

CORE TRAINING IMPACTS RUNNING ATHLETES' PHYSICAL CAPACITY



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IMPACTOS DO TREINAMENTO NO CORE SOBRE A CAPACIDADE FÍSICA EM ATLETAS DE CORRIDA

IMPACTO DEL ENTRENAMIENTO DEL CORE EN LA CAPACIDAD FÍSICA DE LOS ATLETAS QUE CORREN

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ABSTRACT

Introduction: Core strength training focuses mainly on the muscle group and neuromuscular system of the central area of the human body to gain strength and stability for complex movements. Studies have reported the effect of core training on high-capacity athletes, but there is still a gap regarding the impacts on physical capacity in running athletes. **Objective:** To study the effects of strength training on athletes' core and the direct impacts on running quality. **Methods:** Athletes of the men's running team at the athletic training center of the Institute of Physical Education were core strength trained for 10 to 12 weeks. After the period, physical tests, according to predetermined protocols. The data were compared before, after the intervention, and after statistical treatment, and the findings were discussed according to the scientific literature. **Results:** After 12 weeks of training, among the five sports skills, there was only a significant difference before and after training of body lateral flexion (right side) ($P < 0.05$), and there was no significant difference before and after training of the other four sport skills ($P > 0.05$). **Conclusions:** Through the static and dynamic exercises of core strength training, we can effectively improve the proprioception intervention in body movement so that runners can more accurately control their joints and muscles, ensuring movement and postural accuracy. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Track and Field; Endurance Training; Sports.

RESUMO

Introdução: O treinamento de força do core concentra-se principalmente no grupo muscular e no sistema neuromuscular da área central do corpo humano, com o propósito de ganho de força e estabilidade para movimentos complexos. Estudos relatam o efeito do treinamento do core em atletas de alta capacidade, porém ainda há uma lacuna quanto aos impactos sobre a capacidade física em atletas de corrida. **Objetivo:** Estudar os efeitos resultantes do treinamento de força no core dos atletas e os impactos diretos na qualidade da corrida. **Métodos:** Os atletas da equipe masculina de corrida, no centro de treinamento de atletismo do Instituto de Educação Física, foram treinados com força fundamental por 10 a 12 semanas. Após o período, testes físicos, segundo protocolos pré-determinados, foram executados. Os dados foram comparados antes e após a intervenção, após o tratamento estatístico, os achados foram discutidos segundo a literatura científica. **Resultados:** Após 12 semanas de treinamento, entre as cinco habilidades esportivas, houve apenas diferença significativa antes e depois do treinamento de flexão lateral corporal (lado direito) ($P < 0,05$), e não houve diferença significativa antes e depois do treinamento das outras quatro habilidades esportivas ($P > 0,05$). **Conclusão:** Através dos exercícios estáticos e dinâmicos do treinamento de força do core, podemos melhorar efetivamente a intervenção da propriocepção no movimento corporal, para que os corredores possam controlar com mais precisão as articulações e músculos, garantindo a precisão do movimento e postural. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Atletismo; Treino de Resistência; Esportes.

RESUMEN

Introducción: El entrenamiento de la fuerza del core se concentra principalmente en el grupo muscular y en el sistema neuromuscular de la zona central del cuerpo humano, con el fin de ganar fuerza y estabilidad para los movimientos complejos. Los estudios han informado sobre el efecto del entrenamiento del tronco en los atletas de alta capacidad, pero todavía hay un vacío en cuanto a los impactos en la capacidad física en los atletas que corren. **Objetivo:** Estudiar los efectos resultantes del entrenamiento de fuerza en el core de los atletas y los impactos directos en la calidad de la carrera. **Métodos:** Los atletas del equipo masculino de atletismo, en el centro de entrenamiento de atletismo del Instituto de Educación Física, fueron entrenados con fuerza central durante 10 a 12 semanas. Tras el periodo, se ejecutaron pruebas físicas, según protocolos predeterminados. Los datos se compararon antes y después de la intervención, tras el tratamiento estadístico, los resultados se discutieron de acuerdo con la literatura científica. **Resultados:** Después de 12 semanas de entrenamiento, entre las cinco habilidades deportivas, sólo hubo diferencia significativa antes y después del entrenamiento de la flexión lateral del cuerpo (lado derecho) ($P < 0,05$), y no hubo diferencia significativa antes y después del entrenamiento de las otras cuatro habilidades deportivas ($P > 0,05$). **Conclusiones:** A través de ejercicios estáticos y dinámicos



de entrenamiento de la fuerza del core, podemos mejorar eficazmente la intervención de la propiocepción en el movimiento del cuerpo, de modo que los corredores puedan controlar con mayor precisión las articulaciones y los músculos, asegurando la precisión del movimiento y la postura. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptores: Atletismo; Entrenamiento de resistencia; Deportes.

