

# JOINT INJURIES IN MARTIAL ARTS AND THEIR PREVENTIVE MEASURES

LESÕES ARTICULARES NAS ARTES MARCIAIS E SUAS MEDIDAS PREVENTIVAS

LESIONES ARTICULARES EN LAS ARTES MARCIALES Y SUS MEDIDAS PREVENTIVAS



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## ABSTRACT

**Introduction:** Martial arts athletes are highly prone to joint injuries during training or sports events. These injuries can affect professional performance and cause deleterious psychological damage to athletes. **Objective:** Explore the current status of joint injuries in martial arts and propose effective preventive measures. **Methods:** Martial arts athletes were selected to evaluate the types of joint injuries and the method of training in rehabilitating these injuries (n=32). They were randomly divided into an experimental group and a control group. The experimental group received a specific functional preventive training protocol based on updated scientific findings, while the control group received traditional physical training. Range of motion and functional FMS tests were performed before and after the interventions. The results were compared statistically. **Results:** The most common type of injury for athletes in martial arts is joint injury, followed by ligament and synovial inflammation. The probability of a joint injury rises when athletes are in continuous action training; the FMS test results of the athletes in the experimental group were significantly improved, with a very significant effect. **Conclusion:** The preventive functional training proposed in this paper can improve athletes' fitness, improve coordination and joint stability, and prevent sports injuries. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Martial Arts; Athletic Injuries; Joints; Accident Prevention.

## RESUMO

**Introdução:** Os atletas de artes marciais são altamente propensos a lesões articulares durante o treinamento ou em eventos esportivos. Essas lesões podem afetar o desempenho profissional, além de causar danos psicológicos deletérios aos atletas. **Objetivo:** Explorar a condição atual das lesões articulares nas artes marciais propondo medidas preventivas eficazes. **Métodos:** Atletas de artes marciais foram selecionados para avaliar os tipos de lesões articulares e o método do treinamento na reabilitação dessas lesões (n=32). Eles foram divididos aleatoriamente em grupo experimental e grupo de controle. O grupo experimental recebeu um protocolo específico de treinamento preventivo funcional baseado nos achados científicos atualizados, enquanto o grupo controle recebeu o treinamento físico tradicional. Foram efetuados os testes de amplitude de movimento e FMS funcional antes e após as intervenções. Comparou-se os resultados estatisticamente. **Resultados:** O tipo de lesão mais comum dos atletas nas artes marciais é a lesão articular, seguida da ligamentar e a inflamação sinovial. A probabilidade de uma lesão articular eleva-se quando os atletas estão em treinamento de ação contínua; os resultados do teste FMS dos atletas do grupo experimental foram significativamente melhorados, com um efeito muito significativo. **Conclusão:** O treinamento funcional preventivo proposto neste trabalho pode efetivamente melhorar a aptidão física dos atletas, melhorar a coordenação e estabilidade das articulações, prevenindo as lesões esportivas. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Artes Marciais; Traumatismos em Atletas; Articulações; Prevenção de Acidentes.

## RESUMEN

**Introducción:** Los atletas de artes marciales son muy propensos a sufrir lesiones articulares durante los entrenamientos o las pruebas deportivas. Estas lesiones pueden afectar al rendimiento profesional, además de causar daños psicológicos deletéreos a los deportistas. **Objetivo:** Explorar la situación actual de las lesiones articulares en las artes marciales proponiendo medidas preventivas eficaces. **Métodos:** Se seleccionaron atletas de artes marciales para evaluar los tipos de lesiones articulares y el método de entrenamiento en la rehabilitación de estas lesiones (n=32). Se dividieron aleatoriamente en grupo experimental y grupo de control. El grupo experimental recibió un protocolo específico de entrenamiento funcional preventivo basado en hallazgos científicos actualizados, mientras que el grupo de control recibió entrenamiento físico tradicional. Se realizaron pruebas de amplitud de movimiento y de FMS funcional antes y después de las intervenciones. Los resultados se compararon estadísticamente. **Resultados:** El tipo de lesión más común en los deportistas de artes marciales es la lesión articular, seguida de la inflamación de ligamentos y sinovial. La probabilidad de una lesión articular aumenta cuando los deportistas realizan un entrenamiento de acción continua; los resultados de las pruebas FMS de los deportistas del grupo experimental mejoraron significativamente, con un efecto muy significativo. **Conclusión:** El entrenamiento funcional preventivo propuesto en



