

INFLUENCE OF STRENGTH TRAINING ON PHYSICAL FITNESS OF BADMINTON PLAYERS



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INFLUÊNCIA DO TREINAMENTO DE FORÇA SOBRE A APTIDÃO FÍSICA DOS JOGADORES DE BADMINTON

INFLUENCIA DEL ENTRENAMIENTO DE FUERZA EN LA APTITUD FÍSICA DE LOS JUGADORES DE BÁDMINTON

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ABSTRACT

Introduction: Strength training uses loads greater than 75% of 1RM of the individual, being indicated for optimization of endurance and controlled muscular hypertrophy. It is believed that the performance of badminton players can be improved with this technique, due to the intrinsic benefits regarding the power of muscle contraction explosion. **Objective:** Verify the influences of strength training on the physical fitness of badminton players. **Methods:** 24 young volunteer badminton players were randomly selected and divided into experimental and control groups. The experimental group was trained with high-load training, and the experimental data was recorded with FirstBeat® before and after the experiment. **Results:** The action speed of the experimental group was reduced from 216.46km/h to 240.81km/h, while the release speed was increased from 293.79km/h to 364.25km/h. The release velocity was significantly improved, increasing the net velocity from 169.57km/h to 200.94km/h, while the control group showed no statistical change. **Conclusion:** Strength training was found to significantly improve the physical fitness of badminton players, significantly impacting the finishing abilities of badminton players. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Resistance Training; Badminton; Athletes; Physical Fitness.

RESUMO

Introdução: O treinamento de força utiliza cargas maiores que 75% de 1RM do indivíduo, sendo indicadas para otimização de endurance e hipertrofia muscular controlada. Acredita-se que o desempenho dos jogadores de badminton possa ser aprimorado com essa técnica, devido aos benefícios intrínsecos quanto ao poder de explosão da contração muscular. **Objetivo:** Verificar as influências do treinamento de força sobre a aptidão física dos jogadores de badminton. **Métodos:** 24 jovens jogadores de badminton voluntários foram aleatoriamente selecionados e divididos em grupo experimental e grupo de controle. O grupo experimental foi treinado com treinamento de alta carga, sendo os dados experimentais registrados com FirstBeat® antes e depois do experimento. **Resultados:** A velocidade de ação do grupo experimental foi reduzida de 216,46km/h para 240,81km/h, enquanto a velocidade de liberação foi aumentada de 293,79km/h para 364,25km/h. A velocidade de liberação foi significativamente aprimorada, aumentando a velocidade líquida de 169,57km/h para 200,94km/h, enquanto o grupo de controle não apresentou alterações estatísticas. **Conclusão:** Constatou-se que o treinamento de força melhorou significativamente a aptidão física dos jogadores de badminton, impactando significativamente nas habilidades de finalização dos jogadores de badminton. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Treinamento de Força; Badminton; Atletas; Aptidão Física.

RESUMEN

Introducción: El entrenamiento de fuerza utiliza cargas superiores al 75% de 1RM del individuo, siendo indicado para optimización de la resistencia e hipertrofia muscular controlada. Se cree que el rendimiento de los jugadores de bádminton puede ser mejorado con esta técnica, debido a los beneficios intrínsecos en cuanto al poder de explosión de la contracción muscular. **Objetivo:** Verificar las influencias del entrenamiento de fuerza en la condición física de jugadores de bádminton. **Métodos:** 24 jóvenes jugadores voluntarios de bádminton fueron seleccionados aleatoriamente y divididos en grupo experimental y grupo control. El grupo experimental fue entrenado con entrenamiento de alta carga, y los datos experimentales fueron registrados con FirstBeat® antes y después del experimento. **Resultados:** La velocidad de acción del grupo experimental se redujo de 216,46km/h a 240,81km/h, mientras que la velocidad de liberación aumentó de 293,79km/h a 364,25km/h. La velocidad de liberación mejoró significativamente, aumentando la velocidad neta de 169,57km/h a 200,94km/h, mientras que el grupo de control no mostró cambios estadísticos. **Conclusión:** Se constató que el entrenamiento de fuerza mejoró significativamente la aptitud física de los jugadores de bádminton, impactando significativamente en las habilidades de remate de los jugadores de bádminton. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptor: Entrenamiento de Fuerza; Badminton; Atletas; Aptitud Física.



