

# SPORTS INJURY AND REHABILITATION OF THE SHOULDER JOINT IN VOLLEYBALL

LESÃO ESPORTIVA E REABILITAÇÃO DA ARTICULAÇÃO DO OMBRO NO VOLEIBOL

LESIÓN DEPORTIVA Y REHABILITACIÓN DE LA ARTICULACIÓN DEL HOMBRO EN EL VOLEIBOL



ORIGINAL ARTICLE  
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## ABSTRACT

**Introduction:** Volleyball is a high-intensity sport, and sports injuries are not rare. The shoulder joint has the highest incidence of injury among the most injured joints. **Objective:** Study the shoulder joint injury during volleyball practice and explore the effects of its rehabilitation. **Methods:** The article used an experimental control with 40 athletes with shoulder joint injuries, randomly divided into experimental and control groups. The experimental group performed comprehensive shoulder joint rehabilitation training lasting 30 minutes daily. The control group performed traditional massages of the same duration and frequency. The experiment lasted 8 weeks, and the data on the shoulder joint injuries and the performance of the volleyball players were recorded and statistically analyzed. **Results:** The experimental group's scores stood out compared to the control group regarding flexibility and functional performance. **Conclusion:** Integral rehabilitation training showed greater efficacy in shoulder joint rehabilitation and may effectively reduce the risk of secondary sports injuries in athletes. Its promotion in the current rehabilitation and sports training scenario is valid and can be promoted.

**Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Volleyball; Shoulder Joint; Athletic Injuries.

## RESUMO

**Introdução:** O voleibol é um esporte de alta intensidade e não são raros os acidentes esportivos, sendo a articulação do ombro a de maior incidência dentre as articulações mais lesionadas. **Objetivo:** Estudar a lesão da articulação do ombro durante a prática do voleibol e explorar os efeitos da sua reabilitação. **Métodos:** O artigo utilizou um controle experimental com 40 atletas lesados na articulação do ombro, divididos aleatoriamente em grupo experimental e controle. O grupo experimental realizou um treinamento de reabilitação integral na articulação do ombro com duração de 30 minutos em intervalos diários. O grupo de controle realizou a massagem tradicional, de mesma duração e frequência. O experimento durou 8 semanas, os dados das lesões articulares do ombro e o desempenho dos jogadores de voleibol foram registrados e analisados estatisticamente. **Resultados:** A pontuação do grupo experimental destacou-se frente ao grupo de controle, tanto em termos de flexibilidade como no desempenho funcional. **Conclusão:** O treinamento de reabilitação integral demonstrou maior eficácia na reabilitação articular do ombro, podendo efetivamente reduzir o risco de lesões esportivas secundárias no atleta. Conclui-se que a sua promoção no atual cenário de reabilitação e treinamento esportivo é válida e pode ser promovida. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Voleibol; Articulação do Ombro; Traumatismos em Atletas.

## RESUMEN

**Introducción:** El voleibol es un deporte de alta intensidad y los accidentes deportivos no son raros, siendo la articulación del hombro la de mayor incidencia entre las articulaciones más lesionadas. **Objetivo:** Estudiar la lesión de la articulación del hombro durante la práctica del voleibol y explorar los efectos de su rehabilitación. **Métodos:** El artículo utilizó un control experimental con 40 atletas lesionados en la articulación del hombro, divididos aleatoriamente en grupos experimental y de control. El grupo experimental realizó un entrenamiento integral de rehabilitación de la articulación del hombro de 30 minutos de duración a intervalos diarios. El grupo de control realizó un masaje tradicional con la misma duración y frecuencia. El experimento duró 8 semanas, se registraron y analizaron estadísticamente los datos de las lesiones de la articulación del hombro y el rendimiento de los jugadores de voleibol. **Resultados:** Las puntuaciones del grupo experimental destacaron frente a las del grupo de control, tanto en términos de flexibilidad como de rendimiento funcional. **Conclusión:** El entrenamiento de rehabilitación integral demostró una mayor eficacia en la rehabilitación de la articulación del hombro, y puede reducir eficazmente el riesgo de lesiones deportivas secundarias en el atleta. Se concluye que su promoción en el escenario actual de la rehabilitación y el entrenamiento deportivo es válida y puede promoverse. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptorios:** Voleibol; Articulación del Hombro; Traumatismos en Atletas.



