

# INFLUENCE OF ABDOMINAL CORE STRENGTHENING ON FLEXIBILITY IN KUNG FU ATHLETES



ORIGINAL ARTICLE  
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INFLUÊNCIA DO FORTALECIMENTO DO CENTRO ABDOMINAL NA FLEXIBILIDADE EM ATLETAS DE KUNG FU

INFLUENCIA DEL FORTALECIMIENTO DEL NÚCLEO ABDOMINAL EN LA FLEXIBILIDAD DE LOS ATLETAS DE KUNG FU

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## ABSTRACT

**Introduction:** Good flexibility is one of the foundations for developing a high level of exercise. Flexibility training in martial arts mainly focuses on flexibility training of the abdominal center and upper and lower limbs. **Objective:** Explore the effect of strengthening the abdominal center on flexibility in martial arts athletes. **Methods:** Among 20 experimental volunteers from the team of martial arts athletes, five men and five women in the experimental group and five men and five women in the control group, the experiment was conducted by strengthening the training of the abdominal center in a specific protocol for four months. **Results:** Among the control group athletes in orthostatic posture, eyes open on both feet before the experiment, the flexibility score increased by 6.69% after the experiment; among the control group athletes in the same orthostatic posture, with eyes closed, the flexibility score increased by 3.41% after the experiment. **Conclusion:** Strength training with the developed protocol and traditional strength training can promote flexibility improvement in martial arts athletes, with the specific protocol presenting the most significant effects. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Abdominal Core; Martial Arts; Resistance Training.

## RESUMO

**Introdução:** A boa flexibilidade é uma das bases para o desenvolvimento do alto nível em exercícios. O treinamento de flexibilidade nas artes marciais concentra-se principalmente no treinamento de flexibilidade do centro abdominal, membros superiores e inferiores. **Objetivo:** Explorar o efeito do fortalecimento do centro abdominal sobre a flexibilidade nos atletas de artes marciais. **Métodos:** Entre os 20 voluntários experimentais da equipe de atletas de artes marciais, sendo 5 homens e 5 mulheres no grupo experimental, e 5 homens e 5 mulheres no grupo de controle, o experimento conduziu-se por treinamento de fortalecimento do centro abdominal num protocolo específico por quatro meses. **Resultados:** Entre os atletas do grupo de controle em postura ortostática, olhos abertos sobre ambos os pés, antes da realização do experimento, a capacidade de flexibilidade aumentou em 6,69% após o término do experimento; entre os atletas do grupo de controle encontravam-se na mesma postura ortostática, de olhos fechados, a pontuação de flexibilidade aumentou em 3,41% após o experimento. **Conclusão:** O treinamento de força com o protocolo desenvolvido e o treinamento de força tradicional podem promover a melhoria da flexibilidade dos atletas de artes marciais, sendo o protocolo específico o que apresenta maiores efeitos significativos. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Centro Abdominal; Artes Marciais; Treinamento de Força.

## RESUMEN

**Introducción:** La buena flexibilidad es una de las bases para el desarrollo del alto nivel en los ejercicios. El entrenamiento de la flexibilidad en las artes marciales se centra principalmente en el entrenamiento de la flexibilidad del núcleo abdominal y de los miembros superiores e inferiores. **Objetivo:** Explorar el efecto del fortalecimiento del núcleo abdominal sobre la flexibilidad en atletas de artes marciales. **Métodos:** Entre 20 voluntarios experimentales de un equipo de atletas de artes marciales, siendo 5 hombres y 5 mujeres en el grupo experimental, y 5 hombres y 5 mujeres en el grupo de control, se llevó a cabo el experimento mediante un entrenamiento de fortalecimiento del núcleo abdominal en un protocolo específico durante cuatro meses. **Resultados:** Entre los atletas del grupo de control en postura ortostática, con los ojos abiertos sobre ambos pies, antes del experimento, la capacidad de flexibilidad aumentó en un 6,69% tras el final del experimento; entre los atletas del grupo de control en la misma postura ortostática, con los ojos cerrados, la puntuación de flexibilidad aumentó en un 3,41% tras el experimento. **Conclusión:** El entrenamiento de fuerza con el protocolo desarrollado y el entrenamiento de fuerza tradicional pueden promover la mejora de la flexibilidad en atletas de artes marciales, siendo el protocolo específico el que presenta efectos más significativos. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptores:** Núcleo Abdominal; Artes Marciales; Entrenamiento de Fuerza.



