

From a research point of view, once injury occurs, the causes of that injury – personal involvement, environmental factors and chance – should be studied. Chance can be the one thing that makes life worth living. It is the root of all biological and physical evolution, the chance impacts of atomic and subatomic particles, the chance meeting of human beings, the chance of fertilisation in reproduction and the chance of injury. In any one week each of us has about a 1 in 8000 chance of being injured. It is still 8000 to 1 against for the following week, so that there is no immunity as far as chance is concerned.

$$\text{Illness or Injury} = \text{Chance} \times \text{Environment} \times \frac{\text{Accident Proneness} + \text{Risk Acceptance} + \text{Personal Factors}}{\text{Training} + \text{Maturity} + \text{Safety Measures}}$$

Fig. 2. The accident or illness equation

This is an equation that I have been using for many years as a means of studying sudden illness or injury. It can be applied to the sports situation. Chance is of course the basis of a lot of sporting activities. The environment often is controlled or chosen by the individual for his own activity. It can be natural or man-made. The natural environment includes other people and animals in its make-up. These can produce hazards as far as the individual is concerned. The man-made environment is of course one of the big headaches of today.

The accident prone people persistently have minor accidents and minor illnesses. There is invariably a psychological reason for this, such as unhappy homes or broken marriages, frustrated living or dissatisfaction with conditions of life in general. This is really a psychological illness, well known in the sports field.

The acceptance of risk is fairly general and most people will take risks for fun, fame or fortune. It plays a very important part in the causation of injury. The people who take bigger risks in perhaps the more dangerous sports, motor-cycling or deep-sea diving for example, have a greater reward for a greater risk. This is a fair way of living.

The fatigue factors are as suggested the minor ailments – distress, hangover, drugs, alcoholism itself, hunger. It is easy to extend the list. It is important on the day to become aware of these and prevent individuals from performing their activities if they are under the weather from one of these recognisable conditions. In the underwater world for example the common cold can be disastrous, pressure changes under water can rapidly transform this to roaring pneumonia.

Training goes without saying, it is the bread and butter of the sportsman. The same applies to maturity, which can be equated roughly with morale and motivation and plays a very important part in maintaining and improving health. Safety precautions exist to protect those under training, as well as the young and the elderly. Care is needed to ensure that the safety precautions, the padding and protective devices, do not interfere with enjoyment and productivity. It's quite wrong to introduce a lot of safety precautions in circumstances when really people should be trained to live with a dangerous environment.

With regard to the incident itself, one wants to know a little about it. I think most of us would like to eliminate all the conditions which are predisposing to injury, and we could. We could make the environment perfect, we could sort out the other causal factors, but we would always be left with the chance factor and we would be very much lost without it.

FITNESS WITHIN SPORT

V. THOMAS, D.L.C., Ph.D.,

Physical Education Department, Liverpool Polytechnic

Physiotherapists are becoming increasingly aware of the specific and specialised problems posed by sports injuries. The existence of an Association of Chartered Physiotherapists in Sports Medicine is evidence of the specialised nature of this branch of physiotherapy. Often physiotherapists are unable to achieve optimal results with their athletic patients because they lack understanding of the environment within which the sportsman functions. This seminar has been organised with the aim of familiarising delegates with some aspects of this environment.