## INTRODUCTION

When volleyball is playing, it is the main way for athletes to hit volleyball by jumping. China has a large number of people participating in volleyball, and its achievements are also very excellent.<sup>1</sup> Volleyball has a high degree of participation, and people are willing to participate in this sport.<sup>2</sup> Because of the special way of volleyball, it is impossible to avoid the whole body joint to participate in the sport. In the state of high intensity sports, it is often accompanied by various joint sports injuries.<sup>3</sup> In volleyball, shoulder joint injuries are common. By studying how to prevent shoulder joint sports injury, it is necessary to reduce the probability of shoulder joint sports injury. And how to recover after suffering from shoulder joint sports injury can effectively reduce the impact of injury.<sup>4</sup> The research on these two links plays a vital role in the positive development of China's volleyball.<sup>5</sup>

## METHOD

This paper first collected a large amount of data, including the relevant literature on kinematics and medicine related to shoulder joint sports injury and shoulder joint rehabilitation, and communicated with front-line sports coaches and hospital specialists to further understand the current volleyball shoulder joint injury situation and the matters needing attention in the recovery process of the shoulder joint, which laid a solid foundation for this study. The study and all the participants were reviewed and approved by Ethics Committee of Coaching Academy of General Administration of Sport(NO.CAGAZT022-2019). Subsequently, 40 subjects were selected from the undergraduate sports volleyball students who had a history of shoulder joint injury in a university to carry out relevant research.

According to the form of random lot drawing, 40 athletes with shoulder joint injuries were divided into the experimental group and the control group. Each group of 20 athletes had little difference in age, height, weight and years of exercise. After calculation,  $P > 0.05$  would not cause too much interference to the experimental results. (Table 1)

This paper designed a comprehensive rehabilitation training model for the shoulder joint, including trapezius muscle traction, prone Y posture stretching, sitting rowing exercise, and in situ weight bearing arm swing. Through the pre experiment and the judgment of the relevant physiotherapy rehabilitation doctors, the comprehensive rehabilitation training model designed in this paper has achieved certain results, and will not have a negative impact on the athletes with shoulder joint damage.

The article uses the control experiment form of control variables. The experimental group carries out comprehensive rehabilitation training of the shoulder joint in the form of one day interval, each time for 30 minutes, including multiple stretching activities, and each group will have a 45 second rest time to ensure the combination of work and rest, and prevent the adverse effects of excessive exercise on the shoulder joint. The control group carried out the traditional massage method at the same time, and its training duration and frequency were completely consistent. The exercise lasted for 8 weeks. Before the experiment, the volleyball players' shoulder joint injuries were recorded. After the experiment for 8 weeks, the relevant data were measured and calculated again, and the  $X \pm SD$  value before and after the experiment, and the proportion of improvement was calculated.

**Table 1.** Basic information analysis of the experimental group and the control group.

| Group              | Age            | Height          | Weight         | Sport years   |
|--------------------|----------------|-----------------|----------------|---------------|
| Experimental group | 21.4730±0.9858 | 183.5657±4.6251 | 77.0497±3.2760 | 5.4230±1.3005 |
| Control group      | 21.2392±1.3998 | 183.3796±4.6659 | 78.7898±3.1091 | 5.5441±1.1849 |

## RESULTS

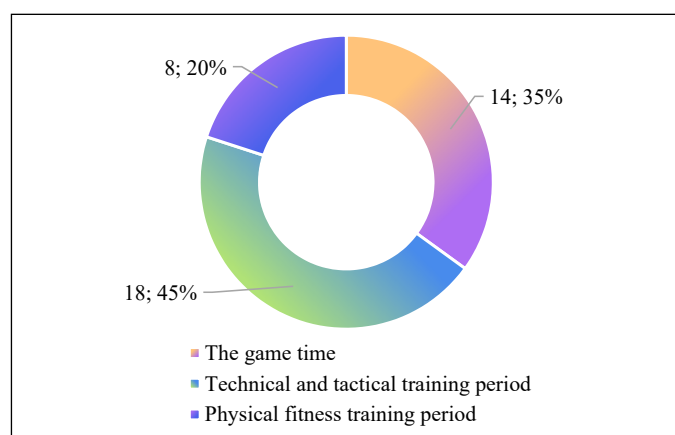
### Analysis of shoulder joint injuries in volleyball

