742
Posterolateral	98.940	4.811	92.247	4.662
Comprehensive score	98.148	5.937	95.778	6.257

93.264, the standard deviation was 7.105, and the average value of the forward stability after the experiment was 97.355, the standard deviation was 5.792; Before the experiment, the average score of the students' posterolateral stability was 92.914 points, the standard deviation was 6.846, and the average score of the students' anterolateral stability after the experiment was 98.940 points, the standard deviation was 4.811; The average score of students' comprehensive stability before the experiment was 93.090 points, with a standard deviation of 7.317. The average score of students' comprehensive stability after the experiment was 98.148 points, with a standard deviation of 5.937.

Table 5 analyzes the results of students' aerobics before and after the experiment. According to the analysis of the students in the experimental group, before the experiment, the average value of the students' scissors jump was 6.913, with a standard deviation of 0.627. After the experimental training, the average value of the students' scissors jump was 9.843, with a standard deviation of 0.791; Before the experiment, the average value of 360 degrees of single foot rotation of students was 4.755, and the standard deviation was 1.154. After the experiment, the average value of 360 degrees of single foot rotation of students was 7.646, and the standard deviation was 0.716; Under the normal condition that no experiment is carried out, the average value of the right angle supports of the split leg height of the students is 8.276, and the standard deviation is 0.869. After training the students, the experimental results show that the average value of the right angle supports of the split leg height is 9.363, and the standard deviation is 0.341; Generally, when the experiment is not conducted, the average value of 180 degrees of

Table 5. The Influence of Core Strength Training on the Performance of Aerobics.

Before experiment	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
Scissor Jump	6.913	0.627	7.631	1.054
Single foot swivel 360 degrees	4.755	1.154	4.641	0.984
Split leg high right angle support	8.276	0.869	8.343	0.737
Lift your hips and turn 180 degrees	7.046	0.605	6.983	0.521
After experiment	Experience group		Control group	
	Average value	Standard deviation	Average value	Standard deviation
Scissor Jump	9.843	0.791	8.140	0.999
Single foot swivel 360 degrees	7.646	0.716	4.906	0.995
Split leg high right angle support	9.363	0.341	9.261	0.009
Lift your hips and turn 180 degrees	9.676	0.897	7.182	0.703

hip lifting and twisting of students is 7.046, and the standard deviation is 0.605. After the experiment, the average value of 180 degrees of hip lifting and twisting is 9.676, and the standard deviation is 0.897.

DISCUSSION

Because there are jumping, turning, bending and stretching, swinging, balance and other movements that need to be completed in aerobics, it requires that the practitioner must have a high control ability of body posture. Therefore, aerobics practice must have a good balance ability. Maintaining the balance of the body is mainly to coordinate and control the muscles in the core area through the body nerve center. In the process of changing aerobics movements, the body posture and the center of gravity of the movement are also constantly changing. The completion of a whole set of movements requires not only the participation of the muscles in the core area, but also the coordination and cooperation of each part of the body. The core strength training is a

kind of targeted training on strength, balance and other abilities for the muscles in the core area of the body. The purpose of training is to better improve the muscle strength, so that the body can be fully exercised from feeling to vision. In the whole core strength training, all systems of the body are trained together, and the body's own gravity is trained through customized foundation and consolidation stage training. By training with straight arm supine, prone and side lying to awaken the deep muscle parts of the body, the degree of muscle participation can be improved and the stimulation of the body can be deepened better; In the later stage, by improving the training difficulty of the three most basic postures of supine, prone and side lying, the height and angle of the limbs are increased, and the auxiliary training is carried out with the help of relevant equipment, so that the whole body system can be well mobilized and the perfect completion of aerobics can be better improved.

CONCLUSION

The physical quality of college aerobics training can be improved by training the core strength. When athletes perform gymnastics, connection and other difficult sports, a strong and powerful trunk will provide strong strength for athletes, thus reducing energy consumption, so that students can move their limbs more quickly and accurately. Compared with the traditional waist and abdomen strength training, the core strength training can improve the students' ability of aerobics training more quickly and comprehensively. In order to form a more obvious impact on the physical quality of competitive aerobics athletes, the core strength training needs at least two short cycles. Although the average results of the experimental group in the first stage of core strength training have improved, the results before the experiment are not much different. After the two core strength training, the results after the experiment have improved significantly compared with the results before the experiment.

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