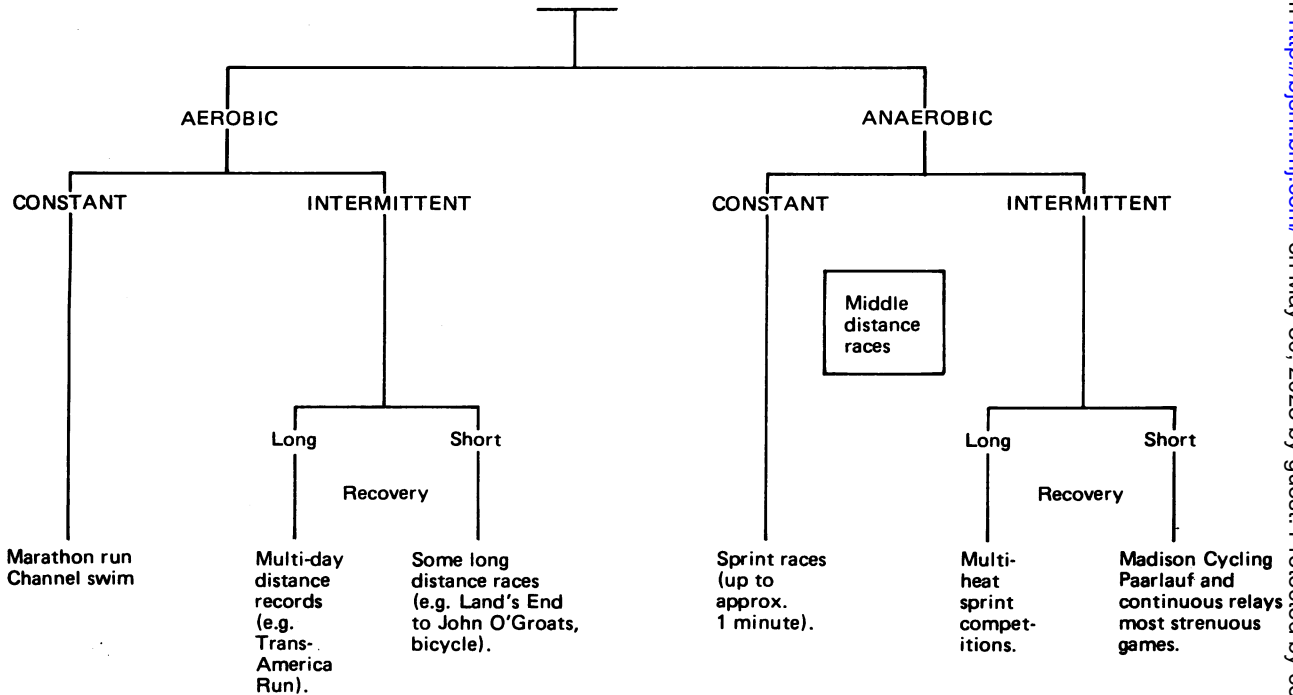
These opening remarks are intended to set the broad scene, showing each of the major elements of sports fitness in context, and implications for the physiotherapist. Sports fitness itself may be subdivided into six major elements.

Strength. This is the ability to exert force. Its importance is threefold. Firstly the athlete should always possess more strength than his sport normally demands. He then will have reserves upon which he may call when subjected to sudden abnormally large stresses, thus reducing the risk of injury. Secondly, strength is important within the strength to weight ratio. Generally the acquisition of strength is associated with an increase in muscle bulk, and therefore an increase in weight. Sportsmen may be concerned with overcoming an external resistance (e.g. weightlifters, shot putters, rugby forwards) or an internal resistance (runners, gymnasts, basketballers). The external resistance group are content to acquire large muscle mass since this helps to develop great body momentum which may then be transferred to the external resistance. The second group, however, must achieve an optimal level of muscle hypertrophy, beyond which the extra mass of muscle would increase the internal resistance to movement by an amount greater than the capacity of the bigger muscle to handle efficiently. Thirdly, the increased mass of stronger muscles can be a critical factor in both degenerative and traumatic sports injuries. Synovial cartilage, particularly in the lower limb joints, degenerates more rapidly if supporting a heavier body. Recuperation from injury may also be hampered by the sheer mass being borne by the injured area.

Speed. Speed in sport is composed of two separate entities. The first of these is the response initiation time (RIT), which comprises the information processing function: i.e. the receipt and analysis of information, the movement decision, and the transmission of the instructions to the muscles. Simple reaction time cannot really be trained, but the analytic and decision processes can. The second entity is the movement of the body. The speeds achievable by the sportsman are dependent upon his power to weight ratio, the contraction speed of his muscle fibres, and his suppleness. All these are capable of being trained.