INTRODUCTION

Badminton, as an antagonistic sport, plays a major role in the sports field in the badminton competition. Because the weight of badminton is relatively light and the speed of movement is fast, killing the ball plays a very important role in the backcourt attack.¹ It is an important technology in the attack and also a technology with high scoring rate. With the development of badminton, from the beginning of the four-ball game to the present time when the other side is forced to create opportunities to attack the backcourt, it is necessary to focus on attack.² In order to gradually reduce the proportion of the use of high ball, it is necessary to speed up and control the rhythm of the game. If the rhythm of the match is accelerated and the attack is enhanced, it will improve the viewing of the game. Therefore, in order to create the attack opportunity of the next row, it is necessary to kill the ball accurately and reasonably to directly generate the score.³ In order to win the game, it is also necessary to increase the defense pressure of the opponent and master the rhythm of the game. No matter what kind of killing process, it is necessary to analyze and study the action of killing the ball in order to win the game. The diversification of badminton technology has gradually diversified the means of scoring.⁴ No matter what kind of killing process, the action needs to be analyzed and studied through biomechanics. The nerves on the body need to be activated with the athletes' muscle activities before core strength training can be carried out on the deep muscles to obtain the maximum killing speed.⁵ In the teaching of badminton, we can combine the stability of the players and the coordination of the movements, so as to improve the physical quality of the players, and then solve the problem of badminton in the movement mode. In order to improve the killing technique, it is necessary to improve the quality of killing.⁶ In this paper, through the research of relevant literature, we can improve the physical quality of badminton players and improve the power of the movement through certain training. If the actual combat level of athletes is improved, we also need to carry out offensive training on the quality level of athletes.⁷

METHOD

Research object

In this paper, the young badminton players in the training center are selected as the main research objects. A total of 24 male badminton players are selected as the research objects. The study and all the participants were reviewed and approved by Ethics Committee of China West Normal University (NO.CWNRZ203). The reason why women athletes are not selected as the research objects is that there are gender differences, which may affect the effectiveness of the results. Before training, all subjects need to be physically examined. Then, all the young badminton players were divided into experimental group and control group by drawing lots. After the training, all subjects did not suffer from chronic pain of knee, back and ankle. There is no problem in the hitting action. See Table 1 for the details of the study object.

During the whole experiment, the training lasted for 12 weeks. Of course, before each course, each athlete should be trained for 2.5 hours. Then, each player will be given a 40-minute high-load training. During this period, each badminton player needs to rest and relax.

Table 1. Basic information of two groups of subjects (N=12).

| Test indicators | Age (years) | Height (cm) | Body weight (kg) |
|------------------|--------------|---------------|------------------|
| Experience group | 22.10 ±1.568 | 177.07 ±2.832 | 72.45 ±1.760 |
| Control group | 21.61 ±1.228 | 178.36 ±2.918 | 75.48 ±1.947 |
| t | 0.4202 | 0.3460 | -0.2821 |
| P | 0.7265 | 0.6214 | 0.4677 |

Research methods

In the experiment, some experienced badminton coaches gave some guidance on the endurance speed of badminton players, and compared it with the training results of each group of young badminton players. The experiment was conducted in the badminton training center. During the test, each athlete wore a heart rate band and was divided into three groups according to the level of exercise. Each group had an open space for training. Different training modes are adopted. After the end of the game, a period of recovery is required. The time interval and rest time of each test are strictly controlled. All rules are carried out according to the process of the simulated game.

In the simulation match, young badminton players need to be guided to maintain their exercise posture during training. The basis of training in the first four weeks includes side-by-side jump, open-close jump, lunge jump, etc. In the 5th to 8th weeks, speed competition needs to be conducted on the basis of training. For different young badminton players, they need to maintain the fluency of movement, and all joints of the body need to maintain a good movement posture. According to the rules of international badminton, different players need to perform dynamic stretching and warm-up for the first 15 minutes, and then take a 10-minute rest adjustment, and wear a heart rate band when performing simulation matches according to their professional level.

Data acquisition and processing

In this study, all the data are monitored, identified and collected, and then all the collected data are entered into Excel tables. When different software is used for analysis and statistics, the method of analysis and matching is used for testing.

