INFLUENCES OF PILATES TRAINING ON POSTURAL BALANCE IN MARTIAL ARTS STUDENTS

INFLUÊNCIAS DO TREINAMENTO DE PILATES SOBRE O EQUILÍBRIO POSTURAL EM ALUNOS DE ARTES MARCIAIS

INFLUENCIA DEL ENTRENAMIENTO DE PILATES EN EL EQUILIBRIO POSTURAL DE ESTUDIANTES DE ARTES MARCIALES

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ABSTRACT

Introduction: Physical stability is extremely important for student-athletes of martial arts, and it is believed that the practice of Pilates can generate benefits in this aspect. Objective: Analyze the influences of Pilates training on postural balance in martial arts students during daily training. Methods: Using the control experiment verification method, this study selected 60 martial arts students and athletes to perform the control experiment. They were randomly divided into the experimental group and the control group. In addition to the traditional daily martial arts training protocol, the experimental group underwent Pilates training, while the control group performed only daily training. Results: In the experimental Pilates training group, vertical balance time increased from 791.25 ± 158.48 ms to 695.64 ± 208.08 ms, and left-right laterality balance time increased from 1,861.04 ± 202.96 ms to 1,994.70 ± 189.67 ms, and anteroposterior balance time increased from 1243.24 ± 475.07 ms to 1419.52 ± 331.62 ms. The balance score increased from 53.16 ± 3.94 to 63.83 ± 3.12. Conclusion: Pilates training improved postural balance in martial arts students. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Pilates Training; Students; Martial Arts; Postural Balance.

RESUMO

Introdução: A estabilidade física é extremamente importante para os estudantes atletas de artes marciais, acredita-se que a prática de pilates possa gerar benefícios neste aspecto. Objetivo: Analisar as influências do treinamento de Pilates sobre o equilíbrio postural em estudantes de artes marciais durante o treinamento diário. Métodos: Usando o método de verificação do experimento de controle, este trabalho selecionou 60 alunos e atletas de artes marciais escolares para realizar o experimento de controle. Eles foram divididos aleatoriamente no grupo experimental e no grupo de controle. Além do protocolo tradicional de treinamento diário de artes marciais, o grupo experimental foi submetido ao treinamento Pilates, enquanto o grupo de controle realizou apenas o treinamento diário. Resultados: No grupo experimental de treinamento Pilates, o tempo de equilíbrio vertical aumentou de 791,25 ± 158,48 ms para 695,64 ± 208,08 ms, o tempo de equilíbrio de lateralidade esquerda e direita aumentou de 1.861,04 ± 202,96 ms para 1.994,70 ± 189,67 ms, e o tempo de equilíbrio antero-posterior elevou-se de 1243,24 ± 475,07 ms para 1419,52 ± 331,62 ms. A pontuação de equilíbrio aumentou de 53,16 ± 3,94 para 63,83 ± 3,12. Conclusão: O treinamento do Pilates demonstrou melhorar o equilíbrio postural dos estudantes de artes marciais. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Método Pilates; Estudantes; Artes Marciais; Equilíbrio Postural.*

RESUMEN

Introducción: La estabilidad física es extremadamente importante para los estudiantes atletas de artes marciales, se cree que la práctica de Pilates puede generar beneficios en este aspecto. Objetivo: Analizar las influencias del entrenamiento de Pilates sobre el equilibrio postural en estudiantes de artes marciales durante el entrenamiento diario. Métodos: Utilizando el método de verificación del experimento de control, este estudio seleccionó a 60 estudiantes y atletas de artes marciales para realizar el experimento de control. Se dividieron aleatoriamente en el grupo experimental y en el grupo de control. Además del protocolo de entrenamiento diario tradicional de artes marciales, el grupo experimental se sometió a entrenamiento de Pilates, mientras que el grupo de control sólo realizó entrenamiento diario. Resultados: En el grupo experimental de entrenamiento de Pilates, el tiempo de equilibrio vertical aumentó de 791,25 ± 158,48 ms a 695,64 ± 208,08 ms, el tiempo de equilibrio de lateralidad izquierda y derecha aumentó de 1.861,04 ± 202,96 ms a 1.994,70 ± 189,67 ms, y el tiempo de equilibrio anteroposterior aumentó de 1.243,24 ± 475,07 ms a 1.419,52 ± 331,62 ms. La puntuación de equilibrio aumentó de 53,16 ± 3,94 a 63,83 ± 3,12. Conclusión: El entrenamiento con Pilates demostró mejorar el equilibrio postural en estudiantes de artes marciales. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Método Pilates; Estudiantes; Artes Marciales; Equilibrio Postural.*

