

IMPROVEMENT OF STUDENTS' TENNIS SKILLS BASED ON HITTING STRENGTH TRAINING



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MELHORIA DAS HABILIDADES DE TÊNIS DOS ALUNOS COM BASE NO TREINAMENTO DE FORÇA DE BATER

MEJORA DE LA TÉCNICA DE TENIS DE LOS ESTUDIANTES BASADA EN EL ENTRENAMIENTO DE LA FUERZA DE PERCUSIÓN

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ABSTRACT

Introduction: The traditional method of synchronous training between the waist and abdomen to improve the strengthening of tennis strokes has been the main form of teaching in Chinese universities, but this method has not yet achieved its most expressive results in these years of teaching. **Objective:** Analyze the differences between traditional strength training for tennis hitting, and provide techniques for its improvement. **Methods:** A comparative analysis of improved hitting strength training and traditional hitting strength training was conducted, the relevant indicators of students before and after the experiment were collected, and a data analysis program was used for comparison and methodological analysis. **Results:** The students' speed and performance were significantly improved. The mean speed of the experimental group increased from 152.66 km/h to 168 km/h; the mean speed of the control group increased from 153.12 km/h to 159.23 km/h; the score of the experimental group relative to the others increased from 42.66 to 72.96. **Conclusion:** Both methods of strength training can improve the skills of students practicing tennis. The main difference was found in the speed of the improvement frequency. Therefore, we noticed corresponding differences between the groups and the students' abilities during the experiment, evidencing expressive short-term results. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Training, Strength; Tennis; Physical Fitness.

RESUMO

Introdução: O método tradicional de treinamento sincrônico entre a cintura e o abdômen para melhorar o fortalecimento dos golpes no tênis tem sido a principal forma de ensino nas universidades chinesas, porém este método ainda não tem alcançado seus resultados mais expressivos nesses anos de ensino. **Objetivo:** Analisar as diferenças do treinamento de força tradicional para os golpes no tênis, fornecendo técnicas para seu aprimoramento. **Métodos:** Foi conduzida uma análise comparativa do treinamento de fortalecimento com golpes aprimorado e do treinamento de fortalecimento tradicional, foram coletados os indicadores pertinentes dos estudantes antes e depois do experimento e utilizou-se um programa de análise de dados para comparação e análise metodológica. **Resultados:** A velocidade e o desempenho dos alunos foram significativamente aprimorados. A velocidade média do grupo experimental aumentou de 152,66 km/h para 168 km/h; a velocidade média do grupo de controle aumentou de 153,12 km/h para 159,23 km/h; a pontuação do grupo experimental relativa aos demais subiu de 42,66 para 72,96. **Conclusão:** Ambos métodos de treinamento de fortalecimento podem melhorar as habilidades dos estudantes praticantes de tênis. A diferença principal foi encontrada na velocidade da frequência de aprimoramento. Portanto, notou-se diferenças correspondentes entre os grupos e as habilidades dos alunos durante o experimento, evidenciando resultados expressivos em curto prazo. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Treinamento de Força; Tênis; Habilidade Física.

RESUMEN

Introducción: El método tradicional de entrenamiento sincrónico entre la cintura y el abdomen para mejorar el fortalecimiento en los golpes de tenis ha sido la principal forma de enseñanza en las universidades chinas, sin embargo, este método aún no ha alcanzado sus resultados más expresivos en estos años de enseñanza. **Objetivo:** Analizar las diferencias del entrenamiento de fuerza tradicional para el golpeo en tenis, aportando técnicas para su mejora. **Métodos:** Se realizó un análisis comparativo del entrenamiento mejorado de la fuerza de golpeo y el entrenamiento tradicional de la fuerza de golpeo, se recogieron los indicadores relevantes de los alumnos antes y después del experimento y se utilizó un programa de análisis de datos para la comparación y el análisis metodológico. **Resultados:** La velocidad y el rendimiento de los alumnos mejoraron considerablemente. La velocidad media del grupo experimental aumentó de 152,66 km/h a 168 km/h; la velocidad media del grupo de control aumentó de 153,12 km/h a 159,23 km/h; la puntuación del grupo experimental en relación con los demás aumentó de 42,66 a 72,96. **Conclusión:** Ambos métodos de entrenamiento de la fuerza pueden mejorar las habilidades de los alumnos que practican tenis. La principal diferencia se encontró en la velocidad de la frecuencia de mejora. Por lo tanto, se observaron las correspondientes diferencias entre los grupos y las capacidades de los alumnos durante el experimento, evidenciando resultados expresivos a corto plazo. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptor: Entrenamiento de Fuerza; Tenis; Aptitud Física.



