

THE EFFECT OF FUNCTIONAL SPORTS TRAINING ON TAE KWON DO ATHLETES' EXPLOSIVE POWER



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EFEITOS DE TREINAMENTO FUNCIONAL ESPORTIVO NA FORÇA EXPLOSIVA DE ATLETAS DE TAE KWON DO

EFFECTOS DE ENTRENAMIENTO FUNCIONAL DEPORTIVO EN LA FUERZA EXPLOSIVA DE ATLETAS DE TAE KWON DO

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ABSTRACT

Introduction: The training methods of Tae Kwon Do athletes need to be scientific and standardized. Their explosive power, especially, has a direct impact on the performance in the sport. **Objective:** To study the content and methods of functional training for Tae Kwon Do athletes. **Methods:** This study includes a bibliographic investigation, an interview, and uses the logical analysis method to explore the functional training of Tae Kwon Do athletes. **Results:** There were highly significant changes in the explosive power before and after the athletes' functional training experiment, as well as in their core endurance, core stability, routine skills, and other indicators. **Conclusion:** Functional training has become an effective method to improve the explosive power in Tae Kwon Do athletes. **Level of evidence II; Therapeutic studies - investigation of treatment results.**

Keywords: Tae Kwon Do; Resistance Training; Sports; Athletes.

RESUMO

Introdução: Os métodos de treinamento de atletas do taekwondo devem ser padronizados com base em evidências. O uso de força explosiva, especialmente, tem um impacto direto na performance nesse esporte. **Objetivo:** Estudar o conteúdo e os métodos do treino funcional de atletas do Tae Kwon Do. **Métodos:** Esse estudo inclui uma investigação bibliográfica, uma entrevista, e usa o método de análise lógica para explorar o treinamento funcional de atletas do Tae Kwon Do. **Resultados:** Houve mudanças muito significativas na força explosiva dos atletas antes e depois do experimento com treino funcional. O mesmo ocorreu quanto à resistência e estabilidade do core, em suas habilidades de rotina, e em relação a outros indicadores. **Conclusões:** O treino funcional tornou-se um método eficiente para melhorar a força explosiva de atletas do Tae Kwon Do. **Nível de evidência II; Estudos terapêuticos – investigação de resultados de tratamento.**

Descritores: Tae Kwon Do; Treinamento de Resistência; Treinamento de Força; Esportes; Atletas.

RESUMEN

Introducción: Los métodos de entrenamiento de atletas del taekwondo deben ser estandarizados con base en evidencias. El uso de la fuerza explosiva, especialmente, tiene un impacto directo en el desempeño en este deporte. **Objetivo:** Estudiar el contenido y los métodos del entrenamiento funcional de atletas del Tae Kwon Do. **Métodos:** Este estudio incluye una investigación bibliográfica, una entrevista y usa el método de análisis lógico para explorar el entrenamiento funcional de atletas del Tae Kwon Do. **Resultados:** Hubo cambios muy significativos en la fuerza explosiva de los atletas antes y después del experimento con entrenamiento funcional. Lo mismo ocurrió con respecto a la resistencia y a la estabilidad del core, en sus habilidades de rutina, y en relación a otros indicadores. **Conclusiones:** El entrenamiento funcional se tornó un método eficiente para mejorar la fuerza explosiva de atletas del Tae Kwon Do. **Nivel de evidencia II; Estudios terapéuticos – investigación de resultados de tratamiento.**

Descriptorios: Tae Kwon Do; Entrenamiento de Resistencia; Entrenamiento de Fuerza; Deportes; Atletas.



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INTRODUCTION

With the continuous development of Taekwondo sport, taekwondo pose competitions are becoming more and more popular among the public. In the Taekwondo pose competitions, the requirements for athletes' body center of gravity control and balance ability are getting higher and higher, and the strength of the core muscle groups is more prominent.¹ The better the stability and balance of the body, the better the athletes will have control and winning ability in the competition.