**Descriptores:** Artes Marciales; Traumatismos en Atletas; Articulaciones; Prevención de Accidentes.

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## INTRODUCTION

Sports have been widely known among the public. More and more people have exercised and participated in various sports.<sup>1</sup> Traditional martial arts has also become an important part of sports, and has played a decisive role in sports. The reason why athletes will have the risk of injury in the process of participating in sports is that the methods of exercise are not scientific and reasonable enough. Athletes who participate in martial arts will also suffer from sports injury due to improper training methods.<sup>2</sup> After sports injury, it will lead to the decline of athletes' physical functions, hinder athletes from continuing training, improve their own skills, and will also have a certain negative impact on athletes' psychology and physiology.<sup>3</sup> At present, the exercise design scheme of martial arts athletes has been gradually improved, but martial arts athletes are still inevitably injured, and sports injuries are often chronic diseases, which easily lead to irreparable negative effects. Through literature research and situation investigation, it can be seen that after the training injury of martial arts athletes, the degree of attention is not high, and proper preventive measures have not been taken, coupled with the lack of scientific and reasonable protection and treatment of sports injuries, resulting in the injury of athletes will affect the training effect and competition results.<sup>4</sup> At present, martial arts training methods have trained a lot of martial arts athletes for China. However, with the continuous development of sports culture and the continuous updating of scientific means of sports training, traditional martial arts also needs scientific training methods to escort its development.<sup>5</sup> Therefore, the problems of joint injury and prevention in martial arts are urgently needed to be solved. At present, there are few researches on joint injuries of martial arts athletes, and most of them are conducted from the aspect of clinical medical treatment, and no reasonable and comprehensive research results have been proposed.<sup>6</sup> Therefore, the research on martial arts sports injuries and preventive measures should be further explored. Through investigation and research, it can be seen that the action completion effect of martial arts is an important factor affecting the competitive level of athletes.<sup>7</sup> Therefore, the most important thing for athletes to obtain excellent skills is that they have no joint injuries and maintain good physical and mental conditions. Any sports event requires long-term training to obtain a good level of skills.<sup>8</sup> How to prevent joint injuries, give full play to the potential of athletes, and achieve outstanding results, martial arts athletes still need further research and discussion. Based on the joint injuries of martial arts athletes, this paper conducts a research, through experimental intervention, compares the physical fitness of martial arts athletes before and after the intervention, and puts forward preventive measures, which lays a certain theoretical foundation for further improving the training methods and means of martial arts.<sup>9</sup>

## METHOD

### Subject of experiment

In this paper, a professional wushu athletes as the research object, a total of 32 wushu training team members, all male, through the method of random grouping, 32 subjects were randomly divided into experimental group and control group. The study and all the participants were reviewed and approved by Ethics Committee of Guangzhou Institute of

Technology(NO.GZIT18-0695P). The basic information of 32 male martial arts athletes is shown in Table 1. This paper makes a comparative analysis on the age, height, weight and BMI of the subjects, and all subjects have no obvious disease. It can be seen from the data in Table 1 that there is no significant difference in the basic situation of athletes between the experimental group and the control group.

## Experimental methods

This paper studies the sports injury of athletes through questionnaire survey. Firstly, the current situation of wushu was investigated, and the common situation of wushu sports injuries was summarized.

The experimental plan formulated in this study follows the scientific principle, comprehensively considers the characteristics of martial arts training and the physical functions of martial arts athletes, so as to design functional action screening tests and injury prevention measures for experimental objects. The content and intensity of experimental training will be gradually improved according to the training effect and physical condition of athletes, so as to ensure that athletes can obtain better training effect.

