SPORTS INJURY BULLETIN
PREVENTION • TREATMENT • REHABILITATION

In this issue

Issue 81 **July/August 2008**

From the editor

Here it is again: the season when the international sporting calender really kicks off – and this Olympics year it just seems to go on and on. It's both fantastic and immensely frustrating for anyone who has to try and hold down a day job, feed the kids, weed the garden and still find time to sit and watch the feast of sporting excellence on offer. It's all very well having a panoply of technology to enable easy time-shifting, but speaking for myself, 1.30am is horribly deceptively convenient: it certainly doesn't feel like such a good idea at 5.50am when I have to crawl out of bed to begin the next day's work...

Enough moaning. I am delighted to introduce another new *SIB* author this month: Jane Johnson, who is an experienced London-based sports massage practitioner and educator. This is the first time in more than four years that I have run a major feature on sports massage, so it is appropriate that this piece looks at the entire discipline and, in particular, at its evidence base. Jane inevitably touches upon that issue that we keep on returning to in the bulletin: professional practice standards. I'd love to hear from readers, particularly those outside the UK, for more insights and thoughts on training and standards for sports massage therapy. Should there be more regulation, standardisation, higher entry barriers for this discipline?

We have a pair of articles focusing on the pelvis this month. The first is a belt and braces briefing on the troublesome pathology of osteitis pubis, but it is quite useful to read this along with Chris Mallac's contribution on pelvic monitoring and assessment. Chris's article is a follow-up to his post-injury screening piece last issue, and while it is a much more technical piece than is normal for *SIB*, I feel it is important to give readers an appreciation of this important aspect of athlete monitoring. Well worth the effort.

Finally, another overdue topic tackled by Sean Fyfe: iliotibial band syndrome. And don't overlook the latest football-injury research tips that Nick Grantham has uncovered for you.

Enjoy the summer of sport; *SIB* will be back with you in September.

Jane Taylor
Email: sib@sports-performance.com

Therapeutic disciplines

Sports massage

What exactly is it? And does it really work? **Jane Johnson** explains

Manual massage, despite a lack of robust evidence for its efficacy, has long been advocated by sportspeople as a useful intervention, pre-event, post-event and as part of a general all-body maintenance programme. While we do not know just how many athletes are using massage, it appears to be extremely popular, with athletes and therapists alike believing in its effectiveness.

Galloway and Watt, in their review of the provision of massage by physiotherapists at 12 major athletic events[1], noted that they spent between 24% and 52% of their total therapy time providing massage; and three out of four of these massage treatments were not injury-related.

The fact that massage is a time-consuming form of intervention has been cited as yet another reason for the importance of research into its efficacy[2]. If Galloway and Watt's findings are representative, it seems as though massage may be becoming a fundamental, not just a complementary component of an athlete's support system – at least in the mind of the athlete!

The benefits of massage

Goats, in his 1994 review of the physiological and therapeutic effects of massage[3], reported on studies supporting the following range of claims made for massage:

- dilates superficial blood vessels
- increases the rate of blood flow
- decreases blood viscosity
- increases lymph flow
- reduces post-surgical swelling and pain
- improves frozen shoulder
- reduces pain in overuse injuries of the knee
- reduces muscle spasm
- reduces muscle soreness
- prevents denervated muscle from losing bulk and contractile capability
- improves relaxation, thus accelerating physical repair.

While some researchers attempt to explain the theoretical processes behind these kinds of changes[2], it is generally acknowledged that there is insufficient scientific evidence to endorse all of these claims. However, as sports professionals have so often to remind themselves in negotiating the gap between theory and practice: *absence of evidence of efficacy is not the same as evidence of absence of efficacy*.

Once you get your head around this wisdom, it helps to explain why so many athletes are using sports massage: just because we haven't found the evidence, doesn't mean it's not effective.

Researchers in the field widely acknowledge that there are serious difficulties inherent in carrying out good-quality research into this form of therapy, including a lack of clear massage protocols and varying methodologies. Despite this, slowly but surely we are piecing together a clearer understanding of the physiological effects.

Research has tended to focus on physiological parameters, perhaps because you don't have to be Einstein to know that unless you are in the hands of a complete sadist, receiving massage is supposed to feel good and is therefore likely to increase your sense of wellbeing. What has mattered to some is whether the claims made by those providing massage can be substantiated; whether massage can help improve performance, speed overall recovery or help athletes to rehabilitate specific injuries. Fortunately for project-hungry researchers, so many claims exist for the benefits of massage that one hardly knows where to start (see box, right).

If massage makes you feel good but has no real effect on you physically, that might not matter. But if it makes you feel good and has a *detrimental* effect on you physically, that certainly could matter to an athlete.

What might massage do?

Massage therapists make the following claims for the benefits of sports massage:

- facilitates the removal of lactic acid and other 'toxins' from the blood
- improves blood flow to tissues
- improves the flow of lymph
- decreases swelling/oedema
- helps to stretch tissues and thereby lengthen muscles
- increases joint mobility
- 'breaks down' scar tissue and 'adhesions' after injury
- may increase muscle tone
- may help decrease muscle tone
- may reduce the effects of delayed onset muscle soreness
- improves psychological wellbeing.

Toxins removal

An accumulation of evidence now suggests that massage does not increase the removal of lactic acid [4-6], perhaps at last allowing us to put this particular beast to bed, much like the pre-exercise static stretching routine.

The ability of massage to clear us of 'toxins' is a myth long perpetuated by therapists, perhaps because it sounds plausible, or perhaps because, given the choice of drinking three glasses of water and peeing a lot, or being pummelled gently on a massage couch for an hour, many of us would choose the latter. So, despite the little devil of evidence-based practice sitting on our shoulders asking annoying questions such as, 'Why would massage be more effective at removing a metabolic byproduct than our own bodies?', we have been easily persuaded that massage is inherently physically important.

DOMS treatment

The effect of massage on delayed onset muscle soreness (DOMS) is not so clear. Massage may be useful in reducing the athlete's perceptions of DOMS[7-10]. Those of us who like to lie down after physical exertion can have our post-10k hamstrings squeezed a bit longer and our quadriceps passively stretched in the legitimate belief that we will recover more quickly and be back on the track on Tuesday instead of Wednesday. But it is not possible to explain this perception of improvement: the presence of neutrophils – believed to contribute to DOMS – seems unaltered after massage.

Does this matter? If sportspeople are choosing massage in the belief that it helps reduce DOMS (anecdotally this seems to be the case), they might not care quite how this works physiologically – as long as it does.

Event preparation

When it comes to pre-event massage, evidence is accumulating that not only might massage have no performance-enhancing benefits[4, 9], it may actually be detrimental, certainly for muscle power. As with pre-exercise stretching, these days pre-event massage is used cautiously, if at all, and therapists are suddenly wary of administering strokes that may stretch tissues in all but the most superficial way.

Enhanced wellbeing

A sense of improved wellbeing is one of the outcomes most sports massage practitioners are likely to be aiming for on top of more specific goals such as decreasing sensations of muscle stiffness or increasing joint range. Unsurprisingly massage appears to enhance psychological perceptions of recovery in sport[10]; which raises the question: what is recovery? The means by which physiological parameters are psychologically mediated is not clear but this, too, is gaining interest among scientists researching the effect of sports massage on athletic performance.

The five basic strokes

One of the challenges to the scientific study of massage and its effects on the athlete is the wide variety of applications available within the modality. For example, basic manual massage consists of five strokes:

- effleurage
- pétrissage
- tapôtement
- frictions
- vibrations.

