Athletic injuries

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(Questions by Elio Locatelli & Jim Alford)

1. What, in your opinion, are the principal reasons for the increase in the number of injuries to the lower limbs in the sport of track and field athletics during the last 10 years?

ARMSTRONG:
I was unaware of a relative increase in the number of injuries to the lower limbs in the sport of Track and Field during the last ten years. However, with the information that there has been an increase, I would suggest that it might be due to the fact that there is now a greater emphasis on competing as opposed to training and that perhaps the quality and quantity of technical coaching has declined in the last ten years.

BENAZZO:
First of all, I would like to underline that it is questionable whether we are facing a real increase in the numbers of injuries or whether, in fact, we are now more skilled at diagnosing these injuries, on the basis of our knowledge of the biomechanics of movement and of the referred symptoms. Furthermore, the systematic use of such diagnostic tools as sonography, bone scan and MRI may give an early indication of injuries or impending pathological conditions.

Secondly, we must distinguish between low/medium level athletes and top level champions. In fact, the overload of high intensity training expected of this second group, if conducted by a skilled coach, may increase the threshold of resistance of muscle, tendon, bone and cartilage, transforming a potentially damaging stimulus into a good one. In lower level athletes, however, an abrupt increase of mileage or of strengthening exercises of any type may results in an injury to the lower leg.

The increase in the number of injuries must be separately analyzed for each speciality or group of events.
1. What, in your opinion, are the principal reasons for the increase in the number of injuries to the lower limbs in the sport of track and field athletics during the last 10 years?

- In the jumps (long, triple and pole vault) speed may have assumed more importance than strength and the athletes may work for a too abrupt improvement of it, both in training and competition. Consequently, the impact forces are greater than before, and feet, ankles and hamstrings are overloaded.
- In the running events, the extra power of the athletes of the emerging countries, who are naturally endowed with an extra quality of muscle, has compelled white athletes to undertake different and heavier training.
- In other specialities, such as the throws and race walking, I am not aware of any increase of injuries to the lower limbs.

COMBI:
In my opinion, the increase in the number of injuries is due to the difficulty of adjusting the supporting body structures (skeleton, joints, ligaments, miotendinous junctions and tendons) to the ever more sophisticated and demanding training methods used to develop the athlete’s motor and neuromotor abilities.

GRAFF:
There are and can be no statistical data regarding any increase in the number of lower extremity injuries during the last ten years. In most countries sports-medical care for injured athletes is decentralized. In Germany, for example, there is no publication about the occurrence of injuries in athletes based on samples which can be evaluated statistically. This, however, would be a prerequisite for a survey of the dynamics of injuries in track and field athletes, as well as of their differentiation with regard to age and sex. I think that the following causes are mainly responsible for the frequent occurrence of injuries:

- Double and triple periodisation, which is nowadays normal, places borderline stress on the motor apparatus of even young athletes.
- As there is almost a blanket availability of synthetic tracks and indoor tracks, most track and field athletes have the opportunity to train on these surfaces all through the year. After the first synthetic tracks were constructed, at the end of the sixties and the beginning of the seventies, there was a remarkable increase in injuries in the area of the lower extremities (achillodynias, shin splint syndromes, ankle joint injuries). Today, apart from training all through the year on synthetic tracks, most athletes take part in two competition periods (indoor season, outdoor season). Although a positive adaptation of the motor apparatus to the running and jumping surface is possible, the total strain during the course of an athlete’s career (15 to 20 years) is extremely high. Therefore, it is advisable to reduce this strain now and then by doing more gentle training on natural surfaces.
- Because too little time is allowed for regeneration after the competition season, there is no chance of healing injuries to the motor apparatus by reducing the stress or by interspersing a lay-off period.
- Since there is an inflation of international meetings, there are hardly any opportunities for interspersing short regeneration periods in the competition season.
- All over the world there is a lack of young talented track and field athletes. Potential track and field athletes change over to other sports, in which lower international performance standards provide a greater chance to achieve success quickly.
1. What, in your opinion, are the principal reasons for the increase in the number of injuries to the lower limbs in the sport of track and field athletics during the last 10 years?