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INTRODUCTION

The technical characteristics and energy metabolism characteristics of sprint are the important basis for designing and selecting strength training methods.¹ In the process of strength training, only by solving the problem of transforming special strength into special achievements, can strength training better serve special needs. Core strength training has entered China's training industry with a new way of strength training for 7 to 8 years. When winning praise and praise, some coaches hold a wait-and-see or even questioning attitude towards it. The reason is that at present, the research on core strength training in domestic training industry is more vague and theoretical. In particular, the training methods and means related to sports, the design of means, the core strength detection methods and evaluation means of sports need to be further studied. This study tries to summarize and refine the special training means of core strength training of high-level Female Sprinters, so as to explore the core strength training mode suitable for high-level female sprinters.² Core strength training focuses on the core nerve and muscle group, focusing on the balance ability and muscle group strength. It can effectively improve the coordination ability, balance and stability of athletes, help sprinters quickly improve their physical function and reduce the probability of sports injury. Because sprint events require athletes to complete the competition in the shortest time, core strength training can help athletes concentrate their strength on their lower limbs, improve the pedal strength, enable athletes to obtain greater "kinetic energy", and then obtain better sports results. However, the traditional strength training is usually limited to the "lower limbs", and there is no systematic and detailed training on the waist and abdomen, which affects the balance and stability of Sprinters in high-speed movement. In this regard, we need to explore a more comprehensive core strength training method combined with the characteristics of sprinters, so as to improve the competition results of sprinters and promote the healthy development of sports in China.³

Experimental subjects and methods

The 24 male athletes of the track and field sprint team of the Institute of physical education are basically freshmen in the first year of college. The overall level is slightly lower than that of the athletes of the provincial sprint team. Most of them are close to the level of the second level of athletes, and the training period is basically about 1-3 years.⁴ The 24 athletes were randomly divided into experimental group and control group. It can be seen that there was no significant difference in age, training years, sports grade, weight, height and other basic conditions between the control group and the experimental group before the experiment ($P > 0.05$). It is conducive to the comparative analysis of the experimental group and the control group and improve the effectiveness of data analysis.

Experimental method

According to the principle of step-by-step training, when athletes learn new skills and movements, they should follow the scientific logical system and the law of athletes' understanding and development,

from shallow to deep, from easy to difficult, from simple to complex. The core strength training studied in this paper is a strange training method for the experimental subjects.⁵ In order to help athletes master the training method in a limited time, according to the principle of step-by-step training, the core strength training in this study is divided into three training stages: The basic stage of core strength training, the consolidation stage of core strength training and the improvement stage of core strength training. The training density of the two experimental groups is also slightly different. In order to avoid conflict with the training of provincial sprint team, the training density of group A is 3 times every two weeks, while the training density of group B is 2 times a week. Each training session lasts 120 minutes. At the same time of core strength training in the experimental group, the control group used the traditional strength training method for lumbar and abdominal muscle training. The main instruments are sponge pad and barbell. The training contents of 12 weeks are the same, and each training class is 120 minutes.⁶

In the basic stage of core strength training, we mainly do some static actions on the sponge pad to improve the strength quality of small lumbar and abdominal muscles, and preliminarily develop the ability of neuromuscular system, so as to lay the foundation for later core strength training. The questionnaire survey of experts shows that the training methods and scores suitable for this stage.⁷

Experimental results

The comparison table of various strength indexes between the experimental group and the control group before the experiment is shown in Table 1.

Before the experiment, the sports skills of the two groups of athletes were tested. According to the expert questionnaire, five sports skills indexes were selected as the analysis indexes. From 1, it can be found that there is no significant difference in the five indexes ($P > 0.05$) between the two groups.⁸

The comparison of various strength indexes of the control group before and after the experiment is shown in Table 2.

It can be seen from Table 2 that after 12 weeks of training, among the five sports skills, only the difference before and after the training of head holding body lateral flexion (right side) is significant ($P < 0.05$), and the difference before and after the training of the other four sports skills is not significant ($P > 0.05$). It can be seen that the effect of improving

Table 1. Comparison of various strength indexes between the experimental group and the control group before the experiment.

