

# Principles of Injury Prevention

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CHAPTER

6

An important role for the sports medicine practitioner is to minimize activity-related injury, that is, to improve the benefit:risk ratio associated with physical activity and sport. There have been many advances in the field of sports injury prevention in the past decade.

Sports injury prevention can be characterized as being 'primary', 'secondary' or 'tertiary'. In this book, we use the term 'prevention' synonymously with what is technically known as 'primary prevention'.<sup>1</sup> Examples of primary prevention include health promotion and injury prevention (e.g. ankle braces being worn by an entire team, even those without previous ankle sprain). Secondary prevention can be defined as early diagnosis and intervention to limit the development of disability or reduce the risk of reinjury. We refer to this as 'treatment' in this book (e.g. early RICE treatment of an ankle sprain, see Chapter 10). Finally, tertiary prevention is the focus on rehabilitation to reduce and/or correct an existing disability attributed to an underlying disease. We refer to this as 'rehabilitation' (Chapter 12); in the case of a patient who has had an ankle sprain, this would refer to wobble board exercises and graduated return to sport after the initial treatment for the sprain. The proactive clinician will initiate injury prevention strategies, give prevention advice during consultations where treatment is being sought and devise in-season strategy planning sessions with coaches and during screening of athletes (Chapter 57).

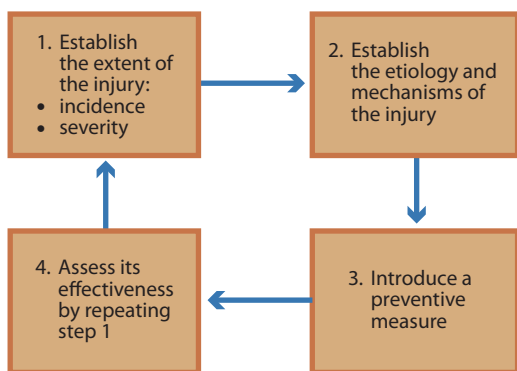
This chapter begins with a widely used model of how sports injuries occur. This is a very useful guide to ways to prevent sport injuries in a systematic manner. From there, we direct the reader to review the importance of correct biomechanics of sports for injury prevention, as outlined in Chapter 5. Then, we

discuss other important factors that may assist in the prevention of injury:

- warm-up
- stretching
- taping and bracing
- protective equipment
- suitable equipment
- appropriate surfaces
- appropriate training
- adequate recovery
- psychology
- nutrition.

## Systematic injury prevention

Research on sports injury prevention typically follows a sequence described by van Mechelen et al. (Fig. 6.1).<sup>2</sup> This conceptual model can be applied successfully by sports clinicians as well. Firstly, the magnitude of the problem must be identified and described in terms of the incidence and severity of sports injuries. If you are responsible for a team, this would involve recording all injuries within the squad, as well as training and match exposure. Secondly, the risk factors and injury mechanisms that play a part in causing sports injuries must be identified. For the clinician, this could involve systematic steps to examine the athletes and their training and competition program (see below). The third step is to introduce measures that are likely to reduce the future risk and/or severity of sports injuries. Such measures should be based on information about the etiological factors and the injury mechanisms as identified in the second step. Finally, the effect of the measures must be evaluated by repeating the first step. From



**Figure 6.1** The sequence for prevention of sports injuries<sup>2</sup>

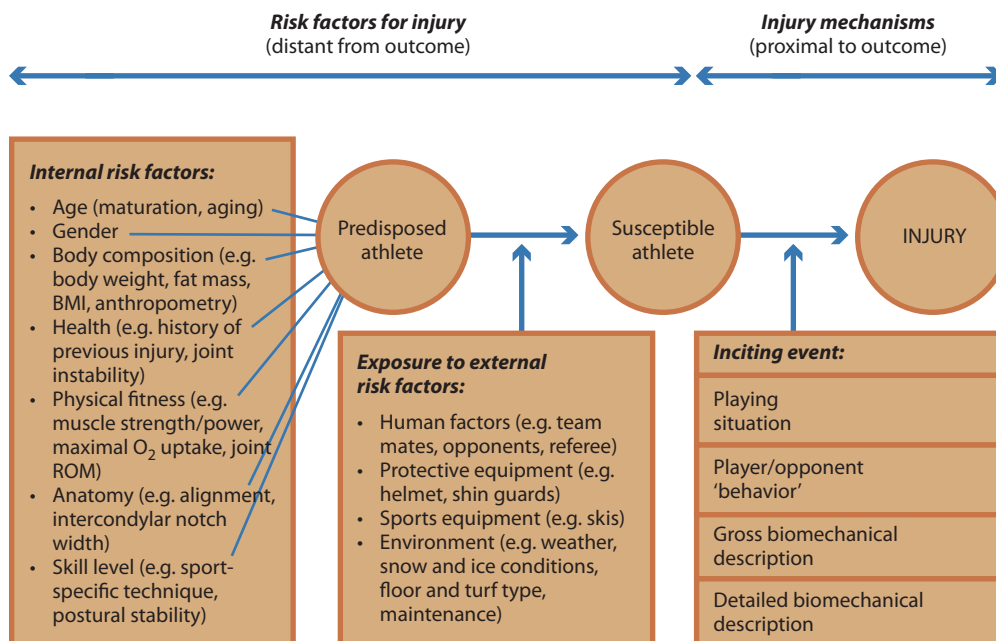
a research standpoint, it is preferable to evaluate the effect of preventive measures by means of a randomized controlled trial. For the medical practitioner responsible for a team, continuous surveillance of the injury pattern within the team will reveal whether changes occur in the injury risk.

Sports clinicians who want to prevent injuries in a systematic way could base their approach on a model of potential causative factors for injury, which was first described by Meeuwisse,<sup>3</sup> and later expanded by Bahr and Holme<sup>4</sup> and Bahr and Krosshaug<sup>5</sup> (Fig. 6.2). The

model not only takes into account the multifactorial nature of sports injuries, but also the time sequence of events leading to injuries.

Firstly, it considers the internal risk factors—factors that may predispose to or protect the athlete from injury. This includes athlete characteristics, factors such as age, maturation, gender, body composition and fitness level. One factor that consistently has been documented to be a significant predictor is previous injury—almost regardless of the injury type studied. Internal factors such as these interact to predispose to or protect from injury. Internal risk factors can be modifiable and non-modifiable, and both are important from a prevention point of view. Modifiable risk factors may be targeted by specific training methods. Non-modifiable factors (such as gender) can be used to target intervention measures to those athletes who are at an increased risk.

The second group of risk factors is the external factors the athletes are exposed to, for example, floor friction in indoor team sports, snow conditions in alpine skiing, a slippery surface (running track), very cold weather, or inappropriate footwear. Exposure to such external risk factors may interact with the internal factors to make the athlete more or less susceptible to injury. When intrinsic and extrinsic risk factors act simultaneously, the athlete is at far greater



**Figure 6.2** A comprehensive injury causation model based on the epidemiological model of Meeuwisse<sup>3</sup> and modified by Bahr and Krosshaug<sup>5</sup> BMI = body mass index; ROM = range of motion