Therefore, on a regional, national and international level, coaches, clubs and federations are forced to make continuous use of the few elite athletes and to exploit fully the resources of the less talented ones. Consequently, both groups are in danger of being overtaxed.

KINGSBURY:
Overall, there has been an increasingly and unavoidably fine dividing line between injury and the range, speed and force of movement, together with the high technical and training demands required for elite competition. Apart from this, I would add:
• The stress caused by the increasing frequency of competition, with its need to maintain a high competitive level, and the tiredness due to the travel entailed.
• Inadequate incorporation of rest days or times as a planned part of training, rather than simply taking rest when one can. This is vital for tissue and mental recovery and can be especially important if the athlete has a regular job, when training may have to be early morning before work or in the evening after work. The athlete can be tired before starting training, sleep can be disturbed and meals may be ‘snatched’.
• Insufficient thought given to a musculo-skeletal ‘service’ (including the release of any area of muscle tightness) and medical screening, to pick up potential problems early or to prevent lesions developing. This can be crucial, if athletes are travelling from one competition to another and in the run-up to an important event.

All these factors can increase a liability to injury, for example, from limb misalignment or muscle imbalance.

2. How would you list the most common athletics injuries in order of incidence?

ARMSTRONG:
To list in order the most common injuries, one must first break down the sport into its various disciplines. For example, the most common injury to a javelin thrower may be a strain of the soft tissue on the medial side of the elbow; a triple jumper may have strong predisposition to low back pain and distance runners may develop ilio-tibial band tightness or stress fractures in their extremities.

However, one can generalize to some extent. In the case of runners and jumpers, the most common injury of consequence stems from tight hip flexors and knee extensors. This may manifest itself in low back pain. These athletes also may suffer from various kinds of patello-femoral or foot ailments. The second most common injury results from a tight ilio-tibial band. This, like hip flexor tightness, may lead to an inefficient gait pattern, which, in turn, may cause knee or back pain and/or repetitive stress related injuries, ranging from stress fractures to heel spurs and fallen arches.

In throwers, the most common site of pain is the lower back, followed by the shoulder, the elbow and the knee.

BENAZZO:
We should take into consideration the different specialities.
• Sprints, hurdles and middle distances
Hamstring strains and ruptures at the myotendinous junction are historically extremely common. Achilles tendon problems (in my experience, insertional tendinopathies with bursitis and calcaneal
2. How would you list the most common athletics injuries in order of incidence?

Osteoarticular and osteocartilaginous reactions more frequently than peritendinitis with or without tendinosis) follow second. Particular tendon problems, including ruptures such as those of tibialis posterior, flexor digitorum longus and flexor hallucis longus, are less frequently diagnosed.

Stress fractures of the foot (especially those of the tarsal navicula and the metatarsal bones) are becoming the most common injuries diagnosed at our hospital.

The increased banking of the indoor surface, coupled with the counter-clockwise running direction, may cause inflammation of the medial structures of the right knee, or iliobursal band friction syndrome, strain of the medial collateral ligament of the left knee or overload of the medial joint, without a true meniscal damage.

* Long distance and marathon

In these events, overloading of the cartilage and subchondral bone of the ankle, patello-femoral and femoro-tibial surfaces may take place. However, the most common injuries in long distance runners are damages due to an excessive eccentric muscle contraction. Compartment syndromes, in our experience, are not frequently encountered, while tibialis anterior tendinitis must often be surgically treated. Achilles tendon pathology and stress fractures are frequent.

* Throwing events

Pathology of the shoulder is most frequently found in javelin throwers. It includes rotator cuff impingement with and without bursitis, supero-posterior impingement, SLAP lesions and Bankart lesions with subsequent acquired instability.

