DEDICATED TRAINING OF EXPLOSIVE STRENGTH IN THE ABDOMINAL CORE OF SOCCER PLAYERS

TREINAMENTO DEDICADO DA FORÇA EXPLOSIVA NO CORE ABDOMINAL DOS JOGADORES DE FUTEBOL

ENTRENAMIENTO ESPECÍFICO DE LA FUERZA EXPLOSIVA EN EL CORE ABDOMINAL DE FUTBOLISTAS

Original Article
Artigo Original
Artículo Original

Xiaohui Liu[1]
(Physical Education Professional)
Liping Liao[1]
(Physical Education Professional)
Shengnan Zhou[2]
(Physical Education Professional)

1. School of Physical Education, Nanchang Jiaotong Institute, Nanchang, Jiangxi, China.
2. School of Business, Nanchang Jiaotong Institute, Nanchang, Jiangxi, China.

Correspondence:
Liping Liao
Nanchang, Jiangxi, 330100, China.
330100. llp1106@126.com

ABSTRACT

Introduction: Physical confrontation in soccer games presents greater demands on athletes' physical fitness. A soccer player's speed, strength, flexibility, coordination, endurance, and explosiveness can affect the body's fighting capacity. Objective: This study analyzes the relationship between strength training in soccer players' abdominal core and physical fitness. Methods: The effect of abdominal core stability strength training on performance improvement in volunteer soccer players selected as research subjects was verified by random division into two groups (experimental and control groups). Both groups performed daily training. The experimental group added special abdominal core training. Mathematical-statistical algorithms were used to statistically analyze the physical indicators of the two groups of volunteers. Results: The indices of physical fitness and body explosiveness of the two groups of athletes were significantly improved (P<0.05). After systematic training, the competition performance of the experimental group and the physiological and biochemical indicators were better than the control group (P<0.05). Conclusion: After abdominal core training, soccer players' physical fitness and explosive power indexes were improved. Research shows that strength training can help improve abdominal core performance in soccer players. It is recommended that coaches implement abdominal core strength training in the daily training of athletes. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Resistance Training; Reactivity-Stability; Soccer; Physical Fitness; Muscle Strength.

RESUMO

Introdução: O confronto físico nos jogos de futebol apresenta maiores exigências quanto à aptidão física dos atletas. A velocidade, força, flexibilidade, coordenação, resistência e explosividade de um jogador de futebol podem afetar a capacidade de combate corporal. Objetivo: Este estudo visa analisar a relação entre o treinamento de força no core abdominal dos jogadores de futebol e sua aptidão física. Métodos: O efeito do treinamento de força da estabilidade do core abdominal sobre a melhoria do desempenho nos jogadores de futebol voluntários selecionados como objetos de pesquisa foi verificado por divisão aleatória em dois grupos (grupos experimentais e grupos de controle). Ambos os grupos realizavam treinamentos diários. O grupo experimental acrescentou treinamento especial de core abdominal. Foram utilizados algoritmos matemáticos-estatísticos para analisar os indicadores físicos dos dois grupos de voluntários de forma estatística. Resultados: Os índices de aptidão física e explosividade corporal dos dois grupos de atletas foram significativamente melhorados (P<0,05). Após o treinamento sistemático, o desempenho de competição do grupo experimental e os indicadores fisiológicos e bioquímicos foram melhores que os do grupo de controle (P<0,05). Conclusão: Após o treinamento do core abdominal, a aptidão física dos jogadores de futebol e os índices de potência explosiva foram melhorados. Pesquisas mostram que o treinamento da força pode ajudar a melhorar o desempenho do core abdominal nos jogadores de futebol. Recomenda-se aos treinadores a implementação do treino de força no core abdominal ao treinamento diário dos atletas. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Treinamento de Força; Reatividade-Estabilidade; Futebol; Aptidão física; Força Muscular.*

