

# EFFECTS OF PILATES ON AEROBIC PERFORMANCE OF COLLEGE STUDENTS



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EFEITOS DO PILATES SOBRE O DESEMPENHO DE AERÓBICA DE ESTUDANTES UNIVERSITÁRIOS

EFFECTOS DEL PILATES EN EL RENDIMIENTO AERÓBICO DE ESTUDIANTES UNIVERSITARIOS

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## ABSTRACT

**Introduction:** The Pilates is a training method that aims to improve body awareness for movement re-education, bringing muscular and mental balance. It is believed that these benefits can effectively improve the flexibility of female university aerobics students. **Methods:** 90 female college students in the optional aerobics course were selected and divided into two groups. Data from the experimental and control groups were evaluated for comparison before and after the experiment. The aerobic exercises of the two groups of female university aerobics students were scored, aiming to compare and explore which training method was more effective. **Results:** The baseline time and pace score in the Pilates intervention was changed from  $2.35 \pm 0.71$  to  $2.55 \pm 0.76$ , a movement set changed from  $3.86 \pm 0.98$  to  $4.01 \pm 1.07$ , movement performance from  $1.67 \pm 0.61$  to  $1.72 \pm 0.57$ , and foot skills from  $1.40 \pm 0.48$  to  $1.41 \pm 0.50$ . The mean aerobic movement performance score changed from 62.45 to 80.53, an increase of 18.08 points. **Conclusion:** The Pilates training can effectively improve the aerobic performance of female university students. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Pilates Training; Sports Performance; Aerobic Exercise.

## RESUMO

**Introdução:** O Pilates é um método de treinamento que visa trabalhar a consciência corporal para reeducação do movimento, trazendo equilíbrio muscular e mental. Acredita-se que esses benefícios possam efetivamente melhorar a flexibilidade das estudantes universitárias de aeróbica. **Objetivo:** Avaliar os efeitos do treinamento baseado em pilates sobre o desempenho esportivo de estudantes universitárias. **Métodos:** 90 estudantes universitárias femininas do curso opcional de aeróbica foram selecionadas e divididas em dois grupos. Os dados do grupo experimental e do grupo de controle foram avaliados para comparação antes e depois do experimento. Os exercícios aeróbicos dos dois grupos de estudantes universitárias femininas de aeróbica foram pontuados, visando a comparação e explorar qual o método de treinamento mais eficaz. **Resultados:** O valor de tempo e ritmo basal na intervenção com pilates foi alterado de  $2,35 \pm 0,71$  para  $2,55 \pm 0,76$ , o conjunto de movimentos mudou de  $3,86 \pm 0,98$  para  $4,01 \pm 1,07$ , o desempenho do movimento de  $1,67 \pm 0,61$  para  $1,72 \pm 0,57$ , e as habilidades com os pés de  $1,40 \pm 0,48$  para  $1,41 \pm 0,50$ . A pontuação média do desempenho do movimento aeróbico mudou de 62,45 para 80,53, um aumento de 18,08 pontos. **Conclusão:** O treinamento de Pilates pode efetivamente melhorar o desempenho de estudantes universitárias femininas de aeróbica. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Método Pilates; Aeróbica; Desempenho Esportivo; Exercício Aeróbico.