INTRODUCTION

With the constant acceleration of economic development, people's living standards have also been improved, and more and more people begin to pursue things other than material things. Tennis has been loved by more and more people in the long-term development.¹ With the expansion of its popularity, tennis has gradually become the most popular ball game besides football. At present, China's economic development has also achieved good results, domestic hardware facilities have also been improved, and tennis has gradually become a popular leisure sport.² China's tennis has also made many breakthroughs in its development, which has aroused the attention of the World Professional Tennis Forum on the development of China's tennis technology, and has also increased the attention of the domestic people to tennis.³ Under this background, tennis teaching activities in colleges and universities in China have also been developed. Many colleges and universities have opened tennis courses, and there are more and more different types of college students' tennis competitions.⁴ At present, the coverage of tennis in China is small, and the professional level of tennis training is also low, so there is still a big gap between China's domestic tennis teaching level and the world's advanced level.

The technical advantages of tennis players can be reflected in the process of actual training and competition. Good hitting skills can ensure that tennis players can fully control the rhythm of tennis matches on the court.⁵ According to the characteristics of tennis and the characteristics of human body structure, we can know that under the premise of ensuring the law of tennis players' physical development, we can use the principle of biomechanics to improve the hitting power of the body.⁶ In this process, we can use a more scientific training method to correct the hitting posture of sports mobilization, and use the forehand and backhand hitting methods to improve the basic ability of the baseline of tennis players.⁷ In a word, improving tennis players' hitting power is the key to improving their tennis technical level. The use of hitting training can train tennis players' ability to hit the bottom line with their forehand and backhand, which is also one of the important means to improve tennis players' hitting power.⁸ It is of practical significance to study the specific effect of hitting power training on college students' tennis technical improvement.

METHOD

Research object

Take 20 college students from A College as the research objects of this experiment, and ensure that all students are beginners of tennis lessons. The study and all the participants were reviewed and approved by Ethics Committee of Sichuan Top IT Vocational Institute (NO.21SCTIV-069P). In the process of selecting experimental objects, it is necessary to ensure that the research objects meet three conditions. First, I was a beginner of tennis because I had no or less contact with tennis before; Second, the body is free from any defect or disease; Third, the age should be between 19 and 22. The specific conditions of the objects of this study are shown in Table 1. The subjects were divided into experimental group and control group, with 10 persons in each group.

Experimental methods

This experiment consists of two rounds. The first round is the pre experiment, which aims to let the subjects know the whole process and contents of the experiment, and let them know the precautions of the experiment, so as to ensure that the experiment can be carried out smoothly. The results of this round of experimental tests are ignored. The experiment will be conducted from March 1 to March 5, 2022. The second round is the formal experiment, which lasts from March 5 to June

Table 1. Basic information of the research object.

