CORE STRENGTHENING IMPACT ON SOCCER TRAINING OF HIGH SCHOOL PLAYERS

IMPACTO DO FORTALECIMENTO DO CORE NO TREINO DE FUTEBOL EM JOGADORES COLEGIAIS

IMPACTO DEL FORTALECIMIENTO DEL CORE EN EL ENTRENAMIENTO DE FÚTBOL EN JUGADORES DE SECUNDARIA

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ABSTRACT

Introduction: The strengthening of the CORE is one of the essential methods for physical conditioning on elite soccer players, but there are no analyses on the impact of this method on young players. Objective: Analyze the strength training impact on the CORE in high school soccer players. Methods: This article uses mathematical statistics to study the application of strengthening of the CORE in soccer training for athletes. Based on these results, the role and influence of CORE strengthening training on skills in collegiate soccer training are analyzed. Results: After implementing CORE strengthening, both athletes' fitness indicators and soccer skills were significantly improved. Conclusion: Strengthening the CORE can improve players' stability and balance and contribute to greater effectiveness in physical training. ***Evidence Level II; Therapeutic Studies - Investigating the result.***

Keywords: Resistance Training; Soccer; Exercise Test; Athletes.

RESUMO

*Introdução: O fortalecimento do core é um dos principais métodos para condicionamento físico em jogadores de futebol de elite, porém não há analises sobre o impacto desse método em jovens jogadores. Objetivo: Analisar Impacto do fortalecimento do core no treino de futebol em colegiais. Métodos: Nesse artigo são utilizadas estatísticas matemáticas para estudar a aplicação do fortalecimento do core no futebol para atletas. Com base nesses resultados, analisa-se o papel e a influência do treino de fortalecimento do core sobre as habilidades no treino do futebol colegial. Resultados: Após a implementação do fortalecimento do core, tanto os indicadores de aptidão física dos atletas quanto as habilidades no futebol foram significativamente melhorados. Conclusão: O fortalecimento do core pode melhorar a estabilidade e o equilíbrio dos jogadores além de contribuir para a uma maior efetividade no treinamento físico. **Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.***

Descritores: *Treinamento de Força; Futebol; Teste de Esforço; Atletas.*

RESUMEN

*Introducción: El fortalecimiento del core es uno de los principales métodos de acondicionamiento físico en los futbolistas de élite, pero no existen análisis sobre el impacto de este método en los jugadores jóvenes. Objetivo: Analizar el impacto del fortalecimiento del core en el entrenamiento de fútbol en jugadores de secundaria. Métodos: En este artículo se utiliza la estadística matemática para estudiar la aplicación del fortalecimiento del core en el fútbol para los atletas. A partir de estos resultados, se analiza el papel y la influencia del entrenamiento de fortalecimiento del core en las habilidades en el entrenamiento del fútbol universitario. Resultados: Tras la aplicación del fortalecimiento del core, los indicadores de aptitud física y las habilidades futbolísticas de ambos atletas mejoraron significativamente. Conclusión: El fortalecimiento del core puede mejorar la estabilidad y el equilibrio de los jugadores, además de contribuir a una mayor eficacia en el entrenamiento físico. **Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.***

Descriptores: *Entrenamiento de Fuerza; Fútbol; Prueba de Esfuerzo; Atletas.*

INTRODUCTION

Modern football puts forward higher requirements on athletes' physical fitness and skills. Running, starting, emergency stopping, dribbling, passing, fighting, and other actions in a football game requires athletes to have good coordination and control posture capabilities.[1] Core strength training plays a role in linking the past and the next, and it plays a vital role in football training. The core muscle group is responsible for stabilizing the center of gravity, conducting force, and coordinating control. It is an important part of exerting force, and it is also a tie for coordinating various parts of the upper and lower limbs. This article implements experimental teaching of core strength training for students. Compare and experiment some indicators of the football training level of the two groups of students.[2] At the same time, we propose that core strength training has a significant effect on improving athletes' physical fitness and skills.

METHOD

Research object

We select 4 classes for students in the football option class of the Physical Education Department.[3] There are 40 students in each class, totaling 160 students. The volunteer has no history of football training and is in good health. We divide it into two experimental classes and two control classes.

Research methods

Literature data method

Search CNKI, China Newspaper Catalog Index, and Library, and check and understand the research results and progress of football core strength training at home and abroad.

Experimental method

The control class is carried out following the traditional teaching method, and the experimental class runs through the core strength training in the traditional teaching.[4] The specific method is shown in Table 1. The two groups are consistent in terms of teaching numbers, teaching hours, and teaching methods. After 32 weeks of training for 4 hours a week, the two students' exercise indicators were tested for significance.

Mathematical Statistics

We use SPSS14.0 software for the statistical analysis of experimental data.