## RESUMEN

**Introducción:** Pilates es un método de entrenamiento que pretende trabajar la conciencia corporal para la reeducación del movimiento, aportando equilibrio muscular y mental. Se cree que estos beneficios pueden mejorar eficazmente la flexibilidad de las estudiantes universitarias de aeróbica. **Objetivo:** Evaluar los efectos del entrenamiento basado en pilates en el rendimiento deportivo de estudiantes universitarias. **Métodos:** Se seleccionaron 90 estudiantes universitarias del curso optativo de aeróbica y se dividieron en dos grupos. Se evaluaron los datos del grupo experimental y del grupo de control para compararlos antes y después del experimento. Se puntuaron los ejercicios aeróbicos de los dos grupos de estudiantes universitarias de aeróbica, con el objetivo de comparar y explorar qué método de entrenamiento era más eficaz. **Resultados:** La puntuación inicial de tiempo y ritmo en el experimento de pilates pasó de  $2,35 \pm 0,71$  a  $2,55 \pm 0,76$ , la del conjunto de movimientos pasó de  $3,86 \pm 0,98$  a  $4,01 \pm 1,07$ , la del rendimiento de los movimientos pasó de  $1,67 \pm 0,61$  a  $1,72 \pm 0,57$ , y la de las habilidades con los pies pasó de  $1,40 \pm 0,48$  a  $1,41 \pm 0,50$ . La puntuación media del rendimiento de los movimientos aeróbicos pasó de  $1,67 \pm 0,61$  a  $1,72 \pm 0,57$ , y la de las habilidades con los pies de  $1,40 \pm 0,48$  a  $1,41 \pm 0,50$ . La puntuación media del rendimiento del movimiento aeróbico pasó de 62,45 a 80,53, lo que supone un aumento de 18,08 puntos. **Conclusión:** El entrenamiento con Pilates puede mejorar eficazmente el rendimiento aeróbico de las estudiantes universitarias. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptorios:** Método Pilates; Rendimiento Deportivo; Ejercicio Aeróbico.



## INTRODUCTION

When training Pilates, we should activate the exhausted and long-term undeveloped muscle tissue, strengthen the basic core function, strengthen the correct rib breathing, strengthen the coordinated mental control of various muscle tissues, and enhance the nerve connection ability by collecting more deep muscle tissue, improve the function of small muscle groups, effectively control the movement of the human body, improve the physical quality, strengthen the stability of the trunk, joint flexibility, body balance, symmetry, and movement coordination.<sup>1</sup> For example, the spine extension in Pilates is a classic function of strengthening the flexibility of the spine, which can not only improve the body curvature of the spine, but also increase the muscle strength of the abdominal muscles and the dorsal extensor muscles; Shoulder bridge action is a classic action to activate the hamstring muscle, which can activate the hamstring muscle, strengthen the hip joint extension and gluteus muscle, and effectively increase the stability of the trunk.<sup>2</sup> Pre-support and advanced movement are also one of the main movements to increase the stability of the trunk. The correct breathing mode can adjust the proper arrangement of the body joints.<sup>3</sup> Aerobics is a project that can well reflect the overall quality of human speed, strength and flexibility, and its sports range includes transitional sports, difficult sports and strategic sports. College students must have good trunk stability, balance, coordination and muscle control ability to make changeable and complex technical movements.<sup>4</sup> Good aerobics requires strong core strength as the support of college students. Pilates can effectively improve the stability of the trunk, improve body balance, adjust the flexibility of joints through core strength exercises, and help college students improve their sports skills and quality.<sup>5</sup> The focus of this paper is on the improvement and influence of Pilates training on the movements of aerobics college students. Deeply explore the various functions of Pilates training and the related role of aerobics training, which not only modernizes the training methods and methods of aerobics college students, but also provides more innovative training paths for college students to improve the quality of movements.<sup>6</sup>

## METHOD

### Experimental object

In order to avoid gender differences, 90 female college students in the aerobics optional class were selected, and there was no significant difference in the physical indicators of 90 female college students in the aerobics optional class. The study and all the participants were reviewed and approved by Ethics Committee of Jiangsu Research Institute of Sports Science (NO. JRISS2022FD-19). Before the experiment, 90 female college students were measured with basic body data, including height, weight and age. The average height is 167 cm, the average weight is 58 kg, and the average age is 20 years old. The 90 female college students in the optional sports class were randomly divided into two groups, 45 in each group. One group was the experimental group, and the other group was the control group. 45 female college students in the experimental group were trained in Pilates, while the control group was trained in routine aerobics. (Table 1)

### Experimental method

First of all, before the experiment, the basic physical quality of 90 female college students in the aerobics optional course was measured.