Experience group	A	B	C	D	E	F	G	H	I	J
Age	21.90	20.84	19.69	20.99	21.62	20.69	20.18	19.91	20.70	20.48
Height (cm)	175.19	178.62	173.97	174.20	177.51	175.01	173.85	178.98	175.52	175.20
Weight (kg)	73.33	73.54	72.52	72.29	73.99	70.82	73.72	73.60	70.53	71.64
Control group	A	B	C	D	E	F	G	H	I	J
Age	20.21	20.16	19.60	20.72	20.42	21.16	20.54	21.30	20.94	20.30
Height (cm)	179.90	179.36	176.27	176.74	178.22	177.27	175.59	175.21	179.51	177.05
Weight (kg)	71.89	73.14	70.02	69.24	69.69	69.88	71.17	73.03	73.58	70.39

5, 2022. In the process of the experiment, the experimental subjects were trained for three months. In the early and late stages of the experiment, the corresponding measures were taken to intervene the experimental subjects and collect their data during the experiment. When grouping the experimental objects, the operation shall be carried out according to the principle of paired experiment. The matching conditions of this experiment will not affect the experimental results during the experiment, and the height, weight and age of the subjects are not the main factors of the experiment. During the experiment, it was confirmed that the physical quality and sports skill level of the subjects were the main factors of the experiment. In this experiment, students with similar height, weight and age were paired. After successful pairing, one of them was randomly selected to the experimental group and the other to the control group. The number of students in each group was 10.

Experimental control

According to the needs of this experiment, it is necessary to ensure that all variables other than training methods will not affect the experimental results. These variables include the physical condition, sports ability, mental state of the students participating in the experiment and the weather conditions at the time of the experiment. First, we need to pay attention to the physical condition of the subjects. Before the experiment, collect the height, weight, age and other basic information of the subjects, and then use interviews to understand whether the subjects themselves have chronic diseases, hidden diseases or other injuries. In a word, before the formal experiment, the physical condition of the experimental object should be checked in an all-round way to avoid problems in the physical condition of the experimental object during the experiment, thus affecting the final results of the experiment. Second, we should pay attention to the sports ability of the experimental subjects. Before the experiment, we should use professional hitting strength testing methods to investigate the sports ability of the experimental subjects, so as to ensure that they have the sports ability to participate in the tennis experiment. Third, the mental status of the experimental subjects can not be ignored. Mental status is an invisible variable, and it is not easy to find abnormal mental status during the experiment. Therefore, it is necessary to observe the experimental subjects' mental status at all times before and during the experiment. Fourth, we should always pay attention to the weather changes on the day of the experiment. In the process of training, if the weather is not good, such as high temperature weather, the training effect of athletes will be greatly reduced. If it is rainy season, outdoor tennis training courses will have to stop. If the training is interrupted due to rainy weather, you can choose to train tennis skills on the indoor training ground facing the wall. Fifth, the choice of training venues. The students in the experimental group and the control group all took the campus tennis court as the main training venue, which can avoid the change of training effect caused by different training venues.

RESULTS

Impact of hitting strength training on college students' basic physical ability

The data in Table 2 shows the impact of ordinary strength training on college students' physical fitness. Through training intervention, the number of sit ups that college students can do in one minute has increased from 52.02 ± 10.671 before training intervention to 56.13 ± 10.453 . The result of statistical analysis is $P < 0.05$, which proves that there is a significant difference between the results before and after training. The number of push ups in one minute has also been increased, and the statistical analysis result is $P > 0.05$, which proves that there is no significant difference between the training and the results after training. The height of college students jumping in situ has also changed compared with the height before training, but the results of experimental statistics do not have obvious differences. The strength of the left hand grip increased a lot compared with that before training, and the results of statistical analysis showed that $P < 0.01$, indicating that there was a significant difference between the results before and after training. The strength of the right hand grip was also increased compared with that before training, but the statistical score showed that $P > 0.05$, so there was no significant difference. The time of half court round-trip was much shorter than that before training, and the results of statistical analysis showed $P < 0.05$, indicating that there was significant difference between the results before and after training.

