

# INFLUENCES OF ABDOMINAL CORE STRENGTH TRAINING ON SPORT DANCING



ORIGINAL ARTICLE  
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INFLUÊNCIAS DO TREINAMENTO DE FORÇA DO CENTRO ABDOMINAL SOBRE A DANÇA ESPORTIVA

INFLUENCIAS DEL ENTRENAMIENTO DE LA FUERZA DEL NÚCLEO ABDOMINAL EN EL BAILE DEPORTIVO

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## ABSTRACT

**Introduction:** The essential characteristics of the unique fitness of sport dancing are composed of the athletes' skill, quality, and physical characteristics. All are directly affected by proper abdominal core strength training. Kick strength is an important variable for controlled balance in lower limb elevation. It is produced by the combined action of the pelvic girdle and thigh muscle groups, beginning at the abdominal core. **Objective:** This paper explores the effect of abdominal core strength training on the quality of kicking movement in dance sports work. **Methods:** Forty-six college students majoring in sport dance were randomly selected as volunteers for the research. Randomly divided into control and experimental group, they participated in the experiment for four weeks. The experimental group added a specific strength exercise for the abdominal core at each class, while the control group followed only with the routine exercises. Several indicators of the athletes were tested before and after the end of the experiment. The collected variables went through the statistical methodology and data analysis. **Results:** The experimental group members showed significantly higher kicks than those of the control group ( $P < 0.05$ ). The balance and stability scores in the experimental group were also significantly higher ( $P < 0.05$ ). **Conclusion:** Abdominal core strength training significantly affects the quality of lower limb lifting movements in sports dance practitioners and significantly affects the overall performance improvement of athletes.

**Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Abdominal Core; Resistance Training; Dancing; Athletes.

## RESUMO

**Introdução:** As características essenciais da aptidão física única da dança esportiva são compostas pela habilidade, qualidade e características físicas dos atletas. Todos afetados diretamente pelo treinamento de força do centro abdominal adequado. A força do chute é uma variável importante para o balanço controlado na elevação dos membros inferiores. Ela é produzida pela ação combinada da cintura pélvica e dos grupos musculares da coxa, iniciando no centro abdominal. **Objetivo:** Este artigo explora o efeito do treinamento da força do centro abdominal sobre a qualidade do movimento de pontapés no trabalho de dança esportiva. **Métodos:** Foram selecionados aleatoriamente 46 estudantes universitários graduados em dança esportiva como voluntários para a pesquisa. Divididos aleatoriamente em grupo controle e experimental, participaram do experimento durante quatro semanas. Ao grupo experimental foi acrescido um exercício de força específico para o centro abdominal a cada aula, enquanto o grupo de controle seguiu apenas com os exercícios rotineiros. Foram testados vários indicadores dos atletas antes e após o término do experimento, as variáveis coletadas passaram pela metodologia estatística e análise de dados. **Resultados:** Os membros do grupo experimental apresentaram chutes significativamente mais altos que os do grupo de controle ( $P < 0,05$ ). A nota de equilíbrio e estabilidade no grupo experimental também foi significativamente superior ( $P < 0,05$ ). **Conclusão:** O treinamento da força do centro abdominal afeta significativamente a qualidade dos movimentos de elevação dos membros inferiores nos praticantes de dança esportiva além de produzir um efeito significativo sobre a melhoria geral do desempenho dos atletas.

**Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Centro Abdominal; Treinamento de Força; Dança; Atletas.

## RESUMEN

**Introducción:** Las características esenciales de la aptitud única de la danza deportiva se componen de la habilidad, la calidad y las características físicas de los atletas. Todo ello se ve directamente afectado por un adecuado entrenamiento de la fuerza del núcleo abdominal. La fuerza de la patada es una variable importante para el equilibrio controlado en la elevación de las extremidades inferiores. Se produce por la acción combinada de los grupos musculares de la cintura pélvica y de los muslos, empezando por el núcleo abdominal. **Objetivo:** Este trabajo explora el efecto del entrenamiento de la fuerza del núcleo abdominal en la calidad del movimiento de pateo en el trabajo de danza deportiva. **Métodos:** Cuarenta y seis estudiantes universitarios de la especialidad de danza deportiva fueron seleccionados al azar como voluntarios para la investigación. Divididos aleatoriamente en grupo de control y experimental, participaron en el experimento durante cuatro semanas. Al grupo experimental se le añadió en cada clase un ejercicio de fuerza específico para el núcleo abdominal, mientras que el grupo de control siguió sólo con los ejercicios de rutina.



