



# **sports injuries**

**A review of evidence for prevention  
from the UK focal point for violence and injury prevention**

**S. Wood, M. A. Bellis**

## About the UK focal point for violence and injury prevention

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The 49th World Health Assembly (1996) declared violence a major and increasing global public health problem. In response, the World Health Organization (WHO) published the *World Report on Violence and Health* and initiated a major programme to support and develop violence and injury prevention work globally. As part of this programme, each member state has designated a national focal point for violence and injury prevention. The network of focal points works with the WHO to promote violence and injury prevention at national and international levels, develop capacity for prevention, and share evidence on effective prevention practice and policy.

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## A summary of evidence: successful or promising interventions to prevent sports injuries

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**Safer sports equipment:** The use of safer sports equipment (e.g. safety balls for baseball) for younger or inexperienced players can reduce sporting injury rates.

**Use of protective equipment:** The use of protective equipment can be effective in reducing injury but is dependent on the sport played. This includes helmets (e.g. in cycling, cricket and skiing), ankle braces, mouthguards (e.g. in football, rugby and basketball), wrist and elbow guards (e.g. in skiing), and eye goggles (e.g. in lacrosse).

**Changing rules of play:** Modifying rules of play to prohibit aggressive or dangerous behaviour has been associated with a decrease in reported sporting injuries (e.g. in rugby or American football where they have been associated with reductions in spinal cord injuries).

**Training programmes:** Participation in training programmes to improve co-ordination, strength, technique and awareness of injury risks, has been successful in reducing rates of sporting injury. Programmes are more effective for those participants reporting a previous injury.

**Multi-component programmes:** Programmes that combine more than one element (e.g. warm up sessions, regular training, ankle braces and rehabilitation of injuries) can be effective in reducing sporting injuries.

Although the exact definition of what constitutes a sport can be debated, sports injuries usually refer to any kind of injury that is sustained during an athletic game (e.g. football or rugby) or other sporting activity (e.g. running, cycling or skiing). While they are a common occurrence, the number of sports injuries that occur in the UK is largely unknown. This is because epidemiological studies rarely examine sports injuries as a whole, investigating instead specific injuries (e.g. ankle sprains or fractures) due to sporting activities or injuries sustained through playing a particular sport (e.g. football). However, an estimated 80,000 to 85,000 fractures due to sporting activities occur in the UK each year (1). In addition to fractures, participation in sports can lead to a wide range of other injuries, including: muscle and ligament sprains (2); injuries to the central nervous system (3,4); internal organ damage (5); and concussion (6). Injuries are most usually caused by impact or trauma but in some cases can be the result of repetitive use or overuse of muscles, tendons and ligaments.

## Sports injuries in the UK: some facts

- Injuries occur more often during competitive play than in training. For instance, among rugby union players, the overall incidence of injury was 2 per 1,000 player-hours during training and 91 per 1,000 player-hours during matches (13,14);
- In a Scottish hospital, 13% of all fractures seen over a one year period (both in-patient and out-patient) were sports related. Although these injuries were sustained through playing 41 different sports, almost 60% were gained through playing football or rugby (1);
- Among sports injuries presenting to a Scottish Accident and Emergency department (A&E), 73% were soft tissue injuries. Around 16% were for fractures, 4% for laceration and 3% for head injury (7);
- The majority (67%) of people attending a Scottish A&E department for a sporting injury were discharged with instructions to visit their GP. A quarter of people were referred to outpatient clinics, 5% to physiotherapy and 3% were admitted to hospital (7).

Certain groups of people are more likely than others to sustain a sporting injury, including males and those of a younger age (less than 30 years) (1,7). Unlike injuries from other causes such as road traffic accidents or falls, there is little association between sporting injuries and socio-economic class. A number of factors can increase the risk of a sporting injury. These can include: inexperience or lower ability (8,9); decreased strength and endurance (10); aggressive play (11); greater amount of time spent engaging in an activity (8); having a previous injury (10); lack of protective equipment (9); characteristics of the environment (e.g. certain slopes for skiing and snowboarding [9]); and less off-season or pre-game training (12).

Many sporting injuries can be prevented by addressing factors that increase their risk. This document presents a broad overview of prevention programmes, including evidence for their effectiveness. The majority of evaluated prevention programmes derive from the US and focus on more traditional American sports that are less popular in the UK (e.g. American football, baseball and ice hockey). However, examples from the UK, or from sports played in the UK, have been included wherever possible.

## 1. Safer sports equipment

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For some sports, injuries can be prevented by making sporting equipment safer. This is particularly useful among young or amateur sports players who are still developing sporting skills. For instance, in the US, the use of softer baseballs (known as safety baseballs) have been found to have less potential for injury than standard balls (18) and have been associated with a 23% reduction in ball-related injury (17). In the UK, similar sports such as cricket are sometimes played with softer balls, particularly among younger players. However, their effectiveness in preventing injuries has not been measured.

