


Epidemiology of Track and Field Injuries

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ABSTRACT

Injury is a cause of concern for all athletes - from amateurs at the recreational and grass roots levels to the elite professionals taking part in the IAAF World Championships in Athletics and the Olympic Games. Preventive measures, focused on the most relevant injuries (high frequency and/or severity), should be implemented in the preparation of the athlete with the aim of reducing future risk and/or severity of injury. Epidemiological data make it possible to identify and highlight the most relevant injuries, and thereby develop appropriate prevention strategies. The authors survey the existing literature focusing their attention on data linked to 1) injuries over the course of a season, 2) injuries at major championships and 3) injuries in young athletes. In addition to identifying the variations in injury risk in elite athletes by discipline and age, they point out that the data shows increased injury risk for young athletes. After calling for increased knowledge of injury incidence and characteristic in youth athletes, they conclude with identification of the main injury prevention strategies found in the literature.

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Introduction

Injury is a cause of concern for all athletes - from amateurs at the recreational and grass roots levels to the elite professionals taking part in the IAAF World Championships in Athletics and the Olympic Games. The practice of athletics involves a certain risk of injuries that might lead to missed training and/or competition for athletes¹⁻³ and could also impact everyday life away from the

sport (difficulty at school, work, or in daily activities)^{1,4}. Injury is one of the factors in performance failures and may even end a career. Moreover, injury can lead to long-term or even permanent damage of musculoskeletal system, especially in youth athletes^{5,6}.

The ultimate aim for health professionals working with athletes must be to increase safety in the sport. Prevention is always better than treatment⁷. Preventive measures, focused on the most relevant track and field related injuries (high frequency and/or severity), should be implemented in the preparation of the athlete with the aim of reducing future risk and/or severity of injury^{3,8}. Therefore, epidemiological data are very important. They make it possible to identify and highlight the most relevant injuries, and they help to develop prevention strategies adapted to the injury mechanisms and risk factors⁹, following the four-step sequence of sports injury prevention described by van Mechelen et al.⁴.

This purpose of this article is to draw on the existing literature to describe the incidence and characteristics of athletics injuries occurring over the course of an athletics season and during top-level competitions in order to determine the priority of injury preventive measures.

Injury During an Athletics Season

The current knowledge of injury risk during an athletics season is based on few studies with different methods of injury surveillance, which makes comparison between them and conclusion difficult^{1,10-17}. However, we can say that according to the available studies the prevalence of injuries is from 3.1 to 169.8 per 100 athletes per year. This represents a high injury risk. In the course of a season most injuries occur during training (60 to 91%) compared with those during competition (9 to 30%)^{1,10,13,15,18}. This finding is consistent with the fact that most of the time during a season is spent in training rather than competition^{1,13,15}.

Due to the differences in physical and technical constraints, injury risk varies between athletics disciplines^{1,18,19}. The characteristics of injuries also vary between disciplines, according to the biomechanical and technical movements, the implements used, the duration of practice and the training workload. For example, a higher acute injury risk is reported in explosive events (sprint, hurdles and jumps) and a higher chronic injury risk is reported in middle- or long-distance runs^{10,12,18}. In Table 1 we can also see that thigh injuries and especially hamstring strains are frequent in sprints and hurdles^{11,12,19,20}, Achilles tendinopathy in explosive events (jumps/sprints/hurdles) or in middle- and long-distance events^{11,18}, ankle sprains and back pain in the pole vault¹⁵, severe head and spinal cord trauma also in the pole vault²¹, chronic knee lesions (patellar cartilage lesions, iliotibial syndrome, patellar tendinopathy...) and stress fractures in middle- and long-distance runs^{11,12,17-19,22}.

In general, most injuries in athletes are to the lower limbs (from 60 to 100%)^{1,10-12,14-18,22,23}, because the lower limbs are critical to performance in every event. Musculo-tendinous lesions are frequent in explosive events (sprints, jumps), and are often due to indirect force on the muscle-tendon junction, which is often the weakest point¹⁹.

However, lower back injuries are also common (12%), especially in jumps, throws and combined events^{11,15,23}. The technical skills required for pole vault and javelin throw for example (including intense musculoskeletal contortion) put athletes at risk of lumbar strain^{5,15}. Moreover, all track and field events require a good back and abdomen sheathing in order to optimally transmit the force of the lower limbs for performance⁵.

Upper limbs injuries are also reported frequently, with shoulder injury representing the main injury in throwers (70%)²⁴, and in combined events athletes^{5,23}.

Table 1: Main injuries (higher risks) among different athletics disciplines

Disciplines	Causes	Types
Sprints and hurdles	Acute	Thigh injuries (hamstring strains)
	Overuse	Achilles tendinopathy
Jumps <i>Pole vault</i>	Overuse	Achilles tendinopathy, Patellar tendinopathy
	Acute	Ankle sprains
	Overuse	Back pain
	Major injuries	Severe head and spinal cord trauma
Throws	Overuse	Shoulder and elbow injuries
	Overuse	Back pain
Middle- and long-distance	Overuse	Achilles tendinopathy
	Overuse	Knee chronic lesions (patellar cartilage lesions)
	Overuse	Iliotibial syndrome
	Overuse	Stress fractures

Among the risk factors of athletics injury, a previous history of injury is a predisposing factor to re-injury^{15,22}. Injury prevalence has been reported to be lower when training is supervised by coach¹³ and when athletes have mastered the technical skills¹⁵. The gender, age, number of years of practice, and level of practice, are discussed but currently are not determined as risk factors^{1,2,12,13,15-18,25}.