Core strength training is a modern strength training model proposed based on relatively early studies on core stability in medical rehabilitation. The core training method can well stimulate the deep-seated small muscle

groups of the body, complement each other with the large muscle groups. It can more effectively improve the balance and performance of the Taekwondo pose athletes, thereby improving the competition ability.² This research introduces core strength training into training based on the characteristics of difficult movements of Taekwondo pose athletes, formulates a set of reasonable and effective core strength training methods. And methods and strives to explore the core strength of the human body and the completion of difficult movements by developing the strength of athletes' core muscles. The internal connection between the effects provides theoretical and practical data reference for the strength training and specific difficulty training of Taekwondo style coaches and athletes.

METHOD

Research objects

Take the effect of core strength training of Taekwondo Pingshi athletes as the research object.

Research methods

Interview Method

According to Taekwondo Pinshi special strength training, core strength training, and other related issues, interviews were conducted with experts and professors engaged in sports theory and sports training.³ This lays a theoretical and practical foundation for research on experimental design, core strength training methods and methods, and test indicators.

Experimental method

The article takes 16 high-level male athletes from the Taekwondo Pinshi team as the experimental subjects. The average age is 22 years and the average training period is 2 years. There were no significant differences between the experimental and control groups in terms of age, height, and weight. The subjects of the experiment were all second-level athletes.⁴ Volunteers were trained for 16 weeks and compared the differences within and between groups.

Mathematical Statistics

We use SPSS16.0 statistical software to process the test data. The value is expressed as "mean ± standard deviation." The data were analyzed by paired T-test and independent T-test. $P < 0.05$ indicates a significant difference. When $P < 0.01$, there is a very significant difference.

Inverse dynamic simulation of the dynamic response of limbs under impact load

This study uses the static optimization method based on inverse dynamics in the AnyBody Modeling System, which is the optimization model shown below:

$$\min G(F^M) \quad (1)$$

$$G(F^M) = \max(A_i^M) = \max\left(\frac{F_i^M}{N_i}\right) \quad (2)$$

$$CF^M = R, \quad 0 \leq F_i^M \leq N_i, i = 1, 2, L, n^M \quad (3)$$

The optimization model is based on the assumption that muscle fatigue is directly related to its mobility. We believe that the distribution of muscle strength follows the maximum activity and minimum optimization criteria to ensure the minimum degree of fatigue.⁵ Distribute the load equally among the muscles as much as possible, taking into account the different strengths of each muscle. In the model, F^M is muscle strength. N_i is muscle strength (the maximum force that can be provided under the optimal length of the muscle). A_i^M is the degree of muscle activity, that is, the ratio of muscle strength to its strength. C is the system coefficient matrix. R is the external force on the system (the ground reaction force in this study). n^M is the number of muscles in the model.

RESULTS

Comparative analysis of the indicators before and after the experiment in the control group

From Tables 1, 2, 3, and 4, it can be seen that there is no significant difference in the core strength-related indicators (core endurance, core strength, core explosive power, and core stability) of the two tests before and after the 16-week Taekwondo routine training in the control

Table 1. Comparison of differences in core endurance before and after the control group.

Time	1' from both ends	1' upper kick	1' in the leg fit	1' Outer swing leg
Before the experiment	46.74±4.82	76.74±3.42	42.74±3.38	49.56±4.82
After the experiment	49.03±4.42	79.24±3.52	44.76±4.22	51.55±3.53
T	0.9	1.233	0.832	0.978
P	>0.05	>0.05	>0.05	>0.05

Note: ($P > 0.05$ means no significant difference; $P < 0.05$ means significant difference; $P < 0.01$ means very significant difference, the same below).

Table 2. Comparison of differences in core strength before and after the control group.

Time	Complete the barbell volume for 10 sit-ups	Maximum barbell weight for 10 sit-ups
Before the experiment	16.33±1.82	21.96±2.32
After the experiment	18.25±1.64	24.54±3.32
T	2.032	1.344
P	>0.05	>0.05

Table 3. Comparison of the difference in the stability of the rotation before and after the control group.

Time	10 horse spins (successful)	10 side kicks (successful)
Before the experiment	2.74±1.93	1.65±1.34
After the experiment	3.10±1.62	2.97±1.66
T	1.347	1.378
P	>0.05	>0.05

Table 4. Comparison of differences in the scores of Pinshi technology and related components before and after the control group.

