

COORDINATED TRAINING AND PHYSIOLOGICAL INDICES IN YOUNG TENNIS PLAYERS



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TREINAMENTO COORDENADO E ÍNDICES FISIOLÓGICOS EM JOVENS TENISTAS

ENTRENAMIENTO COORDINADO E ÍNDICES FISIOLÓGICOS EN JÓVENES TENISTAS

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ABSTRACT

Introduction: Motor coordination and physiological functions in young players are crucial for maximum performance in training. To release the potential of athletes for their competitive careers, it is necessary to open the way for their careers in the first years of performance. **Objective:** Analyze the effect of training coordination of young tennis players on prescribed physical conditioning and its physiological indicators. **Methods:** 12 young tennis players were randomly selected and divided into experimental and control groups. Technical, speed, endurance, and physiological exercise indicators were recorded. **Results:** After six weeks of the experiment, the experimental group had a particularly significant improvement in 30-meter speed quality, about 0.5 seconds; forehand and backhand swing scores before the experiment were 75.01, and after the experiment was 89.79, an increase of 14.78 points, revealing significant improvement. The experimental group also excelled in terms of physiological indicators of exercise. **Conclusion:** Coordination training can effectively improve the physical conditioning and exercise physiological indicators of young tennis players, with the effect of coordination training being most evident without altering the external characteristics. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Tennis; Psychomotor Performance; Exercise Movement Techniques.

RESUMO

Introdução: A coordenação motora e as funções fisiológicas dos jovens jogadores são cruciais para o máximo desempenho no treinamento. Visando liberar o potencial dos atletas para sua carreira competitiva, é necessário abrir o caminho de sua carreira nos primeiros anos de atuação. **Objetivo:** Analisar o efeito da coordenação de treinamento de jovens tenistas sobre o condicionamento físico prescrito e seus indicadores fisiológicos. **Métodos:** 12 jovens tenistas foram selecionados aleatoriamente e divididos em grupo experimental e grupo de controle. Foram registrados os indicadores técnicos, de velocidade, resistência e exercícios fisiológicos. **Resultados:** Após 6 semanas de experimento, o grupo experimental teve uma melhora particularmente significativa na qualidade de velocidade de 30 metros, cerca de 0,5 segundos; a pontuação de forehand e backhand swing antes do experimento foi de 75,01, e após o experimento foi de 89,79, um aumento de 14,78 pontos, revelando melhora significativa. O grupo experimental também se destacou em termos de indicadores fisiológicos de exercício. **Conclusão:** O treinamento de coordenação pode melhorar efetivamente o condicionamento físico e os indicadores fisiológicos do exercício de jovens tenistas, sendo o efeito do treinamento de coordenação mais evidenciado sem alteração das características exteriores. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Tênis; Desempenho Psicomotor; Técnicas de Exercício e de Movimento.

RESUMEN

Introducción: La coordinación motora y las funciones fisiológicas de los jugadores jóvenes son cruciales para obtener el máximo rendimiento en los entrenamientos. Con el objetivo de liberar el potencial de los atletas para su carrera competitiva, es necesario abrir el camino para su carrera en los primeros años de rendimiento. **Objetivo:** Analizar el efecto del entrenamiento de la coordinación de los jóvenes tenistas sobre el acondicionamiento físico prescrito y sus indicadores fisiológicos. **Métodos:** Se seleccionaron al azar 12 jóvenes tenistas y se dividieron en grupo experimental y grupo de control. Se registraron los indicadores técnicos, de velocidad, de resistencia y fisiológicos del ejercicio. **Resultados:** Después de 6 semanas de experimento, el grupo experimental tuvo una mejora especialmente significativa en la calidad de la velocidad de 30 metros, alrededor de 0,5 segundos; las puntuaciones de forehand e backhand swing antes del experimento fueron de 75,01, y después del experimento fueron de 89,79, un aumento de 14,78 puntos, lo que revela una mejora significativa. El grupo experimental también se destacó en cuanto a los indicadores fisiológicos del ejercicio. **Conclusión:** El entrenamiento de la coordinación puede mejorar eficazmente la condición física y los indicadores fisiológicos del ejercicio de los jóvenes tenistas, siendo más evidente el efecto del entrenamiento de la coordinación sin alteración de las características externas. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptores: Tenis; Desempeño Psicomotor; Técnicas de Ejercicio con Movimientos.