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INTRODUCTION

Pilates, as a major fitness exercise, is closely combined with the method of breathing. In Pilates exercise, exercise trainers need to contract the waist muscles according to active and powerful breathing to facilitate the movement of abdominal organs.[1] In order to make the muscles of the whole body contract radially, they need to reduce the vital capacity of the trainer, so that the muscles contract in key parts of the body, while avoiding the contraction of pelvic floor muscles, which will cause corresponding anal contraction reaction.[2] In order to increase the lung volume when Pilates inhales, it is necessary to reduce the working pressure of the diaphragm during each pelvic expansion and contraction. Every martial art movement, including Pilates, can better bring the basic quality of the human body into play, reflecting the combination of different forces. Pilates can reasonably stimulate muscle groups in the complete set of movements.[3] In each movement, it is necessary to divide the over-connected movements of special students and various difficult movements. In order to train students to have better torso stability, balance and muscle coordination and make complex technical movements, each sports project needs to carry out core technical training.[4] Excellent martial arts trainers need to improve special core technical support training in each competition. Pilates can not only change the balance ability of the body, but also adjust the flexibility of joints to a certain extent.[5] In order to deeply study the stability of Pilates training and the auxiliary role of martial arts training, this paper constantly innovates training methods and means according to Pilates training technology, and also improves the training approach of movement stability.[6]

METHOD

Research object

In this paper, 60 student athletes with no significant difference in physical indicators were selected from the school martial arts special student athletes as the experimental subjects. The study and all the participants were reviewed and approved by Ethics Committee of Xi'an Aeronautical Institute (NO.XAAIF063PT). The average age of the experimental subjects was 21 years old, the average height was 174 cm, the average weight was 63 kg, and the average training period was 6 years. The 60 student athletes were randomly divided into the experimental group and the control group. The basic information of the two groups of martial arts students is shown in Table 1. The two groups of martial arts students mainly carry out the test experiment of joining Pilates training in terms of sports level and stability, so as to explore whether Pilates training can improve the sports stability of the students who carry out martial arts special training.

Experimental method

After measuring the basic situation of 60 student athletes, they were randomly divided into the experimental group and the control group for 6 weeks. According to the basic information in Table 1, the P value of age is 0.436, the P value of height is 1.013, the P value of weight is 0.835, the P value of training years is 0.393, and the P value is greater than 0.05, which can show that there is no significant difference between the 60 student athletes and can be tested. The experimental group joined the Pilates training during the daily martial arts special training, while the control group did the same daily training content without any other additional training, so as to ensure the accuracy of the experimental results. Through the use of professional equipment and software, the two groups of data after the experiment are collected and sorted in time for the analysis of the following experimental data results.

Table 1. Basic situation of two groups of martial arts students.

Basic indicators	Experience group	Control group	P value
Age/year	21.27 ±1.049	21.88 ±1.125	0.436
Height/cm	174.42 ±5.474	173.78 ±4.015	1.013
Body weight/kg	62.12 ±12.352	64.66 ±4.998	0.835
Training years/year	6.66 ±2.559	6.50 ±2.282	0.393

RESULTS

The influence of Pilates training on the sports level of martial arts students

After the six-week training experiment of martial arts, after collecting and analyzing the data obtained by using the software, we obtained the experimental results of the experimental group in terms of students' sports level before and after the experiment Table 2.

After finishing the six-week special training experiment of martial arts, after collecting and analyzing the data obtained by using the corresponding software, we obtained the experimental results of the students' sports level in the control group before and after the experiment Table 3.