Stamina. Stamina is essentially concerned with the replacement of energy and the supply of oxygen. Any voluntary movement requires the expenditure of energy, which is required to be replaced by a greater or lesser rate. Stamina can be classified as aerobic and anaerobic, aerobic being concerned with work the energy for which is derived from biochemical processes which occur in the presence of oxygen. Anaerobic work is of a more explosive character, and proceeds largely independently of oxygen supply. Fig. 1 illustrates the types of event which utilise in the main each form of stamina.

Fig. 1. STAMINA ATTRIBUTES OF SPORT



Skill. The skill element of the performance of sports may vary greatly not only from one sport to another, but also within sports. Apart from the quite specific performance of the techniques of the sport, competitors also require to be skilful with regard to injuries:

1. skilful performance of game techniques generally reduces degeneration and trauma effects of those techniques;
2. skill is required to avoid injury caused by other factors within the game e.g. ducking and swerving to avoid blows, shifts of balance to avoid falls, physical manipulation of dangerous objects;
3. skill is also necessary to develop or amend techniques in coping with temporary or permanent disabilities.

“Soul”. Perhaps in the sporting contest it is easier to visualise this element of sports fitness in terms of barriers (Fig. 2).

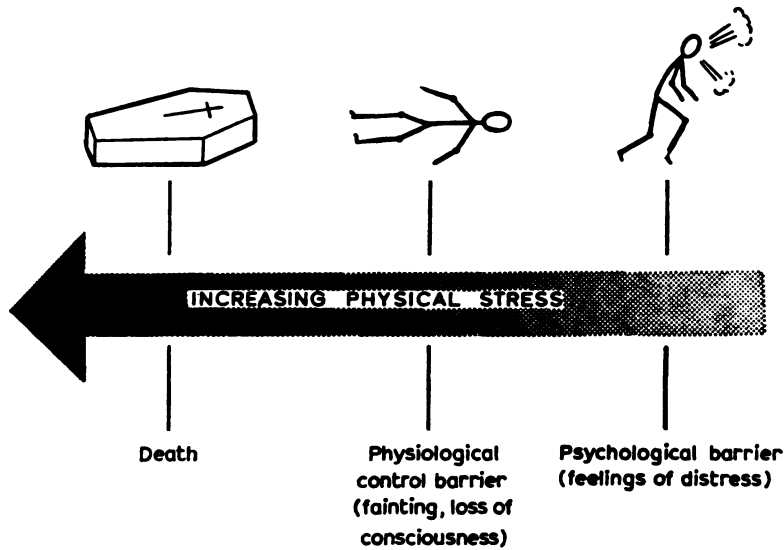


Fig. 2. BARRIERS TO HUMAN PERFORMANCE

The first is psychological and often called the pain barrier. It consists of an array of unpleasant sensations (knees buckling, jelloid muscles, profuse sweating, intense heat, harsh rasping breath, difficulty in vision, decrement in coordination etc.). The second barrier is physiological. Various control systems of the body may reach levels of function which are dangerous to the athlete who automatically loses the power to continue activity. With training the athlete is constantly attempting to improve his ability to ignore the first barrier, and in superbly conditioned athletes, it is possible to reach the physiological barrier without artificial stimulants. This barrier may, however, only be surmounted by the use of drugs or hypnosis. In either case the practice is most dangerous since the athlete by so doing approaches the final barrier of complete physical breakdown and death.

Sports Injury. The last category of sports fitness is a freedom from injury. Fig. 3 shows a classification of sports injuries which helps to understand the emotional background to the treatment of sportsmen.