INTRODUCTION

At present, the Chinese tennis team is still exploring, and the Chinese tennis team needs to work harder to find the right direction of breakthrough. Therefore, this paper chooses to study the future of China - teenagers. Teenagers' plasticity is the strongest, but their physical fitness is their weakness. Therefore, this paper studies it based on the coordination in physical fitness training.¹ The reason for exercising their physical fitness is: at present, there are more and more professional tennis players, and the lower limit is higher and higher. If the most basic body cannot keep up with the offline of professional tennis players, there will be almost no win in the tennis competition of the same level. Tennis is one of the many competitive events that have strict requirements on various physical fitness and physical functions. Due to the reasons of serving and high-pressure ball, the height is too short, which is limited to a certain extent. Athletes must run in a wide range, and even rush forward to save the tennis ball with low bounce. There are also some restrictions on being too high. From these aspects, we can see that coordination training, an important training of tennis players, is improved through the day after tomorrow. Therefore, based on this point, this paper studies the children in adolescence. Adolescence is the stage of laying the foundation, adolescence is an important stage of physical quality development, and coaches should make use of this important period. So as to release the potential of athletes and pave the way for their competitive career.²

In this study, the elements of tennis can be summarized as skill net confrontation. The evaluation points of its physiological and biochemical functions are mainly muscle fiber type, proprioception, vision, hearing, posture, cardiopulmonary function, aerobic metabolism, energy supply capacity, ATP-CP, etc. muscle strength is usually used under isometric, isotonic and isokinetic conditions, such as heart rate, blood pressure, ECG and vital signs, To evaluate the ability of athletes' skeletal muscle system, respiratory system, internal circulation, cardiovascular system, vital capacity and other indicators.³

METHOD

The study was conducted among 12 young tennis players selected from school tennis teams. Teenagers aged 10-13 were randomly divided into two groups, the experimental group and the control group. The study and all the participants were reviewed and approved by Ethics Committee of Sanming University (NO. 2017SANUZ26). The experimental group received coordination training, while the control group did not. The criteria are as follows: (1) no serious physical diseases and normal intellectual development; (2) Normal vision, uncorrected or no color blindness after correction; (3) One year training period. The subjects' age, height and weight were roughly similar. After analysis, $P > 0.05$ shows that there is no significant difference in the conditions of the subjects (Table 1), which can ensure that the experimental results are objective, reliable and accurate. When the experimental results are affected by coordinated intervention, they can be effectively verified.

The influence of coordination on technology is evaluated by the coach. Three coaches invited to supervise (coaches do not know which is the experimental group and the control group). At the beginning of the technical evaluation, the two groups of students carried out forehand and

Table 1. Comparison of basic information of subjects in the experimental group and the control group.

Basic information	Test group	Control group	P
Age	12.22±0.31	12.32±0.38	0.692
Height	139.83±1.09	140.4±0.99	0.891
Weight	30.31±1.09	31.5±1.53	0.759

backhand swing practice at the same time, and the three coaches gave full marks to the players' forehand and backhand technical movements. The full score of single action is 10 points, of which 6 points (inclusive) and above are qualified, 7 points (inclusive) and above are medium, 8 points (inclusive) and above are good, and 6 points (inclusive) and above are excellent.⁴

RESULTS

Effect of coordination training on endurance of young tennis players

Endurance quality refers to the ability of the body to maintain a specific intensity load or action quality within a certain period of time. Tennis players must have high endurance quality, because tennis belongs to the classified event group of net competition, and its competition has no time limit. Men's competitions are basically more than three hours, and there are four or five hours of competitions, which are very common; Women's tennis players must have good endurance, especially in two or three hours. However, because every movement performed by athletes in sports is very short, when asked to perform many such short movements continuously, it will soon lead to physical discomfort and fatigue. Therefore, the resistance from one point to another in the game usually determines the final result. When the technical and tactical level of both athletes is the same, anaerobic endurance is particularly important, especially in the stage of a large number of multi shot stall. Athletes must complete various technical actions in anaerobic state, which is a great challenge to physical coordination. Athletes with strong coordination can save more physical strength, ensure technical and tactical performance and maintain competitive state in order to win the game.

Because tennis has high requirements for anaerobic endurance, we chose 400-meter run as the test task. The importance of anaerobic endurance to tennis players is self-evident. It is equally important to improve anaerobic endurance through coordinated training. When comparing each group, the improvement of anaerobic endurance of athletes in the experimental group after coordinated training is better than that in the control group. However, through the comparison before and after the experiment, the improvement of anaerobic endurance quality is not obvious ($P > 0.05$), which is closely related to the current inability of teenagers to tolerate strong physiological reactions, as shown in Figure 1.

