

Research on Core Strength Training of Competitive Athletes Based on Network Environment

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Keywords: Core Strength, Sports Training, Athletes.

Abstract: Athletes should have better physical quality. In the competition, all kinds of technical movements need good coordination ability and body posture control ability in the completion process. Core strength training is also often called core stability training, which belongs to the content of functional training in the field of sports training and plays a positive role in improving the stability and explosive force of athletes' core strength. Core strength training is to help explore new methods of strength training for modern athletes by establishing a relatively unstable body state to mobilize more deep muscle groups to participate in the training together. In the daily training of the team, the scientific use of core strength training will undoubtedly greatly improve the individual ability of the athletes. Combined with practical experience, this paper expounds the role of core strength training in improving athletes' performance, puts forward the methods and precautions of core strength training, and sums up the basic training ideas according to the theoretical knowledge related to sports training.

1. Introduction

Core strength refers to the strength of muscles, ligaments and connective tissues located in the "core parts" of the human body and the cooperation between them. For the understanding of core training, most people are still only a vague concept and cannot really understand the essence and main points of core training, thus failing to fully play its due role in competitive sports training [1]. Core strength training is also called core area training, which includes stability strength and specialized strength. It is a scientific and modern physical fitness training method. Core strength training is one of the important contents of modern physical fitness training, which plays an important role in the training of some sports that fully reflect the artistic expression of athletes [2]. If athletes do not have sufficient strength, it is impossible to meet the quality requirements required to complete technical movements. If the method of core strength training is not used properly, it will definitely affect the training quality of athletes [3]. The core part serves as a link between the preceding and the following, and is especially important for the completion of actions. Since most of the joints to which these core muscles are attached are fixed joints, these joints are unstable structures [4]. Therefore, the core muscle group plays a role in stabilizing the center of gravity, exerting force on the link, and transmitting power in the process. At the same time, it is also the main link of the overall force.

At present, core strength training has become an important part of the athlete's physical fitness training system. In the athlete's daily training, core strength training is even more essential, which is directly related to the athlete's physical stability, coordination and control ability [5]. The body has better control and stability, which can better control the body posture and movement posture in the game, so as to better play [6]. The core strength exists in all sports, and all sports actions are exercise chains centered on the central and cardiac muscle groups. A strong core muscle group stabilizes and supports body posture, motor skills, and specialized technical movements during exercise. In traditional athletes' physical training, traditional strength and endurance training is usually used. The technical action of any competitive event is not accomplished by a single muscle group, it must mobilize many muscle groups to coordinate work [7]. The core muscle group is the

main link of overall strength, and plays a pivotal role in cooperating and integrating the upper and lower limbs [8]. Discussion on the role and methods of athletes' core strength training can play a good role in promoting athletes' scientific training and continuous progress [9]. From the perspective of core strength training, this paper explores the characteristics and training value of core strength training for competitive athletes. According to the basic principles of core strength training and theoretical knowledge related to sports training, combined with the changes in new rules and practical experience, the basic ideas of core strength training are proposed.

2. The Necessity of Core Strength Training in Sports

Core strength exists in all sports, and all sports movements are sports chains with the middle myocardial group as the core. Strong core muscle groups play a stabilizing and supporting role in body posture, sports skills and special technical movements in sports. Strong core muscle group ability plays a role of connecting the preceding and the following, ensuring athletes to quickly, accurately and coordinately change their movement direction and speed, and improving their personal sensitivity level. In order to keep the body balance during the rotation, the rotation axis of the human body must always pass through the total center of gravity of the human body as much as possible. Then only by strengthening the training of the core control force, can erector spinae stabilize the trunk and ensure the enhancement of the athletes' ability to rotate their limbs around the longitudinal axis [10]. Some training forms in core strength training aim at the physiological and anatomical structure characteristics and biomechanical characteristics of the muscle groups in the core region, and introduce oblique force and rotational force forms as well as a compound multidimensional motion form combining flexion, extension and rotational force. When the limb exerts force, the energy accumulated by the core muscle group is conducted from the center of the body to every link of the movement. The core has the largest muscle group and the largest capacity and energy storage. The core area is like a bridge connecting the lower half of the body. It is as important as the foundation of the house. It not only affects the movements of the limbs, but also bears the heavy responsibility of controlling the posture of the whole body. The strength quality of athletes in competition does not depend entirely on the strength of athletes' muscle groups, and the coordination between muscle groups has great influence on it. In order to effectively improve the strength quality required by athletes in competitions, strength training and technical training should be organically combined.