All sports massage therapists learn these basic techniques prior to further training. But each stroke may be performed in a variety of ways and the effects will depend on variables such as strength of the therapist, speed of application, and perhaps even factors such as whether a limb is elevated or not during treatment.

Effleurage is a smooth gliding stroke used to apply and spread the massage medium (such as oil or wax), usually used at the start and end of each treatment and prior to and following deeper work. It is performed in the direction of venous and lymph flow, distal to proximal, with the palms flat against the client's skin.

Generally considered to be soothing and calming, its benefits, according to therapists, are: enhanced relaxation, improved blood flow, decreased muscle tone and reduced swelling. Although considered in Swedish massage to be a light stroke, effleurage may be used in sports massage slowly and with more pressure to compress, flatten and stretch tissues. Performed quickly it is believed to increase muscle tone and may be beneficial during preparation for competition[11], although, as mentioned above, some studies indicate that massage may decrease muscle power so should be used cautiously in a pre-event setting.

There has been huge concern in recent years that massage therapists are themselves developing overuse injuries of the upper limbs and speculation that the application of constant pressure (albeit light) with the wrist in extension (as in this stroke) is a contributing factor. The technique is therefore often modified by the use of the forearms instead of palms.

Pétrissage is deeper than effleurage, with the therapist using both hands to grasp muscle, lift, squeeze and wring it in a rhythmic motion. In theory such mechanical compression of tissues helps improve blood flow, stretches contracted muscles and adherent fibrous tissue and thus helps normalise muscle tone in healthy individuals.

Overuse of this technique may again be contributing to injuries among therapists themselves, with constant squeezing and gripping motions aggravating muscles of the common flexor and extensor origins and possibly resulting in medial and lateral epicondylitis. Overuse injuries to the thumb are also not uncommon in therapists.

Tapôtement is stimulatory and represents a variety of percussive techniques aimed at inducing vasodilation, tissue vibration and triggering of cutaneous reflexes.

The most gentle form involves rapid tapping of the fingers; more vigorous forms include striking the skin lightly with the ulnar side of the hands (hacking), the hands cupped (clapping), or fists (beating).

Frictions are short rubbing-type strokes localised to a particular area of soft tissue. Transverse frictions are commonly used in the treatment of tendons(12). The therapist simply rubs the tendon using the pad of their finger, often reinforced by another finger, with the aim of deliberately causing localised mild inflammation. Such techniques are commonly used in the treatment of medial and lateral epicondylitis(13) where they induce mild local analgesia and could in theory stimulate a healing process.

Vibrations and shaking involve the therapist placing trembling hands firmly against the skin in an attempt to vibrate and relax tissues. Gentle shaking is commonly used in the treatment of the limbs where it is believed to lower muscle tone and facilitate fluid drainage, especially when the limb is slightly elevated.

Protocol problems

Effleurage and pétrissage are the techniques usually used in research but the protocols for their use are rarely stipulated. More recent studies(5) are getting better at clearly setting out these basic parameters. In research circles, attention to detail clearly matters but one sympathises with those to whom the task falls. It's a bit like what happens when you begin the deceptively simple task of writing a recipe: do you whisk the milk and then add flour? Or add flour and then whisk? For how long do you whisk? What if the flour is not dispersed after a few minutes – have you added too much, or whisked too little? It is hardly surprising that research findings vary, when one training source(14) gives nine examples of how to apply just one of the five main massage techniques.

Sports massage techniques

So what are sportspeople receiving when they go for a sports massage treatment? To the surprise and even annoyance of some physiotherapists, the session need not include any actual massage. The therapist may indeed use any or all of the five basic massage strokes but they are likely also to use more advanced techniques to address specific problems such as muscle cramp, overly tight muscles, joint stiffness or excessive scar tissue. The precise application of techniques may vary widely in terms of the medium of massage (oil, wax, balm or cream), pressure used, and so on.

Among the more specialised techniques of sports massage are:

- soft tissue release (STR)
- muscle energy technique (MET)
- proprioceptive neuromuscular facilitation (PNF).

MET and PNF are forms of facilitated stretching that employ contract-relax type methods; STR localises a stretch to a specific area of soft tissue.

Sports massage therapists also widely use trigger point therapy. The growing use of this technique may be at least in part because it allows the therapist to facilitate a reduction in muscle tone and tension without the need for so much potentially damaging (to the therapist) effleurage and pétrissage; practitioners have become skilled at applying static pressure to trigger points using their elbows and specially designed massage tools (massage tools are used more in sports massage than among therapists offering Swedish/holistic treatments).

Some massage therapists are fitness instructors who can assist in overall exercise rehabilitation; others are physiotherapists with a keen interest in sport. Many therapists may be physically active themselves and have a particular interest in a certain type of sport and a good understanding of the injuries associated with this.

No pain, no gain?

Many people consider that 'real' sports massage necessarily involves deep tissue work, and a small population of sports massage practitioners believe in the no-pain-no-gain approach, with 'stripping' of muscle fibres being particularly popular. There is, however, growing interest among therapists in how to treat fascia, with myofascial 'release' courses offering specialist training in the much more subtle and less invasive movement of tissues. This may not appeal to those clients who desire their DOMS to feel positively heightened before they'll believe a sports massage has been effective, but is more than welcomed by those of us who like to be allowed to breathe during treatment.

Use of fascial 'rollers' and deep stripping techniques – believed by some athletes and therapists alike to be necessarily painful – would horrify others. As is the case with physiotherapy, surgery, fitness instruction etc, we all follow the basic principles of our trade but have preferences based on training, skills, beliefs and our own experiences.

A therapist known to provide painful 'deep tissue' massage in a slightly brusque manner is likely to attract clients who prefer no-nonsense, painful deep tissue massage. Sports massage therapists working more intuitively are going to attract clients who themselves prefer a less structural-mechanical, more 'energy'-based approach. The sportsperson used to having regular massage is likely to be horrified if you ask them to change their therapist. We like what we know and we know what we like.

Conclusion

There is ongoing speculation within the UK as to whether sports massage as a profession will be self- or state-regulated. Regulation of any kind is likely to result in greater conformity. Yet there is disagreement as to what the specific role of the sports massage therapist should be; whether they should work independently or alongside other professionals such as physiotherapists; whether they should be skilled in strapping and taping; what additional range of soft tissue manipulation they should deliver beyond the five basic massage strokes; how far they can or should facilitate recovery from injury and so on.

In the UK there is as yet no standardised approach to the training of sports massage practitioners; the content of training programmes remains highly controversial. Although this article does not address the international situation, there are no obvious examples of a highly developed national standards and training structure for this emerging sports-therapy discipline. Until the industry is regulated huge diversity is likely to remain. All we can say with any confidence is that most therapists would be unlikely to remain in work if they didn't meet at least a substantial part of their clients' expectations.

In a world bent on evidence-based practice it is reasonable to expect that the quest for quantitative data will continue. But there is a different and extensive body of potential evidence yet to be explored: the beliefs and experiences of all those sportspeople who use massage; and the experiences of so many practising therapists. What of their evidence? It is perhaps because the therapists themselves are not trained researchers and have unwittingly perpetuated certain myths as to the efficacy of their treatments, that anecdotal claims are sometimes consigned to the realm of pseudo-science. What a shame. Here is a field of qualitative research bursting with opportunities to add to our understanding of the effects of sports massage. Not many seem willing to venture into that particular pasture. Surely that matters?