Injuries to the shoulder are followed in frequency by those to the elbow, especially with the so-called American style of throwing, where the shoulder and elbow work in maximal extrarotation and abduction; this movement places overloading torque forces on the shoulder and elbow.

Injuries to the elbow may be listed as follows: olecranon stress fractures and bursitis, medial elbow pain (ulnar neuritis, medial collateral ligament complex ruptures, flexor forearm mass rupture (rare) and heterotopic bone mass formation).

In our experience, injuries such as knee and ankle sprains, with or without rupture of ligamentous structures, are rare and, in any case, not related to a particular speciality.

**COMBI:**

The most frequent injuries are:

* Acute pathology
  - Hamstring strains (39.7%)
  - Ankle sprains (22.9%)
  - Knee sprain and internal derangement
  - Achilles tenosynovitis and partial tendon rupture
  - Metatarsal stress fractures
  - Gastrocnemius strains
  - Adductor strains
  - Medial and lateral epicondylitis
  - Low back pain
  - Quadriceps strains
  - Avulsion of the iliac spine
  - Disorders of the shoulder rotation muscles and bicipital tendinitis
  - Retrocalcaneal bursitis
  - Abductor strains.
2. How would you list the most common athletics injuries in order of incidence?

- Chronic pathology
  - Achilles tendinitis and tendinosis (27.36%)
  - Low back pain (20.54%)
  - Patellar tendinitis and tendinosis (12.34%)
  - Tibial, metatarsal, foot, peroneal stress fractures
  - Patello-femoral pain syndrome
  - Achilles bursitis
  - Plantar fascitis
  - Metatarsalgia
  - Hamstring syndrome
  - Adductor syndrome
  - Rotator cuff impingement
  - Iliotibial band friction syndrome
  - Tibialis posterior tendinitis
  - Peroneal tendinitis
  - Neck and thoracic pain
  - Bursitis of popliteal fossa.

GRAFF:
In a sample of 483 track and field athletes (runners/jumpers) with 1341 injuries, the following regions of the body were injured:
- Foot 48.0%
- Knee 14.0%
- Spinal column 13.2%
- Thigh 8.7%
- Calf 7.2%
- Pelvic region 5.3%
- Hips 0.7%
- Other regions 2.8%

In a sample of 483 track and field athletes (runners/jumpers) with 635 foot injuries the following regions were injured:
- Ankle joints 41.7%
- Achilles tendon 25.3%
- Fatigue fractures 7.2%
- Soft tissue in the plantar region 5.4%
- Toe joints 2.4%
- Other regions 18.0%.

KINGSBURY:
This depends on the athletic event. In my experience, sprinters, middle distance runners, jumpers and throwers all have a different injury spectrum, although overall low back, hamstring and tendo-achilles problems are common.

3. What practices would you recommend as a way of preventing some of these common injuries?

ARMSTRONG:
To prevent injuries common to a particular sport or event, the athlete must first become aware of the requirements of the sport relating to range of action, strength and conditioning. Then, before taking up any specific practice, it is important that the athlete follows these directions:
- get healthy – pay attention to proper body weight and general fitness
- develop the necessary range of movement needed to perform all aspects of the activity in a technically optimal manner.
- develop general and specific strength throughout the extremes of range.
3. What practices would you recommend as a way of preventing some of these common injuries?

- develop endurance both for the cardiovascular system and for the muscles that are needed to perform specific action.
- then work sport specific; that is, start throwing or jumping or vaulting, and, yes, even competitive running.

In summary, first build a sound base.

BENAZZO:
Again, it is not easy to give an answer valid for every injury. Prevention still remains the key point in reducing the incidence and gravity of athletic injuries. We must keep in mind that the healing of a ruptured tissue such as, for example, a musculotendinous unit, produces a scar, which decreases the possibility of the athlete reaching a maximum performance when he is competing alone against time or a measure of space. Furthermore, injuries occur more commonly in training than in competition, and are usually due to training errors.