As shown in Figure 1, the process of shoulder joint sports injury in this research object. It can be seen from the figure that the largest proportion is in the technical and tactical training period, with 18 people, accounting for 45%. In this period, athletes need to learn relevant technologies and simulate the battle. Facing a more intense situation and unfamiliar skills, it is easy to damage the shoulder joint due to the lack of standardized skills or warm-up activities. Secondly, shoulder joint injuries occurred during the competition period, with 14 people, accounting for 35%. The fierce competition has brought double pressures to the athletes both physically and psychologically. Some athletes are eager to win. When they fight, the action range is too large, which exceeds the load that the shoulder joint can bear, and it is very easy to cause shoulder joint injuries. There are also some athletes who are too nervous during the competition, resulting in negligence or inadequate warm-up, which leads to injury during the competition. There were also 8 people who suffered from shoulder joint injuries during physical fitness training. In addition to insufficient preparation activities, this situation also resulted in irregular movements due to insufficient concentration during training, leading to fine joint injuries. In order to pursue perfection excessively, some athletes train hard, regardless of the strength of their bodies, overload sports, and over time caused shoulder injuries. It can be seen that in the process of sports, we should pay attention to the prevention of shoulder joint injuries, prepare for activities, and scientifically train our bodies and movements, so that our ability level and physical health can develop together.

### Recovery effect of rehabilitation training on shoulder joint injury of volleyball players

When judging the recovery effect of shoulder joint injury, straight arm forward flexion and upward lifting and straight arm backward extension were selected as the judgment criteria. The athletes completed relevant actions as far as possible until they had to stop because of the pain, and their distances were calculated. The greater the distance, the greater the range of movements that the athlete can complete, which proves that the better the flexibility of the shoulder joint.

Table 2 shows the relevant data of the experimental group after 8 weeks of comprehensive rehabilitation training. The left straight arm forward flexion and lifting increased by 2.8452%, the right straight arm forward flexion and lifting increased by 1.1864%, the left straight arm backward extension increased by 10.2891%, and the right straight arm backward extension increased by 11.7096%,  $P < 0.05$ , indicating that there were significant differences. It can be seen from the data results that comprehensive rehabilitation training can greatly improve the range of



**Figure 1.** Time of Sports Injury.

**Table 2.** Effect of rehabilitation training on recovery of shoulder joint injury in experimental group.

| Experimental group              | Before          | After           | Improvement rate | P      |
|---------------------------------|-----------------|-----------------|------------------|--------|
| Left straight arm forward lift  | 151.7815±1.8763 | 156.5833±1.6131 | 2.8452%          | 0.0040 |
| Right straight arm forward lift | 153.1276±1.9061 | 154.5895±1.5791 | 1.1864%          | 0.0199 |
| Left straight arm extension     | 33.4658±1.2862  | 36.7120±1.6430  | 10.2891%         | 0.0263 |
| Right straight arm extension    | 32.3139±1.0356  | 37.0314±0.9828  | 11.7096%         | 0.0183 |

shoulder joint activity on both sides of the experimental group athletes, and the optimization effect in straight arm backward extension is higher than that in straight arm forward extension.