Critical injuries are those which prevent a sportsman from competing, whereas non-critical may allow him to compete albeit perhaps in a limited fashion. When a critical injury is temporary, those who are treating the sportsman must understand the enormous urgency (as perceived by the sportsman) in progressing to a non-critical stage. When in that stage the sportsman is far more amenable to a protracted period of rehabilitation. With non-critical injuries, those which limit the sportsman require to be treated as expressly as possible. With non-limiting injuries the competitor will often show no great concern. Even if continued competition results in exacerbation of the non-critical non-limiting injury, the highly motivated sportsman will generally regard this as a worthwhile price to pay. Normal medical criteria

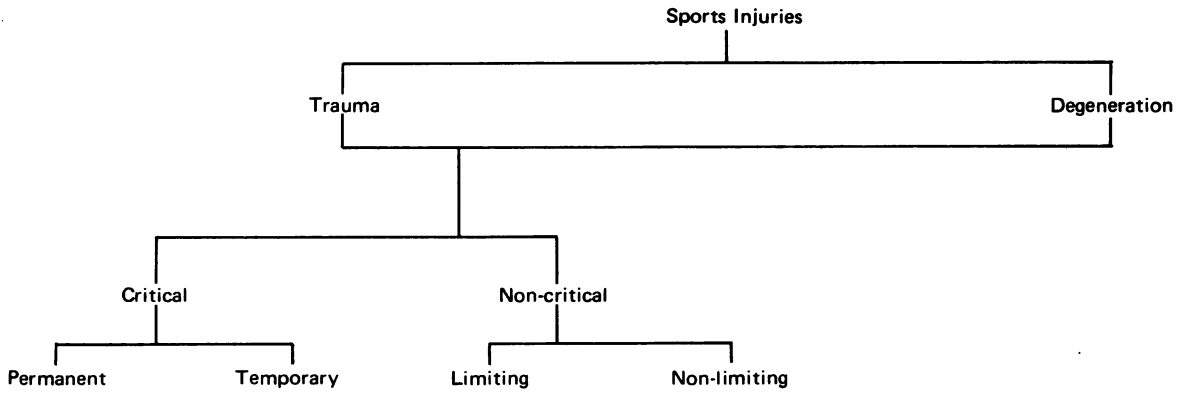


Fig. 3. A CLASSIFICATION OF SPORTS INJURIES

may not necessarily apply here. The decision as to whether future competition, perhaps allied with a neglect of treating the injury, should be undertaken is a matter for the competitor. Sportsmen make this plea to practitioners of sports medicine – “understand that our motivations are strong, and help us occasionally to suffer the consequences of our actions without judging us in strictly medical terms”.

The Place of Physiotherapists

In one sense, the aim of sports medicine is to make physiotherapy unnecessary. The first part of the treatment of the sportsman is the prevention of injuries. In the better organised situations, physiotherapists may play a part in preventative practices, but essentially preventative sports medicine is a combination of proper physical training, efficient medical care, enlightened administration of the regulations of play, and good design of playing facilities or equipment. The responsibility for the prevention of injuries lies with the coach, or manager.

If injuries nevertheless occur, the first aid is again the responsibility of the coach, but in all but the most trivial circumstances his aim must be to advance the injured athlete to the next phase which is the proper assessment of the injury by a sports medicine specialist. In this country, both of these aspects are at a lamentably low ebb. Certainly, the British Association of Sport and Medicine is beginning to improve the latter situation, but very little is being done to improve the former.

The final phase is the rehabilitation of the injured sportsman. This should be a team effort, between the doctor, coach, athlete and sometimes the physiotherapist. Except in professional soccer, this is seldom the case. British sport, with the exception of professional soccer, seems to be dogged by the failures of sportsmen and women to reproduce their best performances because of injury problems. The solution lies in our own hands.

SPORTS INJURIES: THE DEMANDS AND REALITIES OF BASKETBALL

Flt. Lt. W. H. G. WILKINSON, R.A.F., (Retd), A.M.B.I.M., D.M.S.

Physical Education Department, Liverpool Polytechnic

INTRODUCTION

Though basketball is theoretically a non-contact sport, in reality this is not true. The main court location for physical contact is around the basket.

Scores in top class competition average about fifty baskets per team. There are many more scoring attempts resulting from the ball's rebounding off the backboard. Practically all of the ten players on court may be attempting to gain