Injuries During Major Championships

The rigorous method developed by the International Olympic Committee (IOC)²⁶ and validated by the IAAF for track and field injury surveillance² facilitated obtaining relevant data on injury incidence and characteristics during major athletics competitions^{2,3,8,25}. From these studies, it can be said that 10-14% of athletes incur an injury during a top-level championships. During the two most recent IAAF World Championships in Athletics (2009 and 2011), injury incidence was

135 per 1000 registered athletes^{3,25}. About half of these injuries were expected to result in time-loss from training or competition (47 to 64% of registered athletes)^{2,3,8,25}.

During major championships, male athletes suffer more injuries than female athletes^{2,3,25}. The influence of age on injury risk remains unclear; at the 2009 IAAF World Championships in Athletics in Berlin, most injuries occurred to athletes between 26 to 30 years of age²⁵, but two years later at the same event in Daegu most injuries were to athletes more than 30 years old³.

The risk of injury at a major championship varies substantially between the disciplines with athletes competing in combined events, steeplechase and middle- and long-distance runs having the highest risk^{2,3,25}. In these disciplines, although the intensity of exercise is lower than other events, the time spent in training and/or in competition is longer and overuse

Table 2: Overview of epidemiology of injuries in athletics

Injuries in Athletics	
Incidence	Athletes have a moderate to high risk of injury compare to other sports
Characteristics	Higher risk of injury in training Overuse is the most common cause of injury Lower limbs represent close to 80% of injuries in athletics Thigh strain, mainly hamstring strain, is the most frequent injury Ankle sprain is also a common injury
Risk factors	Males seems to have higher risk of injury than females Athletes over 26 seems to have higher risk of injury in competition History and severity of a previous injury is a predisposing factor to re-injury Low mastery of technical skills and/or no supervision by coach Combined events athletes have higher risk of injury in competition

might have a facilitating influence. Although the combined events are practised by a fewer number of athletes than most of the other disciplines, higher injury and time-loss injury risks have been reported in this event^{2,3,5,25,27}.

The majority of injuries are caused by over-use^{1-3,25,28}. The most common diagnoses are thigh strain (14-17%) and hamstring strain (16%), and 46% of these cases leading to time-loss from sport^{2,3,25}. Other common injuries are lower leg strain (5-9%), ankle sprain (3-6%), and trunk muscle cramps (6%)^{2,3,25}. The characteristics of injuries varies between female and male athletes; their locations are shown in Figure 1 and Figure 2, respectively.

Injuries in Young Athletes

To our knowledge, few data are available regarding injury risk in youth athletes¹⁸. From what data is available we can see that higher injury risk has been reported in this age population than in adult athletes^{5,29}. Injuries to young athletes can sometimes lead to drop out from

the sport and/or long-term or even permanent damage of developing tissues and affected structures in this age population^{5,6,18}.

One possible factor in the increased injury risk for young athletes could be the relatively immature musculoskeletal systems of youth athletes.

Increasing the knowledge of injury incidence and characteristic in youth athletes is a priority in order to improve injury prevention programmes and ensure young people can practice track athletics with long-term benefits.

Injury Prevention Strategies

One approach suggested in the literature is for prevention strategies to be focused on the most common injuries. Hamstring strain represents the main injury during training and competition periods^{1,3}. Specific studies have suggested that hamstring mechanics during sprinting³⁰, strength imbalances²⁰, flexibility, fatigue, age, ethnicity (particular racial or ana-



Figure 1: Injury location in female athletes during IAAF World Championships in Athletics



Figure 2: Injury location in male athletes during IAAF World Championships in Athletics

tomical predisposition) and severity of previous injury³¹ play a role in occurrence of track and field hamstring strains³², and should be taken into account to prevent hamstring strain occurrence in the future.

Ankle sprain is also a common injury in athletes^{3,15,17}. Severity of previous injury has been reported as a major risk factor³³. Deficits in ankle joint positional sense, in feet-forward neuromuscular control, in postural stability and in strength, have been described to be associated with chronic ankle instability, ankle pain and risk of repetitive ankle sprain^{34,35}.

Given their severity, stress fractures should be monitored and not be neglected^{12,19,36,37}.

A second approach suggested in the literature is for prevention strategies to be focused on the disciplines with higher injury risk, such as combined events, middle- and long-distance running, pole vault and hurdles^{2,3,5,15,17,25,27}. The biomechanical and/or metabolic demands of these events need to be better understood to direct injury prevention strategies^{3,27}. For highly technical disciplines (pole vault, hurdles), mastery of movements and some vigilance seem to appear as a suggested element of injury prevention^{15,21}.

With reference to injuries at major championships, the literature shows that overuse injuries are the most common^{2,3,25}. Precosciously treating acute injuries, eliminating pe-

riods of overtraining, and improving preventative strengthening and recovery programmes could be relevant prevention strategies³. Appropriate and rigorous treatment and rehabilitation of the first episode of injury is also fundamental in order to prevent recurrence of injury which represents a common cause of injury and an important risk factor of injury^{12,15,31,33}.

Finally, it is suggested that the management of injuries that need a long-term healing process should be optimised by including maintenance of cardio-respiratory and musculo-tendinous capabilities in order to prevent detraining and anticipate the return to sport^{1,11}.

Conclusions

Track and field musculoskeletal injuries are common and may lead to absence from training and competition. The epidemiology is summarised in Table 2.

According to the existing literature, preventive interventions should focus on overuse injuries, adequate rehabilitation of previous injuries, hamstring strains, ankle sprains, and optimised technical mastery.

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