

Why injury prevention has become less efficient: a revision of sport injury prophylaxis

by Grigory Vorobiev

Dr Grigory Vorobiev is a member of the IAAF Medical Committee. He was chief medical officer for the former USSR national team.

Translated from the original Russian by Andrei Vorobiev

1 Introduction

At first sight the present situation in the area of sport injury prevention and rehabilitation appears to be fairly straightforward, and indeed a matter for optimism. Experts in sport medicine are concentrating on developing methods of conservative and invasive injury treatment, and results, particularly in the latter area, have been impressive. The field of sport injury surgery is now more advanced than that of general traumatology.

Various orthopaedic devices are used to correct imbalances in the locomotive system; the design and modelling of footwear are continually revised and modified; and 'hardware' (training surfaces and equipment) is constantly being improved. Moreover, the training process itself – its objectives, contents and techniques – is developing rapidly, and a whole system of injury prophylaxis has been devised with the aim of detecting and eliminating the causes of injury, thus reducing its frequency and the gravity of its consequences.

However, a closer look at the situation reveals reasons for concern. For example, Figure 1 shows that the ratio of chronic to acute injury has increased markedly over the last 30 years. Figure 2 illustrates a rise, albeit fluctuating, in the percentage of injury occurrence in the former USSR national team from just over 20% to almost 60% between 1960 and 1988. This article is concerned with determining the possible causes of such statistics, and the prophylactic measures which can be taken by both doctor and coach in order to prevent the occurrence of injury or at least to limit its severity.

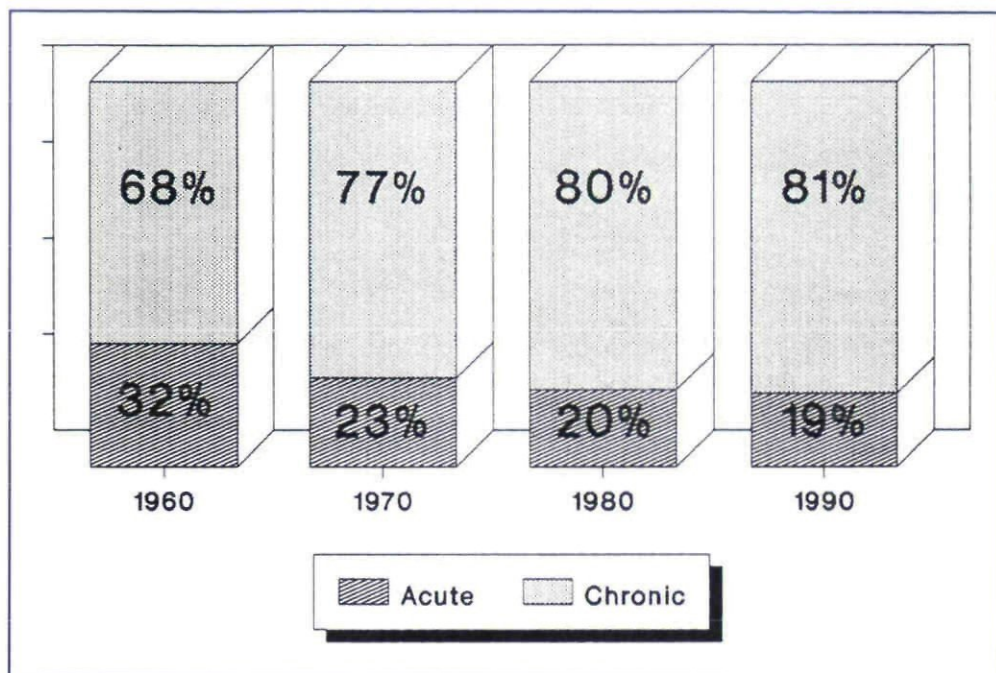
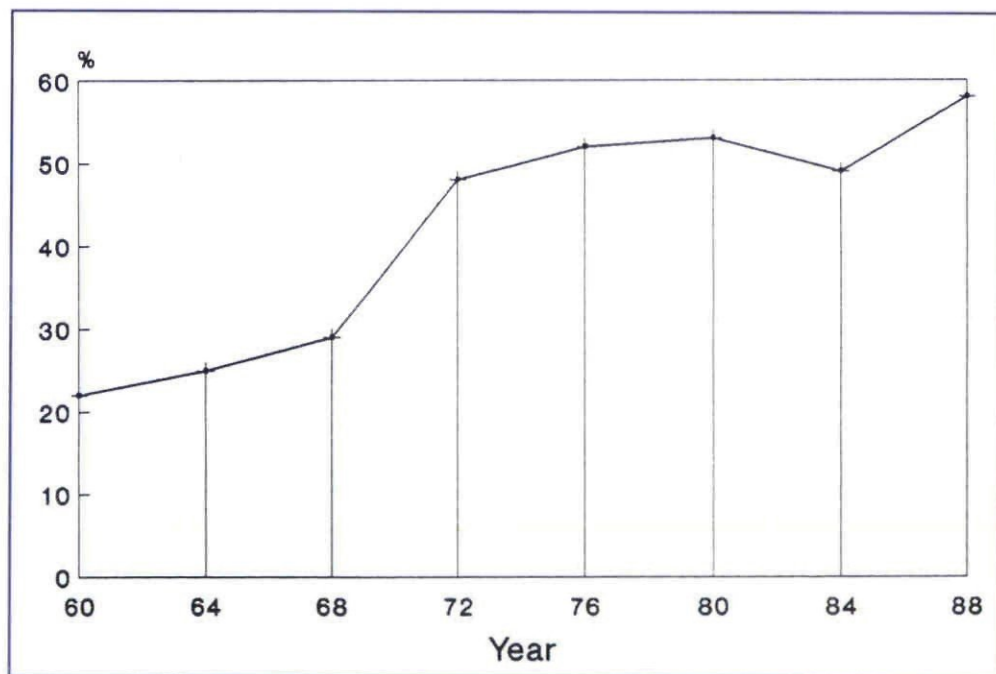