Effect of coordination training on tennis skills

Tennis is one of the many net competition events, which has strict requirements on various physical fitness and physical functions. Due to the reasons of serving and high-pressure ball, the two techniques of being too short are limited to a certain extent, and athletes must run in a large range; Even the forward rush to save the small ball with low bounce has some limitations in some aspects. And excellent coordination ability can make up for the short board in height. However, no matter how fast

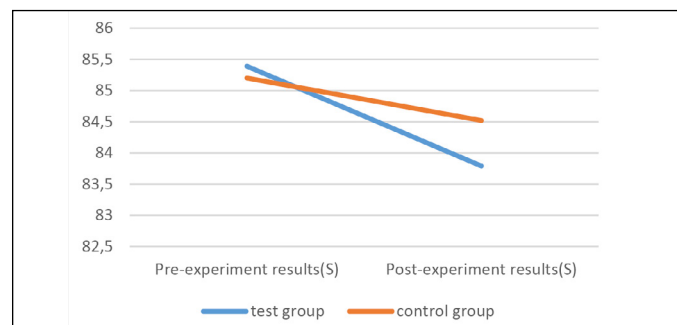


Figure 1. Comparison of anaerobic endurance quality before and after 400m experiment.

and how strong the coordination ability is, without good tennis skills, these excellent physical qualities based on tactics are useless. Therefore, excellent innate and acquired physical quality must be applied to tennis skills and tactics. Mastering and constantly updating tennis skills requires excellent physical conditions as a guarantee. When the physical quality reaches a stable state, the role of coordination is particularly important. Tennis technical action is completed in the process of control and counterattack, which requires athletes to have good muscle sense and control ability. Coordination ability is an important factor to improve muscle sense and muscle control. Therefore, coordination plays a vital role in tennis technology.

The technical evaluation results of forehand and backhand technology are shown in Figure 2.

The results of service skill evaluation are shown in Figure 3.

After 6 weeks of coordinated practice, the scores of forehand and backhand swing skills in the experimental group were 75.01 before the experiment and 89.79 after the experiment, which was significantly improved by 14.78 points ($P < 0.05$).

Detection of exercise physiological indexes

The statera cardiopulmonary function risk assessment system is applied to monitor and analyze the dynamic function indexes, and the test results of exercise physiological indexes are shown in Table 2.

The comparison of the average value of dynamic physiological indexes between the athletes in the experimental group and the athletes in the control group is shown in Table 3.

Table shows that the indexes of equivalent ventilation O_2 and equivalent ventilation CO_2 of athletes in the experimental group are slightly higher, but there is no significant difference between the two groups, reflecting that the heart rate of athletes in the experimental group is lower than that during normal exercise; The research team indirectly reflected the fact that the cardiovascular ability of athletes was higher than that of the control group. The tidal volume index of athletes is higher than that of the control group, indicating the amount of gas inhaled or

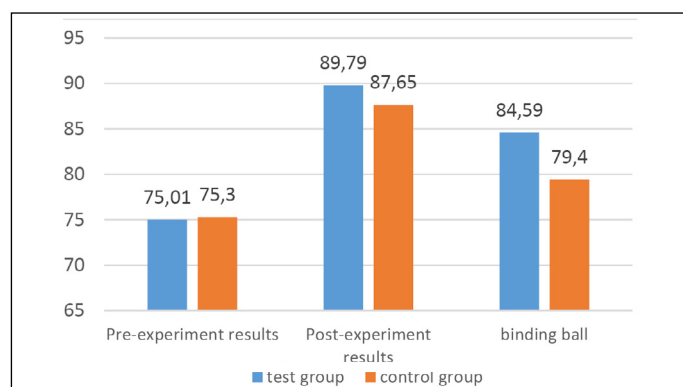


Figure 2. Technical evaluation results: comparison before and after forehand and backhand technical experiments.

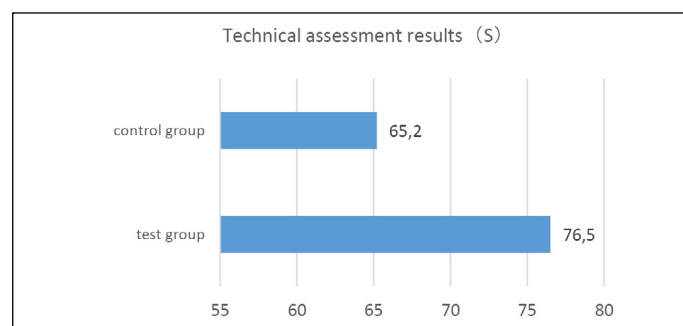


Figure 3. Technical evaluation results: comparison of service technical evaluation.

Table 2. Comparison of mean values of dynamic physiological indexes between athletes in the experimental group and those in the control group.