## 2. The use of protective equipment

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For certain sports, the use of protective equipment can reduce the risks of experiencing an injury. These are designed either to protect against direct blows to the body (e.g. during contact or ball sports) or to support or protect muscles and joints while a person is active. Protective equipment can include: helmets; faceguards; eye goggles;

knee, wrist and ankle braces or supports; knee or elbow pads; mouthguards; specialised footwear; and cushioned insoles. Since the risks of injury vary from sport to sport, the effectiveness of protective equipment depends to a large extent on the sport being played; equipment that is effective during one sport may not offer protection during another.

## 2.1 Helmets and faceguards

A number of sports recommend or require the use of a helmet to reduce the risk of an injury from a fall or blow to the head (e.g. cricket, ice hockey, horse riding, cycling or skiing). For ball games, faceguards are often added to helmets to prevent facial or dental injuries. For cycling, helmets can reduce the risk of head, brain and severe brain injury by between 63% and 88% (18) and can offer protective benefits regardless of whether an accident involves a motor vehicle (i.e. road traffic accident<sup>1</sup>) or is due to another cause. There is less research on helmet use in other sports but some beneficial effects have been reported for cricket (19), rugby (20) and ice hockey (21). For instance, the introduction of compulsory helmet wearing among junior cricketers in a region of Australia saw a significant fall in the level of head, neck and facial injuries from 35% before its introduction to 4% after (19). Wearing a helmet during skiing can also reduce the risk of head injury from between 22% and 60% (22). However, some studies show that wearing a helmet during skiing can increase the rate of neck injury (23), suggesting a need to study the negative impacts of helmet use in this sport more closely (22) and to examine the impact of helmet design on injury rates.

<sup>1</sup> For more information on the prevention of injuries from cycling accidents, see the *road traffic accidents* review in this series.

## 2.2 Knee braces

Knee braces are supports that can be made from a variety of materials (e.g. foam, plastic or elastic). They are designed to support the knee joint when running and jumping as well as protect it from any direct blows. Although they are widely available and commonly used within many sports, their effectiveness in preventing injury is unclear (24,25). Some studies report protective effects, such as greater resistance to a blow to the knee and decreased risk of ligament sprain (26). Most research has examined the use of knee braces in contact sports but they may also prevent knee pain in other sports (e.g. running [27]).

## 2.3 Ankle braces and taping

As with those designed for the knee, ankle braces can be made from a variety of materials, usually plastic. Ankles can also be supported through taping, which involves wrapping strips of strong tape around the heel and ankle. Both braces and taping are designed to control ankle movement and position and so protect against, or aid rehabilitation from, injury. Ankle braces are effective in reducing ankle ligament sports injuries, particularly amongst those who have a prior history of ankle sprains (28,29). For instance, the use of a brace and taping can reduce ankle sprain by 69% and 71% respectively amongst athletes with previous ankle injuries (30).

## 2.4 Mouthguards

Mouthguards are gum shields that separate the upper and lower teeth as well as separating teeth from surrounding soft tissue. They offer shock-absorbing qualities that limit



damage to the mouth. Mouthguards are used in sports such as boxing, rugby, hockey, ice hockey and basketball, where a blow to the face or head is likely. Mouthguards are effective in reducing the number of fractured teeth through increasing the force needed to fracture teeth and decreasing the forces transmitted to teeth (31). Furthermore, they can offer significant protection against orofacial or dental injuries (31, 32). Beneficial effects have been reported for a variety of sports, including football, rugby and basketball (31). However, their use in preventing other injuries such as concussion is unclear (33).

## **2.5 Other safety equipment**

There is less research on the use of other safety equipment. A review of interventions to prevent ankle ligament sporting injuries reported that there was insufficient evidence for the use of high-top shoes and mixed evidence for the use of cushioned insoles (28). A further review of programmes to prevent lower limb soft-tissue injuries in runners found that the use of cushioning insoles and footwear modification was not clear (27). The use of wrist and elbow guards can reduce the risk of wrist and elbow injury in skaters (34), and among snowboarders, wrist guards can reduce the risk of wrist injury, wrist fracture and wrist sprain (35). Furthermore, although evidence is limited (36), protective eyewear can be effective in reducing head and face injuries in some sports (e.g. for lacrosse players [37]).

## **3. Standards for protective equipment**

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While the use of safety equipment can reduce sporting injuries in some instances, the effectiveness depends largely

on the quality of the safety equipment itself. There are British Standards for a wide variety of protective equipment, specific to certain sports. There has been little research evaluating the impact that these standards have on levels of sporting injuries in the general population. However, their impact can be substantial. For instance, in the US, the introduction of helmet standards for athletic equipment was thought to have contributed (along with changes to the rules of play) to a decrease in serious head injuries among high school football players from 4.25 per 100,000 to 0.68 per 100,000 and fatalities by 74% (38).