Therefore, I would list the more important preventive points as follows:
- Self knowledge of the athlete. This must be guided by the coach, who must reach a true symbiosis with the athlete. He must know where, when and how to train. He must know the signs of fatigue.
- Perseverance in practice.
- Attention to details of training - allowing the appropriate time for the warm-up, refining a proper technique, strengthening, stretching for correct flexibility, practising exercises to correct muscle imbalance, including exercises for the foot, ankle and knee.
- Regular blood tests for iron electrolytes and the determination of muscle enzymes, in order to correct imbalances.

These theoretically simple points may be applied and adapted to each event for successful, profitable and safe training and competition.

COMBI:
For the prevention of injuries, I would recommend exercises to enhance the elasticity of the muscles and tendons and improve the capacity to work through the complete range of movement of the injured joint and of those correlating with it. I would aim to gain the highest level of dynamic articular and muscular proprioceptivity (maximum proprioceptive response in each angle of articular movement). I would also recommend more time to be spent on the warm-up or improved warm-up methods and that at least an equal training time should be spent on the cool-down and regenerative phases. Regeneration should take place at two separate times – immediately after the work-out and 5-6 hours after the work-out.

This phase should include all the techniques of restoration and local and general care of the soft tissues (stretch and spray, stretching, NPF techniques, physical therapy, massage, local muscular relaxation) as well as recuperation for the entire body. These two phases of warm-up and cool-down must be most conscientiously observed. They must become an essential part of the daily regimen and of the athlete’s self discipline Only in this way will it be possible to guarantee total well-being for the following day.

GRAFF:
In general, injuries can be prevented by considering the causes of the increase in injuries listed under question 1. It is very important
3. What practices would you recommend as a way of preventing some of these common injuries?

To adapt both training quantity and intensity to the individual athlete's performance capability. This also applies to group training. Weak points of the motor apparatus (deviation of axes, instabilities in the area of the joints, etc.) should be detected in time and considered with regard to demands.

KINGSBURY:

It is not possible to prevent all injuries. Well-known factors to reduce the incidence are: thorough warm-ups, the possession of ranges of movement, flexibility and strength at least adequate to meet competitive needs, and care with footwear and the hours of training. I would add:

- Attention to 1(a-c) above.
- Limiting tissue restriction/swelling/soreness after training with ice, elevation and massage.
- A thorough recovery from other injuries.
- The ability to relax – if required, with the teaching of relaxation methods.
- Correction, where possible, of pre-disposing factors such as, for example, misalignment, imbalance.

4. On a daily basis, what treatment would you recommend both during and after injuries?

ARMSTRONG:

On a daily basis, one must maintain an adequate functional range of movement and one must work hard to maintain and increase the endurance necessary to carry out the event. Efforts must be made to maintain general and specific flexibility and event specific fitness.

BENAZZO:

I wish again to stress the importance of an early and precise diagnosis. With muscle strain it is mandatory to know whether a major bleeding with disruption of the fibres has taken place or whether we are merely dealing with a simple first degree strain, which may also be very painful. In the first case, rest will last until the haematoma is largely organized and then appropriate exercises will follow. In the second case, rest is unnecessary and eccentric contractions with careful stretching must begin as soon as possible.

The question, however, seems to concern the minor injuries experienced by athletes; in other words, the everyday problems they may face in the form of pain, muscle stiffness, tiredness and other symptoms, which are more psychological than physical.

Ultrasound, phonophoresis, iontophoresis, magnetic waves, laser beams or any other form of producing heat or cold may be considered convenient and deserving attention by doctors and therapists. Again each treatment must be diagnosis oriented and a psychological dependence of the athlete must be avoided. If an injury requires daily and prolonged treatment, the diagnosis should probably be revised and/or training should be discontinued. I personally consider of extreme importance appropriate reconditioning exercises, in order to treat the unavoidable imbalance caused by the athletic action.