	Experimental group before experiment	Control group before experiment	t	p
	$\bar{x} \pm s$	$\bar{x} \pm s$		
Lateral flexion of head holding body (left) (times / 20s)	14.65±1.50	14.31±1.70	1.031	>0.05
Lateral flexion of head holding body (right) (times / 20s)	15.60±1.35	14.15±1.34	0.357	>0.05
Dorsal muscle tension (kg)	107.65±1.83	107.48±1.87	0.245	>0.05
Suspension leg lifting (s)	16.87±2.81	16.98±2.49	0.157	>0.05
Sit ups (times / 20s)	18.73±1.08	15.25±1.26	1.247	>0.05

the strength quality of lumbar and abdominal muscles in the control group is not obvious in the 12 week training cycle.⁹

It can be seen from Figure 1 that there is an imbalance of muscle strength on the left and right sides in both groups before and after training. After training, it can be found that the muscle strength of the left and right sides of the two groups of athletes increased, and the growth rate of the control group was less than that of the experimental group. The increase range from large to small is the left muscle of the experimental group, the right muscle of the experimental group, the right muscle of the control group and the left muscle of the control group. Although the problem of muscle strength imbalance on the left and right sides of athletes has not been solved, after 12 weeks of core strength training, the load on the left muscle in exercise is significantly higher than that in the experimental group and the control group before the experiment. After a long time of special core strength training, the strength of the left muscle may be gradually increased to balance the strength of the left and right muscles.¹⁰

Table 2. Comparison of various strength indexes of the control group before and after the experiment.

	Experimental group before experiment	Control group before experiment	t	p
	$\bar{x} \pm s$	$\bar{x} \pm s$		
Lateral flexion of head holding body (left) (times / 20s)	14.25±1.50	14.32±1.28	1	>0.05
Lateral flexion of head holding body (right) (times / 20s)	15.15±1.52	15.48±1.34	2.435	>0.05
Dorsal muscle tension (kg)	105.48±1.87	106.95±1.47	0.704	>0.05
Suspension leg lifting (s)	16.79±2.30	18.66±2.65	0.081	>0.05
Sit ups (times / 20s)	15.46±1.26	14.59±1.05	1.925	>0.05

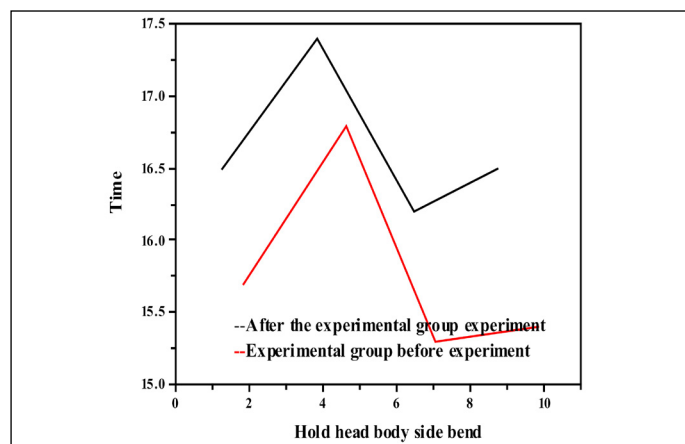


Figure 2. Data analysis of head holding body lateral flexion in the experimental group and the control group before and after the experiment.

Through the training of core strength, we can effectively increase the muscle strength of muscle groups in the core area. After 12 weeks of training, the back muscles of athletes have increased in different degrees, as shown in Table 3. The completion of an action by the body is usually the result of the cooperative work of several muscles or several muscle groups. It is precisely because of the help of fixed muscles that the prime mover muscles can easily complete a certain action. Therefore, in strength training for a certain prime mover muscle, we should try to reduce the number of fixed muscles or prolong the torque. For example, in static training, pick ups and pull in training, the number of support points is controlled at 2 or 3, and the support points are composed of palm, toe or heel as much as possible, which not only reduces the area of support, but also reduces the number of fixed muscles; In the training of reverse back extension, with the help of Swiss ball, the center of gravity of human body is increased by about 50cm, and the contact between lower limbs and goats is avoided, which not only increases the load of fixed muscles, but also prolongs the torque.¹¹

Table 3. Back muscle tension data of two groups of athletes before and after training.

	Standard error r	t value	P value
Cut-off coefficient	0.167 29	11.46	<0.01
Time slope	0.000 41	3.78	<0.01
Individual mean intercept of athletes	86	6.754	<0.01
Rehabilitation exercise	86	1 016	<0.01

CONCLUSION

Through core strength training, we can increase the muscle strength in the core area of sprinters, improve the working efficiency of muscles, fix trunk posture and prevent sports injury. Through experimental exploration, we can clarify the impact of core strength training methods and traditional strength training methods on Sprinters, demonstrate the value and function of core strength training methods, and provide basis and starting point for Chinese sprinters to carry out training activities. In addition, through the analysis and interpretation of the movements of core strength training, it can provide reference and Enlightenment for coaches to carry out core strength training activities, and help them explore updated training methods and strategies, so as to provide help for the healthy development of China's sports industry.

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