

IMPACTS OF CROSSFIT TRAINING ON THE TENNIS ATHLETE'S PERFORMANCE



ORIGINAL ARTICLE
ARTIGO ORIGINAL
ARTÍCULO ORIGINAL

IMPACTOS DO TREINAMENTO DE CROSSFIT SOBRE O DESEMPENHO DOS ATLETAS DE TÊNIS

IMPACTO DEL ENTRENAMIENTO DE CROSSFIT EN EL RENDIMIENTO DE ATLETAS DE TENIS

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ABSTRACT

Introduction: The competitive level of tennis has increased in recent years, challenging researchers to promote a higher level of endurance and performance of its practitioners. **Objective:** Analyze the impacts of CrossFit training on the performance of tennis athletes. **Methods:** This work conducted a four-week experiment with 50 professional tennis players, introducing a protocol based on CrossFit training to the experimental group. Levels of sports endurance and competition performance were statistically analyzed before and after the experiment. It was also analyzed whether CrossFit training could effectively improve tennis players' sports endurance and performance level. **Results:** After the intervention, the time required for the tennis players to take off and hit the ball 20 times in three steps after the recoil was reduced from 71.12 seconds before the experiment to 60.04 seconds in the experimental group. The forehand strike's linear and diagonal speeds increased by 11.00% and 6.57%, respectively. And the number of effective and accurate balls in the recoil increased by 5.87% and 5.58%. **Conclusion:** CrossFit training can improve tennis players' sporting endurance, playing a positive role in improving the players' level. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Physical Education and Training; Tennis; Physical Fitness.

RESUMO

Introdução: O nível competitivo do tênis tem se elevado nos últimos anos, desafiando os pesquisadores na promoção de um maior nível de resistência e desempenho dos seus praticantes. **Objetivo:** Analisar os impactos do treinamento de CrossFit sobre o desempenho dos atletas de tênis. **Métodos:** Este trabalho conduziu uma experiência de quatro semanas com 50 tenistas profissionais, introduzindo um protocolo baseado no treinamento de CrossFit ao grupo experimental. Níveis de resistência esportiva e o desempenho na competição foram analisados estatisticamente antes e depois do experimento, também foi analisado se o treinamento CrossFit poderia efetivamente melhorar a resistência esportiva e o nível de desempenho dos tenistas. **Resultados:** Após a intervenção, o tempo necessários para os tenistas decolarem e baterem na bola por 20 vezes em três etapas após o recuo foi reduzido de 71,12 segundos antes do experimento para 60,04 segundos, no grupo experimental. A velocidade linear e a velocidade diagonal da batida dianteira também aumentaram em 11,00% e 6,57%, respectivamente. Sendo que o número de bolas efetivas e de bolas precisas no recuo aumentaram em 5,87% e 5,58%. **Conclusão:** O treinamento de CrossFit pode melhorar a resistência esportiva dos tenistas, desempenhando um papel positivo na melhora do nível dos jogadores. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Educação Física e Treinamento; Tênis; Aptidão Física.

RESUMEN

Introducción: El nivel competitivo del tenis ha aumentado en los últimos años, desafiando a los investigadores en la promoción de un mayor nivel de resistencia y rendimiento de sus practicantes. **Objetivo:** Analizar los impactos del entrenamiento de Crossfit en el rendimiento de atletas de tenis. **Métodos:** Este trabajo realizó un experimento de cuatro semanas con 50 tenistas profesionales, introduciendo en el grupo experimental un protocolo basado en el entrenamiento CrossFit. Se analizaron estadísticamente los niveles de resistencia deportiva y rendimiento en competición antes y después del experimento, también se analizó si el entrenamiento de Crossfit podía mejorar eficazmente la resistencia deportiva y el nivel de rendimiento de los tenistas. **Resultados:** Después de la intervención, el tiempo requerido por los tenistas para despegar y golpear la pelota durante 20 veces en tres pasos después del retroceso se redujo de 71,12 segundos antes del experimento a 60,04 segundos en el grupo experimental. La velocidad lineal y la velocidad diagonal del golpe de derecha también aumentaron un 11,00% y un 6,57%, respectivamente. Siendo que el número de pelotas efectivas y de pelotas precisas en el retiro aumentaron en 5,87% y 5,58%. **Conclusión:** El entrenamiento de Crossfit puede mejorar la resistencia deportiva de los tenistas, desempeñando un papel positivo en la mejora del nivel de los jugadores. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptor: Educación y Entrenamiento Físico; Tenis; Aptitud Física.