INTRODUCTION

With the development of modern competitive martial arts routines, especially the continuous connection with the world, the technical requirements for athletes are getting higher and higher.<sup>1</sup> It is the athlete's good flexibility, speed, strength, endurance, coordination and other physical qualities that carry difficult techniques. In terms of flexibility training in competitive martial arts routines, a combination of traditional static stretching methods, dynamic stretching methods, and modern dynamic stretching methods and proprioceptive neuromuscular stretching methods can be used to improve athletes' flexibility.<sup>2</sup> According to the differences of athletes' age, gender, body and type of boxing, technical requirements, etc., different stretching methods are designed to achieve the purpose of improving flexibility, thereby ensuring that athletes can improve the quality and difficulty of movements without injury, and obtain Excellent athletic performance. In response to this research question, Pollock AC et al., based on a large number of readings of previous literature, discussed the impact of core strength training on the landing stability of martial arts athletes, providing a theoretical basis for the training of coaches and athletes.<sup>3</sup> Tao L et al. analyzed the impact of core strength training on the physical stability of juvenile martial arts routine athletes, and put forward suggestions for core strength training to better improve the physical stability of young martial arts routine athletes.<sup>4</sup> Epifanov VP et al found in an 8-week core endurance training study of 45 rowers: The core endurance of rowers has been significantly improved. At the same time, the athletes' vertical jump height, long jump, return running, and 40-meter sprint performance have all improved, at the same time, it is pointed out that core strength training can help improve the function of the core area.<sup>5</sup>

METHOD

Research object

Select the martial arts routine athletes with the first-level level or above of a provincial martial arts team as the experimental objects, and take the influence of strength training on the flexibility of martial arts routine athletes as the research content. The basic situation of the experimental group and the control group, among the 20 experimental subjects of the martial arts routine athlete team, the experimental group consisted of 5 men and 5 women, and the control group consisted of 5 men and 5 women, the sports grades are all above the level of national first-level athletes.<sup>6</sup>

Experimental method

Athletes in the experimental group adopted strength training methods, such as single-leg squat with Swiss ball, deep squat, 360-degree turn and jump, etc. The control group used common flexibility training methods, such as in-situ jumping exercises, closed-eye single-leg support, stair jumping, and single-leg flexion support. The experimental period was from March 2016 to July 2016, and 20 martial arts routine athletes were randomly divided into two groups, 10 in each group for 4 months of training, 4 times a week, 30 minutes each time. The training equipment mainly adopts sports training equipment such as Swiss ball and yoga mat.<sup>7</sup>

Mathematical statistical methods

Statistical software SPSS16.0 was used to carry out routine statistical processing on the obtained survey data and experimental results. Including the reliability and validity test of the questionnaire to extract the most suitable core strength training method reflected in the questionnaire, statistical analysis of the data of the pre-experiment and post-experiment, in order to explore the influence of core strength training

on the flexibility of juvenile martial arts athletes.<sup>8,9</sup> For data processing, independent samples T test was used to test the difference of sample data.

Design of the experimental program for core strength training

Taking the physical characteristics of martial arts routine athletes as the starting point, we hope to achieve the ultimate goal of enhancing the flexibility of martial arts routine athletes. Through reasonable scientific experimental planning, it is hoped to explore the effect of core strength training on the improvement of flexibility of martial arts routine athletes. Judging from the current situation, with the continuous efforts of domestic and foreign experts, the planning of core strength training programs has been relatively rich. A four-month core strength training experiment will be carried out for 20 martial arts routine athletes, and the thinking will be based on the special characteristics of martial arts routine athletes, combined with the individual characteristics of the subjects in this study, we should select and arrange the training actions reasonably, plan the training time scientifically and reasonably, and control the training process reasonably.<sup>10</sup>

RESULTS AND ANALYSIS

Comparative analysis of flexibility before and after the experimental group

The relevant results and analysis results of the impact of core strength training on the flexibility of the feet are shown in Table 1, Figures 1 and 2. From the data in Table 1, Figures 1 and 2, we can know that, when the athletes in the control group were in a state of static eyes open with both feet, their flexibility score before the experiment was 475.69±219.46, after the end of the experiment, the score of flexibility ability level was 443.71±165.13, and the percentage of increase reached 6.69%; When the athletes in the control group were in a static state of eyes closed

Table 1. The test results of the balance ability index of both feet before and after the experimental group.

group	Experimental content	Before experiment	After the experiment	T	P
test group	Static feet and eyes closed	476.41±231.144	432.91±185.88	0.813	>0.05
	Static eyes open with feet	1439.01±633.231	1398.61±518.52	0.692	>0.05
	Dynamic feet	1702.11±307.32	1640.1±268.73	2.932	>0.05
control group	Static feet and eyes closed	475.69±219.46	443.71±165.13	1.062	>0.05
	Static eyes open with feet	1534.91±759.31	1482.31±657.98	0.898	>0.05
	Dynamic feet	1762.91±249.9	1699.29±229.35	2.159	>0.05