What are your views and experiences of the efficacy of sports massage therapy? Can you tell us more about standards, training and integration with other professionals in your country? Share your thoughts with SIB readers, email us at sib@sports-performance.com

References

1 Galloway SDR and Watt JM 'Massage provision by physiotherapists at major athletic events between 1987 and 1998', *Br J Sports Med* 38: 235-237 (2004)
2 Callaghan MJ 'The role of massage in the management of the athlete: a review', *Br J Sports Med* 27(1) (1993)
3 Goats, GC 'Massage – the scientific basis of an ancient art: part 2. Physiological and therapeutic effects', *Br J Sports Med* 28:3 (1994)
4 Hemmings B, Smith M, Graydon J et al 'Effects of massage on physiological restoration, perceived recovery, and repeated sports performance', *Br J Sports Med*, 34: 109-115 (2000)
5 Robertson A, Watt JM, and Galloway SDR 'Effects of leg massage on recovery from high intensity cycling exercise', *Br J Sports Med* 38: 173-176 (2004)
6 Gupta A, Goswami A, Sodhukhan AK et al 'Comparative study of lactate removal in short term massage of extremities, active recovery and passive recovery period after supramaximal exercise sessions', *J Sports Med* 17: 106-110 (1996)
7 Ernst E 'Does post-exercise massage treatment reduce delayed onset muscle soreness? A systematic review', *Br J Sports Med*, 32: 212-214 (1998)
8 Hilbert JE, Sforzo GA and Swensen T 'The effects of massage on delayed onset muscle soreness', *Br J Sports Med* 37:72-75 (2003)
9 Ogai R, Yamane M, Matsumoto T et al 'Effects of petrissage massage on fatigue and exercise performance following intensive cycle pedaling', *Br J Sports Med*, 2 April (2008)
10 Hemmings BJ 'Massage effects on regeneration, recovery and performance in sport', *Physiotherapy In Sport*, Volume XXII, No 2, (July 1999).
11 Goats GC 'Massage – the scientific basis of an ancient art: part 1. The techniques', *Br J Sports Med*, 28 (3), (1994)
12 Mayer F, Hirschmüller S, Schuberth M, et al 'Effects of short-term treatment strategies over 4 weeks in Achilles tendinopathy', *Br J Sports Med*, 41:e6 (2007).
13 Sevier TL and Wilson JK 'Methods utilized in treating lateral epicondylitis', *Physical Therapy Reviews* 5:117-24 (2000).
14 Razuvayev A and Razuvayeva V *Russian Sports Massage*, Utah College of Massage Therapy (2004).

Pathologies

When TFL and ITB spell trouble

Lateral knee pain in distance runners is all too common. **Sean Fyfe** explains why and how to treat it

Iliotibial band friction syndrome (ITBFS) is the most common cause of chronic lateral knee pain in runners, with distance runners being most likely to develop it. It usually appears as an aching pain on the outside upper part of the knee during foot contact; in severe or acutely irritated cases pain can be felt when bending the knee at about 30 degrees of flexion.

It is usually not too hard to diagnose ITBFS; the tougher challenge for the therapist tasked with restoring the athlete to running is to address the underlying causes. Rehabilitation has to take a holistic approach, encompassing scrutiny and modification, as appropriate, of training volumes, lower-limb and lumbopelvic biomechanics, running technique, shoes, muscle function, soft tissue tone and range of movement.

Anatomical context

As always, the therapist cannot hope to succeed without thorough structural and functional knowledge. So let's start by looking at the anatomy of the relevant muscular and fascial structures.

The **tensor fascia lata**, or **TFL**, acts as:

- hip flexor
- abductor
- medial rotator.

It begins at the anterior (front) part of the outer lip of the iliac crest and the anterior superior iliac spine (ASIS). This means it lies between the gluteus medius and sartorius muscles. TFL has two parts: the anteromedial (front and inner) aspect and the posterolateral (rear and outer) aspect. The tendinous fibres of the anteromedial aspect extend down the thigh and attach at the outer edge of the kneecap (lateral patellar retinaculum) and the deep fascia of the leg superficial to the patellar ligament. These fibres are most active in non-weight bearing and hip flexion.

The tendinous fibres of the posterolateral aspect join the fibres of the longitudinal middle layer of the iliotibial band (ITB), which then attaches to the top outer notch (lateral tubercle) of the tibia. These TFL fibres are most active around heel strike and thus play an important knee stabilising role.

Some of the deep TFL fibres attach to the lateral femoral condyle and linea aspera (posterior bony ridge) of the femur. The ITB also attaches into the tibia high up at Gerdy's tubercle and blends with the hamstring muscle biceps femoris and outer quad muscle vastus lateralis.

The **gluteus maximus** is a powerful extender and external rotator of the hip, also assisting in hip abduction. It attaches proximally to the rear edge of the ilium and iliac crest, the posterolateral surface of the sacrum and other small attachments into the coccyx, fascia and ligaments. It inserts distally into the ITB and the gluteal tuberosity of the femur.

Gluteus medius is a powerful abductor, whose anterior fibres also assist in medial rotation of the thigh. It lies deep to the gluteus maximus, attaching proximally to the front three-quarters of the iliac crest and distally to a broad tendon anchored to the greater trochanter.

The **vastus lateralis** begins three-quarters of the way up the femur, on the rear outer side, and distally inserts into the outer edge of the patella, crossing the knee via the patella ligament. Some fibres attach into the lateral patella retinaculum. Vastus lateralis extends the knee as part of the quadriceps mechanism. During walking and running, the quadriceps are very active before and during heel strike to control knee flexion.

Friction or compression?

ITBFS is typically believed to result from excessive friction between the ITB and the lateral femoral condyle, causing inflammation of the under surface of the ITB or the inflammation of the bursa that sits between the two structures. Fredericson and Wolf in 2005[1] reported that impingement of the ITB over the lateral femoral condyle is at its greatest in 30 degrees of knee flexion. Other studies report that this maximal zone lies between 20 and 30 degrees. During running the knee is flexed at approximately 21 degrees at heel strike and then flexes to 30 degrees, so you can see how this is a plausible theory of friction and hence irritation developing.

However, this may not be the exact mechanism of injury. Fairclough et al in 2007[2] challenge this theory. They have subsequently put forward an alternative theory based on their belief that three major anatomical considerations have been overlooked:

'**a.** the ITB is not a discrete structure, but a thickened part of the fascia lata which envelops the thigh;
b. it is connected to the linea aspera by an intermuscular septum and to the supracondylar region of the femur (including the epicondyle) by coarse, fibrous bands (which are not pathological adhesions) that are clearly visible by dissection or MRI; and
c. a bursa is rarely present but may be mistaken for the lateral recess of the knee.'[2]

Fairclough et al propose that forwards and backwards movement doesn't occur at all, even though it seems that way because of the change in tension along the ITB. Instead they believe the injury relates to increased compression of the highly vascularised and innervated layer of fat and loose connective tissue that separates the ITB from the epicondyle.

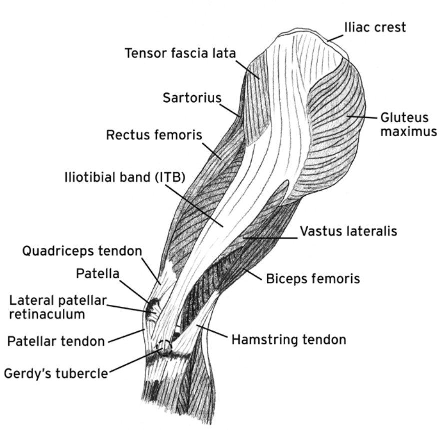
So as far as the science goes, we don't completely understand what occurs in the injury we classify as ITBFS. But we do have a pretty good idea of the underlying causes of the problem and how best to manage it.

