STRENGTH TRAINING METHOD FOR TENNIS PLAYERS

MÉTODO DE TREINAMENTO DE FORÇA PARA TENISTAS

MÉTODO DE ENTRENAMIENTO DE FUERZA PARA TENISTAS

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ABSTRACT

Introduction: Tennis is highly technical, and any error in its players' strength training can exponentially impact the competition. A timely review and analysis of tennis players' biomechanics will help to better understand the training system and reveal the basis for future scientific sports training strategies. Objective: Analyzes the effect of different strength training methods to design the best protocol considering tennis players' speed and success rate. Methods: The effect of training on 40 tennis players is discussed. The volunteers were divided into the experimental and control group. The experimental group performed strength training for 40 minutes daily, thrice a week. The control group continued with conventional training. The trial lasted eight weeks. The speed and success rate of the training were tested before and after the experiment. Results: The experimental group players significantly improved serve speed (P<0.05). The success rate of the experimental group was also significantly improved (P<0.05). Conclusion: The proposed strength training significantly improved the success rates of speed in tennis players. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Physical Conditioning, Human; Tennis; Athletes; Resistance Training.

RESUMO

Introdução: O tênis é um esporte altamente técnico e qualquer erro no treinamento de força de seus praticantes pode gerar impactos exponenciais na competição. Uma revisão e análise oportuna da biomecânica dos tenistas ajudará a entender melhor o sistema de treino e revelar as bases para a formulação de estratégias de treinamento esportivo científico no futuro. Objetivo: Analisa o efeito de diferentes métodos de treinamento de força para elaborar o melhor protocolo considerando a velocidade e a taxa de sucesso dos jogadores de tênis. Métodos: Discute-se o efeito do treinamento em 40 jogadores de tênis. Os voluntários foram divididos em grupo experimental e controle. O grupo experimental realizou um treinamento de força por 40 minutos diários, três vezes por semana. O grupo de controle continuou com o treino convencional. O ensaio durou oito semanas. A velocidade e a taxa de sucesso do treino foram testadas antes e depois do experimento. Resultados: Os jogadores do grupo experimental tiveram melhora significa na velocidade de saque (P<0,05). A taxa de sucesso do grupo experimental também foi significativamente aprimorada (P<0,05). Conclusão: O treinamento de força proposto conseguiu melhorar significativamente as taxas de sucesso a velocidade nos jogadores de tênis. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Condicionamento Físico Humano; Tênis; Atletas; Treinamento de Força.*

RESUMEN

Introducción: El tenis es un deporte altamente técnico y cualquier error en el entrenamiento de la fuerza de sus jugadores puede generar impactos exponenciales en la cancha. Una revisión y un análisis oportunos de la biomecánica de los tenistas ayudarán a comprender mejor el sistema de entrenamiento y revelarán la base para la formulación de estrategias científicas de entrenamiento deportivo en el futuro. Objetivo: Analizar el efecto de diferentes métodos de entrenamiento de fuerza para diseñar el mejor protocolo teniendo en cuenta la velocidad y el índice de éxito de los tenistas. Métodos: Se analiza el efecto del entrenamiento en 40 tenistas. Los voluntarios se dividieron en grupo experimental y grupo de control. El grupo experimental realizó un entrenamiento de fuerza durante 40 minutos diarios, tres veces por semana. El grupo de control continuó con el entrenamiento convencional. La prueba duró ocho semanas. La velocidad y la tasa de éxito del entrenamiento se comprobaron antes y después del experimento. Resultados: Los jugadores del grupo experimental tuvieron una mejora significativa en la velocidad de saque (P<0,05). La tasa de éxito del grupo experimental también mejoró significativamente (P<0,05). Conclusión: El entrenamiento de fuerza propuesto fue capaz de mejorar significativamente las tasas de éxito la velocidad en los jugadores de tenis. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Acondicionamiento Físico Humano; Tenis; Atletas; Entrenamiento de Fuerza.*

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INTRODUCTION

Tennis is a project based on an anaerobic and lactic acid-free energy supply. At the same time, the exercise is also based on aerobic exercise. Tennis has a rest period after each match. Tennis matches are intermittent and continuous. Tennis focuses not only on physical strength but, more importantly, on the explosiveness and explosiveness brought about by the rapid contraction of muscles. When holding a tennis racket, you should pay attention to the line of the ball and the action itself, as well as the observation and judgment of the ball. Serve is a process that combines the athlete, the opponent, the environment, the pressure of the game, and the athlete's resilience.[1] Athletes' recovery of physical function and mental state is very different from informal training. The essence of the service technology concept of tennis is to improve the players' service stability and anti-interference performance through simulated training, simulated environment, and functional training.[2] This paper focuses on how college tennis players can improve their serving speed and success rate when training their core strengths. This paper analyzes the effect of different strength training methods on the athlete's serve speed and serve success rate.

