

REACTION SPEED TRAINING IN VOLLEYBALL

TREINAMENTO DE VELOCIDADE DE REAÇÃO NO VOLEIBOL

ENTRENAMIENTO DE VELOCIDAD DE REACCIÓN EN EL VOLEIBOL



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ABSTRACT

Introduction: Volleyball is a team sport where winning the confrontation at the net largely determines characteristics. Volleyball players must constantly strive to improve team cooperation, defensive ability, and speed skills to improve their ability to perform over the net. **Objective:** Establish a fixed intensity load model for speed training on the athlete's visual response in volleyball. **Methods:** This paper selected several volleyball players as research subjects, randomly divided into two groups (regular training and experimental groups). The experimental group was subjected to a visual response speed training protocol based on routine training. Mathematical statistics were employed to analyze the athletes' reaction speed and defensive ability against the net. **Results:** The qualities analyzed, mainly movement speed, swing speed, agility, and endurance for fast swing and fast movement, showed a significant differential after the intervention. The speed response was concentrated in the center of body balance. The lower limbs increased the endurance for speed. After visual reaction speed training, the experimental group's ability to cope with attacks on the net was statistically superior ($P < 0.05$). **Conclusion:** The proposed protocol can improve the reaction speed training of volleyball players. Volleyball players should reinforce reaction speed training daily to perform better close to the net. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Volleyball; Resistance Training; Athletes; Sports.

RESUMO

Introdução: O voleibol é um esporte coletivo e suas características de vitória são determinadas em grande parte pelo confronto em rede. Os jogadores de vôlei devem se esforçar constantemente para melhorar a cooperação da equipe, a capacidade defensiva e habilidades de velocidade para melhorar a capacidade de atuarem pela a rede. **Objetivo:** Estabelecer um modelo de carga de intensidade fixa para o treinamento de velocidade na resposta visual do atleta em voleibol. **Métodos:** Este trabalho seleciona vários jogadores de vôlei como objetos de pesquisa, divididos aleatoriamente em dois grupos (grupos de treinamento regular e grupos experimentais). O grupo experimental teve o diferencial de ser submetido a um protocolo treinamento de velocidade de resposta visual baseado no treinamento de rotina. Estatísticas matemáticas foram empregadas para analisar a velocidade de reação dos atletas e a capacidade defensiva contra a rede. **Resultados:** As qualidades analisadas, principalmente velocidade de movimento, velocidade de balanço, agilidade e resistência para balanço rápido e movimento rápido mostraram um diferencial significativo após a intervenção. A velocidade de resposta concentrou-se no centro de equilíbrio corporal. A resistência para a velocidade foi incrementada pelos membros inferiores. Após o treinamento da velocidade de reação visual, a capacidade do grupo experimental de enfrentar os ataques sobre a rede foi estatisticamente superior ($P < 0,05$). **Conclusão:** O treinamento da velocidade de reação dos jogadores de vôlei pode ser aprimorado com o protocolo proposto. Os jogadores de vôlei devem reforçar o treinamento da velocidade de reação em seu treinamento diário afim de uma melhor capacidade de atuação próxima à rede. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Voleibol; Treinamento de Força; Atletas; Esportes.

RESUMEN

Introducción: El voleibol es un deporte de equipo y sus características ganadoras están determinadas en gran medida por el enfrentamiento en la red. Los jugadores de voleibol deben esforzarse constantemente por mejorar la cooperación en equipo, la capacidad defensiva y las habilidades de velocidad para mejorar su capacidad de actuación sobre la red. **Objetivo:** Establecer un modelo de carga de intensidad fija para el entrenamiento de velocidad sobre la respuesta visual del deportista en el voleibol. **Métodos:** Este trabajo selecciona a varios jugadores de voleibol como sujetos de investigación, divididos aleatoriamente en dos grupos (grupos de entrenamiento regular y grupos experimentales). El grupo experimental tuvo el diferencial de ser sometido a un protocolo de entrenamiento de la velocidad de respuesta visual basado en el entrenamiento rutinario. Se emplearon estadísticas matemáticas para analizar la velocidad de reacción y la capacidad defensiva de los atletas contra la red. **Resultados:** Las cualidades analizadas, principalmente la velocidad de movimiento, la velocidad de balanceo, la agilidad y la resistencia para el balanceo rápido y el movimiento rápido mostraron un diferencial significativo después de la intervención. La velocidad de respuesta se concentró en el centro de equilibrio del cuerpo. La resistencia para la velocidad se incrementó en los miembros inferiores. Tras el entrenamiento de la velocidad de reacción visual, la capacidad del



grupo experimental para afrontar los ataques sobre la red fue estadísticamente superior ($P < 0,05$). Conclusión: El entrenamiento de la velocidad de reacción de los jugadores de voleibol puede mejorar con el protocolo propuesto. Los jugadores de voleibol deben reforzar el entrenamiento de la velocidad de reacción en su formación diaria para mejorar su capacidad de actuación cerca de la red. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptores: Voleibol; Entrenamiento de Fuerza; Atletas; Deportes.