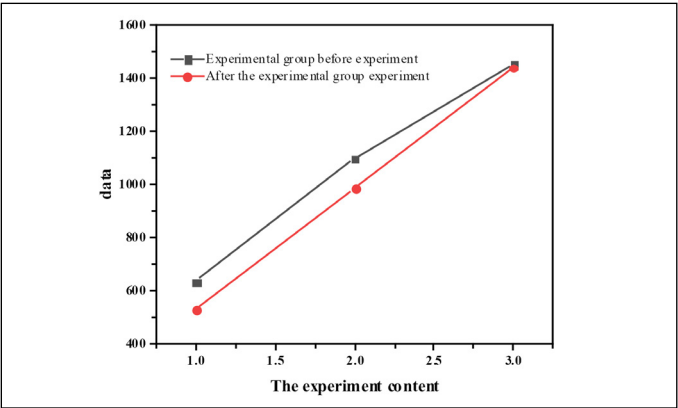
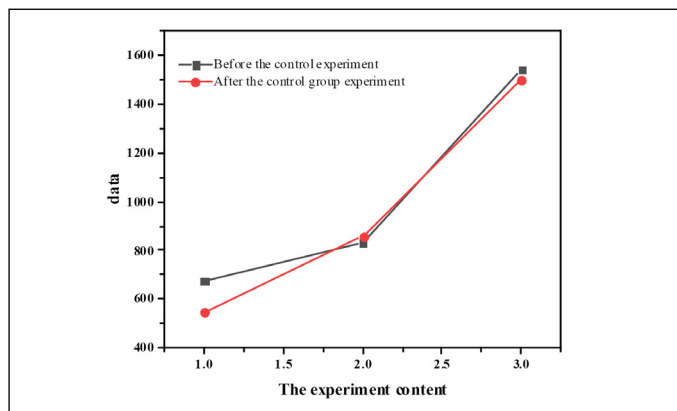


Figure 1. The test chart of the balance ability index of both feet before and after the experimental group.



**Figure 2.** The test chart of the balance ability index of both feet before and after the control group.

with both feet, their flexibility score was  $1534.91 \pm 759.31$ , and the score after the experiment was  $1482.31 \pm 657.98$ , an increase of 3.41%; When the athletes in the control group were in the dynamic state of their feet, their flexibility score before the experiment was  $1762.91 \pm 249.9$ , and the score after the experiment was  $1699.29 \pm 229.35$ , an increase of 3.6%. According to the T test, we can know that when the athletes in the control group are in the state of supporting their feet, although their flexibility has made some progress, but the progress is not very obvious, the obtained T values are 0.317, 0.394, 0.078, respectively.

### Comparison and analysis of the flexibility of the experimental group and the control group after the experiment

The results of the study are shown in Table 2, showing that: Before the experiment, there was no significant difference between the athletes in the experimental group and the control group in the static eyes open, the static eyes closed and the dynamic indicators of the feet ( $P > 0.05$ ).

According to the experimental group and the control group, when the athletes were in the double-foot support state, analysis and research on their flexibility scores, according to the data presented in Table 2, we can see that, core strength training and traditional strength training improve the flexibility of athletes' feet in support state, no significant effect. But, the improvement effect of the flexibility of the athletes in the experimental group who took core strength training, slightly better than the control group of athletes who did traditional strength training.

### Analysis

In the flexibility training of competitive martial arts routines, athletes can use many means. For example, the swallow balance method is used. When practicing, keep the five fingers straight up, let the back lift both arms sideways, and the right leg must be straightened and lifted back, the body is bent forward in an arched shape, and the soles of the supporting feet are firmly attached to the ground, the whole body should be kept parallel to the ground, showing a state of a line, which can effectively

**Table 2.** The test results of the balance ability index in the experimental group and the control group under the state of both feet support after the experiment.

Experimental content	test group	control group	T	P
Static feet and eyes closed	432.91±185.9	443.71±165.13	0.118	>0.05
Static eyes open with feet	1398.61±518.52	1482.31±657.98	0.317	>0.05
Dynamic feet	1641±268.73	1699.21±229.35	0.271	>0.05

enhance the support ability of the gluteus maximus, and can achieve flexibility and stability for the quadriceps, iliopsoas and other parts. After the founding of New China, education became the biggest driving force for the development of Wushu. In contemporary college education, the teaching of martial arts courses has always been labeled as "boring, boring, laborious, and pretentious". The unsatisfactory teaching effect and the misunderstanding of ideological understanding, as a result, most students abandon Chinese martial arts culture in behavior and consciousness, instead, he is flocking to other countries' "fashionable" fighting events such as taekwondo and karate. According to martial arts rules, competitive martial arts routines are mainly based on the difficulty of movements, the quality of movements and the level of movement drills. Among them, for the quality of the action, the rules stipulate the action specifications and requirements of each action, such as the balance action, which requires the support leg and the outgoing leg to completely straighten the knee. Once the legs are bent due to insufficient flexibility, it will affect the action specifications, deduct the action quality points, and even not confirm the action, which will affect the final score.

### CONCLUSION

The author proposes the effect of core strength on improving the flexibility of martial arts athletes, using strength training methods, such as Swiss ball single-leg squat, squat, 360-degree turn and jump, etc. The control group used common flexibility training methods, such as in-situ jumping exercises, closed-eye single-leg support, stair jumping, and single-leg flexion support. There was a significant correlation between the composite value of flexibility and core strength. Core strength training strengthens the stable posture of the core area for a long time and regularly, and the sexual movement between the completed limb movement and the trunk is strengthened, mainly in the completion of the action, the transfer of force between the limbs and torso is more efficient and stable. Therefore, in the traditional training method, adding certain core strength training has better effect on the movement stability of athletes.

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