Figure 1: Dynamics of sport injury distribution (acute and chronic)



8 Figure 2: Injury occurrence in the former USSR national team (% of team members)

2 The causes of injury – overt and concealed

The potential for injury has greatly increased with the conversion of amateur sport into professional. The accompanying commercialization of sport has produced a tougher approach to the training process and encouraged both athlete and coach to take greater risks. A dramatic improvement in standards has both resulted from and brought about an increase in the volume and the intensity of training loads. In other words, the psychology behind the training concept has changed and continues to do so, and the athlete's body, often at the threshold of its limitations, is constantly exposed to extreme levels of stress. The existing system of injury prevention, although established over many years, is now failing to cope with these new problems.

The interaction between modern methods of injury prevention and the increases in stress caused by the present sporting climate determines the frequency and the gravity of injuries. In other words, as Figures 1 and 2 suggest, factors provoking physiological trauma are prevalent, producing an appalling picture of injury growth. However, there are ways in which these factors can be controlled and influenced, even to the extent of converting them into measures for injury prevention.

The causes of injury may be classified in the following way:

- Main causes
- Accompanying causes
- Provocative causes

All of these can exist in overt or concealed forms. The existing measures for injury prevention are aimed at the obvious causes and are by and large able to control them. The hidden causes, however, are by their very nature less easily diagnosed, and therefore are less easily prevented or controlled.

As a rule, injury occurs as a result of a conflict between the load that the body is able to support and the actual size of the load that is applied: a local overload of a certain link of the locomotive system takes place. This

link is the one most likely to get injured. However, the links which are normally sufficiently strong can also be damaged when forced to compensate for the inadequate links. This process follows a logical order: hidden causes of injury lie in unseen overloads; these usually affect the weak points of the body, which themselves arise from a disharmony in the locomotive system. This disharmony is caused by incorrect training. Thus, the source of the injury lies in a fault in the training process, in the course of which the proper balance of the various components of the locomotive system is violated either incidentally or on purpose.

3 Methods of prevention

3.1 *The role of the coach*

One of the main tasks of the coach is to ensure that the load applied is proportional to the system's ability to sustain it. While increasing the training load is the most direct way of improving the athlete's performance, and the easiest to offer, it takes considerable time to increase the body's load-sustaining capacity. Moreover, the ensuing improvements in performance are not always put down to these increases in training load, but may sometimes be attributed to other factors. In fact, the level of 'capability' of the locomotive system is directly responsible for both improvement in performance and injuries suffered.

The art of the coach is measured by the extent to which he succeeds in reinforcing the locomotive system according to the requirements of the specific sport or event, and in exploiting the advantages of this reinforcement: a mechanically strong locomotive system is the basis of all sporting achievement. Nevertheless, in common practice the loads often increase faster than the load-resisting capabilities (i.e. the mechanical strength) of the system, producing negative effects.