Time	Full set of technologies	The accuracy of the action	A full set of technical blocks to compare the proficiency of the action	Expressiveness of movement
Before the experiment	8.74±0.82	4.73±0.14	2.76±0.06	1.54±0.13
After the experiment	8.90±0.32	4.80±0.12	2.80±0.07	1.59±0.11
T	0.912	1.076	1.093	0.735
P	>0.05	>0.05	>0.05	>0.05

group.⁶ Although the core strength level and basic skills of posture, leg movements, stability of rotation, and a full set of technical levels have improved to a certain extent, there is also no significant difference.

Comparative analysis of the indicators of the experimental group before and after the experiment

From the statistical results in Tables 5 and 6, the core endurance indicators of the athletes after the experiment: lying on both ends, kicking on the basic skills of the posture, closing the legs and swinging the legs, etc., have significant changes compared with the indicators before the experiment. Pings movement is a movement with certain characteristics that consists of continuous movement, sudden stop, and sudden movement.⁷ The main driving force for the connection of the upper and lower limbs of these actions comes from the rapid and non-stop contraction of the muscle groups in the body's core area. Especially when the body is tired, the role of the "ring" and "belt" in the core area is reduced, and the connection of the upper and lower limbs is prone to be disconnected. The completion of the movement is incomplete. If athletes have good endurance of core muscles, the above problems can be avoided. To maintain a certain physical strength and good competitive state in the long game. Therefore, core endurance plays a very important role in taekwondo poses.

Table 5. Comparison of differences in core endurance before and after the experimental group.

Time	1' from both ends	1' upper kick	1' in the leg fit	1' Outer swing leg
Before the experiment	46.90±4.55	73.33±4.32	39.12±3.02	48.93±4.12
After the experiment	63.42±4.92	89.59±4.13	54.40±5.54	64.55±5.42
T	3.76	3.89	3.64	3.12
P	<0.005	<0.005	<0.005	<0.005

Table 6. Comparison of differences in core strength before and after the experimental group.

Time	Complete the barbell volume for 10 sit-ups	Maximum barbell weight for 10 sit-ups
Before the experiment	16.41±1.82	21.67±2.72
After the experiment	28.05±2.84	37.56±5.42
T	5.702	4.122
P	<0.001	<0.05

DISCUSSION

In recent years, coaches of various sports have realized the influence of "special strength" on sports performance and its effect on athletes to break through the "bottleneck" of competition.⁸ Therefore, they gradually increased the proportion of strength in training and made developing the athlete's specific strength level a key breakthrough in their training. When we formulate a core strength training plan, we should not deviate from the scope of its special strength. Rather, it must be carried out in combination with its special technology and forceful methods.⁹ Therefore, when formulating the core strength training plan, the starting point is to develop Taekwondo athletes' exceptional core strength level. Only in this way can we receive a more significant effect.

Core strength training is more significant for improving the level of athletes' "action accuracy," "action proficiency," and "action expressiveness."

In the aspect of "movement expressiveness," athletes have complete coordination and cooperation of upper and lower limbs in the whole set of exercises. The speed of movement conversion and connection has been significantly improved. Regarding "action accuracy," the legwork and rotation success rate is very high, the body shape and posture remain intact, and the acceleration of kicking has been significantly improved.¹⁰ In terms of the expressiveness of the movement, the athletes' previous shaking and tremors when completing a single fixed movement have been significantly improved.

The improvement of muscle strength related to the core muscles improves the nerves of Taekwondo athletes and improves the orderly transmission of upper and lower limbs. This makes the movements of Taekwondo pose athletes appear more smoothly.¹¹ At the same time, it also speeds up the conversion and connection between specific actions to make the actions appear more coordinated. This can better reflect the style and characteristics of the whole set. The core muscles' improvement of core stability plays a key role in supporting Taekwondo athletes when they complete their movements. The quality of the special technology mainly depends on the cooperation between the muscles during exercise and the ability to control the center of gravity in fast movements. The changes in the strength and stability of the core muscles are the key to this ability of Taekwondo athletes.

CONCLUSION

Continuous 16 weeks of core strength training can effectively improve the core endurance, core stability, core strength, and core explosive power of Taekwondo athletes. Core strength training has become an effective method to improve the competitive level of Taekwondo athletes. The characteristics of the project should be fully considered when formulating a core strength training plan. Combining the specific movement form and the strength link mode to develop the athlete's core strength level in a targeted manner. Achieve special strength and optimal benefit.

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