INTRODUCTION

In recent years, with the rapid improvement of the living standard and economic level of urban residents, people have begun to pay attention to the improvement of quality of life and quality of life, and pay attention to strengthening people's physique. And tennis, an elegant sport, has gradually entered the lives of ordinary residents and the campus.¹ In order to strengthen technical training and respond to the attention of tennis players, tennis players have conducted in-depth research and analysis on their sports endurance, such as flexibility, agility, endurance, speed, strength and explosive power, etc. displayed in tennis training. When the basic skills of tennis players have a certain foundation, improving their tactical ability is also crucial. In order to effectively improve the flexibility of sports, we need to combine healthy spirit and strong physique with special skills, so that we can better complete the training objectives of tennis players.² Modern competitive sports are developing very rapidly. Tennis is a sport with many tactical changes in various sports. Therefore, the endurance and training requirements for tennis players are very strict. Endurance training in tennis is a basic link. Tennis has the characteristics of fierce confrontation and heavy sports load. Therefore, the key element to win the game is to master certain tactics.³ Therefore, in tennis training, it is not only necessary to strengthen the legs of the trained athletes, but also to improve the endurance of the athletes, so that they can have enhanced responsiveness, and at the same time, it is necessary to carry out special training on the athletes' steps. First, endurance training is an important basis for tennis players to participate in tennis.⁴ It can be seen from the results of various sports events that only relying on the use of technical and tactical advantages in the competition, the competition won has been incomparable with the past, and a team or athlete with a higher level may not necessarily win the competition. Because the endurance of athletes plays a key role in the fierce competition. If the level of several athletes is comparable, this feature will be fully reflected.⁵ Second, if a tennis player's level cannot be improved only through normal training, then good endurance training may improve the tennis player's level. At the initial stage of China's tennis training, endurance training was not paid attention to, so the level of Chinese tennis players was always not improved. However, in the later stage, foreign teachers were introduced, and China gradually paid attention to endurance training, which improved the physical level of Chinese tennis players.⁶ Therefore, in the later fierce competition, he paid attention to endurance. During the rest period in the middle of the game, the athletes' endurance can be restored and supplemented, which has promoted China's comprehensive strength in the field of tennis. If any athlete has superb skills and does not have good endurance as the basis, it will only be a shot in the dark. Therefore, scientific reserve of endurance is an important basis for enhancing athletes' skills and abilities.⁷ Cross Fit training is more conducive to comprehensive physical exercise within the effective time, aiming at obtaining specific sports ability, and strengthening training through various forms. It uses aerobic and anaerobic interposition training to significantly improve aerobic endurance, anaerobic endurance and explosive power. In terms of mental health, a group of people can train together, either indoors or outdoors.⁸ Group training is the main way to encourage and encourage each other to create a good exercise atmosphere, which can play a role in group therapy. Therefore, this paper tests the impact of cross fit training on the improvement of tennis players' sports endurance.

METHOD

Research object

This paper selects 50 professional male tennis players from the tennis training center. 50 male tennis players were divided into two groups:

experimental group and control group. The study and all the participants were reviewed and approved by Ethics Committee of Nanjing University(NO.NJUNST21-Z106). The experimental group received Cross Fit training for 4 weeks. For the control group, only normal tennis training was conducted. The specific conditions of the experimental objects are shown in Table 1. The whole process of the 4-week training was recorded with professional equipment for the purpose of comparative analysis of the subsequent experimental data.

Research methods

This paper combines the sports characteristics of Cross Fit training. On the basis of basic tennis training for the experimental group, and under the guidance of professionals, an additional five times a week of Cross Fit training will be conducted. The first two weeks will be the initial intensity of Cross Fit training. These include the open and close jumps, sit-ups, squats, and bobby jumps. In the next two weeks, we will carry out medium-high intensity training. It includes turn-back running, flat support, brisk jump, etc. The whole training process is guided by professional Cross Fit trainers to ensure the accuracy of training actions. Through the gradual cross fit training stage, tennis players can gradually adapt to this training mode. By continuously improving the intensity of training, a buffer period is provided for the change of endurance level of athletes. Test the impact of Cross Fit training on tennis players' endurance and performance level through monitoring equipment. The control group was only given normal tennis training for 4 weeks, and the tennis training instructor recorded the experimental data. At the same time, different levels of tennis competitions were conducted before and after the experiment to test the changes of tennis players' performance level.

Data processing

Test the basic physical information of tennis players such as physical fitness and exercise endurance of the experimental group and the control group through the sports information monitoring equipment, and analyze the impact of Cross Fit training on the improvement of performance level through the record of competition results. The specific data is summarized and analyzed by Excel.