Control of factors related to the experiment

In the process of the experiment, it is necessary to control and grasp some external environmental factors. Of course, all the staff involved in the experiment also need to undergo a standardized training. Only after reaching the unified test standards can the measurement personnel involved in the experiment before and after the test be allowed to carry out the test. All the test locations and test methods need to be consistent with. Young badminton players need to carry out a speed endurance test. According to different composite training, they also need different methods to guide young badminton players to warm up, so as to avoid sports injuries. At the same time, during the experiment, in order to maintain the accuracy of the experimental results, it is also necessary to strictly control the exercise intensity and exercise time of all young badminton players. During the training experiment, the badminton players in the experimental group and the control group need to strictly control the course arrangement and training, and do not need to carry out any form of training at other times.

RESULTS

Influence of high load training on the sports level of badminton players

Table 2 describes the differences in physical fitness of badminton players between the experimental group and the control group.

By comparing the data in Table 2 before and after the experiment, the high load training improved the physical fitness level of the badminton players in the experimental group, while there was no significant statistical difference in the physical fitness level of the control group. The physical level of badminton players can be improved through high-load training in daily training, and then the strength and distance of service of badminton players can be improved.

Table 3 describes the differences between the experimental group and the control group in the specific indicators of badminton players.

By comparing the data before and after the experiment in Table 3, the high load training significantly improved the special indicators of badminton players, which is in sharp contrast with the control group. The high load training can be added to the daily training so that the badminton players can serve and receive the ball at a faster speed.

Impact of high load training on badminton players' killing skills

Table 4 shows the results of the impact of high-load training on badminton players' killing skills.

Table 4 compares the movement speed, release speed, net speed, landing time and other data of the experimental group and the control group before and after the experiment. High-load training can improve the level of badminton players' killing skills and effectively improve the professional quality of badminton players.

DISCUSSION

Badminton, as a sport skill-led event in sports, requires high physical fitness in terms of flexibility and speed sensitivity of athletes. It needs to maintain an active position in the process of competition to improve physical fitness and special skills at the same time and achieve better results. Both beginners and players with high level of badminton need to improve and make breakthroughs in different aspects. Not only do

all backcourt kills need to take the initiative, but also all powerful slam dunks will pay attention to the effect of line landing, speed and other aspects when killing. If you use blind technology in the process of killing the ball, it will cause great consumption of your physical energy, and also put you in a passive state. In the whole game, the higher the tactical position, the more important the role will be. Killing the ball is the starting point of the whole tactics, and can also be the important ending point of the whole round. To take the initiative of the game in all competitions is to use the technology of killing the ball to create more offensive opportunities, so that the current round can be effectively ended, which can minimize the consumption of physical energy, and lay the foundation for subsequent games.

From the analysis of the situation on the spot, we can know that the shorter the opponent's reaction time is, the faster the backcourt's release speed is, the faster the release speed is, the more able to play the flat lob, drop ball, high ball, etc. at a faster speed, and the greater the deterrent force is. The faster the change of the shot in the course of the match, the more accurate it is to judge the opponent's mistakes. In order to achieve a maximum transmission of the release speed, it is necessary to transfer the wrist joint and finger joint of the athlete. At the end of power transmission, it is necessary to maximize the efficiency of upper limb muscles to ensure the effectiveness of power and speed transmission.

The research findings show that in order to ensure the full activity of muscle fibers to the maximum strength, it is necessary to promote the strength development of the training load at the maximum load. In

Table 2. Effect of high load training on the physical fitness of badminton players (N=12).

| Before experiment | 30s short rope jump | 1min sit-ups | 1 min prone from both ends | Badminton throw distance (m) |
|-------------------|---------------------|--------------|----------------------------|------------------------------|
| Experience group | 79.97±6.979 | 47.36±6.222 | 29.25±7.772 | 7.87±1.058 |
| Control group | 75.71±7.455 | 46.24±5.631 | 32.71±8.359 | 7.65±0.819 |
| t | 1.8925 | -0.3757 | 0.9740 | -1.1510 |
| p | 0.0395 | 0.0418 | 0.0568 | 0.0389 |
| After experiment | 30s short rope jump | 1min sit-ups | 1 min prone from both ends | Badminton throw distance (m) |
| Experience group | 82.47±8.171 | 54.24±4.874 | 37.08±6.712 | 8.50±0.751 |
| Control group | 76.65±7.296 | 48.70±5.550 | 35.95±8.319 | 7.97±0.649 |
| t | 2.2473 | -2.4519 | -0.4870 | -2.6585 |
| p | 0.0617 | 0.0537 | 0.0678 | 0.0521 |