RESUMEN

Introducción: El enfrentamiento físico en los partidos de fútbol presenta mayores exigencias a la aptitud física de los atletas. La velocidad, la fuerza, la flexibilidad, la coordinación, la resistencia y la explosividad de un jugador de fútbol pueden afectar a la capacidad de combate del cuerpo. Objetivo: Este estudio tiene como objetivo analizar la relación entre el entrenamiento de la fuerza en el core de los jugadores de fútbol y su condición física. Métodos: El efecto del entrenamiento de la fuerza de la estabilidad del core abdominal sobre la mejora del rendimiento en jugadores de fútbol voluntarios seleccionados como sujetos de la investigación se verificó mediante la división aleatoria en dos grupos (grupo experimental y grupo de control). Ambos grupos realizaron un entrenamiento diario. El grupo experimental añadió un entrenamiento especial del core abdominal. Se utilizaron algoritmos matemático-estadísticos para analizar de forma estadística los indicadores físicos de los dos grupos de voluntarios. Resultados: Los índices de aptitud física y explosividad corporal de los dos grupos de atletas mejoraron significativamente (P<0,05). Tras el entrenamiento sistemático, el rendimiento en competición del grupo experimental y los indicadores fisiológicos y bioquímicos fueron mejores que los del grupo de control (P<0,05). Conclusión: Tras el entrenamiento del core abdominal,

mejoraron la condición física y los índices de potencia explosiva de los futbolistas. Las investigaciones demuestran que el entrenamiento de fuerza puede ayudar a mejorar el rendimiento del core abdominal en los jugadores de fútbol. Se recomienda que los entrenadores implementen el entrenamiento de fuerza en el core abdominal al entrenamiento diario de los atletas. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Entrenamiento de Fuerza; Reactividad-Estabilidad; Fútbol; Aptitud Física; Fuerza Muscular.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0327 Article received on 06/07/2022 accepted on 07/15/2022

INTRODUCTION

Core stability training can improve the strength of the muscles in the core area of the athlete. It can coordinate and integrate the force generation and transmission of the upper and lower limb muscles. Core strength stability training also controls body posture stability. Modern football puts forward higher requirements for physical fitness and skills. This requires players to have better abilities.[1] Athletes need to coordinate and integrate the strength of the upper and lower limbs in various running, breaking through with the ball, fighting, and controlling the ball in each collision process. Athletes need reasonable body posture control. Therefore, the stability of the core part is essential. From the perspective of improving football players' physical fitness and skills, this paper designs some training methods and means to enhance the core strength of prominent football players and improve body posture stability.[2] This paper aims to investigate the effect of core stability training on the physical fitness and skills of football training in big football players.

METHOD

Research objects

This paper selects 100 male football players as the research object. We randomly divided them into two groups. Before the experiment, the experimental and control football players were tested on the basic level.[3] At the same time, we conduct a three-sex test on the test results. We teach the two groups with two sets of lesson plans. The pre-experimental test was conducted the day before the teaching experiment. The post-test was conducted immediately after the teaching experiment.

Research methods

The control group arranges regular teaching content, while the experimental group increases the core stability practice content of football players in the preparatory activities of each class.[4] The two groups remained the same regarding teaching numbers, teaching hours, teaching methods, and venue equipment. We conducted a significant difference test on the results before and after the experiment.

The control group used traditional preparation activities in preparation activities. Training is mostly jogging and simple leg presses. The experimental group increased the training content of the body's core stability in the preparation activities. The experimental group mainly used a Swiss ball for core strength training. We adjust the training difficulty according to the fitness level of the football player.[5] We have arranged the following training methods and means according to the teaching experiment design. The fundamental part and the end part of the football training remain unchanged. We use spss11.5 software for statistical analysis of the relevant data.