RESULTS

Influence of Cross Fit Training on Tennis Players' Sports Endurance

Table 2 shows the changes of tennis players' sports endurance before and after the experiment in the control group. Whether in terms of speed endurance or strength endurance, conventional tennis training can not significantly improve the sports endurance of tennis players.

Table 3 shows the changes of sports endurance of tennis players after cross fit training. After the cross fit intervention training in speed endurance and strength endurance, the endurance of tennis players has been significantly improved. Among them, the time of taking off and hitting the ball 20 times with 3 steps backward is the most obvious. It shows that CrossFit training can effectively improve the sports endurance level of tennis players. Then improve the time of hitting the ball, and you can be more agile to serve and hit the ball.

Table 1. Basic information of the research object.

Grouping	Experience group	Control group
Height (cm)	183.660 ±5.308	178.399 ±4.005
Body weight (kg)	74.336 ±8.565	76.085 ±8.107
Age (y)	19.955 ±1.488	20.958 ±0.944
Years of training (y)	7.725 ±1.071	9.961 ±2.279

The influence of Cross Fit training on tennis players' performance level

Table 4 shows the changes of tennis players' performance level before and after the experiment. The result level of tennis players in the control group did not change significantly. The change rate of both forehand and backhand strokes is small, and conventional training can not significantly improve the performance level of tennis players.

Table 5 shows the change of the performance level of tennis players in the experimental group after the Cross Fit training. Cross Fit training can effectively improve the straight-line speed and diagonal speed of tennis players' forehand and backhand strokes, increase the score of effective ball and precision ball, and then improve the score of precision ball. After four weeks of Cross Fit training, it has a significant impact on forehand and backhand strokes, and can significantly improve the performance level of tennis players.

DISCUSSION

Tennis is an explosive sport. The sport is not irregular. Every time you play a ball and score a point, you have to change direction many

Table 2. The influence of regular tennis training on tennis players' sports endurance.

Index		Before experiment	After experiment	P	Rate of change
Speed endurance	Move back and forth 15 times (seconds)	66.346 ±5.212	60.624 ±3.356	0.0505	-8.6249%
	Move both sides 40 times (seconds)	65.258 ±5.185	62.529 ±3.476	0.0548	-4.1820%
	Step back and take off to hit the ball 20 times (seconds)	73.480 ±5.876	66.437 ±3.421	0.0818	-9.5838%
	Take off at home and hit the ball 40 times (seconds)	76.732 ±6.019	71.752 ±3.959	0.0810	-6.4909%
Strength and endurance	Squats 1RM (times)	141.116 ±16.480	140.998 ±15.470	0.0648	-0.0841%
	Run-up one-foot vertical jump touch height (m)	3.149 ±0.089	3.163 ±0.081	0.0824	0.4428%
	Throw solid ball forward (m)	11.902 ±1.975	12.099 ±1.949	0.0449	1.6518%
	30 meter sprint (seconds)	3.741 ±0.110	3.710 ±0.132	0.0687	-0.8152%

Table 3. Influence of Cross Fit Training on Tennis Players' Sports Endurance.

Index		Before experiment	After experiment	P	Rate of change
Speed endurance	Move back and forth 15 times (seconds)	63.583 ±5.001	57.386 ±2.889	0.0299	-9.7466%
	Move both sides 40 times (seconds)	64.706 ±4.893	58.230 ±2.993	0.0435	-10.0092%
	Step back and take off to hit the ball 20 times (seconds)	71.127 ±5.442	60.042 ±3.090	0.0389	-15.5843%
	Take off at home and hit the ball 40 times (seconds)	73.802 ±5.684	64.737 ±3.193	0.0246	-12.2836%
Strength and endurance	Squats 1RM (times)	138.624 ±24.669	148.223 ±16.880	0.0284	6.9246%
	Run-up one-foot vertical jump touch height (m)	3.250 ±0.099	3.236 ±0.081	0.0136	-0.4450%
	Throw solid ball forward (m)	12.296 ±1.336	12.353 ±1.362	0.0157	0.4582%
	30 meter sprint (seconds)	3.709 ±0.151	3.625 ±0.139	0.0175	-2.2690%

Table 4. The influence of regular tennis training on tennis players' performance level.

