

# EFFECTS OF LADDER TRAINING ON THE MOBILITY OF VOLLEYBALL PLAYERS



ORIGINAL ARTICLE  
ARTIGO ORIGINAL  
ARTÍCULO ORIGINAL

EFEITOS DO TREINAMENTO COM ESCADA NA MOBILIDADE DOS ATLETAS DE VOLEIBOL

EFFECTOS DEL ENTRENAMIENTO DE ESCALERA SOBRE LA MOVILIDAD DE LOS JUGADORES DE VOLEIBOL

Jing Zhou<sup>1</sup>   
(Physical Education Professional)

Yunrui Xu<sup>2</sup>   
(Physical Education Professional)

1. He Bei Sport University, Shijiazhuang, Hebei, China.
2. Jiangsu Normal University, XuZhou, Jiangsu, China.

## Correspondence:

Yunrui Xu  
XuZhou, Jiangsu, China. 221116.  
15230837160@163.com

## ABSTRACT

**Introduction:** The step movement in volleyball is a fundamental skill that volleyball players must master, being the basis of the support of all other techniques of this sport. **Objective:** Explore the effect of ladder training on the mobility of high school volleyball players. **Methods:** Twenty high school male volleyball players aged 16-17 were selected as experimental volunteers. Randomly divided into experimental and control groups, 10 individuals in each group received a training intervention for 8 weeks, with ladder training added to the experimental group. **Results:** Both pieces of training resulted showed positive effects on the improvement of movement ability and speed and could effectively improve the athletes' movement speed ability. **Conclusion:** Through systematic ladder training, the excitatory conduction time in the reflex arc of athletes was significantly reduced, leading to a faster response to various signal stimuli, bringing the athletes' central nervous system to a state more prepared for sports practice. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Physical Education and Training; Exercise; Volleyball.

## RESUMO

**Introdução:** O movimento dos passos no voleibol é uma habilidade fundamental que os praticantes de voleibol devem dominar, sendo a base da sustentação de todas as demais técnicas desse esporte. **Objetivo:** Explorar o efeito do treinamento de escada sobre a mobilidade dos jogadores de voleibol do ensino médio. **Métodos:** Vinte jogadores de voleibol masculino com idade entre 16 a 17 anos do ensino médio foram selecionados como voluntários experimentais. Divididos aleatoriamente em grupo experimental e controle, 10 indivíduos em cada grupo, receberam uma intervenção de treinamento por 8 semanas, sendo acrescido ao grupo experimental o treinamento em escada. **Resultados:** Ambos treinamentos resultaram apresentaram efeitos positivos na melhoria da capacidade e velocidade de movimento, podendo efetivamente melhorar a capacidade de velocidade de movimento dos atletas. **Conclusão:** Através do treinamento sistemático por escada, o tempo de condução excitatória no arco reflexo dos atletas foi reduzido significativamente, levando a uma resposta mais rápida a vários estímulos de sinal, aproximando o sistema nervoso central dos atletas a um estado mais preparado para a prática esportiva. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Educação Física e Treinamento; Exercício Físico; Voleibol.

## RESUMEN

**Introducción:** El movimiento de paso en el voleibol es una habilidad fundamental que los jugadores de voleibol deben dominar, siendo la base del apoyo de todas las demás técnicas de este deporte. **Objetivo:** Explorar el efecto del entrenamiento en escalera sobre la movilidad de los jugadores de voleibol de secundaria. **Métodos:** Se seleccionaron 20 jugadores de voleibol masculinos de secundaria de entre 16 y 17 años como voluntarios experimentales. Divididos aleatoriamente en grupo experimental y grupo de control, 10 individuos en cada grupo, recibieron una intervención de entrenamiento durante 8 semanas, con entrenamiento de escalera añadido al grupo experimental. **Resultados:** Ambos entrenamientos mostraron efectos positivos en la mejora de la capacidad de movimiento y la velocidad, y pudieron mejorar efectivamente la capacidad de velocidad de movimiento de los atletas. **Conclusión:** Mediante el entrenamiento sistemático en escalera, se redujo significativamente el tiempo de conducción excitatoria en el arco reflejo de los atletas, lo que condujo a una respuesta más rápida a diversos estímulos de señal, llevando el sistema nervioso central de los atletas a un estado más preparado para la práctica deportiva. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptor:** Educación y Entrenamiento Físico; Ejercicio Físico; Voleibol.