The establishment of the data model of the muscle strength of football players

$c(d)$ represents the different labor intensity of athletes. $v(d)$ represents the different BMIs of athletes. $f(d), g(d)$ represents the temperature and humidity of the environment. We use Equation (1) to describe the effect of squatting on the decline of an athlete's knee flexion and extension of isokinetic muscle strength

$$R(M)=\frac{[c(d),v(d),f(d),g(d)]}{\theta(P)+[S(j)]\times u_{(j)}}\times \upsilon_{(G)} \quad (1)$$

$\theta(P)$ represents the discriminant function for the influencing factors. $S(j)$ represents the optimal difference factor. $\upsilon(G)$ represents the absolute difference of the characteristic indicators of each recession influencing factor. $\omega(R)$ represents the difference between the observed frequency of the athlete's muscle decline and the frequency of the athlete's muscle decline.[6] We used formula (2) to cluster the correlation between the serum estradiol level of athletes and the sulfite content in synovial fluid using the principle of maximum entropy fuzzy clustering

$$\omega(M)=\frac{\omega(R)+P(\lambda)}{F(E_1)\times s(q_\sigma)}\times R(M) \quad (2)$$

$P(\lambda)$ represents the weighted association between serum estradiol levels in athletes' knees and sulfite levels in synovial fluid. $F(E_1)$ represents a sample of the ratio between serum estradiol levels and sulfite levels in synovial fluid at different ages. $s(q\sigma)$ represents the course of changes between serum estradiol levels and sulfite levels in synovial fluid in patients with osteoarthritis with age. $p(j)$ represents the multi-characteristic information of an athlete's muscle decline. $d(p)$ represents the weight assigned to each feature information. $\upsilon_{(\gamma)}$ represents the state vector of knee extensor muscle decline.[7] We used it to obtain the correlation between knee extensor and flexor strength and knee stability in athletes. On this basis, we established a model of the effect of volleyball squats on the decline of knee flexion and extension of isokinetic muscle strength

$$B(F\times J)=\frac{\omega(M)\times \upsilon_{(\gamma)}\times T_{r\varepsilon}}{p(j)\times d(p)}\times T'' \quad (3)$$

$T_{r\varepsilon}$ represents the weight coefficient of the corresponding feature information. T'' represents the probability weighting coefficient for each valid observation.

There is no need for a code of ethics for this type of study.

RESULTS

Test results of each index in the experimental group and the control group before the experiment

Before the experiment, the physical shape, physical quality, intelligence level, and football-specific skill indexes of the football players in the experimental and control groups were tested and examined.[8] After the t-test, there was no significant difference between the control and experimental groups regarding body shape, physical quality, intelligence level, and soccer-specific skills. This guarantees experiments with high internal effects (Table 1, 2, 3, and 4).

Table 1. Physical shape and intelligence of the two groups of football players before the experiment.

Group	Test group	Control group	T	P
Height/cm	171.70±5.48	174.75±6.53	-1.08	0.34
Weight/kg	61.15±10.30	64.40±10.67	-0.98	0.55
Age	18.44±1.08	19.15±1.10	-0.56	0.58
SAT score	377.75±38.87	364.54±43.00	-1.87	0.81

Table 2. The physical fitness of the two groups of football players before the experiment.

Group	Test group	Control group	T	P
30m acceleration run/s	5.34±0.49	5.37±0.51	-1.3	0.9
100m run/s	13.70±0.38	13.71±0.79	-0.1	0.92
1500m run/s	372.84±44.32	377.53±78.25	-1.55	0.59
Throwing a medicine ball/m	9.35±1.35	8.87±1.17	1.23	0.28
Standing long jump/m	2.58±0.44	2.70±1.13	0.87	0.41

Table 3. The football skills of the two groups of football players before the experiment.

Group	Test group	Control group	T	P
1 minute ball/N	26.56±1.35	28.47±1.47	-0.92	0.86
Dribble shot around the goal/s	11.05±0.45	10.65±0.69	-1.56	0.53
25m kicking accuracy / N	4.83±1.33	4.41±0.92	-1.88	0.12
Kick far/m	21.66±8.45	22.86±7.83	-1.87	0.09

Table 4. The physical fitness of the two groups of football players after the experiment.