Index		Before experiment	After experiment	P	Rate of change
Forehand stroke	Linear speed (km/h)	90.099 ±8.365	91.774 ±6.768	0.0376	1.8593%
	Slant speed (km/h)	87.810 ±6.475	89.496 ±8.325	0.0624	1.9200%
	Effective ball (PCS)	14.419 ±1.346	14.590 ±1.311	0.0550	1.1906%
	Precision ball (PCS)	9.746 ±1.512	10.125 ±1.591	0.0804	3.8892%
	Precision ball score (points)	19.587 ±4.265	20.197 ±3.645	0.0311	3.1136%
Backhand shot	Linear speed (km/h)	87.572 ±6.871	91.086 ±7.243	0.0338	4.0125%
	Slant speed (km/h)	86.707 ±5.042	86.261 ±4.908	0.0692	-0.5143%
	Effective ball (PCS)	13.881 ±1.425	14.123 ±0.874	0.0803	1.7457%
	Precision ball (PCS)	10.149 ±1.683	10.256 ±1.502	0.0392	1.0595%
	Precision ball score (points)	17.758 ±2.661	18.022 ±2.551	0.0840	1.4883%

Table 5. The Effect of Cross Fit Training on Tennis Players' Performance.

Index		Before experiment	After experiment	P	Rate of change
Forehand stroke	Linear speed (km/h)	88.845 ±9.311	98.619 ±8.559	0.0189	11.0011%
	Slant speed (km/h)	90.068 ±9.767	95.987 ±6.450	0.0439	6.5717%
	Effective ball (PCS)	14.219 ±1.603	15.784 ±1.758	0.0026	11.0022%
	Precision ball (PCS)	10.078 ±1.572	11.613 ±1.910	0.0391	15.2287%
	Precision ball score (points)	18.500 ±3.348	23.653 ±4.151	0.0112	27.8571%
Backhand shot	Linear speed (km/h)	87.393 ±8.792	97.583 ±6.610	0.0214	11.6597%
	Slant speed (km/h)	85.239 ±8.494	91.198 ±7.881	0.0388	6.9915%
	Effective ball (PCS)	14.279 ±1.524	15.118 ±1.545	0.0393	5.8708%
	Precision ball (PCS)	10.481 ±1.774	11.066 ±1.432	0.0287	5.5805%
	Precision ball score (points)	17.554 ±4.315	21.274 ±3.635	0.0254	21.1928%

times. There are about hundreds of explosive sports in each game, so the endurance requirements of every tennis player are very high. Each explosive movement is an important part of the movement chain, such as the arm, waist, abdomen, back and every important joint, under the specific load conditions, which reflects the importance of speed, strength and endurance of this movement. Like badminton, although tennis is an explosive sport, without good endurance as the basis, the improvement of tennis sports ability will be limited, so the important role of endurance cannot be ignored.

Cross Fit training integrates many training actions such as fitness training, gymnastics, running, etc. Cross Fit training is one of the classic sports. Many of its movements are very classic. Learners need to know and learn the correct posture, and also need to learn the very basic jumping movements. These movements are mainly to cultivate the balance, coordination and core strength of the athletes' body, and improve the control ability of the body and the endurance of the muscles. Therefore, tennis players should be trained to overcome their self-weight, which can improve their ability to control their body and make them easier to participate in it, and lay a foundation for training to improve the intensity. In the training of strength type, it is mainly to carry out small weight movement training to stimulate the movement of body muscles, make your body more coordinated, and carry out complex movement training of the whole body muscles, so as to better control the body, so that you can freely control your muscles during the training process. Prepare for the next stage of lifting your training weight. In the next stage, we will improve the cardiorespiratory ability of athletes through simple aerobic exercises such as running and rope skipping, so that they can have stronger cardiorespiratory function to improve metabolism and adapt to this training mode.

CONCLUSION

Tennis has a very high requirement for the endurance of athletes. It is an explosive sport of physical fitness. Therefore, in order to effectively improve the performance of tennis players, we can improve their performance by improving their endurance. Cross Fit training is an important way to improve physical endurance. Therefore, this paper aims to explore whether the cross-fit training can effectively affect the endurance of tennis players and further improve the performance of tennis players by conducting four-week cross-fit training for tennis players. The experimental results show that. Before and after the experiment, the forehand speed and backhand speed of tennis players have

been significantly improved, and the accuracy of hitting has also been significantly improved. At the same time, the physical quality of the players has been significantly improved, which helps the tennis players to achieve better results in the tennis match. At the same time, you should not be eager to do cross fit training. We should take progressive training and gradually increase the intensity of exercise. Adopt scientific training methods. Only in this way can we avoid the damage caused by excessive training on the physical quality of athletes.

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

AUTHORS' CONTRIBUTIONS: The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Zhu Jing: writing and execution.

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