DOI: [http://dx.doi.org/10.1590/1517-8692202329012022\\_0575](http://dx.doi.org/10.1590/1517-8692202329012022_0575)

Article received on 10/28/2022 accepted on 11/25/2022

## INTRODUCTION

The movement of footsteps in volleyball is a basic skill that volleyball players must master, and it is the most fundamental guarantee to support the entire volleyball technique.<sup>1</sup> The current development trend of competitive volleyball strengthens the prediction in advance and

moves at a faster speed, more flexible footsteps are used to command the heights quickly, which requires athletes to have flexible steps to ensure that they can take an advantage in the game, whether in attacking or defending, in order to pose a greater threat to the opponent. And in college volleyball training, the training methods and means are often

single, this requires coaches to use new training methods and means to improve the training interest of athletes, and achieve the best training effect with half the effort. As a new method of training athletes' agility, the ladder training method has a variety of training methods, it is not only interesting, but also can exercise the agility of athletes well, and it is a good training method for training volleyball players' footsteps.<sup>2</sup>

## METHOD

### Experimental method

Select 20 high school men's volleyball players aged 16-17 years old from middle school A as experimental subjects, the subjects are required to be healthy, without congenital chronic diseases and serious sports injuries, they are randomly divided into experimental group and control group, the members of each group are 10 people each.<sup>3</sup> The experimental period is from October 12, 2020 to December 13, 2020, a total of 8 weeks. The experimental group added the ladder training experimental intervention in the 8-week training, while the control group adopted the traditional training method, and strictly controlled the variable factors during the experiment, it is sorted and analyzed, and finally a conclusion is drawn.<sup>4</sup>

Combined with the physiological characteristics and developmental characteristics of high school students, five test indicators were selected. Among them, the test indicators of the moving speed ability are the cross quadrant jump, the half-meter movement, and the 36m movement, and the test indicators of the reaction ability are the hexagonal ball response test during the starting reaction.<sup>5</sup>

### Mathematical statistics

The data obtained in this test were recovered and grouped, and the relevant data was imported into Excel, SPSS23.0 and other software for inspection and analysis, and a conclusion was drawn.

### Logic Analysis

By summarizing the test data of the experimental group and the control group before and after the experiment, conducting scientific research and analysis, and earnestly summarizing whether the ladder training is effective in improving the mobility of high school volleyball players, the conclusions and suggestions of this paper are finally drawn.

### Ethical Compliance

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Hebei sport university and Jiangsu Normal University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

## RESULTS

### Comparative analysis of the test index results of mobility between the experimental group and the control group before the experiment

Before the official start of the experiment, an independent sample t-test was conducted on the performance of the 20 volleyball players in A in the mobility ability index, the specific test data results are shown in Table 1. It can be seen that there is no significant difference in the cross quadrant jump index half-meter movement index 36m movement, the start reaction time, and the hexagonal ball reaction test index between the two groups of subjects.<sup>6</sup>

To sum up, the experimental group and the control group are divided into reasonable groups, and there is no significant difference between the test indicators, so experimental research can be carried out.

### Comparative analysis of the test index results of mobility between the experimental group and the control group before and after the experiment

#### 1. Comparative analysis of the test index results of the movement speed ability between the experimental group and the control group before and after the experiment

The data before and after the experiment were compared and tested for differences. After inspection, the three test indicators of the movement speed ability of the experimental group were  $P < 0.01$  before and after the experiment, showing a very significant difference, indicating that the experimental group after training, the three indicators of movement speed ability have been significantly improved; The three test indicators of the movement speed ability of the control group, before and after the experiment,  $P < 0.05$ , showed a significant difference, indicating that the control group after training, the three indicators of movement speed ability have also been improved, and the specific content is shown in Table 2 and Table 3. The comparison chart of the growth rate between the experimental group and the control group is shown in Figure 1.<sup>7</sup>

**Table 1.** Comparison statistics of the test data of mobility ability between the experimental group and the control group before the experiment.