Table 3 shows the impact of hitting strength training on college students' physical fitness. Through the training intervention, the number of sit ups that college students can do in one minute has increased from 52.27 ± 16.718 before the training intervention to 57.67 ± 15.23 . The result of statistical analysis is $P < 0.01$, which proves that there is a significant difference between the results before and after the training. The number of push ups in one minute has also been increased, and the statistical analysis result is $P < 0.05$, which proves that there is a significant difference between the training and the results after training. The height of college students jumping in situ has also changed compared with the height before training, but the results of experimental statistics do not have obvious differences. The strength of the left hand grip increased a lot compared with that before training, and the results of statistical analysis showed that $P < 0.01$, indicating that there was a significant difference between the results before and after training. The strength of the right hand grip also increased compared with that before training, but the

Table 2. The influence of general strength training on college students' basic physical ability.

Index	Before training	After training	P
One minute sit ups	52.02 ± 10.671	56.13 ± 10.453	$P < 0.05$
One minute push ups	46.42 ± 8.721	47.99 ± 6.843	$P > 0.05$
Vertical jump height in situ (m)	2.56 ± 0.162	2.62 ± 0.187	$P > 0.05$
Grip grip (left) (kg)	29.97 ± 6.233	30.86 ± 5.428	$P < 0.01$
Grip (right) (kg)	41.46 ± 3.646	41.66 ± 3.620	$P > 0.05$
Half court round trip (s)	16.08 ± 0.933	16.19 ± 0.998	$P < 0.05$

Table 3. The influence of hitting strength training on college students' basic physical ability.

Index	Before training	After training	P
One minute sit ups	52.27 ± 16.718	57.67 ± 15.234	$P < 0.01$
One minute push ups	49.86 ± 10.408	56.09 ± 8.265	$P < 0.05$
Vertical jump height in situ (m)	2.62 ± 0.203	2.71 ± 0.167	$P < 0.01$
Grip grip (left) (kg)	31.50 ± 7.053	33.07 ± 6.336	$P < 0.01$
Grip (right) (kg)	42.22 ± 5.789	44.77 ± 5.987	$P < 0.05$
Half court round trip (s)	15.72 ± 0.421	15.62 ± 0.385	$P < 0.05$

statistical score showed $P < 0.05$, so there was no significant difference. The time of half court round-trip was much shorter than that before training, and the results of statistical analysis showed $P < 0.05$, indicating that there was significant difference between the results before and after training. According to the data in Table 2 and Table 3, hitting strength training can better improve the physical fitness of college students, and the effect is better than traditional strength training.

Impact of hitting strength training on college students' tennis service speed

Figure 1 shows the impact of hitting strength training on college students' service speed. It can be seen from the data in the figure that the average speed of the students in the experimental group before the start of the experiment is 152.66km/h. After the training intervention, the service speed of the students reached 168km/h. The average service speed of the students in the control group before the experiment was 153.12km/h. After the training intervention, the average service speed of the students reached 159.23km/h, indicating that the hitting strength training method can improve the tennis service speed of college students more than the ordinary training method.

Impact of hitting strength training on college students' performance

Figure 2 shows the impact of hitting strength training on college students' tennis performance. It can be seen from Figure 2 that the tennis score of the students in the experimental group increased from 42.66 points to 72.96 points after the experiment, and that of the students in the control group increased from 43.12 points to 64.21 points after the training.

DISCUSSION

In the process of tennis, players need to coordinate all parts of the body, and give full play to the coordination of various parts, such

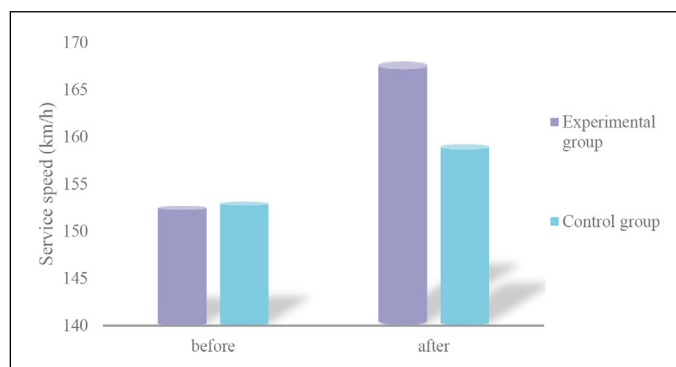


Figure 1. Changes of tennis service speed between two groups of college students (km/h).