According to the change trend of athletes' flexion angle and muscle force, the changes of knee joint three-dimensional motion angle and muscle force in each analysis step are applied to the finite element model as boundary conditions. The motion angle parameters applied to the finite element model are shown in Figure 1.

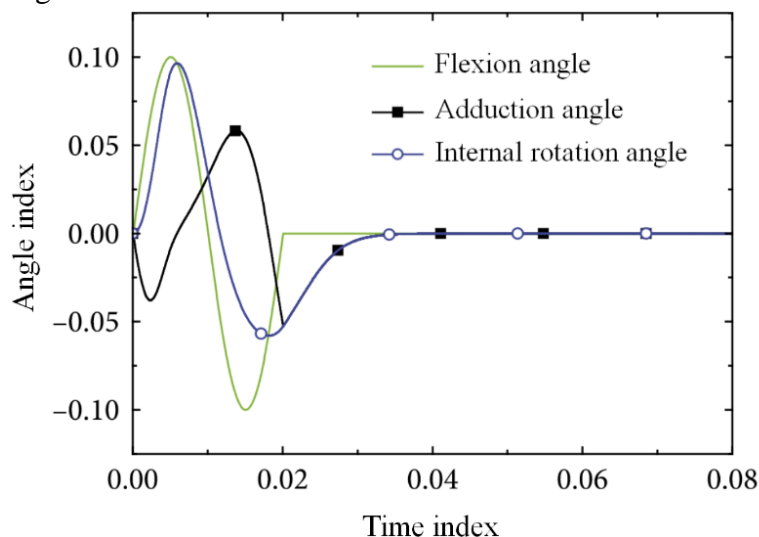


Figure 1 Motion angle data applied to the finite element model

The ultimate goal of training is to give full play to the athletes' level and achieve the best results in the competition. If athletes have a strong core strength to rely on, they can rely more effectively on the strength of the lumbar and hip primary muscles when starting quickly. During the running process, according to the principle of physics that the rotational moment is kept constant in a closed individual, the lower limb generates a forward rotational moment, and it is inevitable that other parts will generate an opposite rotational moment, so as to achieve balance. When the limb exerts force, the energy accumulated by the core muscle group is conducted from the center of the body to every link of the movement. The core strength exercise is to establish a relatively unstable body state so as to mobilize more deep muscle groups to participate in the exercise in coordination, thus improving the proprioceptive function of muscles and nerves [11]. In function, although many core muscles are not directly involved in exercise. However, almost all movements are inseparable from the stable control of the core by the core muscle group. So as to create a fulcrum for the generation of power and a channel for the transmission of power. If the sports team can pay full attention to the core strength training at ordinary times and ensure that each player has a high level of core strength training, the team's tactics will undoubtedly be better implemented and the possibility of winning is greatly mentioned.

3. The Effect of Core Strength Training on Competitive Athletes

3.1 To Improve the Athletes' Balance and the Ability to Control the Center

If the function of stabilizing the body at the core is not enough and the body loses balance, it is likely to damage the muscles of the waist and back. What controls these factors is also the function of the core muscles. biceps femoris, semitendinosus and semimembranosus muscles are very important muscles to straighten the large and small legs. The spine itself is an unstable structure, and its ligaments can only provide stability at the maximum range of spinal joint activity during spinal motion. However, ligaments are almost impossible to provide stable support for the movement below the maximum joint amplitude. Strength training is a complicated and thorough process. Without a detailed and reasonable training plan, athletes' strength cannot be improved very well, and even injuries may be caused, affecting their sports life span [12]. However, due to the weakness of muscle group strength in the core area, many athletes cannot fully display their developed limb muscle strength in the whole performance process. The result seriously affects the overall exertion of strength and directly affects the exertion of competitive ability. The core area is like a hinge connecting the upper part and the lower part. The stability of this link directly affects the firmness of the fulcrum of the limb movement force and controls the correctness of the whole body movement. A strong core muscle group can ensure that the limbs remain in a normal position during the movement process, and the stable function of deep small muscle groups plays a key protective role in preventing the occurrence of acute waist and back injuries.