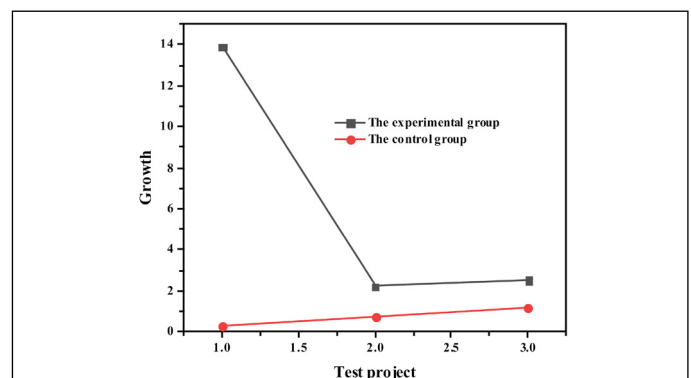
Test items	Test group	Control group	P
Cross Quadrant Jump(s)	9.22±1.32	9.00±1.04	0.68
Half-meter movement (s)	17.55±0.77	18.26±0.92	0.79
36m move(s)	14.25±0.85	14.91±0.70	0.80
Start reaction time(s)	0.22±0.02	0.23±0.41	0.81
Hexagonal ball reaction test (pcs)	4.50±1.07	4.30±1.33	0.72

**Table 2.** The comparison statistics of the movement speed ability of the experimental group before and after the experiment.

Test items	Before the experimental group	After the experimental group	P	Growth rate
Cross Quadrant Jump(s)	9.22±1.32	7.94±0.83	0.00	13.9
Half-meter movement (s)	17.55±0.77	17.16±0.71	0.001	2.2
36m move(s)	14.25±0.85	13.90±0.88	0.004	2.5

**Table 3.** Comparison statistics of movement speed ability before and after the experiment in the control group.

Test items	Before the control group	After the control group	P	Growth rate
Cross Quadrant Jump(s)	9.00±1.04	8.87±1.04	0.044	0.3
Half-meter movement (s)	18.26 ±0.91	18.14±0.88	0.035	0.7
36m move(s)	14.91±0.70	14.73±0.52	0.029	1.2



**Figure 1.** Comparison of the growth rate between the experimental group and the control group.

The results show that the training of the experimental group and the control group has a good effect on the improvement of the movement speed ability, and can effectively improve the movement speed ability of the athletes.<sup>8</sup> The reason for the improvement may be that the two groups of athletes have undergone systematic training, which has improved their physical abilities in all aspects, and can make better use of their physical functions during the test, which fully reflects the training effect. From the three test indicators of moving speed ability, it can be seen that the ladder training has a more obvious improvement effect on the test indicators related to the jumping ability compared with the traditional training.

## 2. Comparative analysis of the test index results of the reaction ability between the experimental group and the control group before and after the experiment

Ladder training is more conducive to improving the ability of volleyball players to respond to this test at the start, after experimental intervention, the hexagonal ball response ability of the experimental group has been significantly improved, and the control group has also improved the hexagonal ball response ability after training.<sup>9</sup> Ladder training is of great help to the improvement of lower limb gait rhythm, the coordination and development of the nervous system and the muscular system. Through systematic ladder training, the excitatory conduction time in the athlete's reflex arc is significantly shortened, and the athlete can quickly respond to various signal stimuli, so that the human central nervous system can reach an ideal state. Athletes in the middle of a volleyball match, need to be ready to accept external stimuli at all times, and make a quick response, the direction and trajectory of the volleyball flight and the change of the speed of the ball and other factors always test the volleyball player's reaction ability.

## Comparative analysis of the results of the movement ability test index between the experimental group and the control group after the experiment

### 1. Comparative analysis of the test index results of moving speed ability after the experiment

After the experiment, it was found that the scores of both the experimental group and the control group improved after 8 weeks of training, through the difference test, it was found that the P values of the three movement speed ability test indicators were all less than 0.05, which proved that there was a significant difference between the experimental group and the control group after the experiment, that is, the ladder training could better improve the movement speed ability.<sup>10</sup> The specific content is shown in Table 4.

### 2. Comparative analysis of the results of the post-experiment reaction ability test indicators

After the experiment, the difference test of the hexagonal ball reaction test results between the experimental group and the control group was carried out, and the result was  $P < 0.05$ , there was a significant difference

in the hexagonal ball reaction test between the experimental group and the control group after the experiment, it is proved that the ladder training method is more conducive to the improvement of the performance of the hexagonal ball response test. See Table 5 for details.