Table 3 shows the influence of rehabilitation training on the recovery of shoulder joint sports injury in the control group. It can be seen from the data that the traditional massage method is also effective and can improve the range of shoulder joint activity, but compared with the experimental group, the range of improvement is relatively low. Based on the comprehensive analysis of the research results of the experimental group and the control group, it can be seen that in the overall treatment, the optimization range of the left shoulder joint is relatively larger than that of the right side, indicating that many athletes will give priority to the rehabilitation of the right shoulder joint in order to recover their self-care ability as much as possible during the rehabilitation training process, which makes the left shoulder joint have certain problems. Through this shoulder joint injury rehabilitation training, we can balance the activities of the left and right shoulder joints and promote the balanced development of the athletes. Through data comparison, it can be seen that the comprehensive rehabilitation training method designed in this paper has a higher improvement rate and a better shoulder joint recovery effect than traditional massage training.

### Preventive effect of rehabilitation training on sports injuries of volleyball majors

When studying the effect of sports injury prevention, the commonly used test is FMS test, which includes deep squat, hurdle step, straight lunge squat, shoulder joint flexibility, active straight leg lift, trunk stability push up, rotation stability and other options. The three-point system is used for scoring. The higher the score, the higher the fluency of the action, and will reduce the risk of sports injury in subsequent sports training.

Table 4 shows the preventive effect of rehabilitation training on action injury in the experimental group. The squat score increased by 16.4098%, the hurdle step score increased by 20.7597%, the straight lunge squat score increased by 28.7377%, the shoulder joint flexibility score increased by 35.8367%, the active straight leg lift score increased by 12.8820%, the trunk stability push up score increased by 23.9506%, and the rotation stability score increased by 22.8847%. The data results show that the comprehensive rehabilitation training can greatly optimize the relevant data of the experimental group athletes, making the flexibility of the athletes greatly improved. So as to prevent secondary injury as much as possible, it shows that the comprehensive rehabilitation training in this paper is meaningful.

As shown in Table 5, the analysis of the sports injury of the control group by rehabilitation training. From the data results, we can see that the traditional massage method pays more attention to the recovery of the last injury, and pays less attention to the prevention effect of the subsequent sports injury. Not only is the proportion of the increase smaller than that of the experimental group, but also scores of many items show a decline. This shows that even after the rehabilitation training of the control group, the athletes are easy to have secondary injuries in the

**Table 3.** Effect of rehabilitation training on recovery of shoulder joint sports injury in control group.

| Control group                   | Before          | After           | Improvement rate | P      |
|---------------------------------|-----------------|-----------------|------------------|--------|
| Left straight arm forward lift  | 152.0005±2.5811 | 155.1551±2.0114 | 2.4165%          | 0.0150 |
| Right straight arm forward lift | 153.6070±2.0550 | 154.5397±1.8236 | 0.9048%          | 0.0319 |
| Left straight arm extension     | 33.7714±1.2963  | 35.5980±1.4538  | 5.9976%          | 0.0354 |
| Right straight arm extension    | 32.2642±0.9260  | 34.8717±1.1317  | 5.3392%          | 0.0438 |

**Table 4.** Preventive effect of rehabilitation training on sports injury in experimental group.

| Experimental group       | Before         | After          | Improvement rate | P      |
|--------------------------|----------------|----------------|------------------|--------|
| Squat                    | 2.4959±0.3259  | 2.9055±0.0473  | 16.4098%         | 0.0000 |
| Hurdle step              | 1.9927±0.5291  | 2.4064±0.5194  | 20.7597%         | 0.2000 |
| Straight Lunge Squat     | 2.3661±0.5081  | 2.9461±0.0000  | 28.7377%         | 0.0110 |
| Shoulder flexibility     | 1.8632±0.9667  | 2.5309±0.3473  | 35.8367%         | 0.0971 |
| Active straight leg lift | 2.4809±0.4381  | 2.8005±0.1703  | 12.8820%         | 0.1738 |
| Torso stability push ups | 1.7366±0.4583  | 2.1526±0.6498  | 23.9506%         | 0.0000 |
| Rotational stability     | 1.2479±1.0489  | 1.5335±0.7488  | 22.8847%         | 0.5733 |
| Total score              | 14.1411±1.7471 | 17.3315±1.2553 | 22.5617%         | 0.0000 |