If the electromyography signal of muscle cannot be measured by surface electromyography signal, the electromyography signal value of deep muscle can be measured by reference electrode. A muscle algorithm based on kinematic parameters is adopted, and the muscle force of the method is expressed by the following formula:

$$\theta(P) = \text{Logit}(P) = \text{Ln}\left(\frac{P}{1-P}\right) \quad (1)$$

Where P represents the force of the contraction unit and is calculated by the following formula:

$$\theta(P) = \text{Ln}\left(\frac{P}{1-P}\right) = \alpha + \sum \beta_i X_i + \xi \quad (2)$$

Modern athletes' body shapes are developing towards diversification, and athletes with different body shapes can find their own positions in the competition field. Through comparison, it is found that the calculated values of brachial muscle, brachioradialis muscle, triceps brachii muscle and elbow muscle are within the range of anatomical results, while the value of biceps brachii muscle is

obviously larger than the anatomical results. The calculation results of physiological transverse area are shown in Table 1.

Table 1 Calculation results of physiological cross-sectional area

Muscle name	Calculated value
Long head of biceps brachii	4.63
Short head of biceps brachii	5.44
Long head of triceps brachii muscle	4.57
Lateral muscle of triceps brachii	3.68
Medial brachial triceps muscle	4.72

3.2 Improve Athletes' Body Posture

The control of the athlete's body posture is the embodiment of the required movement quality and the ability of the whole set of movement techniques, which is the most basic and primary requirement in training the athlete's competitive ability. Stability is the main purpose of core pre-training and core strength training is the basis of other sports abilities, such as speed, agility, coordination and other quality training. The human body system model provides a tool for studying human body biomechanics and increases the research scope of human body biomechanics. The least square method is commonly used to identify the coefficients of time series models. The model parameter identification assumes that there are data observation points, and the model is:

$$i_t = (1 - \rho)i_t^* + \rho i_{t-1} + \xi_t \quad (3)$$

Then the least square algorithm completed at one time takes the criterion function as follows:

$$i_t = (1 - \rho) \left[r^* + \pi_t + \alpha(\pi_t - \pi^*) + \beta(y_t - y_t^*) + \gamma e_t + \delta m_t \right] + \rho i_{t-1} + \xi_t \quad (4)$$

The estimated values of the parameters are obtained so that the output of the model can best predict the output of the system:

$$i_t = \alpha_c + \rho i_{t-1} + \alpha_\pi \pi_t + \beta'(y_t - y_t^*) + \gamma' e_t + \delta' m_t + \xi_t \quad (5)$$

Launch the listing and apply the following vector integral formula:

$$i_t = \alpha_c + \alpha_\pi \pi_t + \beta'(y_t - y_t^*) + \gamma' e_t + \delta' m_t + \xi_t \quad (6)$$

On the working principle of muscles, the core strength emphasizes more stability and balance, the fixation of small muscle groups at the core depth, and the innervation of nerves to muscles. The traditional strength training method and the core training method are fixed, and the training amount and intensity of the experimental group and the control group are consistent respectively. The control group and the control group design a test method for fast direction change and movement ability, test the data before and after the two teams, and record the results. As shown in Table 2 and Figure 3, the improvement ranges of the experimental group and the control group after the experiment are shown.

Table 2 The difference between the experimental group and the control group before and after the experiment

Experimental content	Control group before the experiment	Control group after the experiment	Experimental group before the experiment	Experimental group after the experiment
Nebraska	12.69	11.87	12.93	12.54
The word "T" runs	6.61	6.97	8.32	7.24
Square run	8.83	8.52	8.78	8.27

The posture of the athlete is the key, not the strength of the big muscle, in the process of exerting

force. At this time, it is the iliopsoas muscle, the deep muscle in the core area, which is located on both sides of the iliac fossa and lumbar spine. Core strength training has the nature of general strength training, the function of special strength training and the concept of rehabilitative physical fitness training. The change curve of patella position in the global coordinate system with knee joint flexion angle is as shown in Figure 2. the internal and external displacement of patella has little change during flexion. The change of patella three-dimensional rotation angle with flexion angle is shown in Figure 3.