Se comprobaron varios indicadores de los atletas antes y después de la finalización del experimento, las variables recogidas pasaron por la metodología estadística y el análisis de datos. Resultados: Los miembros del grupo experimental mostraron patadas significativamente mayores que los del grupo de control ( $P < 0,05$ ). Las puntuaciones de equilibrio y estabilidad en el grupo experimental también fueron significativamente mayores ( $P < 0,05$ ). Conclusión: El entrenamiento de la fuerza del núcleo abdominal afecta significativamente a la calidad de los movimientos de elevación de las extremidades inferiores en los practicantes de danza deportiva, además de producir un efecto significativo en la mejora general del rendimiento de los deportistas.

**Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptor:** Núcleo Abdominal; Entrenamiento de Fuerza; Baile; Atletas.

## INTRODUCTION

A kick is a quick lift of the leg by activating the muscles. After reaching the maximum amplitude, the action legs begin to descend in a controlled manner. Kicks occupy a certain proportion of dance techniques and skills. Kick force is the most basic strength ability in jumping.<sup>1</sup> The skill requirements of kicking force in terms of energy and reflected speed are consistent with the function and essence of speed ability in the category of dance ability. Many techniques in jumping require high requirements on the rotational speed and amplitude of the lower limbs. The associated tendons are stretched over the kick's length throughout the kick. The working method of this muscle is the super-length contraction movement, and the kicking exercise can simultaneously improve the elasticity and explosive power of the body.<sup>2</sup> Because the ability and range of kicks are tremendous, dancers can significantly improve their skills when doing a lot of dynamic stretching exercises. Changes in the strength, amplitude, and spatial position of the lower limbs in dance performances will visually impact the audience.

Many students will have problems such as slow kicking speed, insufficient force, single dynamic completion, and precarious balance when mastering sports dance postures. How do we make the kicking action more concise, concise, stronger, faster, and more stable in the dance teaching activities? This paper proposes a method to improve the quality of students' kicking and kicking action based on the basic theory of core strength training.<sup>3</sup> The effect of adding core strength training in dance kicks on improving the quality of dance kicks and athletic performance was analyzed through teaching experiments. This can effectively improve the quality of dance kicks. At the same time, the research results of this paper provide an effective teaching method for cultivating students' kicking skills.

## METHOD

### General information

Forty-six students were randomly selected in the elective course of the sports dance unit and divided into experimental and control groups.<sup>4</sup> The experimental group added a core strength exercise to each class, while the control group did not. Before and after the test, this paper tested the various indicators of the athletes.

### Regulation of experimental conditions

The kicks in this experimental dance are new. After the kicking instruction, the experimental group performed four core strength exercises within 15 minutes of each class.<sup>5</sup> This test is adjusted according to the ability of the students. The control group did not perform core strength exercises.

### Subjects after the trial

After the experiment, the two groups of contestants were tested in a combination of "leg kick" and "dance leg" to examine the abilities of "preparation posture," "leg suction," "leg kick," and "complete kick." Two other external dance sports judges served as judges.

## Tests for Equilibrium and Stability Performance

The subject placed the right foot on the ground, flexed the left foot to the right knee, and kept the arms raised. Subjects are not allowed to change their posture and movements during the exam.<sup>1</sup> Five weeks later, we tested the indicators in the experimental and control groups.

### A high dynamic dance movement recognition method based on the two-dimensional pose

Assuming that the grayscale dance video image has  $L$  grayscale levels and its resolution is  $P \times Q$ , the grayscale probability distribution function is as follows:

$$g_i = \frac{q_i}{P \times Q} \quad (1)$$

When the boundary between the background and the pixels contained by the dancers in the foreground is  $T$ , the gray distribution probability function of the background is:

$$L_1(t) = \sum_{i=0}^T g_i \quad (2)$$

The gray distribution probability function of the dancers in the front field is as follows:

$$L_2(t) = \sum_{i=T+1}^{L-1} g_i \quad (3)$$

The information entropy of the background and foreground dancers obtained by formulas (1)-(3) is:

$$K_1 = - \sum_{i=0}^T \frac{g_i}{L_1(t)} \times \log \left( \frac{g_i}{L_1(t)} \right) \quad (4)$$

$$K_2 = - \sum_{i=T+1}^{L-1} \frac{g_i}{L_2(t)} \times \log \left( \frac{g_i}{L_2(t)} \right) \quad (5)$$

In this paper, the information entropy of the whole picture is obtained by analyzing the information entropy of the background and foreground dancers:

$$K_s(t) = K_1 + K_2 \quad (6)$$

$$x = \arg \max_{T \in L} K_s(T) \quad (7)$$

In this paper, x is the final critical value, and the threshold is used to segment the image after the threshold is obtained.<sup>6</sup> This makes the foreground dancer stand out in the image.

### Statistical analysis

The obtained data were analyzed by SPSS 22.0.

### ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Shangqiu Normal University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

### RESULTS

#### Dance kick technique score

The dance kicking skill scores of the test and control groups were expressed in all four angles. The kicking score was better than the control group's, and the difference was undeniable ( $P < 0.01$ ). The experimental group prepared for postural assessment scores was significantly better than the control group.<sup>7</sup> The difference was statistically significant ( $P < 0.05$ ). The experimental group's performance showed a significant improvement over the students in the control group. (Table 1)

#### Test Results for Equilibrium and Stability Performance

Ten subjects were controlled for balance and stabilization in the trial for 15 seconds; 12 were within 10-15 seconds. This result is much better than the control group. The experimental data showed that the experimental group showed significant advantages in balance and stability on a four-week basis.<sup>8</sup> The cognitive level of core strength, the degree of kick completion, and the degree of kick completion in the experimental group were significantly higher than those in the control group. (Table 2)

### DISCUSSION

In the training of kick strength, attention should be paid to the distribution and requirements of training intensity. Dancers use high intensity as the primary means, combining high intensity with a small amount of training.<sup>9</sup> In the training of leg work, some teachers often arrange a lot of training. Dancers have to kick dozens or even hundreds of times each time. The low training intensity causes the coaches to ignore the training intensity in terms of speed, amplitude, and strength. This is detrimental to the practice of kicking ability. Low-intensity, high-intensity repetitive exercises are beneficial to increase the body's endurance. This will make the muscles look stronger. This exercise does not increase the kick's relative ability and reaction speed. As mentioned earlier, the power of "leg work" is based on the power of kicking legs. The main goal of leg work is "lightness of the legs." It can be seen that the development of relative strength is a primary basic principle of kicking force practice, and strong reasons such as speed are a significant part of kicking force.<sup>10</sup> The intensity mentioned above training method, rapid repetition training method, rapid super strength training method, rapid sub-strength training method, super isometric training method, etc.

Other factors of essential physical ability in kick strength training will also have a particular impact on kick strength. The kick is a fast, significant, powerful movement. The sport is particularly demanding on physical support and flexibility. Keep your back straight when kicking rather than sitting on a chair.<sup>11</sup> The dancers are supporting their legs instead of bending at their knees. In the period of further development of kicking strength, in addition to the exercises to strengthen the supporting force, it is also necessary to appropriately adjust the training load of the supporting force according to the size of the kicking strength. In this way, the dancer's support strength is improved. Increasing the lower body's flexibility allows for the kick's rate, magnitude, and power. Dancers should reasonably coordinate the development of relevant body movement flexibility in the practice of kick strength to meet the expansion of the active area of the hip and the antagonistic muscles of the lower limbs. Long swimming causes tension in the antagonist's muscle and stimulates contraction of the antagonist's muscle. Slow swimming promotes active relaxation of antagonist muscles.<sup>12</sup> Active dynamic flexibility training should be used when developing high levels of kick strength. The trainer must schedule slow, relaxed leg movements to increase flexibility. This helps the dancer improve the active relaxation of the antagonist's muscles.

Core strength is a core part of dance sports. It plays the role of "connecting the past." Almost all movements are done with core strength. For example, pumping, kicking, etc., must participate in core technical abilities.<sup>13</sup> Teachers should include core strength exercises in their movement arts dance classes. Teachers need to pay attention to the influence of core strength exercises on further improving the teaching quality of Chinese sports dance performances.

**Table 1.** Comparison of two dance kicking techniques scores (percentage scale).

Group	Preparing posture/10 (minutes)	Suction legs/50 (min)	Kick out/40 (points)	The total score of the complete kicking technique assessment
Test group	9.08±1.88	46.1±3.37	35.79±3.37	89.93±5.04
Control group	7.68±1.98	40.71±3.89	31.22±3.95	79.62±5.93
p	<0.05	<0.01	<0.01	<0.01

**Table 2.** Equilibrium and Stability Test (Bassey).

Group	Time (n)	Time (n)	Time (n)	Time (n)
Test group	15+ seconds (10)	10-15 seconds (12)	5-10 seconds (1)	Less than 5 seconds (0)
Control group	15+ seconds (2)	10-15 seconds (5)	5-10 seconds (8)	Less than 5 seconds (7)

Teachers need to emphasize the importance of core competency exercises further to improve the teaching quality of competitive dance performances. In the teaching process of core strength exercises, coaches need to conduct teaching core ability exercises in stages and pertinently according to the students' learning situation and characteristics. This enables students to improve their ability to develop core muscle groups.

## CONCLUSION

The experimental group scored higher than the control group in dance kicks and balance ability. The effect of core strength training on overall improvement is significant. The three links of kicking preparation, sucking, and kicking rely on the strength of the core and legs for organic combination and transmission.

In the technical link, the elasticity of the ankle and knee, the transfer of the center of gravity, and the swing of the crotch can make the kicking technology more integrated and applied. In the teaching of dance kicks, the trainer must consciously increase the training content of core strength.

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