COMBI:

As treatment, I would recommend an attentive, exact, daily and personalized rehabilitation and therapeutic programme. The two major causes of re-injury are insufficient rehabilitation and insufficient control of the timing and progress of future activity. After
On a daily basis, what treatment would you recommend both during and after injuries?

The clinical restoration to fitness, the resumption of sporting activities must be gradual and progressive and the athlete must be obliged to repeat, in the same amount of time and the same sequence, the exercises learned during rehabilitation period – restoration of dynamic proprioceptivity, timing, stretching, muscular re-activation and self massage. These techniques should be performed every day, even if the athlete has gained a condition of optimal fitness.

GRAFF:
It is important that the athletes themselves develop a feeling for the severity of an injury. The more often they are injured, the earlier they will recognize the signals of their bodies. In the course of time, a mature athlete learns to recognize the effect of training and different types of load. Similarly, both the athlete and the doctor learn to understand the body's individual reactions to certain forms of therapy. Athletes learn to estimate the effect of the injury on their current load tolerance and develop a realistic concept about the time needed for regeneration. In my opinion, this is much more important than the application of lotions or electotherapy.

KINGSBURY:
This depends on the type of injury but, for all injuries, precise diagnosis can be vital. Athletes, as others, need the right kind and level of medical expertise.

Haematomas, tissue swelling, sprains and strains are well known to benefit from immediate and repeated ice/compression/elevation. However, whether or not surgery, physiotherapy etc. are initially required, an athlete's full recovery may need various types of treatment, for which an 'overview' can be important.

Measurement and work against a chosen resistance over selected ranges is a valuable guide and stimulus to recovery but, for all injuries, therapists need to provide a daily protocol, so that athletes can contribute themselves. Total recovery may need the correction of predisposing factors. To avoid a chronic injury, it can be vital that initial treatment and rehabilitation are thorough and that injuries slow to recover are reviewed.

5. Do you think that surgery, particularly in the case of Achilles tendon, knee patella tendon and javelin elbow or shoulder injuries, can permit athletes to recover all of their pre-injury capacity?

ARMSTRONG:
There are certain cases that clearly necessitate surgical attention to allow the athlete to return to high level performance. However, if an athlete is competing at, or very close to, his or her potential, prior to an achilles or a quadriceps tendon rupture or a third degree shoulder strain, it is unlikely that full pre-injury capacity will be recovered following surgery. Nevertheless, I can think of two instances when surgery may lead to a greater performance:

1) In the case of a javelin thrower straining an elbow to the point of needing surgery, it is quite likely that the cause of the injury in the first place was a matter of technique – which cannot be repaired in the surgery! Therefore, it is possible that the athlete might be forced, for the first time, to learn to accelerate the javelin properly and thus throw further and more safely with a better technique.

2) Most great athletes have had to overcome a major physical barrier and, for some, it may be overcoming the catastrophic
5. Do you think that surgery, particularly in the case of Achilles tendon, knee patella tendon and javelin elbow or shoulder injuries, can permit athletes to recover all of their pre-injury capacity?

Effects of surgery. This surgical setback may provide the focus for greater concentration and effort and, therefore, ultimately greater performances.

BENAZZO:
It is commonly thought that surgery means the end of an athlete’s career, or at least an abrupt decline in performance. This is particularly true for shoulder problems in throwers. However, I would say that recovery of pre-injury capacity is strictly related to the degree of pre-operation pathology. In other words, the less severe the structural alterations to the tissue, the better will be the results of surgery.

A simple Achilles peritendinitis is less difficult to cure than a peritendinitis with peritendinosis, and more difficult to cure than an insertional tendinopathy, where the calcaneal bone is involved. Surgery often leaves scarring adhesions and intratendinous calcifications, with resulting lack of flexibility and persisting pain. Shoulder impingement, without acquired instability and/or cuff degeneration or tears, is easily treated with a subacromial decompression, with a reasonably rapid recovery. Degeneration and/or tears of the rotator cuff are really performance threatening conditions.