Diagnosis

Most cases of ITBFS can be diagnosed from subjective and objective analysis. The subjective analysis is usually associated with an increase in volume or intensity of exercise. The pain will follow a typical overuse pattern, at first appearing at the end of a run, then at the start and end of the run spilling over into soreness after the run, and eventually occurring daily.

Pain will usually increase with downhill running. There will be tenderness over the distal ITB, increased pain with compression over the ITB as the knee is moved past 30 degrees of flexion. The Thomas test will usually be positive both for tightness of hip flexion and the hip falling into abduction, Ober's test will be positive, showing restricted adduction, and there will be pain

Left thigh, lateral view



with activities such as stair-climbing.

You are unlikely to need scans to diagnose ITB pain, but they can be used to eliminate differential diagnoses. A local corticosteroid injection can also be used to help confirm the diagnosis: the steroid is injected between the lateral femoral condyle and ITB: if this reduces the pain, the diagnosis is confirmed.

As always, therapists should rule out other possible pathologies. In the case of ITBFS this isn't particularly difficult. In older patients, we must be aware of osteoarthritis (OA) in the lateral compartment of the tibiofemoral joint. This is felt as a deeper pain, with more joint line tenderness. OA can be seen on x-ray.

Pain in the lateral patello-femoral joint (patello-femoral pain syndrome or PFPS) or lateral retinaculum can be harder to distinguish. Pain and tenderness will be felt on the rim of the lateral femoral joint or just laterally, and will be reproduced with loaded knee flexion. Lateral meniscus injury or irritation will also give lateral knee pain and must be eliminated by assessing the area of tenderness and testing the integrity of the meniscus. With meniscal damage, pain will normally be reproduced with end of range knee flexion, particularly when squatting.

Address the root causes

As with any overuse injury, the prime cause of ITBFS is training error. The most common relevant background factor, when athletes present at the sports clinic, is an increase in training volume. Typically this client will be a three-times-a-week social runner, who decides one day they are going to run a marathon. The next few weeks consist of daily running and increases in distance. They start to develop soreness on the outside of the knee on heel strike and in stance phase. At first they think it will go away, so they just keep going, but then it gets worse and they start getting daily pain, particularly with stairs. That's when they turn up at the sports clinic with a raging ITBFS.

It is very likely that this runner will also have other underlying causative factors. But they might still have saved themselves time, expense and pain had they had a better understanding of how to manage the increase in their training volumes, thereby allowing their body time to adapt. Nevertheless, the therapist should keep on digging for the underlying factors at work.

There are two biomechanical malfunctions that can cause increased load to the under surface of the ITB during running. The first is increased femoral abduction during the heel strike to mid stance phase, which increases ITB tension over the lateral femoral condyle. This could exacerbate friction or compression of the ITB fat deposit. Runners are more at risk of this dysfunction if they have:

- genu varum (bow legs)
- rear-foot varus (congenital condition in which the rear foot tilts inwards) or
- pes cavus (high arches).

The second type of malfunction is increased pronation of the foot and ankle complex, leading to increased tibial internal rotation – which will again increase the friction on the ITB.

To determine whether the runner's underlying biomechanics are playing a role in the injury, the therapist must assess their client statically (in lying and standing) and dynamically. To perform a dynamic assessment and see what exactly is occurring during running, you really need to use video feedback. If you have never used it before, the difference between what you see with your eyes and what you see when you slow the movement right down can be quite alarming.

It is not advisable for the client to run again until they have achieved two key changes:

- Symptom relief. This is the therapist's immediate priority and can be done through rest, cross-training, ice, anti-inflammatories and possibly steroid injection.
- Correct the underlying cause(s) as identified in your assessment. If it is just a training error, the therapist should examine and modify the return to running and subsequent training programme. For an elite athlete this must be done with the coach.

If the underlying biomechanics are to blame, you will need to consider orthotics to correct the motion of the foot, lower limb and pelvis during running. Orthotics are generally most effective for those runners who over-pronate, rather than those with a high arch, as the arch and heel support will decrease pronation and tibial internal rotation. However, they can sometimes be useful for the latter, as increased pronation will decrease the femoral abduction force and disperse load at the foot.

Myofascial restrictions can also play a role in causing ITB injury. Increased tension and trigger points in the TFL and vastus lateralis, and fascial tightness along the ITB will wind up the tension between the ITB and the femoral condyle. Trigger point therapy, soft tissue massage, fascial releasing and stretching will help this.

But ITB tightness can continue to be a problem for the runner if they still have muscle imbalances around the hip and pelvis. This leads to a crucial part of rehabilitation from ITBFS: to assess and strengthen the hip and pelvic musculature, which the therapist must look at during the biomechanical assessment.

Gluteus medius must be firing to stabilise against pelvic tilt, and to ensure the femur doesn't fall into internal rotation. Gluteus medius must be working correctly in sequence with other postural muscles such as VMO (vastus medialis) and tibialis posterior to maintain appropriate posture of the leg during stance phase. If the gluteus medius is weak, TFL overworks and this leads to chronic myofascial restrictions.

Gluteus maximus must also be firing to ensure rapid propulsion through stance phase. Runners with a hip-flexor dominant running style will often have poor glute max function and will demonstrate poor hip extension through the end of stance phase. If the system isn't functioning well, the foot strike can often be too far out in front, which causes greater knee flexion and increased load to the ITB. The appropriate correction to running technique here will involve shortening the stride and bringing the heel strike underneath the hip.

Conclusion

The diagnosis of ITBFS isn't too difficult, but there is conjecture about what is actually occurring. The real challenge for the therapist is to address the underlying causes, especially if there are multiple factors at play, such as training volume, myofascial restrictions, biomechanics and hip muscle imbalances.

References

1 Fredericson M, Wolf C 'Iliotibial band syndrome in runners: innovations in treatment.' *Sports Medicine* 35/5 451-459

2 Fairclough J, Hayashi K, Toumi H, et al 'Is iliotibial band syndrome really a friction syndrome?' *Journal of Science and Medicine in Sport* 10/2, 20070401 74-76

Futher reading

JG Travell and DG Simons 'Myofascial pain and dysfunction' *The trigger point manual: Vol 2 The lower extremities*. Lippincott Williams and Wilkins 1997.

Brukner P and Kahn K *Clinical Sports Medicine*. McGraw Hill. 2003.

Dubin J 'Conservative therapy stretches iliotibial band for recovery – the repetitive motions of long-distance running leave these athletes susceptible to ITB injury'. *Biomechanics* 1075-9662 April 1, 2006 p41.

Pathology briefing

Osteitis pubis

Henry Colaço and **Fares Haddad** explain this common cause of groin strain among athletes

Osteitis pubis is a painful condition of the pubic symphysis in athletes, resulting in sclerosis and erosive changes of the surrounding pubic rami. The condition was first described in 1924 as a complication of urological surgery(1), and in 1932 in athletes. Although it can occur acutely as a result of trauma, it is usually thought of as a chronic overuse injury and may be degenerative or inflammatory(2). The exact causation is unknown, but theories include:

- abdominal/adductor muscle imbalance, leading to shearing forces across the symphysis
- repetitive microtrauma
- bone oedema
- stress fracture
- adductor-related groin injury.

Osteitis pubis can also be considered as one component of a complex pathological process of adductor-related groin pain(3) or sports-related chronic groin injury(4) that includes adductor tendonitis, conjoint tendon deficiency syndrome, and inguinal ligament pathology(5).