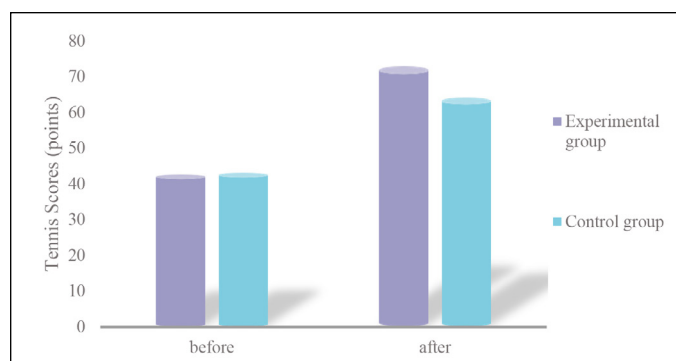


Figure 2. Changes in tennis scores of two groups of college students before and after training (points).

as legs, waist, shoulders and arms when they hit the ball. In order to ensure that athletes can maintain good condition in the normal technical and tactical training and high intensity competitions, it is necessary to require athletes to have good physical fitness, which is also the basis for athletes to maintain good condition in the process of training and competition. At the same time, it can also prevent tennis players from body injury in the process of tennis sports, so as to extend the sports life of athletes. Good physical fitness is also an important basis for amateur tennis enthusiasts to play tennis tactics and experience the happiness of tennis. Various researches have shown that the way of hitting strength training can play a key role in improving athletes' fast strength, hitting speed and endurance, and the results of experimental research also prove that the way of hitting strength training has certain advantages. Some scholars believe that hitting sports use the largest muscle group in the human body, which plays a key role in the stability and balance of the human body. Some scholars also believe that muscle group is the main source of energy

generated by the human body, which can play a decisive role in the movement of the human body.

CONCLUSION

According to the results of the experiment, after three months of training, the physical fitness of the students in the experimental group and the control group has been significantly improved, which is enough to show that strength training is helpful to the physical fitness of students. However, the physical quality of the students in the experimental group is much better than that of the students in the control group, especially their physical ability. Moreover, the tennis skill level of the students in the experimental group has also been improved qualitatively. Therefore, it is of great practical significance to improve students' physical quality and tennis technical level by means of hitting strength training.

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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. Shen Yang: writing and execution.

REFERENCES

1. Ulbricht A, Fernandez-Fernandez J, Mendez-Villanueva A, Ferrauti A. Impact of fitness characteristics on tennis performance in elite junior tennis players. *J Strength Cond Res.* 2016;30(4):989-98.
2. Mülling K, Kober J, Kroemer O, Peters J. Learning to select and generalize striking movements in robot table tennis. *Int J Rob Res.* 2013;32(3):263-79.
3. Kramer T, Huijgen BCH, Elferink-Gemser MT, Visscher C. Prediction of tennis performance in junior elite tennis players. *J Sports Sci Med.* 2017;16(1):14-21.
4. Mowling CM, Fittipaldi-Wert J, Favoretto L. Soundball: Teaching Tennis to Students with Visual Impairments. *Strategies.* 2017;30(4):3-10.
5. Negara JDK, Mudjianto S, Budikayanti A, Nugraha A. The effect of gamma wave optimization and attention on hitting skills in softball. *Int J Hum Mov Sport Sci.* 2021;9(1):103-9.
6. Padli P, Mardela R, Yendrizal Y. Improving students' cricket hitting skills using digital test. *CJES.* 2022;17(5):1495-507.
7. Haselhuhn S, Burton D. Creating consistent hitters: A growth hitting system to promote a mastery climate in collegiate baseball. *J Sport Psychol Action.* 2013;4(1):56-70.
8. Baiget E, Iglesias X, Rodríguez FA. Maximal aerobic frequency of ball hitting: A new training load parameter in tennis. *J Strength Cond Res.* 2017;31(1):106-14.