**Table 5.** Preventive effect of rehabilitation training on sports injury in control group.

| Experimental group       | Before         | After          | Improvement rate | P      |
|--------------------------|----------------|----------------|------------------|--------|
| Squat                    | 2.3661±0.5061  | 2.2778±0.6946  | -3.7320%         | 0.6955 |
| Hurdle step              | 2.1123±0.4389  | 2.4064±0.3536  | 13.9243%         | 0.1726 |
| Straight Lunge Squat     | 2.1165±0.3487  | 2.5384±0.4259  | 19.9325%         | 0.0799 |
| Shoulder flexibility     | 2.2418±0.7427  | 2.1462±0.8451  | -4.2647%         | 0.7484 |
| Active straight leg lift | 2.4809±0.5181  | 2.6681±0.3214  | 7.5458%          | 0.3588 |
| Torso stability push ups | 1.6076±0.5081  | 1.7769±0.7107  | 10.5284%         | 0.7454 |
| Rotational stability     | 1.3677±1.0795  | 1.0224±0.7488  | -25.2526%        | 0.2902 |
| Total score              | 14.2601±1.6772 | 14.8006±1.7008 | 3.7902%          | 0.6479 |

subsequent sports, which will have a more serious impact on some parts that already have injuries. Therefore, the comprehensive rehabilitation training mode proposed in this paper is a more effective rehabilitation training mode than the traditional massage method.

## DISCUSSION

In the process of volleyball, due to frequent upper limb exertion, it is likely to cause various shoulder joint sports injuries. The common symptoms of shoulder joint sports injury are that the shoulder cannot be lifted, there is pain at the shoulder joint, and shoulder joint dislocation. In many cases of shoulder joint sports injury, the clinical manifestations are mainly pain and limited joint movement angle. Shoulder sports injuries not only affect the daily training of volleyball, but also cause psychological damage to the injured. After suffering from shoulder joint sports injury, when playing volleyball again, having a history of injury will lead to psychological fear, which indirectly affects the practice of volleyball. Therefore, we should know the relevant protective measures in advance when playing volleyball. The prevention of shoulder joint sports injury can effectively improve training efficiency and project performance, which is of great significance to the development of volleyball. First of all, we should cultivate the awareness of sports personnel to prevent injuries. In volleyball related teaching, cultivating students' self-protection awareness should be put in the first place. Guide students

to understand the causes of injuries in volleyball. Suggestions on effective injury prevention are given. Secondly, adequate warm-up activities should be carried out before sports, which is a necessary link before all sports. Warm up activities can turn on your own sports activity. Make your own muscle tissue flexible. The activity of the nervous system meets the requirements of sports. And the warm-up exercise is more flexible for opening joints. Guiding students to warm up correctly can effectively avoid all kinds of shoulder injuries in volleyball. The next step is to strengthen joint strength training. In the daily training activities, the corresponding strengthening training should be carried out for the shoulder joint. When you have excellent joint strength attributes, the probability of joint sports injuries will be reduced a lot. Excellent joint strength, able to withstand sudden pressure or stress during exercise. Teachers can carry out targeted special teaching according to the joint strength of different students. The next step is to avoid exercising under fatigue. During the exercise, if you feel tired, you should stop the exercise in time. Exercise under fatigue state increases the probability of sports injury. Wait until your body is fully rested before exercising.

## CONCLUSION

In terms of current sports injury rehabilitation, many athletes only pay attention to the recovery of existing injuries, but not enough attention to the prevention of subsequent injuries. Therefore, many athletes will have secondary injuries at the same joint after rehabilitation, which has a lot of adverse effects on the physical health and career of athletes. The comprehensive rehabilitation training proposed in this paper combines the rehabilitation of shoulder joint with the prevention of shoulder joint sports injury, so as to conduct all-round research on shoulder joint protection. The results show that comprehensive rehabilitation training, compared with traditional massage, not only has a better effect on shoulder joint rehabilitation, but also can effectively reduce the risk of shoulder joint secondary sports injury. Therefore, it is worth promoting in the field of current sports training and sports rehabilitation.

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

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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. Zhigang Song: writing and execution. Ran Wang and Hua Zheng: data analysis and article reviews.

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