Real-time extraction and simulation of football arc trajectory

In the process of extracting the arc trajectory of the footsteps of the football ball, we decompose the video of the arc trajectory of the footsteps of the ball into video clips of different lengths.[5] We identify the bounding box of the arc trajectory of footsteps from each image frame and extract the position information corresponding to each arc trajectory. Predict its position in the next frame based on the history of the arc trajectory of the footsteps. On this basis, the extraction of the arc trajectory of the footsteps is completed. The specific steps are detailed as follows:

Assume that T_{ert} represents the delay coefficient. m_{erp} represents the sampling frequency and the number of frequency-domain bands. r_{frp}, u_{fyl} represents the input and output music signals at time t. m_{lm} represents the comb filter of the pulse. Then use formula (1) to decompose the video of the arc trajectory of the footsteps of the football with the ball into video clips of different lengths

$$W_{ller}^{"} = \frac{m_{lm}^{'} + [r_{frp}^{'}, u_{fyl}^{'}]^{t}}{m_{erp}^{'} \mp T_{ert}^{'}} + R_{iop}^{'} + s_{sgh}^{'} \quad (1)$$

Table 1. Core strength training methods.

Training content	Times	Action requirements
Straight support	60s³3, 1min intermittent	Lie prone on the ground, with elbows supported, shoulder-width apart, elbow angle 90°, the pelvis should below, a straight line from head to toe
Prone up	3s³10³3, intermittent 1min	Lie prone on the ground, arms and legs straight, as high as possible, the torso and pelvis are on the ground, stop for 3 seconds, put down and then raise
Lie on the side	10-15 times³3	Lie prone on the ground, arms and legs straight, as high as possible, the torso and pelvis are on the ground, stop for 3 seconds, put down and then raise
Russian twist	10-15 times³3	Lie on your side, with your elbow joints just below your shoulder joints, your feet together, your body straight, the skeletal joints are slowly descending, contact with the ground, repeated exercises
Crunchy	30-50 times³3	Sit on the floor with your upper body straight, arms crossed in front of your chest, feet raised, the upper body turned, left elbow touched right knee and then turned right, repeated practice
Prone diagonal support	20-30s³3	Lie on your back with your knees bent, arms crossed in front of your abdomen, feet fixed, and your body is rolled up. When your elbow joint touches your thigh, you should lower your body, and your shoulders and feet touch the ground. Repeat practice

R_{iop} represents the gain factor. s_{sgh} represents the set of video action clips. η_{we} represents the set of initial crest points. m_{gj} represents the moving arc trajectory feature in the bounding box of the foot moving arc trajectory. k_{lpm} represents the importance of different pixels in the bounding box in the keyframe of the trajectory. Θ_{sg} represents the different areas of the bounding box. Use formula (2) to identify the bounding box of the arc trajectory of the footsteps from each frame of the image

$$r_{sgh}^{'} = \frac{\theta_{sg}^{'} + \eta_{we}^{'}}{m_{gj}^{'}} \times \frac{\{k_{lpm}^{'} \mp \theta_{sg}^{'}\}}{c_{jkl}^{'} \mp x_{pol}^{'}} \quad (2)$$

c_{jkl} represents the average value of the trajectory direction in each area. x_{pol} represents two image frames with different trajectory directions. ∂_{plk} represents the state vector of the arc trajectory of the footsteps. E_{ser} represents the observation vector. Then use formula (3) to extract the position information corresponding to each arc trajectory

$$W_{wdr}^{'} = \frac{\partial_{plk}^{'} \times E_{ser}^{'}}{u_{wep}^{'}} \times e_{fru}^{'} \quad (3)$$

u_{wep} represents the system noise vector with zero mean. e_{fru} represents the observed noise vector. ω_{wep} represents the grayscale function of the image of the arc trajectory of the footsteps. ζ_{zse} represents the different spatial characteristics of the gray image distribution. Then use equation (4) to predict its position in the next frame based on the history of the arc trajectory of the footsteps

$$C_{KP}^{'} = \frac{\zeta_{zse}^{'} \times \omega_{wep}^{'}}{r_{sgh}^{'} \times W_{ller}^{"}} \times W_{wdr}^{'} \times \frac{\{k_{kp}^{'}\} \pm m_{lpo}^{'}}{m_{ey}^{'}} \quad (4)$$

m_{lpo} represents the reference feature vector set of the arc trajectory of footsteps. m_{ey} represents the maximum weight of the observed vector of the arc trajectory of the footsteps. k_{kp} represents the sampling interval of two adjacent frames. σ_{plk} represents the maximum weight of the state vector of the arc trajectory of the footsteps predicted at time p_k. Then use formula (5) to complete the extraction of the moving trajectory

$$E_{erty}^{'} = \frac{p_{k}^{'} \times \sigma_{plk}^{'}}{r_{sgh}^{'} \times W_{ller}^{'}} W_{wdr} \times C_{KP} \quad (5)$$

In summary, the principle of extracting the arc trajectory of the footsteps of a football dribbling through a person can be explained.[6] This principle is used to complete the extraction of footsteps movement trajectory for passing the ball.