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INTRODUCTION

Volleyball requires players to have ATP-CP solid energy supply capacity and glycolysis energy supply capacity. At the same time, athletes need to have an excellent aerobic metabolism foundation. The training of volleyball defense techniques is unique content in volleyball training. Scholars have found common laws among the sub-items from the research and analysis of the adversarial item groups in the net.¹ At the same time, they apply these laws to volleyball. We can make better use of these laws to improve the ability of volleyball and volleyball players according to the analysis of the skills of volleyball players. This will help them apply these skills in practice. Volleyball players can develop their unique strengths in training. In turn, athletes win more honors for the collective and the individual. The volleyball visual response speed training load model is established in this paper.² This article analyzes the skills of volleyball's net-separation confrontation according to the ordinary laws of each sub-item explored. The conclusions of this paper can promote the development of volleyball.

METHOD

Research objects

This paper selects 30 male volleyball players as the research object. The average age is 21.5 years old, and the average height is 185cm. Athletes were randomly divided into two groups (regular training and experimental groups). The conventional training group was trained according to the conventional method. In the experimental group, the maximum heart rate of each individual was measured by the MARQIUTTE treadmill before the experiment.³ The indicators of this research mainly include moving speed, action speed, receiving, and spiking. The values of each index before and after training in the conventional and experimental groups were tested.

Build the model

Volleyball visual reaction speed training belongs to non-periodic sports. The model has no specific exercise intensity and quantitative power metrics.⁴ These metrics can be quantified using post-exercise heart rate (pulse). We use this to establish a corresponding model of percent load and pulse intensity.

The volleyball motion vector field transformation algorithm

In this paper, the foreground object masking FOM and the global motion component GMC obtained by the above techniques are expressed as follows:

$$\begin{cases} FOM = (f_{i,j}) \\ GMC = (g_{i,j}) \end{cases} \quad (1)$$

Where $f_{i,j}$ has the value 0 or 1. 0 means that macroblock (i, j) belongs to the background. One indicates that macroblock (i, j) belongs to the foreground object. $g_{i,j}$ represents the global motion component that macroblock (i, j) should compensate for. represents the energy contained

in block (x, y) in the t frame. $overlapS_{ij,x,y}^t$ represents the overlapping area of the matching position of block (x, y) in t frame and block (i, j) in $t - 1$ frame in t frame.⁵ The energy redistribution function is defined as follows:

$$E_{x,y}^t = \left(\sum_{i,j} overlapS_{i,j,x,y}^t \times E_{x,y}^{t-1} \right) / W_b^2 (1 \leq i, j \leq W_b) \quad (2)$$

$\omega_{x,y}$ represents the element at weight template (x, y) . We obtain the response value E_{res}^t for a given energy profile to this template using the following formula.

$$E_{res}^t = \sum_{x,y} E_{x,y}^t \times \omega_{x,y} (1 \leq x, y \leq W_b) \quad (3)$$

Ethical Compliance

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

RESULTS

After three months of training, we conducted experiments in the conventional training group and the experimental group. The results in Table 1 show a significant difference between the experimental group and the control group in the 3-meter round-trip movement speed. The experimental group was significantly better than the control group.⁶ The results in Table 2 show that there are differences in the movement speed test between the experimental group and the control group. The experimental group outperformed the control group. The results in Table 3 show that the experimental group's return and serve pilling rate was significantly improved. It is better than the control group. The results in Table 4 show that the pilling rate of the experimental group was significantly improved. The results were better than those of the control group.

DISCUSSION

Common characteristics of net-separated confrontation events and volleyball skills

Volleyball players have high demands in terms of physical fitness and so on. The content includes good strength, speed, endurance, flexibility,

Table 1. Movement Speed Indicator Test Results.

Group	Content	Before experiment	After the experiment	Average increase	p
Regular training group	3m round trip	10"46	10"26	0.21"	<0.01
Test group	3m round trip	10"38	9"98	0.6"	

Table 2. Response-Action Speed Index Test Results.

Group	Content	Before experiment	After the experiment	Average increase	P
Regular training group	Signal - One Shoulder Roll	1"51	1"35	1.23"	<0.05
Test group	Signal - One Shoulder Roll	1"46	1"12	1.36"	

Table 3. Test results of return and serve indicators.