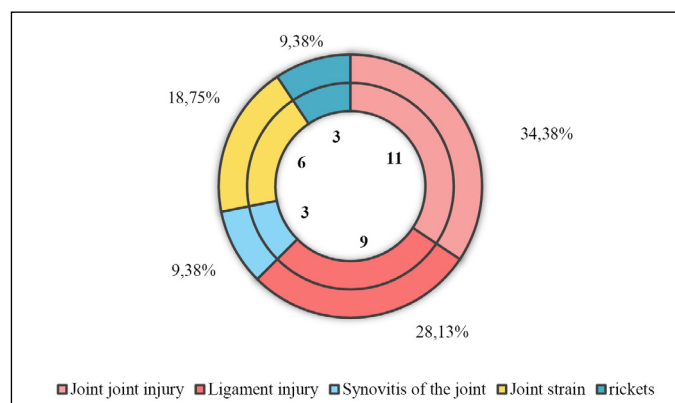
## RESULTS

### Investigation Results of Wushu Sports Injuries

This experiment investigated and analyzed the situation of joint injuries in martial arts, and the main information is shown in Figure 1. It can be seen from the data in Figure 1 that the most common injury type of martial arts athletes is joint injuries, with 11 injuries, up to 34.38%; The second injury type was ligament injury, with 9 injuries, accounting for 28.13%; The third injury type is joint strain, with 6 injuries, accounting for 18.75%; For joint synovitis and chondrosis, the number of injured persons was at least 3, accounting for 9.38%. It can be seen that the most common injury type in martial arts is joint joint injury.

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

Option	Experience group	Control group
Age	23.016 ±2.2062	24.098 ±2.4144
Height (cm)	173.820 ±4.6535	172.794 ±6.1137
Weight (kg)	64.723 ±8.5969	65.128±7.1466
BMI index	21.365 ±2.5354	22.342 ±1.4836



**Figure 1.** Common situations of joint injuries in martial arts.

In order to conduct a more in-depth and detailed experimental analysis on the situation of martial arts sports injuries, this paper investigated the training state of athletes when sports joints were injured, as shown in Figure 2. It can be concluded from Figure 2 that when athletes are in the state of continuous action training, they are more likely to be injured and more likely to cause joint injuries. There are 13 times of injuries, accounting for 40.63%; When the athletes were in the state of repeated training, the number of injuries was 11, accounting for 34.38%; When the athletes carried out split training, the number of injuries was 5, accounting for 15.63%; The number of injuries in other training conditions was 3, accounting for only 9.38%.

Wushu requires high physical quality of athletes. When athletes are tired, they will inevitably feel muscle soreness and lack of confidence subjectively, which will also lead to the decline of movement coordination, control ability and joint damage. When athletes suffer from joint injuries during training, but they are not treated in time, they cannot obtain physical and psychological comfort. Due to unscientific treatment methods, unreasonable recovery time arrangement of injuries and diseases, etc., the recovery effect of athletes' joint injuries is poor. The increase of training time leads to repeated attacks of athletes' joint injuries, resulting in poor training effect and other problems. In addition, some athletes and coaches do not pay enough attention to the physical quality training, over arrange sports training, and constantly increase the

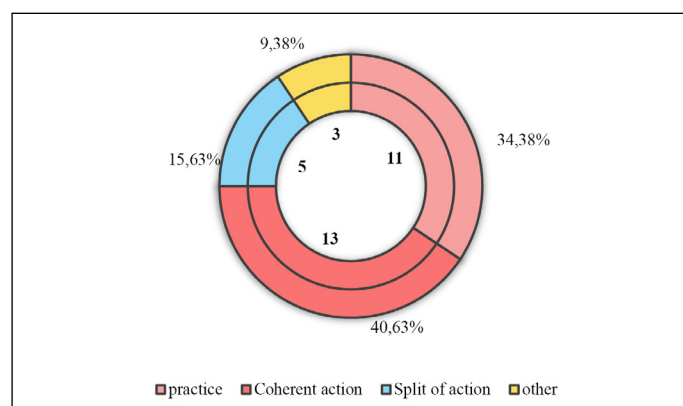


Figure 2. Training state of joint injuries in wushu.

training load, resulting in injuries to athletes. Some athletes were injured because they did not control their emotions, were overexcited, or were distracted due to external factors such as the training site and weather.