METHOD

Research objects

This paper explores how college tennis players can improve their services and success rates during core strength training.[3] The research object of this paper is 40 tennis players. We divided them into two groups: one was the experimental group, and the other was the control group. The technical and mental states of the athletes participating in the test were better.

Test method

First, before the test, this paper measured the initial speed and the rate of the players and made statistics. On this basis, the athletes underwent eight weeks of regular strength and core strength training. Each athlete has ten chances during the test. The paper then calculates the average speed ten times. In this paper, a player's serve rate was tested. Each player has 20 attempts to serve. This article counts the number of balls served. Each player must serve the ball first. A particular measuring device is used to detect the speed of the ball.[4] The experiment is mainly based on the speed measurement of STARK motion radar. The measured speed is 20-200 km/h. This article measures the target for 50 milliseconds. The deviation is ±0.18 km/h.

Stereometry of high-fives in tennis players

In this paper, the dynamic regulation equation of the mechanical properties of the hand bone can be written in the following format:

$$-\frac{\partial}{\partial \alpha_j}\frac{\left(\frac{\partial u_h(\alpha)}{\partial \alpha_q}+\frac{\partial u_q(\alpha)}{\partial \alpha_h}\right)}{\rho_{ijhq}(X)}=g_j,\alpha\in\Omega \quad (1)$$

ρ_{ijhq} is the modulus of elasticity. g_j is a physical or external force. Additional limited boundary conditions are:

$$u_j(X)=\overline{u}_j(\alpha),\alpha\in\Gamma_u \quad (2)$$

$$w_j\frac{\left(\frac{\partial u_h(\alpha)}{\partial \alpha_q}+\frac{\partial u_q(\alpha)}{\partial \alpha_h}\right)}{\rho_{ijhq}(X)}=\overline{t}_j(\alpha),\alpha\in\Gamma_t \quad (3)$$

Γ_u and Γ_t are the displacement and stress boundaries. C is a regularity of the bounds of Γ_t. $\overline{u}_j(\alpha)$ and $\overline{t}_j(\alpha)$ are the displacement and stress field in position. The corresponding weak form is:

$$-\int_\Omega \rho_{ijhq}\left(\frac{\partial u_h}{\partial \alpha_q}+\frac{\partial w_j}{\partial \alpha_j}\right)+\int_{\Gamma_t}\overline{t}_j w_j-\int_\Omega g_j w_j=0,\forall w_j\in(E_0^1)^3 \quad (4)$$

$\{F_h\}$ is a finite element division of Ω. e is the parameter for cutting. If e is the division unit, then the discrete variable problem corresponding to (4) is:

$$-\int_\Omega \rho_{ijhq}\left(\frac{\partial u_h^e}{\partial \alpha_q}+\frac{\partial w_j^e}{\partial \alpha_j}\right)+\int_{\Gamma_t}\overline{t}_j w_j^e-\int_\Omega g_j w_j^e=0,\forall w_j^e\in(V_e)^3 \quad (5)$$

$(V_e)^3$ is a finite element.

Data Analysis

This paper uses SPSS 20.0 for statistics. The data of all athletes in the experimental and control groups are presented as mean-standard values. In this paper, the independent sample size of the two groups was used as the independent sample size of the experimental and control groups.[5] The experimental and control groups' data before and after the test were all verified by matching sampling t. The rank sum test method was used for those that did not meet the t-test. P<0.05 is a significant difference.

Ethical Compliance

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Hebei Sport University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

Differences between the two groups of tennis players before the experiment

Before the experiment, this paper collected and sorted out the primary data such as height, age, weight, serving speed, and serving success rate of the two groups of athletes.[6] This paper compares the primary data of the two projects (Table 1). The results showed no significant difference in the height, age, weight, serving speed, serving speed, and serving winning rate of the two groups of athletes (P>0.05).

Comparison of the performance of the two different groups after the test

The results showed a significant difference between the experimental and control groups in terms of service rate and service rate (P<0.05). (Table 2)

DISCUSSION

Tennis players' physical and mental arousal gradually decreases over time. This can quickly increase unacceptable errors in serving speed, accuracy, and success rate. The LITT (Loughborough tennis skill test: serve)

Table 1. Differences in the basic data of athletes in the early stages of the two trials.

Project	Test Group	Control Group	t	P
Height/cm	177.56±3.41	177.48±3.87	-0.127	0.921
Age/y	21.77±1.37	21.91±1.08	0.709	0.509
Weight/kg	64.36±5.18	64.14±5.15	-1.169	0.277
First serve speed	86.96±3.35	87.37±3.79	1.222	0.256
Serve success rate/%	28.58±9.6	28.83±6.07	0.152	0.902

Table 2. Comparison of the first serve rate and hit rate of the two groups of athletes after the test.