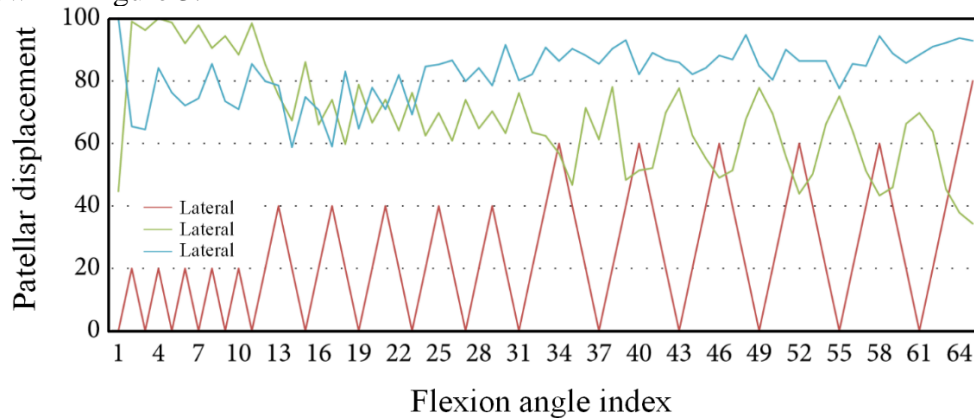


Figure 2 Changes of metatarsal bone displacement to knee flexion angle

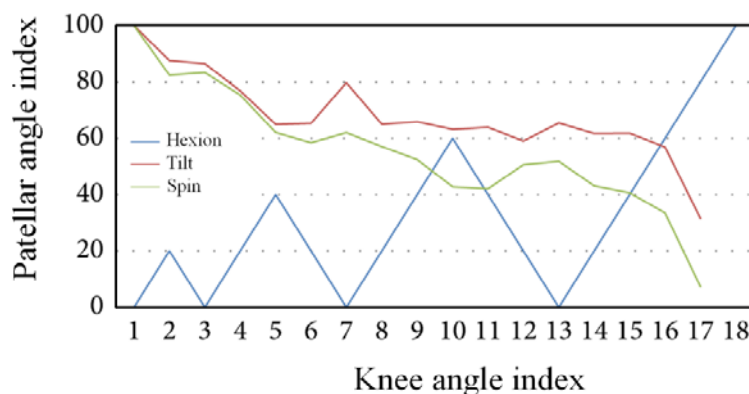


Figure 3 Three-dimensional rotation of the patella with knee flexion

Core strength training refers to the strength, stability and balance training of the body's core muscle group and its deep small muscles. With a strong core force as a guarantee, the trunk can be firmly supported, and the stress of the limbs can be reduced accordingly, so that the limbs can perform more coordinated technical movements with ease. When athletes perform fast power-generating movements, strong core muscle groups can ensure that limbs remain in normal positions during movements, and the stable function of deep small muscle groups plays a key protective role [13]. During the exercise of the whole set of movements, no matter how complicated and changeable the movements are, the standard posture of the whole body is required not to be damaged. Core strength training is different from traditional strength training, which makes the muscles of lower back and abdomen do work at the same time during training, just like making the upper and lower bodies do work at the same time. The training of core strength is to make efforts to coordinate the whole body and ensure that the muscles in the core area can stabilize the body and transmit energy when athletes do exercises.

4. Summary

Strength quality is the basis of all qualities, and also the basis for athletes to master sports skills and improve their performance. Therefore, the strength training of domestic athletes should explore the deficiencies of the theory and practice of strength training of domestic athletes, and improve and improve the strength training of athletes. In the core strength training, coaches should follow the

principle from easy to difficult in difficulty and from small to large in training intensity. Core strength training should basically follow from balance to non-balance, from static to dynamic, from bare hands to weight-bearing difficulty gradually increasing, blindly pursuing high difficulty is easy to cause muscle damage. Physical training is to meet the needs of sports training and competition, and it is the basis of mastering complex and advanced technical actions and tactics. It can not only prevent or reduce sports injury, but also help to cultivate good psychological quality and tenacious will quality of athletes. In the daily training of sports teams, the scientific use of core strength training will undoubtedly greatly improve the individual ability of athletes. The improvement of individual ability is the basis of the overall improvement, and the improvement of the overall physical quality is the premise of the improvement of the comprehensive level of the whole team.

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