### Analysis of injury prevention effect of Wushu athletes

This paper tests the joint range of motion of Wushu athletes before and after the preventive training experiment. The specific test results are shown in Table 2. In the experimental group, the range of motion of wrist palmar flexion was  $85.600 \pm 8.0243^\circ$  before preventive training, and  $89.627 \pm 6.2813^\circ$  after training, an increase of about  $4^\circ$ ; The range of motion of shoulder pronation increased from  $48.562 \pm 7.9900^\circ$  to  $51.659 \pm 9.5986^\circ$ , the range of motion of elbow pronation increased from  $81.052 \pm 8.8709^\circ$  to  $83.737 \pm 6.3284^\circ$ , and the range of motion of elbow pronation increased from  $132.163 \pm 20.5777^\circ$  to  $134.826 \pm 18.6160^\circ$ . Ankle dorsiflexion has no obvious change after preventive training.

In this paper, all subjects were tested with FMS functional motion screening instrument, and the specific results are shown in Table 3. It can be seen from Table 3 that after preventive training, the scores of all subjects in the experimental group have been significantly improved,  $P < 0.01$ . Among them, the score before the right lunge training was  $1.595 \pm 0.5180$ , and after the training was  $2.759 \pm 0.4756$ . The improvement effect was very significant. The left lunge test score increased from  $1.619 \pm 0.7152$  to  $2.791 \pm 0.4291$ , the left and right hurdle step training scores increased from  $1.930 \pm 0.5722$ ,  $1.783 \pm 0.6279$  to  $2.963 \pm 0.3090$ ,  $2.844 \pm 0.4140$ , and the squatting training score increased from  $1.495 \pm 0.6374$  to  $2.539 \pm 0.5152$ . The improvement effect was very significant.

## DISCUSSION

### Analysis of joint injuries in martial arts

Through the summary and analysis of the causes of injury of martial arts athletes, the causes of injury may exist in the following aspects: the athletes' joint injuries are not healed, they participate in training or competition with injuries, their bodies are in a state of fatigue, the athletes' preparations before training or competition are not sufficient, or their joints are overloaded, they do not correctly master the essentials and skills of the movement, and the treatment of injuries and diseases of athletes is not scientific, The training program is unreasonable, and the above reasons for martial arts sports injuries may cause sports injuries to athletes.

Table 2. Joint range of motion of wushu athletes before and after preventive training.

Option	Experience group		Control group		P
	Before training	After training	Before training	After training	
Shoulder joint external rotation ( $^\circ$ )	100.202 $\pm$ 9.4496	103.067 $\pm$ 7.2720	122.539 $\pm$ 14.1036	112.584 $\pm$ 13.3155	0.0086
Shoulder joint pronation ( $^\circ$ )	48.562 $\pm$ 7.9900	51.659 $\pm$ 9.5986	68.877 $\pm$ 5.5889	59.771 $\pm$ 9.6683	0.0486
Elbow pronation ( $^\circ$ )	81.052 $\pm$ 8.8709	83.737 $\pm$ 6.3284	90.216 $\pm$ 6.8376	80.629 $\pm$ 10.4784	0.0386
Elbow supination ( $^\circ$ )	132.163 $\pm$ 20.5777	134.826 $\pm$ 18.6160	146.074 $\pm$ 17.2673	133.562 $\pm$ 16.5010	0.0250
Wrist joint palmar flexion ( $^\circ$ )	85.600 $\pm$ 8.0243	89.627 $\pm$ 6.2813	93.324 $\pm$ 8.0954	88.063 $\pm$ 8.8770	0.0427
Wrist joint dorsal extension ( $^\circ$ )	69.829 $\pm$ 10.2244	69.949 $\pm$ 10.2386	74.334 $\pm$ 8.3915	65.318 $\pm$ 12.1279	0.0096
Hip joint external rotation ( $^\circ$ )	31.050 $\pm$ 6.0998	32.254 $\pm$ 5.3425	40.975 $\pm$ 7.0295	34.591 $\pm$ 8.3128	0.0060
Hip joint internal rotation ( $^\circ$ )	34.696 $\pm$ 6.7685	37.559 $\pm$ 4.9350	48.651 $\pm$ 6.2930	40.214 $\pm$ 9.6145	0.0014
Knee flexion ( $^\circ$ )	126.634 $\pm$ 4.9338	127.686 $\pm$ 6.0426	129.791 $\pm$ 5.3525	127.083 $\pm$ 4.6625	0.0035
Ankle dorsiflexion ( $^\circ$ )	18.190 $\pm$ 4.9879	21.716 $\pm$ 6.3803	23.583 $\pm$ 4.4213	21.076 $\pm$ 5.2113	0.0673

Table 3. FMS Test Results of Wushu Athletes before and after Preventive Training.