According to the results of the experimental data in Table 2, the change rate of the W-shaped running in the experimental group is -8.033%, its P value is 0.031, the change rate of sit-ups is 26.835%, its P value is 0.026, the change rate of prone back is 14.689%, its P value is 0.039, the change rate of throwing solid ball after left rotation is 8.525%, its P value is 0.033, and the change rate of throwing solid ball after right rotation is 12.651%, its P value is 0.009. The P values of these five groups of basic indicators are all less than 0.05. Among them, the biggest change rate is sit-ups. It can be seen that the overall level of students' sports has been improved. According to the experimental data in Table 3, the change rate of the control group's W-shaped run is -4.912%, its P value is 0.046, the change rate of sit-ups is 3.513%, its P value is 0.040, the change rate of prone back is 0.127%, its P value is 0.049, the change rate of throwing solid ball after left rotation is -2.097%, its P value is 0.070, and the change rate of throwing solid ball after right rotation is 8.915%, its P value is 0.059. Among them, the P values of the three basic indicators of W-shaped running, sit-ups, and prone back up are all less than 0.05, although less than 0.05, but very close, which can be seen that although the three basic indicators of W-shaped running, sit-ups, and prone back up have changed,

Table 2. The level of martial arts students in the experimental group.

Basic indicators	Before experiment	After experiment	Rate of change	P value
W-shaped running (s)	14.15 ±0.512	13.10 ±0.813	-8.033%	0.031
Sit-ups (PCS)	28.13 ±2.775	38.45 ±1.214	26.835%	0.026
Prone and back up (pcs.)	34.44 ±2.928	40.37 ±1.997	14.689%	0.039
Throw solid ball after turning left (m)	9.06 ±0.989	9.90 ±0.911	8.525%	0.033
Right turn and throw solid ball (m)	8.21 ±0.512	9.40 ±0.505	12.651%	0.009

Table 3. The level of martial arts students in the control group.

Basic indicators	Before experiment	After experiment	Rate of change	P value
W-shaped running (s)	14.35 ±0.711	13.68 ±0.642	-4.912%	0.046
Sit-ups (PCS)	27.14 ±1.895	28.13 ±1.587	3.513%	0.040
Prone and back up (pcs.)	34.95 ±1.766	34.99 ±1.364	0.127%	0.049
Throw solid ball after turning left (m)	9.07 ±0.730	8.88 ±0.711	-2.097%	0.070
Right turn and throw solid ball (m)	8.50 ±0.839	9.34 ±0.876	8.915%	0.059

the improvement of students' sports level is not obvious. However, the P value of the basic indicators of the two groups of throwing the solid ball after the left turn and throwing the solid ball after the right turn is greater than 0.05, which indicates that the students' sports level has not changed much. Especially in the aspect of throwing a solid ball after turning left. From the comparison of the experimental data obtained after the experiment in Table 2 and Table 3, it can be seen that Pilates training can improve the overall sports level of students in the process of martial arts training.

The influence of Pilates training on the stability of martial arts students

Table 4 shows the data results of the experimental group with Pilates training in the process of martial arts special training.

Table 5 shows the data results of the control group who conducted daily training in the process of martial arts special training. From the perspective of vertical stability time, the change from 624.77 ± 246.267 ms before the experiment to 768.44 ± 293.155 ms, from 1959.61 ± 248.771ms before the experiment to 1912.85 ± 269.261 ms, from 1247.19 ± 377.631 ms before the experiment to 1381.00 ± 347.084 ms, and from 74.45 ± 3.229 points before the experiment to 75.19 ± 3.777 points, The unbalance score changed from 59.57 ± 0.521 before the experiment to 56.96 ± 0.545, the stability score changed from 55.34 ± 1.923 before the experiment to 57.25 ± 1.816, and the total skill score changed from 9.75 ± 0.036 before the experiment to 9.98 ± 0.035.

From the experimental data results in Table 4, we can see that the P value of the vertical stability time of the experimental group is 0.024, the P value of the left and right stability time is 0.033, the P value of the front and rear stability time is 0.036, the P value of the coordination score is 0.016, and the P value of the imbalance score is 0.012. The P value of stability score is 0.033, and the P value of total skill score is 0.033. The P values of the basic indicators in the seven groups are all less than 0.05, and the biggest change rate is the unbalanced score, which can be seen that the students' movement stability has made great progress. From the experimental data in Table 5, it can be seen that the P value of the control group's vertical stability time is 0.040, the P value of the left and right stability time is 0.048, the P value of the front and rear stability time is 0.049, the P value of the coordination score is 0.037, and the P value of the imbalance score is 0.070. The P value of stability score is 0.061, and the P value of total skill score is 0.064. Among them, the P value of the four basic indicators of vertical stability time, left and right stability time, front and rear stability time, and coordination score are all less than 0.05, with changes but not obvious changes. However, in the three groups of basic indicators of unbalance score, stability score and total skill score, P value is greater than 0.05, which can prove that there is no significant change. From the comparative analysis of the experimental data obtained after the experiment in Table 4 and Table 5, it can be found that Pilates training can improve the movement stability of martial arts students.