## DISCUSSION

After a series of traditional mobility training, the control group, in addition to the test index of starting response, the scores of other test indicators have improved to varying degrees, but the improvement is smaller than the various test indicators of the ladder training. The reason may be because the body is in the process of training, it has corresponding adaptability to the stimulation, but cannot further stimulate and effectively improve the various qualities of the athlete's body, so this may be the reason why the traditional training does not have a ladder training performance.

**Table 4.** Comparison statistics of the movement speed ability between the experimental group and the control group after the experiment.

Test items	After the experimental group	After the control group	P
Cross Quadrant Jump(s)	7.94±0.83	8.87±1.04	0.041
Half-meter movement (s)	17.16±0.71	18.14±0.88	0.014
36m move(s)	13.90±0.88	14.73±0.52	0.021

**Table 5.** After the experiment, the experimental group and the control group compared the results of the hexagonal ball reaction test.

Test items	After the experimental group	after the control group	P
Hexagonal ball reaction test (pcs)	6.20±0.78	5.00±1.14	0.014

## CONCLUSION

The author proposes to study the effect of ladder training on the mobility of volleyball players, selects 20 men's volleyball players aged 16-17 years old from middle school A as the experimental objects, and randomly divides them into the experimental group and the control group, each group of 10 players conducted 8-week training to obtain experimental data and organize and analyze it. After 8 weeks of experimentation, the ladder training has a significant effect on the improvement of mobility, while the traditional training has improved other mobility ability test indicators except the starting reaction time, but the improvement rate is smaller than that of the ladder training. From the three test data of moving speed ability, it can be seen that compared with traditional training, the improvement effect of related indicators in the test of jumping ability is more obvious. Ladder training cultivates students' interest and awareness in training.

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

**AUTHORS' CONTRIBUTIONS:** Each author made significant individual contributions to this manuscript. Jing ZHOU: writing and performing surgeries; Yunrui Xu: data analysis and performing surgeries, article review and intellectual concept of the article.

## REFERENCES

- Kreso I, Krapac J, Segvic S. Efficient Ladder-Style DenseNets for Semantic Segmentation of Large Images. *IEEE Trans Intell Transp Syst.* 2020;14(8):1-13.
- Dharsee N, Haule M, Mlawa G, Lwanga T. Identifying Training Needs in Pain Management - A Survey of Staff at a Tertiary Cancer Care Centre. *Pain Studies and Treatment.* 2022;10(2):12.
- Melo AB, Damiani A, Coelho PM, Assis ALEM, Nogueira BV, Ferreira LG, et al. Resistance training promotes reduction in Visceral Adiposity without improvements in Cardiomyocyte Contractility and Calcium handling in Obese Rats. *Int J Med Sci.* 2020;17(12):1819-32.
- Kong Y, Ni D. A Semi-supervised and Incremental Modeling Framework for Wafer Map Classification. *IEEE Trans Semicond Manuf.* 2020;33(1):62-71.
- Martins T, Jesus V, Sasaki D. The Magnus effect in volleyball service by video analysis. *Eur J Phys.* 2022;43(1):015002.
- Zhang S, Mao H. Optimization Analysis of Tennis Players' Physical Fitness Index Based on Data Mining and Mobile Computing. *Wirel Commun Mob Comput.* 2021;2021(11):1-11.
- Racinais S, Alhammoud M, Nasir N, Bahr R. Epidemiology and risk factors for heat illness: 11 years of Heat Stress Monitoring Programme data from the FIVB Beach Volleyball World Tour Original research. *Br J Sports Med.* 2020;55(15):1-6.
- Krzywanski J, Kuchar E, Pierzynski R. Cutaneous larva migrans in a beach volleyball player. *IDCases.* 2021;24(1):e01084.
- Zhang G, Zhong L. Research on volleyball action standardization based on 3D dynamic model. *Alex Eng J.* 2021;60(4):4131-8.
- Yang T. Optimization of Volleyball Motion Estimation Algorithm Based on Machine Vision and Wearable Devices. *Microprocess Microsyst.* 2020;81(4):103750.