Option	Experience group		Control group		P
	Before training	After training	Before training	After training	
Overhead squat	1.495 $\pm$ 0.6374	2.539 $\pm$ 0.5152	1.390 $\pm$ 0.6539	1.821 $\pm$ 0.4266	0.0040
Left Hurdle Step	1.930 $\pm$ 0.5722	2.963 $\pm$ 0.3090	1.619 $\pm$ 0.5211	2.125 $\pm$ 0.5582	0.0010
Right Hurdle Step	1.783 $\pm$ 0.6279	2.844 $\pm$ 0.4140	1.495 $\pm$ 0.7082	2.081 $\pm$ 0.5722	0.0060
Left Lunge	1.619 $\pm$ 0.7152	2.791 $\pm$ 0.4291	1.533 $\pm$ 0.5083	2.146 $\pm$ 0.5520	0.0061
Right Lunge	1.595 $\pm$ 0.5180	2.759 $\pm$ 0.4756	1.495 $\pm$ 0.5261	1.930 $\pm$ 0.5548	0.0030

Therefore, athletes need to scientifically adjust their physiological and psychological fatigue, maintain a positive attitude, release the competition pressure as much as possible, and ensure that their bodies are in good condition. Before training and competition, coaches should design scientific and reasonable preparation activities for athletes, especially focusing on the flexibility and flexibility of athletes' joints. After injury, athletes should be treated in time and recovered scientifically. After recovery, appropriate training and competition should be arranged, and scientific and reasonable training programs should be formulated to avoid athletes from being injured again or participating in training and competition with diseases. Athletes need to continue to learn theoretical knowledge, reasonably arrange training load, and avoid increasing training intensity in a hurry to achieve results, which will lead to overload and sports injury. Coaches need to take a variety of means to help athletes master the essentials and skills of martial arts movements, and pay attention to the practice of correct technical essentials in daily training. Athletes need to improve their self-protection awareness, focus on training and competition, and avoid external factors such as venue or weather affecting their own state.

### Analysis of preventive measures for joint injuries in martial arts

In this paper, through functional preventive training for experimental subjects, according to the data in Table 2, the range of motion of ankle dorsiflexion joints has not been significantly improved, while that of other parts has been significantly improved. FMS functional action screening test has been widely used in sports. This test method can help coaches and athletes obtain objective functional obstacle detection results, and develop professional training programs through the FMS detection results. According to the data results in Table 3, after the functional prevention training, the test results of the athletes' squatting over the

top, left hurdle step, right hurdle step, left bow step and right bow step have significantly improved. After the functional prevention training, the test results of the experimental group have significantly improved, which shows that the experimental training program can effectively improve the physical fitness of athletes, joint range of motion has also significantly improved, and can prevent sports injuries.

### CONCLUSION

Through the investigation on the joint injuries of martial arts in this paper, we know that there are five types of joint injuries easily caused by this sport, including joint joint injuries, ligament injuries, joint strain, joint synovitis and chondromalacia. Among them, joint injuries have the highest incidence, followed by ligament injuries, and joint strain. The above three types of injuries are high frequency of joint injuries of martial arts athletes, which should be paid attention to. Through the analysis of the sports training state in which the athletes were injured, it can be seen that among the three training states of continuous action training, repeated practice training and action splitting, the number of injuries caused is the highest, among which the number of injuries caused during continuous action training accounts for 40.63%, which requires the attention of athletes and coaches, and the reasonable arrangement of continuous action training methods to avoid joint injuries. After the functional prevention training for all experimental subjects, it can be seen that the FMS test results of the experimental group have been significantly improved, and the range of motion of joints has also been improved. The experimental results show that the functional prevention training proposed in this paper can effectively improve the physical quality of athletes, improve joint coordination and stability, and prevent sports injuries.

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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. Wu Maotang: writing and execution. Su Zhifeng and Wan Mingyong: data analysis and article reviews.

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