## 4. Changing rules of play

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Sporting injuries can be prevented through the use of rules that prohibit aggressive or dangerous play, or insist on the use of safety equipment. In some sports, existing rules have been altered to help prevent some of the more common and serious injuries experienced (39,40). For instance, a high incidence of spinal cord injuries in rugby union games led to a change of rules in many countries in the 1980s. This included Britain, where rules were amended for under-19 games relating to the scrum, ruck and maul (where injuries were most likely to be experienced). A study of spinal injuries sustained during rugby in the UK reported a decline in the number of injuries following the rule changes (41). Reductions in injuries have been reported for other sports following a change in rules of play. For instance, in American football, a rule that banned the use of a helmet or faceguard as the primary point of contact when blocking and tackling was implemented in the US in 1976 and was thought to reduce levels of cervical spine injuries in the sport (42).

Additionally, in 2000, the World Karate Federation announced a change in competition rules, including stricter regulations for making prohibited moves (e.g. using excessive force or punching forbidden areas of the body). Evaluations of the new rules in Croatia reported little effects on injury rates across all ages but a decrease for those less than 18 years of age (43).

## 5. Safety guidance or codes of practice

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Safety guidance or codes of practice for sports are often used to promote safe techniques, increase preparedness, educate about the use of safety equipment, promote fair play, and protect against overuse injuries. In the UK, it is a requirement for every governing body to provide safety guidelines for their sport (44). Typically, guidelines highlight the need to: warm up before exercising; stretch after exercising; increase activity levels and fitness gradually; wear protective clothing or equipment; avoid playing if unwell or under the influence of alcohol; and regularly check and maintain sports equipment. Codes of practice are also used for some sports. For instance, the Alpine Responsibility Code is used in many countries to promote safety practices among skiers, urging them to: take lessons from qualified professional instructors; keep to marked trails; never stop or obstruct a run; ensure equipment is in good condition; and avoid skiing under the influence of alcohol or drugs. The use of safety guidelines and codes of practice are important to ensure those involved in sports have the knowledge needed to participate safely and responsibly. However, there is a lack

of research evaluating these measures, meaning that little is known about their effectiveness in preventing injuries.

## 6. Warming up and stretching

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Using gentle initial exercises, a warm up is designed to increase the heart rate and temperature, stretch muscles, and mobilise joints in preparation for more vigorous activity. Warm ups are commonly used in many sports and are widely thought to reduce the risks of sustaining an injury. However, their effectiveness is unclear (45). The use of stretching alone (i.e. without any of the additional warm up exercises) has also been evaluated. Results have been mixed, but in general show either insufficient evidence to determine effectiveness or limited evidence for their ineffectiveness (27,28,46).

## 7. Training programmes

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Training programmes are designed to improve co-ordination, strength and technique, as well as increase awareness of injury risks and prevention strategies. Programmes can include a variety of components, such as: muscle group training; flexibility; weight training; cardiovascular exercise; technique improvement (e.g. how to jump, land or fall safely); and training in the proper use of equipment. Training can be provided pre-sporting season only or provided more regularly throughout the year. In general, studies of training programmes report moderate, positive effects on the rate of injury (36,47,25). Delaying the onset of fatigue during

exercise can reduce the risk of injury (48), suggesting that enhanced fitness levels of the athlete will protect against injury during the later stages of matches or training. Specific muscle strength training programmes have been successful in reducing rates of both knee injury (25) and ankle sprains (28,29). Programmes are more effective for those students who report a previous injury than those who do not (49). Despite the positive effects reported, there is a need to control the level of training undertaken, since higher-volume training programmes have been associated with greater severity of injury (e.g. rugby [50]). Since overuse of joints and muscles can be damaging, in some cases, reducing the level of training may actually offer more protection against injury. For instance, reducing the distance, frequency and duration of running during training is thought to be effective in preventing soft tissue injuries associated with this activity (27).

## 8. Multi-component programmes

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Some initiatives combine a variety of methods in the one, comprehensive programme. There has been little research around these types of programmes, but a small number of evaluated programmes have been associated with reductions in injury (51,52). For instance, in Switzerland, a sports injury prevention programme was implemented for high-school football players to reduce the number of general football injuries. The programme began seven weeks before the start of the football season and comprised: improvement of warm up sessions; regular cool down; taping of unstable ankles; rehabilitation of injuries; and exercises to strengthen muscles and improve flexibility and co-ordination. In addition, the players received one hour a week with a physiotherapist,

who supervised exercises and rehabilitation of injured players. Over a one year time period, there were 21% fewer injuries as a result of the intervention compared to a control group who trained and played football normally (52).

## 9. Summary

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A wide range of interventions have been implemented to prevent sporting injuries. With initiatives often designed for a specific sport or injury type, it is difficult to generalise findings. What is effective for one sport, for instance, may not offer any extra protection for another. However, overall, there is some positive evidence for:

- The use of safer sporting equipment (e.g. safety balls);
- The use of certain protective equipment such as helmets, ankle braces, mouthguards and eye goggles;
- Modification of rules within certain sports to prohibit aggressive or dangerous play;
- Participation in training programmes to improve co-ordination, strength and technique; and
- Multi-component programmes.

Further research is needed on the use of knee braces, safety guidelines or codes of practice and warming up or stretching before exercise, where effectiveness is either unclear or unknown.

All references are included in the online version of this document, available from:

**[www.preventviolence.info](http://www.preventviolence.info) and [www.cph.org.uk](http://www.cph.org.uk)**

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