It has a reported incidence of 0.5-7% in the athletic population(6), although the rate in the general population is unknown. It usually occurs in male athletes who play sports involving sprinting, kicking and cutting manoeuvres, such as football, Australian rules football and rugby. It also occurs in sprinters, ice hockey players, American footballers and other athletes. There is some association with limited range of movement at the hip, particularly loss of internal rotation, and with lumbo-sacral and sacroiliac joint stiffness(7). The average delay to return to pre-injury levels of competitive sport is three to six months(8), and a recurrence rate of up to 25% has been reported(7).

Groin injury and in particular osteitis pubis is the second most common cause for games missed in Australian football, accounting for 18% of all games missed during the 2007 season(9). Contributing factors include(10):

- physical demands: game speed, kicking length, jumping and tackling force
- hard playing surfaces, high impact on landing.

Osteitis pubis is more prevalent in junior (under 18) players(11), which may be the result of increased intensity of training in young athletes who are skeletally immature and have underdeveloped core stabilising muscle groups.

Anatomical basics

The pubic symphysis is a cartilaginous joint made up of a fibrocartilage disc between two layers of hyaline cartilage. It unites the left and right pubic bones. The structure gains extra stability from the superior ligament, reinforced by tendons of rectus abdominis, external oblique, gracilis and the hip adductors, and the inferior arcuate ligament (see Figure 1, opposite, above).

Diagnosis

The athlete will probably present with pain over the symphysis, which can radiate to the lower abdomen, upper adductors, medial thigh or scrotum. Pain is often exacerbated by kicking or cutting manoeuvres and relieved by rest. It can be unilateral or bilateral, and can present acutely or, more usually, with gradual onset and chronic pain or even recurrent episodes. A 'clicking' sensation of the symphysis is a rare but specific symptom, and may suggest associated anterior pelvic instability.

Localised tenderness over the pubic symphysis, painful resisted hip adduction and loss of hip rotation are the classic signs.

Osteomyelitis is rare, but must be excluded if the athlete presents with any associated features such as severe bony pain, fever or other systemic signs of infection. This requires imaging, blood tests, and appropriate referral to a physician.

Different imaging modalities have been used to confirm the diagnosis of osteitis pubis and to exclude other conditions as the cause of symptoms. Plain radiography (x-ray) reveals the characteristic sclerosis and erosive changes of the surrounding pubic bone with widening of the cleft[12]. 'Flamingo' views, where x-rays are taken with the athlete standing on each leg in turn, are useful to detect anterior pelvic instability involving the symphysis[13], although this is not always present in osteitis pubis.

Bone scans show increased uptake (bone growth) around the symphysis[14]. MRI demonstrates bone oedema (bruising) around the symphysis[4, 15], although recent studies have found this in asymptomatic athletes during heavy training[16-18]. MRI is a useful tool to exclude gynaecological, urological and surgical causes of pubic pain, as well as other sports injuries, and can also detect associated adductor or other tendon injuries[15].

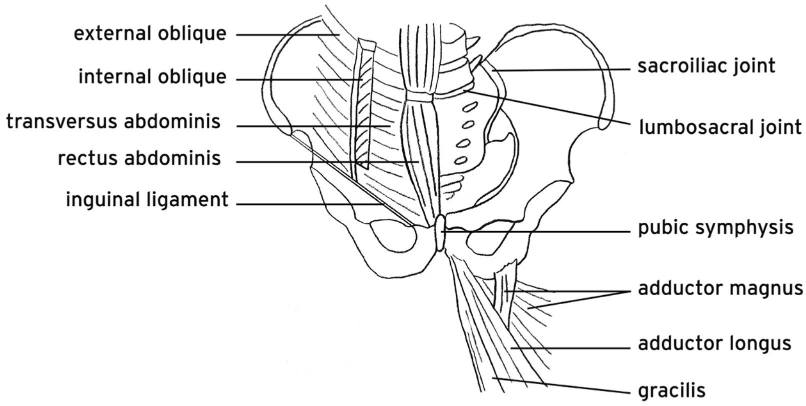
Management

Osteitis pubis is a self-limiting condition, but symptoms can take several months to resolve. Early intervention appears to be beneficial and may avoid prolonged rehabilitation or surgery. There is some variation in protocols; some advocate a complete halt to all sporting activity initially, and begin rehabilitation with stretching and flexibility exercises. However, the only randomised controlled trial to date[3], which introduced the term 'adductor-related groin pain', has supported an early active rehabilitation protocol to improve muscle strength and coordination with no adductor stretching. This study advocates a two-phase rehab lasting eight to 12 weeks, starting with adductor exercises, and subsequently adding in lower back, hip abductor, flexor and extensor exercises. Exercise intensity can be modified according to regular clinical assessment or if symptoms recur.

The therapist needs to have a good understanding of the forces acting on the pelvis which may cause their client to have muscle imbalances and shearing forces across the symphysis; they should be sure to investigate and address restrictions to movement at the lumbo-sacral, sacroiliac and hip joints. Relative weakness in the lower abdominal muscles has been implicated, so the therapist should incorporate appropriate strengthening exercises into the rehabilitation protocol.

Non-steroidal anti-inflammatories are the mainstay of pharmacological treatment, but oral steroids or local steroids have been used. Injection of steroid into the pubic symphysis may speed up recovery and return to sport, and can assist in diagnosis[19]. Intravenous bisphosphonates have been used successfully in particularly difficult cases in non-athletes, and further research may lead to their wider use[20]. Dextrose injection into the pubic symphysis has also been successful[21]. Ultrasound, electrical stimulation, ice massage, manipulation and compressive shorts have all been used successfully to reduce groin pain[22].

Anterior pelvis



Osteitis pubis: differential diagnosis
Adductor strain
Adductor tendinopathy
Iliopsoas strain or bursitis
Stress fracture
Osteomyelitis / bacterial osteitis pubis
Sports hernia
Lumbar spine pathology
Nerve entrapment
Conjoined tendon strain
Gracilis syndrome
Hip joint pathology

Surgical

Surgery is reserved for cases with chronic, debilitating symptoms where the condition has failed to respond to conservative treatment. Several methods have been used. Arthrodesis of the symphysis – rigid joint replacement – using a bone graft and compression plate has been successful in a cohort of rugby players[12], and is probably the best option in athletes with combined anterior pubic instability. More recently, less invasive procedures have been developed, and are yielding promising results[23, 24].

Conclusion

Osteitis pubis is a common, self-limiting condition which can be career-threatening for elite athletes. Causation is not fully understood, and there is no firm base of evidence for how best to manage the condition, although most cases respond well to a structured rehabilitation programme.

References

1. Beer E 'Periostitis of Symphysis and Descending Rami of Pubis Following Suprapubic Operations'. *Intervat J Med & Surg*. 1924;37:224-5.

2. Fricker PA, Taunton JE, Ammann W 'Osteitis pubis in athletes. Infection, inflammation or injury?' *Sports Med*. 1991;12(4):266-79.

3. Holmich P, Uhrskou P, Ulnits L, et al 'Effectiveness of active physical training as treatment for long-standing adductor-related groin pain in athletes: randomised trial'. *Lancet* 1999;353:439-43.

4. Verrall GM, Slavotinek JP, Fon GT 'Incidence of pubic bone marrow oedema in Australian rules football players: relation to groin pain'. *Br J Sports Med*. 2001;35:28-33.