Group	Content	Before experiment	After the experiment	Average increase
Regular training group	Catch 10 serves in place	62.3	76.4	3.17%
Test group	Catch 10 serves in place	62.8	81.6	8.71%

Table 4. Test results of the spiking indicator.

Group	Content	Before experiment	After the experiment	Average increase
Regular training group	Take 10 normal slashes	29.39	31.45	3.07%
Test group	Take 10 normal slashes	29.92	36.53	6.71%

and other physical qualities. In terms of psychology, athletes must have a good sense of struggle and self-control.⁷ They can improve their reaction speed, spatial and temporal awareness, and focus their attention according to the speed and variation of the ball. In terms of intelligence, athletes are required to have the ability to respond flexibly. They can handle all kinds of emergencies on the field and their own emotions. Therefore, athletes need to have professional knowledge and rich experience.

The rules of net-separated confrontational items and groups of points and volleyball skills

According to the statistics of several major competitions of the world men's and women's volleyball teams, it is found that the score is mainly based on spikes. It accounts for half of the total score. The opponents' mistakes and blocks ratio are the same.⁸ The players serve themselves but don't get too many points. The loss of points is mainly to see the opponent's defensive level. About 30% of the points are lost by directly receiving the opponent's smash. Protection spikes account for about 20%. The percentage of spikes and blocks is almost the same. One pass and other losses were not much. Although the ratio of volleyball points gained and lost through various means is also related to the level of the game, the rules of scoring and losing points are not the same.⁹ Therefore, we can take this law as an experience to train, participate in competitions, and conduct scientific research.

The victory of the Chinese women's volleyball team is entirely due to their superb skills and fighting spirit. The training process of volleyball must consciously penetrate these rules and characteristics of scoring and losing points.¹⁰ We guide training work practice based on research and exploration of these theoretical aspects. A volleyball player's better performance in the game is related to its conditions and determined by many objective factors.

The technical commonalities and volleyball skills of the net-separated confrontation item groups

Insulin prevents the body from making contact. It mainly relies on its side's technical and tactical cooperation to win. The net-separated confrontation group requires athletes to focus on basic skills and

increase training intensity. Athletes have higher requirements and higher standards based on completion targets. Basic skills require a variety of performances of the ball.¹¹ Volleyball can use the route and placement to play its accuracy and flexibility requirements fully. It relies on rotation performance to perform various spike attacks and jump serve. In the volleyball game, the float is a non-spin feature for the service.

The technical requirements must be comprehensive according to the net item group's rules of gain and loss. Offensive and defensive teams or players can achieve excellent results. The positions of the volleyball players are reversed. The Chinese women's volleyball team can also develop the characteristics of Chinese rapid attack based on comprehensive technology.¹² Athletes have the advantages of their rhythm in attack and flexible and changeable fast attack techniques. Because these advantages have become their "magic weapon" to overcome the enemy, the women's volleyball team can win the ninth world championship at the 2016 Rio Olympic Games.

Common points of physical fitness and volleyball skills of the net-separated confrontation groups

Physical fitness is a significant factor in the competition of the net division. Quality is the basis for mastering various techniques, and it is also an essential guarantee for technical application and tactical completion in the game. Different item groups adapt to different physical qualities.¹³ They differ markedly in extent and content.

Volleyball is very demanding on quality. The coaches have apparent manifestations in the selection of materials and later training. It requires athletes to have good athletic ability and agility, and flexibility. Volleyball has a certain weight. If an athlete wants to hit a lethal shot, he needs to increase his swing speed.¹⁴ This requires a lot of explosive muscle power-especially the explosive power of the muscles required for the arm swing. When the ball speed and attack tempo are fast, players need to defend their defense area with a faster starting speed and moving speed. Athletes need more flexible movements to deal with changes in the opponent. The hitting time of volleyball is uncertain. Teams of the same ability often require many rounds of competition. This requires athletes to have better physical fitness. These are mainly reflected in fast movement and fast arm swings and bounces, endurance, and speed.

CONCLUSION

The volleyball game against nets requires players to adhere to a "large amount of exercise training." Athletes should carry out special physical training according to particular characteristics. In training, athletes need to distinguish between primary and secondary and grasp the dominant quality. This will lead to the improvement of specific physical fitness levels. In technical and tactical training, grasp technical and tactical tricks to achieve breakthroughs at technical and tactical levels. In psychological training, athletes should grasp psychological weaknesses to achieve the tempering of willpower. The fixed-intensity load model training method optimizes the process of volleyball visual reaction speed training. This has a more prominent effect on improving the athlete's defensive ability. The fixed-intensity load model training method provides a methodological reference for coach training. The coaches should adjust and arrange the training content according to individual indicators in the actual training process.

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

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