Repair time is another key point: recovery of the pre-injury level must respect the biological time of repair, which is long for tissues, such as the tendons, where irrigation is low. Furthermore, the athlete does not need merely to reach the proper condition for “normal” life but the level of fitness sufficient and necessary for high performance, and this can be difficult to accomplish.

Early surgery means early and complete recovery. This concept implies a correct pre-operation diagnosis and, above all, a correct phasing of the treatment of the injury with all available methods, from sonography to MRI, to avoid delay as well as unnecessary surgery. From the deontological point of view, we must keep in mind that the athlete will not produce a better performance because of our surgery, but only the chance of tissue repair. Reconditioning and training may take him back to his top performance.

COMBI:
I have seen a complete recovery of previous capacity after surgery only in cases relating to the achilles tendon or the patellar tendon. As far as shoulder and elbow injuries are concerned, athletes have been able to return to their sport but with a permanent, if slight, reduction of their previous capacity.

GRAFF:
The recovery of one’s full capacity to train and compete after unavoidable operations of the achilles tendon, patella tendon, elbow or shoulder is possible. However, post-operative results are very much dependent on the following factors:

- Pre-operative factors: The athlete’s performance age must be considered. Athletes with therapy-resistant symptoms, who once more want to give their best at the end of their career, should consider that after surgery there is a prolonged regeneration until full loadability has been reached again. After successful achilles or patella tendon surgery, it takes 6 to 12 months to compensate for operation-induced training and competition deficits.
5. Do you think that surgery, particularly in the case of Achilles tendon, knee patella tendon and javelin elbow or shoulder injuries, can permit athletes to recover all of their pre-injury capacity?

- Amount and type of tissue lesion: In the case of advanced tissue degeneration there can be a reduced tolerance to special training loads (e.g. forms of jumping strength training) after surgery. Thus, the recovery of one's full performance capacity can be prevented.
- Surgery: After inept surgery the post-operative result and therefore the athlete's career are called into question.
- Post-operative rehabilitation: Post-operative rehabilitation is as important as expert surgery. A correct load control and the well-timed use of training forms in the course of increasing load tolerance are extremely important. Bad results can be caused not only by too few rehabilitation measures but also by a too extensive rehabilitation.

KINGSBURY:
Certainly: but it has to be emphasised that informed rehabilitation through to complete recovery can be as important as surgery itself.

6. Have you found any significant difference between the injuries most commonly sustained by women as opposed to men athletes?

ARMSTRONG:
I feel that I have witnessed a greater incidence of stress fractures in women runners and certainly a greater incidence of eating disorders in female than in male athletes.

BENAZZO:
Many studies have been conducted on this topic. There are gender differences regarding body composition, hormones, biomechanics, behaviour and work capacity. Both genders are capable of increasing strength, power, muscular endurance and performance with appropriate training. However, the development of strength is lower in women than in men. As far as injuries are concerned, an increased number of stress fractures may be observed in women, especially if menstrual problems are present (amenorrhoea). In comparative studies, the incidence of lower limb problems is double in females. However, they require less time to recover and to reach their pre-injury athletic level.

COMBI:
Of all the common pathologies, I think that low back pain is the one that highlights the difference between men and women. The greater incidence of this in women is probably due to their natural greater accentuation of the lateral curves of the spinal column and to their characteristic conformation of the pelvis.

GRAFF:
There are clear indications that stress reactions and fatigue fractures are more frequent in women than in men athletes.

KINGSBURY:
As far as the ranking of the frequency of injuries is concerned, this needs study by competitive level and type of event, over many seasons. However, my impression is that, at present, pelvic misalignment and pain in the hip stabilisers and rotators requiring attention appear to be more common in women than in men.