5. Fricker PA, Lovell G 'How do you treat chronic groin pain?' In: MacAuley D, Best TM *Evidence Based Sports Medicine*, 2nd ed, Blackwell, 1995:491-509.

6. Rodrigues C, Miquel A, Lima H, et al 'Osteitis pubis syndrome in the professional soccer athlete:

a case report'. *J Athl Train* 2001;36:437-40.
7. Andrews SK, Carek PJ 'Osteitis pubis: a diagnosis for the family physician'. *J Am Board Fam Pract*. 1998;11(40):291-5.
8. Batt ME, McShane JM, Dillingham MF 'Osteitis pubis in collegiate football players'. *Med Sci Sports Exerc*. 1995;27(5):629-33.
9. Orchard J, Seward H AFL *Injury Report 2007*. www.theage.com.au/ed-docs/injury07.pdf (epub ahead of publishing 2008).
10. Norton K, Schwerdt S, Lange K 'Evidence for the aetiology of injuries in Australian football'. *Br J Sports Med*. 2001;35:418-23.
11. Orchard J, Wood T, Seward H, et al 'Comparison of injuries in elite senior and junior Australian football'. *J Sci Med Sport*. 1998;1:82-8.
12. Harris NH, Murray RO 'Lesions of the symphysis in athletes'. *Br Med J*. 1974;4:211-14.
13. Williams PR, Thomas DP, Downes EM 'Osteitis pubis and instability of the pubic symphysis'. *Am J Sports Med*. 2000;28(3):350-5.
14. Burke G, Joe C, Levine M, et al 'Tc-99 bone scan in unilateral osteitis pubis'. *Clin Nucl Med*. 1994;19:535.
15. Kunduracioglu B, Yilmaz C, Yorubulut M, et al 'Magnetic resonance findings of osteitis pubis'. *J Magn Reson Imaging*. 2007;25(3):535-9.
16. Paajanen H, Hermunen H, Karonen J 'Pubic magnetic resonance imaging findings in surgically and conservatively treated athletes with osteitis pubis compared to asymptomatic athletes during heavy training'. *Am J Sports Med*. 2008;36(1):117-21.
17. Slavotinek JP, Verrall GM, Fon GT, et al 'Groin pain in footballers. The association between preseason clinical and pubic bone magnetic resonance imaging findings and athletic outcome'. *Am J Sports Med*. 2005;33(6):894-9.
18. Lovell G, Galloway H, Hopkins W, et al 'Osteitis pubis and assessment of bone marrow oedema at the pubic symphysis with MRI in an elite junior male soccer squad'. *Clin J Sports Med*. 2006;16(2):117-22.
19. Holt MA, Keene JS, Graf BK, et al 'Treatment of osteitis pubis in athletes: results of corticosteroid injections'. *Am J Sports Med*. 1995;23:601-6.
20. Maksymowych WP, Aaron SL, Russell AS 'Treatment of refractory symphysitis pubis with intravenous pamidronate'. *J Rheumatol*. 2001;28(12):2754-7.
21. Topol GA, Reeves KD, Hassanein KM 'Efficacy of dextrose prolotherapy in elite male kicking-sport athletes with chronic groin pain'. *Arch Phys Med Rehabil*. 2005;86:697-702.
22. McKim KR, Taunton JE 'The effectiveness of compression shorts in the treatment of athletes with osteitis pubis'. *NZ J Sports Med*. 2001;29:601-6.
23. Radic R, Annear P 'Use of pubic symphysis curettage for treatment-resistant osteitis pubis in athletes'. *Am J Sports Med*. 2008;36(1):122-8.
24. Paajanen H, Heikkinen J, Hermunen H, et al 'Successful treatment of osteitis pubis by using totally extraperitoneal endoscopic technique'. *Int J Sports Med*. 2005;26:303-6.

Injury management

Beyond rehab: pelvic assessment

Chris Mallac follows up his advice on post-injury athlete monitoring with a closer look at the pelvis

In last month's *Sports Injury Bulletin* (*SIB*80, June 2008), I discussed in general the need for therapists involved with elite squads to adopt a proactive and thorough approach to the routine monitoring of previously injured athletes upon their return to play. One aspect of that monitoring is the daily screening of pelvic biomechanics, which I mentioned only briefly, but promised to cover in more detail in a follow-up feature.

The athlete returning from a recent soft tissue strain belongs to the 'at risk' group of clients who need daily ongoing assessment and maintenance. They represent possibly the most challenging and time-consuming category of clients that a therapist dealing with a large squad will encounter.

The purpose of this article, therefore, is to briefly explain the rationale and basis of pelvic assessment in the ongoing management of the previously injured athlete. This is by no means a comprehensive explanation of pelvic function/dysfunction or the assessment and treatment of pelvic mechanics. The best source of knowledge in this area comes from the work of osteopaths such as Loren Rex, the Canadian physiotherapist Dianne Lee, and authors such as Wolf Schamberger.

Why should there be a need to focus on pelvic monitoring? For two important reasons:

- Generally speaking, the pelvis will have contributed significantly to the athlete having suffered the muscle strain injury in the first place. This may have been cause or effect – either way, dysfunctions need to be addressed if the athlete is to progress and avoid suffering reinjury.
- Athletes returning from a recent muscle strain are more susceptible to changes in muscle tone around the pelvis and thus in pelvic position and joint play. This is because of the complex neurological arrangement between the nervous system and the muscles that attach to and control pelvic movement.

The underlying assumption in all this is that you know your client's pelvic position/mechanics very well, as you will have assessed and dealt with this all through the injury period.

Not all readers are going to be equipped to carry out the following tests. But while it takes considerable skill to become adept at using the kinds of tests described here, it is nevertheless useful for a range of sports support professionals to be aware of the value of this kind of monitoring, not least to be able to reflect on whether and how you might complement the work described here to help maintain the player's fitness and good health.

Setting the scene

As a therapist in charge of the ongoing musculoskeletal management of a squad of athletes (let's say 45 rugby players in an elite squad), you are likely to be fielding multiple athlete complaints of aches/pains and issues that develop from one day to the next.

It is common for a physiotherapist to be confronted with an athlete seeking attention after an 8am team meeting soon to be followed by a 90-minute on-field training session, who is complaining of a tight lower back and tight hamstring that he only noticed upon waking that morning. This particular athlete has also recently returned from a Grade I hamstring strain. You also have a squad of 45 players all needing your attention to strap a thumb, quickly loosen a stiff ankle or help with a routine hip-flexor stretch prior to hitting the training field, and three on-field coaches who need this player out on the field in 10 minutes, as he is a vital part of the upcoming weekend's game. So what do you do?

Quick screens

The first thing you need to do is form a mental picture of what is 'normal' for this athlete in terms of hamstring range of motion and pelvic mechanics, as you will have assessed these aspects multiple times before in this particular athlete. This forms the basis for comparison with what you are about to feel.

Next, ask the athlete to lie supine and run through a quick checklist of screening tests for the pelvis. Forget about performing dynamic sacroiliac/pelvic joint

tests such as standing flexion test, sitting flexion test, Gillet test or supine-to-sit test to detect hypomobility or motion. These are too time consuming and insufficiently accurate. The screening tests you quickly need to run through are:
i. pelvic innominate position
ii. pelvic arthrokinematics
iii. muscle tone.

These are quick to perform (less than three minutes in total) and will immediately lead you to a choice of three possible outcomes so you can make a prompt decision and inform both the athlete and coach. The possibilities are:
- everything has gone haywire and this athlete will not be training today as the injury risk is too great
- things have changed a bit and you need some time to attempt to restore the balance
- things are not too bad, the athlete can warm up and you will monitor how they travel through training.

