

## PROPHYLACTIC EFFECT OF STRENGTH TRAINING METHOD ON HURDLE ANKLE INJURY

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### ABSTRACT

**Objective:** Questionnaire on athletes' ankle injury in hurdle sport with focus on strength training method is done. The findings can provide necessary guidance for training & rehabilitation of athletes.

**Method:** 2500 cases of hurdle athletes from different teams with ankle injury from June 2013 to June 2015 were reviewed. The causes of these injuries were analyzed and appropriate prevention as well as treatments were determined. These findings can help in preventing severe injuries during training and improve teaching methods in hurdle sport.

**Results:** Necessary rehabilitation programs with strength training method can prevent these ankle injuries as well as improve recovery, physical fitness and training quality of the athletes.

**Discussion:** In the process of ankle injury's repair, hurdler athletes' strength training should be improved. Hurdle athletes, coaches and medical staff should implement science based training to prevent ankle injuries during training and competitions.

**Keywords:** Strength Training, Hurdle Movement, Ankle Injury, Prophylactic Effect.

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### Introduction

Hurdling (as shown in Figure 1) is one of the major sport games in the world. Hurdle movement can cause damage to athletes' ankle, which will have negative impact on athletes' careers.

Moreover, serious ankle injury affect not only the physical health, but also the mental state of athletes, thereby affecting their performance during competitions and resulting in unsatisfactory results. It is important to study injury types and recovery methods in hurdling in order to improve training methods. Among hurdle injuries, ankle injury has become the focus of research internationally. Preventing ankle injuries and taking necessary countermeasures is crucial in hurdle training and athletes' development.

The author conducted a questionnaire among sport teachers, school students, track and field teams as well as professional hurdle athletes and coaches. The author documented the responses of the respondents and analyzed common types of hurdle ankle injury in athletes. Figure 2 shows ankle injury X-ray image. The analysis is divided to injury type and injury causes, then prevention and treatment measures were proposed based on cause of injury.



Figure 1: Schematic of hurdle movement<sup>(1)</sup>.



**Figure 2:** X-ray image of a patient with ankle injury.

## Method

Questionnaire was conducted among teachers and students of different sport schools as well as professional hurdle athletes and coaches. The questionnaire investigated common types of ankle injury sustained during training and competitions. The findings were organized and analyzed, then appropriate prevention and treatment measures were selected. At the same time, some authoritative medical journals were also consulted to provide sufficient evidence to back up the arguments and findings of this paper.

## Results

### *The Main Reasons for Hurdle Ankle Injury*

Hurdling gradually evolved from earlier “cross steeplechase” sport. Hurdle athletes mainly need to jump over a wooden fence that is attached to the ground. By the mid-30s of last century, hurdling became popular and emerged as a common competition event in modern sports. Hurdling is a movement with rapid interchanging between running and stride. After striding, the ankle bears a lot of force during landing, almost the weight of the entire body.

Relevant medical experts believe that hurdle movement is an ankle killer. During hurdling, athletes always run at high speed, while striding, soaring and pushing. The most critical moment is the hurdle jump itself, where the angle between angle and ground is about 15 degrees. At this moment, a slight turn of body is required, and the athletes’ body balanced capacity becomes a crucial factor.

Based on the human anatomy knowledge, the ankle is the link between the fibula and tibia of the leg, which is can easily swell. The two bones near the ankle joint are attached by ligaments and tendon. During hurdle movement, if the first jump fails, or athletes’ ankle and knee are not aligned, the

weight of the athletes’ body might cause tendinitis. In the case of an ankle injury, athletes should apply ice and compression in a timely manner, elevate the injured leg and rest<sup>(1)</sup>. If the leg is not kept elevated, tendon laceration and ankle injury will occur. In that case, surgery will be required to avoid further negative impact on athletes (figure 3).



**Figure 3:** Illustration of heel tendinitis.

During hurdling, the chance of ankle injury is relatively high. The main reason for this injury was found to be losing balance. Upon injury, timely examination of the injury should be done and the extent of injury should be carefully estimated, so that attending to the injury can be done based on this assessment<sup>(2)</sup>. The assessment must take note firstly about the location of athletes’ pain, the degree of swelling and then see whether athletes’ joint is deformed. Secondly, the assessor shall check whether the foot has ectropion or introversion, and observe extent of injury on the foot’s lateral ligaments. Thirdly, the assessor shall conduct anterior drawer test by holding the upper part of the ankle with one hand, pull it forward, and check the ankle’s range of movement<sup>(3-5)</sup>. The anterior drawer test of an athlete is shown as Figure 4.



**Figure 4:** Anterior drawer test of an athlete.

### *Simple Treatment for Ankle Injury*

After hurdle athletes sustain an ankle injury, medical personnel in charge need to make simple and immediate treatment:

- Immobilize the athletes' ankle with an elastic bandage, and apply some ice on the affected area;
- Elevate the injured foot for about 4 minutes, inspect for any sign of swelling, and repeat ice, compression and elevation every 20 minutes<sup>(6)</sup>.

### ***Strength Training Method to Prevent and Control Ankle Injury in Hurdling***

Through surveys conducted in different sport schools and teams, the author has gained some understanding on the causes of ankle injury in hurdling. Hence, during training, athletes should use ankle protectors whenever possible to avoid serious introversion and ectropion of the ankle. Moreover, athletes should be recommended certain shoes for training that can play an effective role in injury prevention<sup>(7)</sup>.

Comfortable sport shoes also have strong support, flexibility and lateral stability, which can significantly reduce the chances of an ankle injury<sup>(8-11)</sup>. When athletes sustain an injury, training should be immediately stopped, and ice with compression should be immediately applied.

Then, athletes' shall change to two-week ice compression treatment, twice a day, at 15 minutes interval. Meanwhile, the ankle should be elevated as often as possible<sup>(12)</sup>.

In recent years, use of strength training is very important for ankle injury prevention during hurdle step. Before each training session, athletes should make proper ankle preparation. During out of competition periods, ankle exercises should still be carried out. Coaches should hold necessary "uniform motion" sessions, which can enhance the muscle strength of athletes' ankle. Furthermore, barbell strength exercise should be done. At the end of each training session, ankle hop and shallow lunge ankle jumping exercises should be done with weight-bearing. Athletes should also take uphill running exercise, and gradually increase the amount of exercise<sup>(13)</sup>.

Before training, coaches should let athletes actively cooperate, check training equipment in the training field, pay attention to location, position and direction of the hurdle in the training filed, conduct real-time monitoring of athletes' injury, and take immediate action if an ankle injury occur. These steps can guarantee athletes' physical health and injury free training sessions<sup>(14-17)</sup>. Meanwhile, athletes should make key preparations before training. Coaches should adjust athletes' mood to an optimum state.

Also, based on different climatic and environmental factors, coaches should make adjustments to their activities, develop appropriate preparation steps, which will improve training and keep athletes injury-free<sup>(18)</sup>.

### **Discussion**

In modern hurdling, athletes often suffer from ankle injury, which becomes a major setback for athletes. For athletes, once ankle injury is not effectively prevented and treated, their training and competition performance will be compromised. Many athletes suffer from pain caused by ankle injury, which negatively impact the development of hurdling skill. Thus, effective prevention and control of these injuries needs to be done. Scientific measures should be used during hurdling training sessions, which can effectively reduce the chances ankle injury for athletes, or any other negative impact on their careers. Improvement of the hurdle training methods can prevent injuries, which not only limit the chances of injury, but also effectively promotes development of China's sport careers.

The author studied strength training method and its preventive effect on hurdling associated ankle injury, and hopes to provide guidance for the future studies on hurdle training.

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