What are the sources of this disharmony in the locomotive system which produces stronger (more 'trainable') and weaker (less 'trainable') links within it? In most cases the

nature of these sources is purely pedagogical:

- Forced training
- Too narrow a set of training techniques
- A wrong interpretation of various biomechanical principles, training techniques, anatomy and physiology.

Actually the main sources of trauma are often produced by the coaches themselves, either voluntarily or incidentally. It is still widely believed that sport injury is a purely medical prerogative, and indeed this is so when it comes to the healing of an injury; but the coach too has an important role to play in the initial prevention of that injury. First, he must arrange competently the training process, taking into account the individual strengths and weaknesses of the athlete and the specific requirements of the sport or event. This will allow the development of a balanced system of locomotion, free of weak links. Second, if weaknesses or imbalances are detected in the course of training, it is necessary to determine exactly where they lie and to work with the doctor in order to reinforce them using appropriate exercises.

This part of the coaching job is often carried out inadequately, which is why weak links are frequently found during the medical examination of athletes. For the same reason, the rate of injury increases because the concealed sources of trauma remain unrevealed and continue to play their destructive role. Modern systems of prophylaxis, efficient in the sixties when sport was purely amateur and athletes were better prepared physically, have only a very limited effect because they are orientated towards evident sources of injury. For example, Janis Lusi, Valeriy Brumel and Igor Ter-Ovanesian were all trained for such a wide range of events that they were able to perform in their own special event and in the Decathlon during the same competition, with good results in both. In addition to the Long Jump and the Decathlon, Ter-Ovanesian also competed in the 4 x 100 metres Relay. All these athletes have been injured only once or twice during long careers. At the other extreme, long

jumper Robert Emmiyan is not capable of completing a run over 100m. He is injured very frequently.

3.2 *The role of the doctor*

Consider the process of interaction between doctor, athlete and coach from the standpoint of injury prevention. The athlete as a rule calls upon the doctor only after injury has occurred. He requests that the doctor heal the injury so that he can resume training. The role of the coach at this stage is usually limited to consoling the injured athlete. The doctor produces his diagnosis and starts with the treatment, using all available means to facilitate the fastest possible cure. The most important component – prophylaxis – is excluded from the scheme completely.

To restore their past significance and efficiency, it is necessary to alter the traditional, formal approach to prophylactic methods. It is not easy today for the doctor to advise on the matter of preventative measures; the athlete is in a healthy state, he sees no point in seeing the doctor unless he has something to complain about. He therefore feels reluctant to spend time on a seemingly unnecessary procedure. In fact, the doctor should play an important role in diagnosing the weak links in his system so that potential sources of injury can be identified and strengthened. This would not only reduce injury rate, but also improve the athlete's overall efficiency of movement.

Of course, it is no less necessary to use a wide range of orthopaedic devices in order to correct anatomical and functional defects. However, a major fault of this system is that the functional capabilities of the weak links are not improved, but rather temporarily replaced; for example, supinators are used for athletes with a weak foot. The use of this type of device must be accompanied by a carefully planned functional reinforcement of the weak link. Only this will ensure a lasting improvement.

3.3 *A mutual responsibility*

Who should be ultimately responsible for

injury prevention – the doctor or the coach? The answer is that the responsibility must be shared rather than divided. Some psychological details must be taken into account. The type of prophylaxis discussed in this article involves a large volume of local physical exercises over a considerable period of time. If the doctor tells the athlete to do these his advice is often rejected, because the athlete expects the doctor to give him a pill or an injection rather than tiresome physical exercises. He is, however, psychologically prepared to receive this kind of training from his coach, because it is typical of their usual interaction. The coach should therefore add these local exercises to the general training programme and then they will be taken for granted by the athlete. In conclusion, prophylactic measures taken by the coach are more effective.

4 Conclusion

Coaches and athletes often fail to understand that weak links in the system of locomotion are the cause of intense power losses during the sporting performance, thereby leading to a lower level of achievement. Diagnosis of these weaknesses and their causes, followed by the implementation of local exercises designed to strengthen and reinforce the weaker links, should reduce the injury potential and improve the overall efficiency of the locomotive system. The trend should be towards a transition from the formal, traditional approach to prophylaxis, which deals only with the evident sources of injury, to the newer system aimed at eliminating concealed sources of disharmony and trauma. This might be the way towards restoring the value of preventative treatment and contributing to the athlete's health and improving his level of performance.



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