Table 1: Pelvic asymmetry and related muscle tightnesses

	Anterior rotation	Posterior rotation	Inflare	Outflare	Upslip	Downslip (rare)
Tensor fascia lata (TFL)	✔			✔		
Psoas	✔				✔ (usually with QL)	
Iliacus	✔			✔	✔ (usually with QL)	
Quadratus lumborum (QL)	✔			✔	✔	
Gluteus medius (posterior fibres)		✔	✔			
Adductor magnus		✔	✔			✔
Iliolumbar ligaments	✔			✔	✔	
External oblique		✔			✔	
Rectus abdominis		✔				

Screen 1: position of pelvic innominates

Lie the athlete supine.

Anterior/posterior rotation

Feel for the anterior superior iliac spines (ASIS); compare their relative anterior (forward) and posterior (backward) positions and their cephalad/superior (towards the head) and caudad/inferior (towards the feet) positions. If one ASIS is forwards and down (anterior and inferior) compared with the other side, then the ilium on that side is anteriorly rotated (but note, it may in fact be that the other side is *posteriorly* rotated – you will need to defer your conclusion on which side is dysfunctional until you do the arthrokinematic tests). If the ASIS sits upwards and backwards (posterior and superior), then it is posteriorly rotated. This needs to be confirmed with the position of the posterior superior iliac spines (PSIS) in prone, as only then will you be able to determine if you are looking at a true rotation or an upslip or downslip (see below).

Inflare/outflare

At the same time, compare whether the ASIS is farther from the midline (outflared), or closer to the midline (inflared). It is common to compare the ASIS to the umbilicus for this purpose, but beware: the umbilicus is often 'off centre' because of the pull of the lower transverses abdominis towards the side of any outflare. It is better to confirm ASIS position with a more fixed anatomical structure such as the sternum, which should pretty much be right in the centre line of the body. If you find an anterior/inferior rotation of the ilium, there will often also be an outflare on the same side.

Lie the athlete prone.

Confirm rotation and flare or upslip/downslip

Feel for the PSIS and compare with what you saw anteriorly. If you saw the right ASIS was down and forward (anterior rotation) then you should see the right PSIS is up and forwards (also anterior rotation of that ilium). This confirms a rotation. If the PSIS also happens to be down (inferior) then both the ASIS and PSIS have moved towards the feet and this represents a downslip of the ilium.

It is much more common in an athlete with a dysfunction to see an innominate rotation of the ilium than a slip. Upslips and downslips are more usually associated with trauma such as a heavy fall on to the ischial tuberosity (causing an upslip), or having the foot yanked heavily away from the body (causing a downslip).

It would be very unusual for an athlete who has never demonstrated a down- or upslip suddenly to develop one without a history of recent trauma. Sudden changes are more likely to be rotations and flares.

Screen 2: arthrokinematic tests

In supine, it is quick and simple to perform a basic joint-play test such as a 'squish test'. This is done by cupping the hand and placing the base of the thumb over the superior part of the ASIS. The therapist uses gentle pressure through extended arms to attempt to move the ilium posteriorly. This allows you to compare relative joint play between right and left innominates and thus evaluate how mobile the sacroiliac joints and pubic symphysis are. If one of the innominates moves more freely than the other, then one of the SIJ joints may be hypomobile or blocked.

Other texts describe these tests in much more detail with lots of photographs that illustrate these joint play tests. However, irrespective of the quality of the description and diagrams, mastering these tests comes down to years of feeling countless athletes and their innominate movement. The execution and interpretation of these quick tests has a level of complexity that words and pictures cannot adequately convey.

In athletes, increases in myogenic (muscle) tone in and around the pelvis is generally responsible for sudden changes in pelvic innominate positions and 'squish' tests.

Screen 3: muscle tone

If you feel that your athlete's innominate position is suddenly different from normal, and their 'squish' tests feel a little more blocked than usual, you know the athlete may be in a bit of a risky situation, suggesting that further assessment and treatment may be necessary to try and shift pelvic position and extent of joint play before you give them the go-ahead to train.

Usually, it is a sudden increase in muscle tone somewhere in the pelvic system that will have led to the change in innominate position and blocked pelvic joint play. The cause may have been heavy training the previous day, a sudden increase in leg loading in the gym or an abnormal prolonged resting position, such as a long drive. The therapist can use trigger-point therapy (preferred),

continued on p12

Research Review *by Nick Grantham*

Football fixes

How to spot the weak link

Any sports support professional who works in a club setting knows what a juggling act it is to keep the full squad fit, so is bound to welcome news of any new injury prevention strategies. Norwegian researchers recently investigated whether the most common injuries in football could be prevented, and whether a simple questionnaire could identify players at increased risk **(Prevention of injuries among male soccer players: a prospective, randomized intervention study targeting players with previous injuries or reduced function. *American Journal of Sports Medicine* 2008: 36 (6) 1052-1060).**

More than 500 players answered questionnaires, which the researchers analysed to divide them into high-risk (76%) and low-risk groups. The criteria for 'high risk' were:

- a history of acute injury to the ankle, knee, hamstring or groin during the previous 12 months; or,
- reduced function.

The high-risk players were then placed into two groups: intervention and control. The intervention players received training programmes that focused on the identified area assumed to be at increased risk of injury (ankle, knee, groin, hamstring).

By the end of the study the researchers were able to identify the players with a significantly increased risk of injury simply through the use of the questionnaires. Four questionnaires were used to assess function:

i. Foot and ankle outcome score (FAOS)
ii. Knee osteoarthritis outcome score (KOOS)
iii. Hamstring outcome score (HaOS) and
iv. Groin outcome score (GrOS)

The latter two questionnaires were developed by the researchers based on the same principles as FAOS and KOOS.

However, player compliance with the prescribed training programmes among the high-risk intervention group was low, and if the intervention had any effect on injury risk, it could not be detected. Only 27.5% in the ankle sub-group, 29.2% in the knee sub-group, 21.1% in the hamstring sub-group, and 19.4% in the groin sub-group managed to carry out the minimum recommended training volume. These are pretty amazing figures when you consider that the programmes were designed to help the players avoid injuries and carry on playing a game that they love!

What this study clearly shows is that therapists can produce perfect rehab plans, but if they end up at the bottom of the kit bag, they're not going to help anyone. Maybe a follow-up study should look at how to increase player adherence (maybe a scheme where the player only gets paid if they complete their rehab?).

The appliance of science

For attention of

Sports therapists	✓
Strength and conditioning coaches	✓
Trainers	✓

Significance

Adds to previous knowledge	✓
Cutting edge	
Confirms best practice	
Too early to say	

How to use it

Here is an overview of some of the drills the researchers used, to be performed three times a week.

Ankle
- static balances (double and single leg)
- static balances while bouncing a ball with both hands
- static balances while catching a ball
- single-leg hops on to stability pad
- calf raises on stability pad.

All exercises performed on wobble board or stability pad.

Knee
- static balances (as above)
- double-leg squats (knees over toes)
- single-leg squats (knee over toe)
- zig-zag jumps (on floor).

Unless stated, all exercises performed on wobble board or stability pad.

Groin
- ball squeezes held for 15 sec (knees extended/flexed)
- the plank (supported on elbows and toes, contract core)
- lateral jumps
- lateral slides (ice-skating on the spot wearing socks on a shiny floor).