**Table 1.** Basic information of the two sports elective classes.

Index	Experimental class	Control class	t	p
Height	165.968 ±4.7237	169.297 ±8.8761	-0.1492	0.8958
Weight	59.063 ±7.7768	57.973 ±9.3997	-0.0509	0.9510
Age	20.258 ±0.6718	19.894 ±0.6791	0.0000	1.0079

In addition to the basic height, weight and age, the basic ability of aerobics also needed to be measured, including 1 minute sit-ups, side bridges, waist flexion, waist extension, side throwing medicine balls, plate support, etc., and the comparative analysis of the basic ability data of aerobics was carried out after the experiment. In order to analyze which training mode of general aerobics training and Pilates training has more obvious effect on the ability improvement of female college students' aerobics movement performance.

### Experimental variables

The experiment lasted for 12 weeks. During the whole experiment, the independent variable of the experiment was the different training methods of ordinary aerobics training and Pilates training. Different training methods would have different training effects on female college students.

## RESULTS

### The effect of Pilates training on the basic ability of college students' aerobics

Table 2 shows the comparison of the data before and after the experiment on the basic calisthenics ability of 45 female college students in the control group who took 12 weeks of routine calisthenics training.

Under the guidance of coaches and teachers, after 12 weeks of training, the indexes of the control group of routine aerobics training were improved, and the T value was negative. Routine aerobics training can also improve the basic calisthenics ability of female college students, but from the experimental data, the improvement effect is not obvious. We can try to explore more effective training ways to improve the basic calisthenics ability and movement performance of female college students, so as to promote the improvement of female college students' calisthenics skills and movement optimization.

Table 3 shows the comparison of the basic calisthenics ability of 45 female college students in the experimental group who took 12 weeks of routine calisthenics training before and after the experiment.

**Table 2.** The Effect of Routine Aerobics Training on the Basic Abilities of College Students.

Control class	Before experiment	After experiment	T	P value
1 minute Sit-ups (each)	36.202 ±3.9107	43.261 ±2.8159	-3.0489	0.0030
Side bridge (seconds)	49.534 ±7.6599	60.906 ±3.9393	-2.2639	0.0000
Lumbar flexion (degrees)	54.749 ±2.1399	55.539 ±2.8149	-3.6645	0.0119
Waist stretch (degrees)	19.498 ±0.8754	22.529 ±1.2284	-1.6643	0.0323
Side throw medicine ball (m)	7.929 ±1.1936	8.599 ±1.1087	-2.5986	0.0010
Plate support (seconds)	69.876 ±12.5803	92.979 ±13.7704	-2.0096	0.0010

**Table 3.** The Effect of Pilates Training on the Basic Abilities of College Students in Aerobics.

Experimental class	Before experiment	After experiment	T	P value
1 minute Sit-ups (each)	36.951 ±6.0676	50.264 ±3.059	-2.2436	0.0000
Side bridge (seconds)	51.396 ±9.1479	71.157 ±4.540	-1.4741	0.0010
Lumbar flexion (degrees)	53.701 ±2.4173	65.393 ±3.641	-5.7512	0.0000
Waist stretch (degrees)	21.089 ±1.8831	26.080 ±2.417	-4.1807	0.0020
Side throw medicine ball (m)	8.204 ±1.0245	10.779 ±2.278	-1.9814	0.0041
Plate support (seconds)	72.741 ±11.5775	113.138 ±14.087	-2.0927	0.0020

Under the guidance of the Pilates instructor and teacher, after 12 weeks of training, all indicators of the Pilates training experimental group were significantly improved, while the T value was negative. Compared with the routine aerobics training, Pilates can significantly improve the basic ability of female college students' aerobics. Compared with the data before and after the experiment, the improvement effect is very obvious. You can try to regularly increase Pilates training in the aerobics sports elective course to improve the basic ability and movement performance of female college students' aerobics, So as to promote the improvement of female college students' aerobics skills and the optimization of their movements, so as to make female college students achieve better results in the optional sports courses.