Group	Test group	Control group	T	P
30m acceleration run/s	4.97±1.01	5.24±0.27	-1.44	0
100m run/s	13.05±1.54	13.79±0.16	-1.59	0.03
1500m run/s	367.11±55.72	379.23±41.29	-1.93	0.14
Throwing a medicine ball/m	11.06±2.70	9.46±1.55	1.72	0
Standing long jump/m	2.69±1.99	2.52±0.94	0.71	0

Test results of each index in the experimental group and the control group after the experiment

After the experiment, the test results of various physical fitness indicators in the experimental group were better than those in the control group.[9] There was a significant difference in the 100-meter running performance ($P<0.05$). There were significant differences in the performances of the 30-meter acceleration run, medicine ball throw, and standing long jump ($P < 0.01$). The 1500-meter running results showed no significant difference ($P>0.05$). This shows that core stability training can improve football players' short-range sprint ability and upper and lower body strength. However, it had no significant effect on endurance improvement. (Table 4)

The difference between dribbling around the goal and kicking far was very significant ($P<0.01$).[10] This shows that core stability training can play a specific role in improving some football skills. Some skills even have a significant improvement effect. (Table 5)

DISCUSSION

The speed, lower body strength, and upper body strength of the football players in the experimental group were improved. And there are significant differences in each index before and after the experiment.[11] The 30-meter acceleration and the 100-meter run are fast and periodic single-action structure test items dominated by physical fitness. Movement requires continuous dynamic stabilization of posture during running. The core part undertakes the critical task of maintaining a stable posture during running. It can coordinate the swing arm and the pedal swing of the two legs. Standing long jump and medicine ball throwing are both physical-dominant fast-strength tests. Its action structure is single. These two exercises require a coordinated transfer of upper and lower body strength. The core part plays an essential role in this process.

Table 5. Football skills of the two groups of football players after the experiment.

Group	Test group	Control group	T	P
1 minute ball/N	59.69±3.77	57.56±7.25	1.64	0.11
Dribble shot around the goal/s	7.79±0.43	9.33±0.42	-2.53	0
25m kicking accuracy / N	7.59±1.57	6.06±0.75	-0.51	0.03
Kick far/m	32.47±6.14	27.57±4.67	-2.77	0

Our training for football players using the instability of the Swiss ball and balance pad builds core strength and improves core stability.[12] Continuously strengthen the training of large muscle groups in the core part of the football player's body during training. This will improve the core muscles of the football players in the experimental group in three aspects: First, it improves the nerve's ability to control muscles during exercise, the ability to recruit, and the flexibility of the hip joint. Football player stride length has been increased. Second, in unstable dynamics, the athlete conducts the power transmission of the upper and lower limbs. This reduces the loss of upper body strength. Third, the training of strengthening the strength of the muscles in the core part of the body is conducive to stabilizing the center of gravity of the human body. This training can improve the stability of the human body during exercise. The experimental group continuously stimulated the core muscle groups during training. This promotes the development of core muscle group strength.

After the experiment, the football skills of the football players in the experimental group were improved. In particular, the performance of dribbling around the goal and kicking far away showed a very significant difference compared with the control group. Dribbling and shooting around the bar belong to the multi-action structure of variation combination. In pursuit of a certain speed, athletes also require the ability to control the ball and balance body posture. These can all be improved with core stabilization training. The jumbo is a skill-dominant test of the accuracy, periodic single-action structure. It mainly requires football players to have a good motor perception, feeling, and coordination. This exercise does not require very high lower body strength. Athletes only need to practice hard to strengthen the feeling of the ball. Soccer players should do well on the test of juggling. Football players can better coordinate their upper and lower limbs and stabilize their body posture while bouncing the ball. This can also help improve grades.

CONCLUSION

Most of the physical fitness and technical performance of the football players in the experimental group improved after core stability training. There were significant differences in the performance of some indicators before and after the experiment. This shows that core stability training can enhance the core strength of football players. This exercise can improve core stability and improve muscle balance, and coordination. At the same time enhance the control of movements and the coordination of the upper and lower limbs. This exercise is conducive to the release and transmission of power.

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. LL: data analysis; SZhou: data analysis; XL article review and intellectual concept of the article.

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