Table 3. Effect of high load training on special indexes of badminton players (N=12).

| Before experiment | Straight turn back run (s) | Low center of gravity corner run (s) | Left and right edge touch (s) |
|-------------------|----------------------------|--------------------------------------|-------------------------------|
| Experience group | 9.16 ±0.345 | 17.40 ±0.889 | 28.44 ±1.609 |
| Control group | 9.54 ±0.208 | 17.21 ±0.984 | 28.99 ±1.321 |
| t | -1.8807 | 1.6817 | -1.2205 |
| p | 0.0343 | 0.0472 | 0.0304 |
| After experiment | Straight turn back run (s) | Low center of gravity corner run (s) | Left and right edge touch (s) |
| Experience group | 8.74 ±0.375 | 16.27 ±1.059 | 28.21 ±1.365 |
| Control group | 9.51 ±0.188 | 17.14 ±1.289 | 28.94 ±1.390 |
| t | -2.7175 | -2.1583 | -1.0004 |
| p | 0.0543 | 0.0314 | 0.0645 |

Table 4. Effect of high load training on forehand killing technique of badminton players (N=12).

| Before experiment | Operating speed (km/h) | Release speed (km/h) | Network speed (km/h) | Landing time (s) |
|-------------------|------------------------|----------------------|----------------------|------------------|
| Experience group | 216.46±10.573 | 293.79±19.155 | 169.57±15.991 | 0.52±0.691 |
| Control group | 220.65±10.436 | 287.22±22.037 | 172.05±17.622 | 0.57±0.596 |
| t | -7.7671 | -10.9496 | -7.3861 | 7.9601 |
| p | 0.0601 | 0.0438 | 0.0534 | 0.0455 |
| After experiment | Operating speed (km/h) | Release speed (km/h) | Network speed (km/h) | Landing time (s) |
| Experience group | 240.81±11.194 | 364.25±20.948 | 200.94±6.410 | 0.36±0.557 |
| Control group | 232.36±8.545 | 340.51±19.828 | 186.02±15.712 | 0.44±0.533 |
| t | -7.6173 | -6.3216 | -7.3607 | 10.7795 |
| p | 0.0474 | 0.0658 | 0.0727 | 0.0785 |

high-load training, due to the high speed and intensity of movement, different functional systems can be analyzed from the perspective. Due to the high speed and intensity of movement, the main energy can be supplied by the energy supply system. For different training systems, the length of intermittent rest time will also affect the recovery of function. In order to effectively promote the energy supply capacity of the energy supply system, it is necessary to reasonably allocate the reasonable frequency of the composite group number. Some studies have shown that high-load training may affect the concentration of phosphate sources in athletes. With the increase of muscle mass, high-intensity resistance force will also be stimulated in training. In order to effectively improve the overall phosphate function system capacity, a full-body explosive resistance training was carried out during high-load training. After improving the coordination of the body, it can promote the repair of energy, and can also be used as a means of delaying fatigue during competition.

CONCLUSION

Through the comparative analysis of the physical fitness, special indicators and killing skills of the badminton players in the experimental

group and the control group before and after the experiment, this paper can draw a conclusion that the physical fitness of the badminton players can be significantly improved by carrying out high-load training for the badminton players, and the badminton players can prepare for the badminton match with better physical fitness. High-load training can also significantly improve the special indicators of badminton players, and it has significantly shortened the time in the aspects of straight turn back running, low center of gravity corner running, and left and right side touch. More importantly, high-load training can significantly improve badminton players' killing skills, both in movement speed, release speed, net speed, landing time and so on. This provides a reference for the daily training of badminton players. By adding high-load training to the daily training of badminton players, we can further improve the killing skills of badminton players, so that Chinese badminton players can achieve better results in sports competitions, win more gold medals for China and win glory for the country.

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