### Optimization analysis of pilates training on college students' aerobics movement performance

By observing Table 4, it can be clearly found that in the test of basic calisthenics ability of 45 female college students in the sports elective class before the experiment, the time value and basic rhythm were  $1.456 \pm 0.5353$ , the complete set of movements was  $3.195 \pm 1.2393$ , the movement performance was  $1.398 \pm 0.5334$ , and the footwork skill was  $1.191 \pm 0.3740$ . After the experiment, the specific index changes of the basic calisthenics ability of 45 female college students in the optional physical education class are as follows: the time value and basic rhythm change is  $1.550 \pm 0.5456$ , the complete set change is  $3.276 \pm 1.1886$ , the movement performance is  $1.492 \pm 0.5962$ , and the footwork skill change is  $1.169 \pm 0.3931$ .

After 12 weeks of training in the control group of routine aerobics training, all indicators of basic ability of aerobics have been improved, P value is less than 0.05. After 12 weeks of regular aerobics training, 45 female college students have improved their time value and basic rhythm, complete sets of movements, movement performance, footwork skills and other aspects. Through regular aerobics training, female college students can improve their aerobics movement proficiency, and then improve the beauty and movement performance of aerobics movements. However, it needs continuous practice day after day, and the effect is not significant.

By observing Table 5, it can be clearly found that in the test of basic calisthenics ability of 45 female college students in the experimental group in the sports elective class before the experiment, the time value and basic rhythm were  $2.358 \pm 0.7141$ , the set of movements was  $3.860 \pm 0.9847$ , the movement performance was  $1.671 \pm 0.61694$ , and the footwork skills were  $1.405 \pm 0.4874$ . After the experiment, the specific indicators of the basic ability of aerobics of 45 female college students in the optional physical education class changed as follows: the time value and basic rhythm changed to  $2.553 \pm 0.7614$ , the set of movements changed to  $4.015 \pm 1.0713$ , the movement performance  $1.721 \pm 0.5772$ , and the footwork skill changed to  $1.417 \pm 0.5040$ .

After 12 weeks of training in the experimental group of Pilates training, all indicators of the basic ability of aerobics of 45 female college students have been improved, P value is less than 0.05. After 12 weeks of routine Pilates training, 45 female college students' time value and basic rhythm, complete sets of movements, movement performance, footwork skills and other aspects have improved significantly. Through Pilates training, female college students' body flexibility can be improved, which is crucial for female college students in aerobics, and then improve the consistency of aerobics movements, with significant results.

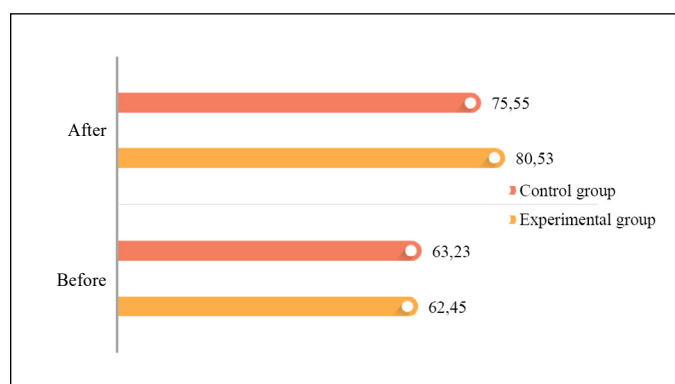
Figure 1 shows the change of aerobics performance score of female college students in the control group and the experimental group before and after the experiment. Before the experiment, the average score of aerobics performance of 45 female college students in the control group of general aerobics training was 63.23, and the average score of

**Table 4.** The Effect of Routine Aerobics Training on the Basic Abilities of College Students.

Control class	Before experiment	After experiment	T	P value
Time value and basic rhythm	$1.456 \pm 0.5353$	$1.550 \pm 0.5456$	7.9037	0.0000
Set of movements	$3.195 \pm 1.2393$	$3.276 \pm 1.1886$	3.2889	0.0020
Movement performance	$1.398 \pm 0.5334$	$1.492 \pm 0.5962$	2.5550	0.0111
Footwork technique	$1.191 \pm 0.3740$	$1.169 \pm 0.3931$	2.7134	0.0081