Measurement index	Dynamic physiological indexes of athletes in the experimental group	Dynamic physiological indexes of athletes in the control group
O_2 equivalent air volume	37.16±3.84	34.21±4.70
Heart rate 1 / min	159.07± 15.39	167.97± 11.48
Tidal amount _b1	1.37±0.19	1.14±0.05
Breathing frequency L1 / min	45.14± 11.19	51.21± 11.19
Volume gas percentage _B l / min	60.44± 14.51	62.47±14.51
Expression peak time L / S	3.26±0.67	2.25±0.67
Expiratory end O_2 concentration Vol%	15.83±0.45	15.25±0.48
Expiratory end CO_2 concentration VOL%	5.38±0.262	5.63±0.262
Pressure Local O_2 Pressure MMHG	28.42±2.29	32.14±1.37
End of the end of the exhalation CO_2 ; pressure MMHG	92.89±2.56	90.83±2.87

Table 3. Comparison of mean values of dynamic physiological indexes between athletes in the experimental group and those in the control group.

Measurement index	Dynamic physiological indexes of athletes in the experimental group	Dynamic physiological indexes of athletes in the control group
Oxygen oxygen content _s 1 / min	1.72±0.242	1.36±0.213
CO_2 exhalation _s 1 / min	1.61±0.242	1.26±0.343
Respiratory exchange rate	0.94±0.08	0.89±0.11
Relative oxygen content mL / min / kg	31.99±4.46	23.92±4.12
Metabolical quantity	6.85± 1.19	6.85±1.19
CO_2 equivalent air volume	38.58±1.98	38.58±1.98
Physiological dead zone / moisture	0.20±0.00	0.278±0.05
Release energy KCAL	10.43±0.90	9.42±0.90
Energy expenditure KCAL / D	11511.53±1601.63	12287.08±1560.83
Energy expenditure / weight KCAL / D / KG	169.01±32.29	176.17±36.12
Carbohydrate oxidation rate g / h	75.85±17.89	52.06±30.21
Fat oxidation rate g / h	12.53 ±6.50	13.03±7.63

exhaled each time. The athletes in the experimental group had a lower ventilation index, which means they had less gas passing through their lungs per minute. Contrary to the index of body oxygen demand and ventilation per minute, the peak expiratory time of the athletes in the experimental group is greater than that of the athletes in the control group, and the difference is very significant, indicating that the retention capacity of the gas inhaled by the athletes in the experimental group in the lungs is higher than that of the athletes in the control group, so the oxygen uptake is more sufficient.

DISCUSSION

The above data show that coordination ability has a great impact on speed. The improvement of speed performance by coordinated training is greater than that by simple tennis technical and tactical training. The three quality levels of speed are also closely related to the coordinated physiological mechanism. Reaction speed is the ability of human body to respond quickly to external environmental stimuli, which is determined by the conduction speed of nerve reflex. Nerve coordination is the interaction of nerve excitation and inhibition to complete an action. Both of them complete the action through nerve conduction.⁵ The movement speed and movement speed maximize their ability through muscle coordination during movement. Muscle coordination refers to

the appropriate and appropriate force of muscles in the process of movement. In exercise, they also have the common ground of coordinated, moderate and reasonable muscle strength.⁶ Due to the complexity of tennis, reaction speed, action speed and movement speed are essential in the project. The reaction speed determines the starting ability, and all random balls need the maximum reaction speed. The movement speed determines the swing ability, and the movement ability determines the attack ability and defense range. Therefore, good coordination is directly proportional to the improvement speed.⁷

The six-week training showed that the speed performance of the two test athlete groups improved to varying degrees. The comparison before and after 30 meters showed that the speed of the test group increased significantly, about 0.5. Table 2 the improvement of speed performance of members in the experimental group is closely related to 30 minutes of coordinated training three times a week. The completed training plan includes the part of developing physical coordination and improving speed and quality at the same time. By comparing the 50m test group, it can be seen that the speed of the test group is significantly improved, and the 50m distance can give full play to the speed advantage of the test group. Although the speed performance of the control group has improved, it is not obvious. The improvement of performance is related

to that they did not participate in sports before.⁸ Instead, they improved their physical function through 6 weeks of tennis training, so as to improve their speed quality.

CONCLUSION

Through the experimental comparative study of 6-week coordination training of young tennis players, it shows that the athletes in the experimental group are better than those in the control group in terms of speed, endurance, coordination and other physical qualities. For the improvement of tennis ability, after the test, it is found that the physiological indexes of the experimental group after coordination training are higher than those of the control group. Therefore, it can also be concluded that the physiological indexes promoted by coordination training can improve the progress of young tennis players. Therefore, this paper comes to the conclusion that coordinated training can improve the physical fitness and skills of young tennis players, as well as the detection of physiological indexes. It is hoped that this conclusion can help young tennis players.

The author declare no potential conflict of interest related to this article

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