RESULTS

Test results of physical fitness indicators before the experiment

Before the experiment, the physical fitness of the two groups of students was tested.[7] The purpose is to explore the influence of core strength training in football training teaching. After the t-test, there was no significant difference in the indexes of the two students in the 100m, 30m, 1500m running, and standing long jump. (Table 2)

Test results of physical fitness indicators after the experiment

Table 3 shows that the physical fitness indicators of the control group lag behind the experimental group after the core training experiment.[8] The two indexes of 30m and 1500m have significant differences (P<0.05).

The two indicators of 100m and standing long jump have very significant differences (P≤0.01). It can be seen that the core strength training of the experimental group has a significant promotion effect on the running ability and explosive power of the lower limbs of the students.

Football skill test results before the experiment

Before the experiment, the football skill scores of the two groups of students were tested. The purpose is to explore the effect of core strength training on students' football skills.[9] There was no significant difference in football skills and various technical indicators between the two groups of students by t-test. (Table 4) This shows that the two groups of students have the same level of football skills before the experiment.

Football skill test results after the experiment

Table 5 shows that after the core training experiment, the football skill indicators of the control group lag behind the experimental group.[10] Among them, there were significant differences in indexes such as 1min bumping, dribbling around the shot, kicking far and 25m kicking accuracy (P<0.05). These football skills are determined by body control,

Table 2. Physical fitness before the experiment.

Class	n	100m/s	30m/s	1500m/s	Standing long jump/m
Experimental class	80	13.7±0.36	5.3±0.9	375.5±55.2	2.59±0.98
Control class	80	13.71±0.78	5.2±0.2	368.2±41.3	2.45±0.79
t		-1.11	-1.48	-1.78	0.79
P		0.81	0.83	0.43	0.45

Table 3. Physical fitness after the experiment.

Class	n	100m/s	30m/s	1500m/s	Standing long jump/m
Experimental class	80	13.1±1.3	4.8±1.1	367.5±55.2	2.69±0.88
Control class	80	13.75±0.26	5.2±0.28	375.2±41.3	2.49±0.89
t		-1.43	-1.56	-1.81	0.71
P		0.01	0.03	0.03	0.01

Table 4. Football skills before the experiment.

Class	n	1min ball/ piece	Dribble shot	Kick far/	25m kick/ each
Experimental class	80	26.46±1.33	11.4±0.38	21.22±6.48	4.8±1.32
Control class	80	28.37±1.17	10.64±0.68	22.45±6.88	4.42±0.92
t		-0.89	-1.46	-1.69	-1.84
P		0.85	0.43	0.08	0.15

Table 5. Football skills after the experiment.

Class	n	1min ball/ piece	Dribble shot	Kick far/	25m kick/ each
Experimental class	80	49.6±3.67	8.59±0.33	32.45±6.4	7.59±1.49
Control class	80	38.66±8.1	9.22±0.24	28.46±3.59	6.1±0.84
t		1.61	-2.33	-2.57	-0.55
P		0.1	0	0.01	0.02

balance, and lower limb strength. And these abilities can be improved in core strength training. It can be seen that core strength training can promote football skills to a certain extent.

DISCUSSION

From the comparison of the above experimental results, it can be seen that core strength training teaching has a significant effect on football players' physical fitness and football skills.[11] This is because core strength training is the center and center of gravity of the limbs, and it is also the conveyor belt that controls the strength of the upper and lower limbs. It plays a coordinated and stable role on the conveyor belt. The exercise of the core muscle group improves the ability of nerves to control the muscles and enhances the flexibility of the hip joint. The exercise of the core muscle group is also conducive to the transmission of unstable upper limb power to the lower limbs, avoiding unnecessary power loss. The core muscles strengthen and stabilize the center of gravity. For example, both static support and supporting walking in exercises significantly affect stability and coordination.

The fierceness and high intensity of football require that the athlete's body posture is often in a state of unfixed support. This requires football players to have a strong balance ability. Muscles such as the hip joint and pelvis in the core area are far from the muscles of the limbs and are not directly involved in human movement. However, the muscle contraction and stability of the core area are closely related to the muscles of the limbs. It provides a support point for sports and ensures coordination, flexibility, and accuracy of body posture. For example, when a football player moves fast and kicks the ball (kicking far, bumping the ball, shooting), the athlete's body needs to flip, float and jump to a large extent. The core muscle group can fix the torso and limbs. When the limbs exert force, they all rely on the rest of the core conduction and control to complete.

CONCLUSION

After the core strength training teaching experiment was carried out, the experimental group's physical fitness and football skills were significantly different from those of the control group. It can be seen that core strength training has special advantages in training and teaching. It promotes the athlete's core stability, muscle coordination ability, and strength level. The core strength is the hub for the body to exert strength and maintain coordination and stability.

ACKNOWLEDGMENT

AUTHORS' CONTRIBUTIONS: The author made significant contributions to this manuscript. BW: writing and performing surgeries; data analysis and performing surgeries; article review and intellectual concept of the article.

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