Hamstring
- Nordic curls
- week 1: 2 x 5 (1 session)
- week 2: 2 x 6 (2 sessions)
- week 3: 3 x 6-8 (3 sessions)
- week 4: 3 x 8-10 (3 sessions)
- weeks 5-10: 1 x 12, 1 x 10, 1 x 8 (3 sessions).

How to avoid ankle sprains

The high incidence of ankle sprains in football and their negative impact on future participation calls for preventive measures. Farshid Mohammadi from the Faculty of Rehabilitation at the Tabriz University of Medical Sciences in Tehran recently investigated three interventions to find the most effective to prevent ankle sprains in male football players **(Comparison of 3 preventive methods to reduce the recurrence of ankle inversion sprains in male soccer players. *American Journal of Sports Medicine* 2008: 35 (6) 922-926).**

Eighty male football players in the first division of a men's league, who had experienced previous ankle inversion sprains, took part in the study. They were randomly assigned to four study groups: Group 1 followed a proprioception programme, Group 2 followed a strength programme, Group 3 used orthoses, and Group 4 was the control. Data on the incidence of ankle reinjury were collected at the end of the trial.

The incidence of ankle sprains in players in the proprioception training group was significantly lower than in the control group. No significant gains were found among the strength and orthotics groups compared with the control group, but the author noted that they do appear to have a potentially significant impact clinically.

The appliance of science

For attention of

Sports therapists

Strength and conditioning coaches

Trainers

Significance

Adds to previous knowledge

Cutting edge

Confirms best practice

Too early to say

How to use it

Adherence to training can be a real stumbling block to success; but the proprioception training guidelines from this study are so simple that no one should have an excuse for flunking their rehab.

Rehab guidelines: use a wobble board daily for 30 mins (this total can be accumulated in shorter sessions).
1. Stand injured leg on board and shift weight to create a continuous circular movement around the board's edge
2. Progress from eyes open to eyes closed and from firm surfaces to soft surfaces.

How to avoid hamstring strains

This study offers some strategies that may help footballers prevent hamstring strains **(Prevention of hamstring strains in elite soccer: an intervention study. Scandinavian *Journal of Medicine and Science in Sport* 2008: 18 40-48)**.

The researchers, based at the Oslo Sports Trauma Research Centre and the Department of Physical Therapy at the University of Iceland, tested the effects of eccentric strength and flexibility training on the incidence of hamstring strains among footballers. Intervention programmes consisting of flexibility and/or eccentric strength training were introduced during the 2001 and 2002 seasons. Warm-up stretching was prescribed as a standard component throughout all programmes. Players were asked to stretch the hamstring musculature using a contract-relax exercise before beginning sprinting or shooting exercises during warm-up before every training session and game.

The flexibility programme was based on a partner contract-relax stretching exercise (supine partner PNF hamstring stretch). Players were asked to do this exercise after training three times a week during the pre-season period and one to two times during the competitive season. The eccentric strength training programme was based on the Nordic hamstring lowers exercise (also known as Icelandic curls or eccentric lowers). Players were asked to perform these during training three times a week during pre-season, and one to two times a week in the competitive season.

The researchers found no difference in the incidence of hamstring strains between teams that used the flexibility training programme and those that did not. However, the incidence of hamstring strains was significantly lower in teams who used the eccentric training programme compared with teams that did not.

The appliance of science

For attention of

Sports therapists

Strength and conditioning coaches

Trainers

Significance

Adds to previous knowledge

Cutting edge

Confirms best practice

Too early to say

How to use it

Eccentric strength training with Nordic hamstring lowers combined with warm-up stretching appears to reduce the risk of hamstring strains. You can use the eccentric training protocol outlined in the earlier review, and here is how to perform a Nordic hamstring lower.

- player kneels on the ground, body upright
- partner/therapist stabilises player's legs from behind throughout the exercise
- lean forwards in a smooth movement, keep back and hips extended, working for as long as possible with hamstring muscles to resist the fall forwards, until landing on hands
- touch down with hands, go all the way down so that your chest touches the ground and forcefully push off into a kneeling position with minimal concentric load on the hamstrings
- the aim is to hold as long as possible, to achieve maximum loading of the hamstrings during the eccentric phase
- load is increased by attempting to withstand the forward fall for longer. When you can withstand the whole range of motion for 12 repetitions, increase load by adding speed to the starting phase of the motion.

continued from p9

muscle energy techniques (least preferred) or aggressive stretching to normalise muscle tone.

There is a whole collection of pelvic muscles that contribute to altered pelvic positions and joint play, and to work out the offending muscle/s can sometimes be a minefield. The best way is gently to feel the resting muscle tone, and if a particular muscle feels high-tone, treat this one and then reassess position and joint play.

As a rule of thumb, feel for the most superficial muscles first, as tissues such as the TFL (tensor fascia latae), posterior fibres of gluteus medius, and quadratus lumborum have the greatest leverage to cause rotations and flares. Table 1 (see page 9) presents some of the more common offending muscles and associated pelvic asymmetry. Be warned, this is a guide only, not an exact description of which muscles cause which asymmetry. The chart is my own interpretation, based on years of experience and the guidance of other therapists with even more years of experience.

To make the all-important judgement call about when your particular athlete is susceptible to further re-injury after a muscle strain injury, you need a bit more to go on than guesswork and intuition. If you know the athlete well enough, then you will be acutely aware of when the picture subtly changes for the worse. If you have thoroughly dealt with this athlete through the entire injury and rehabilitation process, then you will have formulated a 'window' of normality in terms of pelvic position, joint play tests and the feel of their muscle tone.

If you believe the athlete has fallen out of their specific window of normality in these areas, then they need to be removed from training and managed until they do fall back into acceptable ranges. This could take anything from a few minutes to a few days to correct, but to attempt to train through such a significant change may result in re-injury, more time away from sport and the usual disruptive and stressful consequences for team mates, coaches, athletes and medical staff.

Contributors to this issue

Henry ColaÇo is clinical research fellow at University College Hospital, London, with special interests in football and ACL reconstruction.

Sean Fyfe is the strength and conditioning coach and assistant tennis coach for the Tennis Australia National High Performance Academy based in Brisbane. He also operates his own sports physiotherapy clinic.

Nick Grantham is a strength and conditioning coach who has worked with elite athletes for the past 10 years. He has trained many of the country's elite athletes including Olympic and Paralympic finalists, and professionals in a multitude of sports. He now heads up the Strength and Conditioning team at GENR8 Fitness.

Fares Haddad BSc MCh (Orth) FRCS (Orth) is a consultant orthopaedic surgeon at University College London Hospital and editorial consultant to *Sports Injury Bulletin*.

Jane Johnson is a chartered physiotherapist with an interest in musculoskeletal injuries and massage. She is co-director of the London Massage Company.

Chris Mallac has been Head of Sports Med at Bath Rugby and Head Physio at Queensland Reds Super 14. He is currently in private practice in Brisbane, Australia.

Illustrations by **Viv Mullett**

SPORTS INJURY BULLETIN
is published by P2P Publishing Limited.
Reg. office: 33-41 Dallington Street, London EC1V 0BB
Printed by PLP Printers, Printed by PLP Printers, 3-7 Mowlem Street, London E2 9HE, UK.
Sports Injury Bulletin is a trading name of P2P Publishing Limited; Reg. office: 33-41 Dallington Street, London EC1V 0BB, UK. Reg. no: 06014651.
Editor Jane Taylor **Publisher** Jonathan Pye
Email: sib@sports-performance.com
www.sportsinjurybulletin.com

ISSN 1472-0442