Group		Test Group	Control Group	t	P
Test Group	First serve speed	86.96±3.35	91.04±3.04	4.386	0.001
	Serve Success Rate	28.58±9.6	39.45±5.27	8.162	0
Control group	First serve speed	87.37±3.79	89.67±3.29	2.319	0.04
	Serve Success Rate	28.83±6.07	28.32±5.88	0.449	0.681

service test shows that when players perform 2 hours of practice, their serve accuracy decreases.[7] The chance of a wrong shot goes up by 17%. Tennis matches are generally more than an hour long. Some are more than 5 hours. Intense confrontation is also a test of the physical fitness of athletes. The improvement of physical fitness helps to improve the stability and speed of the athlete's serve. Reasonable physical exercise can promote the technical progress of various projects and prevent sports injuries. Tennis projects use energy supply, glycolysis energy supply, aerobic energy supply, and short-term self-healing ability as the primary energy supply methods.[8] According to the energy consumption data released by the International Athletics Federation, the energy consumption of tennis players is about 70% supplied by phosphate, 20% supplied by glycolysis, and 10% supplied by aerobic. Since the game's intensity in the previous stage will significantly impact the serving, it is necessary to carry out targeted fitness exercises in combination with the athletes' metabolic characteristics in the usual practice. Regular core strength training mainly includes stretching, flexibility, strength, endurance, and speed. In the training process, athletes can increase a certain amount of weight employing re-entry running, accelerated running, variable speed running, etc., to match the competition level. Strengthening physical fitness in daily high-intensity simulation competitions helps athletes use their skills in competition.

Core strength exercises work the superficial and deep muscles of the lower back, lower back, and hip joints.[9] This strengthens the corresponding muscle groups in the core area. This can provide a favorable environment for the power transmission of the upper and lower limbs. It maintains balance by strengthening and activating the muscles. This enhances coordination, agility, and balance between the various muscle groups. Ensure that the athlete is better able to perform technical maneuvers while maintaining balance. Core strength and stability are critical elements of body mass in human activities.[10] After consulting several tennis coaches and fitness guides, this article chooses to lie on both ends, hang legs, lie on the back with both legs clamped to the ball and swing the legs, plank support, double-leg hip bridge, side-lying hip lift, a standing position left and right throwing a medicine ball, standing position eight movements such as the elastic rope pulling down. This article completed the core and stability exercises for the athletes in the experimental group. At the same time, this paper selects a side bridge, side throwing of a medicine ball, and 1-min sit-up as three indicators of core stability for athletes.[11] The results showed that after eight weeks of core strength training, the lateral bridge movement, the length of the side throwing medicine ball, the number of 1-min lying-down movements, and the 1-min lying-down movements in the experimental group were significantly improved (P<0.05). There was no significant difference between the control group who did not perform side bridge exercise, side throwing medicine ball, and 1-min sit-up exercise time (P>0.05). The core ability exercise program proposed in this paper can significantly improve tennis players' core ability and core stability.

The tennis player must have a robust technical level. Ensuring the stability and balance of the ball and the ball needs to be achieved by strengthening core training. Coaches build a logical human motion chain by exercising the athletes' muscles to stabilize, balance, and coordinate.[12] This can harmonize the body muscles. When tennis player serves, they can maintain the balance of the whole body and stabilize the overall movement.

The experiment found that after eight weeks of core training, the hitting rate of players in the experimental group increased significantly (P<0.05), while there was no significant change in the control group (P>0.05). A tennis player's serve rate can be significantly improved through core training. The quality of a tennis player's service should ensure the success rate of servinandso tries to speed up the serving rate. A high--quality serve can reduce the opponent's reaction speed and reduce the opponent's return level. This way, the athlete can take the lead in a game. Tennis players should pay attention to the coordination of the body when serving. It combines the movements of various body parts to form a "kinematic chain" based on special laws of motion.[13] The athlete's core strength plays a vital role throughout the serve. Half of the energy and momentum of the service don't come from the upper arm. Most originate from the muscles of the legs and buttocks. The athlete pushes the lower limbs to the ground to provide power to the body and convert it into part of the muscles. The athlete then converts it into high-efficiency, low-cost strength. This makes the legs form a complete technical system. The results showed that the athlete's serve rate significantly improved after eight weeks of core strength (P<0.05). Core strength exercises can significantly improve a tennis player's serve rate.

CONCLUSION

Tennis players improved their starting serve and success rates after eight weeks of regular strength and core strength training. Tennis players significantly improved their serve success rates when they performed core strength exercises, while regular physical training had little effect.

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

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