Table 4. The stability of martial arts students in the experimental group.

Basic indicators	Before experiment	After experiment	Rate of change	P value
Time for vertical stabilization (ms)	791.25 ±158.481	695.64 ±208.087	-13.744%	0.024
Time for left and right stabilization (ms)	1861.04 ±202.961	1994.70 ±189.678	6.701%	0.033
Time for front and rear stabilization (ms)	1243.24 ±475.071	1419.52 ±331.620	12.418%	0.036
Coordination score (points)	75.80 ±8.221	92.02 ±3.759	17.623%	0.016
Unbalanced score (points)	58.38 ±0.553	49.86 ±0.514	-17.085%	0.012
Stability score (points)	53.16 ±3.946	63.83 ±3.124	16.721%	0.033
Total skill score (points)	9.72 ±0.041	10.09 ±0.013	3.701%	0.033

Table 5. The stability of martial arts students in the control group.

Basic indicators	Before experiment	After experiment	Rate of change	P value
Time for vertical stabilization (ms)	624.77 ±246.267	768.44 ±293.155	18.696%	0.040
Time for left and right stabilization (ms)	1959.61 ±248.771	1912.85 ±269.261	-2.445%	0.048
Time for front and rear stabilization (ms)	1247.19 ±377.631	1381.00 ±347.084	9.690%	0.049
Coordination score (points)	74.45 ±3.229	75.19 ±3.777	0.982%	0.037
Unbalanced score (points)	59.57 ±0.521	56.96 ±0.545	-4.571%	0.070
Stability score (points)	55.34 ±1.923	57.25 ±1.816	3.336%	0.061
Total skill score (points)	9.75 ±0.036	9.98 ±0.035	2.326%	0.064

DISCUSSION

In order to activate the muscle groups that have been degraded for a long time during the deep training of muscles, Pilates needs to cooperate with the correct breathing mode during the training, so as to strengthen the core functions of the human body, so as to facilitate the control of the coordination and control ability of each muscle group. In the coordination and control ability of each muscle group, in order to improve the ability of nerve induction, so as to achieve the goal of body stability and balance and coordination. In Pilates movement training, the flexibility of the spine in the training sitting posture needs to be improved. Daily training of classic movements can not only improve the physiological curvature of the spine, but also enhance the muscle strength of muscle groups. In order to strengthen the hip extension of the muscle group, it is necessary to enhance the stability of the trunk in the classic action of the shoulder bridge, and activate the support action of the front part of the rope muscle. In order to match the correct order of the joints of the body, you can adjust the breathing mode during the training process. Many people will confuse some of the movements in Pilates with the conceptual definition in essence, mainly because there are some similarities in the movement mode and completion concept of muscle groups during training. In order to adjust the symptoms of muscle function decline in the long-term exercise of the training students, it is necessary to change the training actions in order to restore the original balance and stability of the body. The details of each movement chain need to be changed in combination with Pilates training methods and movements. Pilates' training methods are varied, so it needs to be improved and supported in the movement training.

CONCLUSION

As Pilates training gradually enters the public's view, people have a certain understanding of Pilates training, and gradually add Pilates training to various sports items to alleviate the muscle damage caused by sports and to recover the injured body. In this paper, Pilates training is added to the experiment of college students who are training martial arts. From the experimental results after the experiment, we can see that Pilates training can improve the overall sports level and stability of students. It can also be seen from the experimental results of the experimental group that sit-ups have a very good improvement effect in the exercise level test. In the test of stability, unbalance and stability also have outstanding effects. Therefore, Pilates training can be added

to the daily special training of martial arts, which not only allows students to exercise the deep muscles of the human body, relieve the muscle tension caused by training, but also can continuously improve the external posture of the human body, make the whole person look more coordinated, and also make the whole body more balanced, so that martial arts training can be better carried out, and martial arts can be better developed.

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