**Table 5.** The Effect of Pilates Training on the Basic Abilities of College Students in Aerobics.

Experimental class	Before experiment	After experiment	T	P value
Time value and basic rhythm	$2.358 \pm 0.7141$	$2.553 \pm 0.7614$	8.2369	0.0000
Set of movements	$3.860 \pm 0.9847$	$4.015 \pm 1.0713$	3.6889	0.0000
Movement performance	$1.671 \pm 0.6169$	$1.721 \pm 0.5772$	2.1547	0.0323
Footwork technique	$1.405 \pm 0.4874$	$1.417 \pm 0.5040$	3.0500	0.0030



**Figure 1.** Optimization of Pilates Training on Aerobics Performance of College Students.

aerobics performance of 45 female college students in the experimental group of Pilates training was 62.45. After 12 weeks of experiment, The average score change of 45 female college students in the control group of general aerobics training is 75.55, and the average score change of 45 female college students in the experimental group of Pilates training is 80.53. Before the experiment, the control group scored 0.78 points higher than the 45 female college students in the experimental group in aerobics. After 12 weeks of experiment, the experimental group scored 4.98 points higher than the 45 female college students in the control group in aerobics. After the experiment, the average performance of the 45 female college students in the experimental group was significantly better than the control group.

## DISCUSSION

Pilates training system is designed according to the principles of human anatomy, sports humanities, sports physiology, etc., creating a set of professional sports training methods. It is an exercise system that can promote overall health, strengthen muscles and improve flexibility, coordination and posture. Pilates emphasizes the importance of the body core, consciously controls the body through the brain, ensures proper bone arrangement and muscle recruitment order, focuses on the details of movement, and uses relevant breathing patterns to carry out whole-body movement. Pilates training methods are flexible, training content is rich, and training objectives are clear. According to the classification of the external environment of the body, Pilates training can be divided into two states: the body is in a stable state and the body is in an unstable state; In the Pilates training process, there may

be training with the help of unarmed training and auxiliary equipment; According to the principles of anatomy and physiology, Pilates training is scientifically targeted at the training site. Generally speaking, Pilates can strengthen deep muscles by controlling the core of the body, combining rhythmic breathing methods, fitness methods on specific mats, or using special tools to enhance the function of body organs. It has a better effect on body control, flexibility and coordination, and strengthens the waist and hip muscles of the body. Initially, Pilates training was used as a means of rehabilitation, and then its role and effect were determined by relevant experts, and gradually developed into a sports project. Through consulting relevant literature and practice, it has been proved that Pilates can enhance the core and muscle strength of different parts of the body, so as to improve bad posture, form beautiful body curves, improve coordination and balance, and relieve muscle tension. Through consulting relevant literature and practice, it has been proved that Pilates can enhance the core and muscle strength of different parts of the body, improve bad posture, form beautiful body curves, improve coordination and balance, and relieve muscle tension. With the continuous development of Pilates, Pilates has different types of training methods. In order to achieve specific training goals, training methods can be combined with specific sports goals according to their

own principles. Pilates training, as a training project, has been gradually valued and adopted in the field of Chinese dance sports, but this method does not include aerobics, and there are few relevant theories about the impact of Pilates training on aerobics college students.

## CONCLUSION

After a 12-week experiment, by comparing the experimental data of the control group and the Pilates training group, the following conclusions can be drawn: (1) Both the routine aerobics training and the Pilates training can improve the basic skills of female college students in aerobics, and can optimize the performance of female college students in the aerobics optional course. (2) Routine aerobics training can improve the proficiency of female college students' aerobics movements, and then can improve their aerobics movement skills and graceful movements. (3) Pilates training can enhance the physical flexibility of female college students, effectively improve the coherence of basic aerobics movements of female college students, and lay a good foundation for aerobics movements.

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

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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. Dan Lv: writing and execution. Shizhan Yan: data analysis and article reviews.

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