PAIN IS PAIN, RIGHT? IT'S YOUR BODY'S WAY OF TELLING YOU SOMETHING IS WRONG, THAT IT'S TIME TO STOP RUNNING AND TREAT THAT NIGGLE OR INJURY, OR WHATEVER YOU WANT TO CALL IT. BUT A NEW SCIENCE OF PAIN IS EMERGING THAT COULD REVOLUTIONISE THE WAY WE VIEW AND RESPOND TO RUNNING INJURIES, AND SERIOUSLY REDUCE THE AMOUNT OF TIME WE HAVE TO SPEND ON THE SIDELINES, SAYS **SAM MURPHY**

TYPOGRAPHY BY SAWDUST

ONE WINTER, MY HIP STARTED TO HURT WHEN I RAN. FLEETINGLY AT FIRST, BUT SOON THE PAIN UNPACKED ITS BAGS AND SETTLED IN. IT'S HARD TO DESCRIBE EXACTLY WHERE IT HURT – SOMEWHERE DEEP INSIDE THAT I COULDN'T TOUCH. SOMETIMES IT WAS RAW AND INTENSE, SOMETIMES QUIETLY SMOULDERING, BUT IT WAS NEVER TRULY ABSENT.

The physio blamed slipping and sliding on muddy trails, told me to lay off running and gave me exercises to stretch and strengthen the surrounding muscles. But nothing – rest, massage, exercises – helped.

Days became weeks and I limped around miserably, picturing the inside of my hip joint like one of those telephone exchange cabinets you sometimes see open in the street – the tangled mass of wires representing the frayed muscle fibres and throbbing nerves I imagined were there.

Eventually I forked out for an MRI and braced myself for the results. The damage? None. I was astonished. Richmond Stace was not. He's a physiotherapist who specialises in treating pain (specialistpainphysio.com). 'Pain is a perception. It is not bound to anything physical,' he says.

It's hard to get your head around the notion that the pain you're feeling isn't directly caused by – and proportionate to – damage within the tissues, but experiences such as mine have been replicated in many studies, showing that not only can pain exist where there is no tissue damage, but that tissue damage can be present without pain.

In one study, MRI scans of the knees of 44 subjects suffering no pain symptoms revealed meniscal degeneration or tears (damage to knee cartilage) in almost every case. Other research, published in *The New England Journal of Medicine,* found 38 per cent of pain-free subjects showed abnormalities (such as 'bulging' discs) in the lumbar spine – the sort of abnormalities that would be used to 'explain' pain, if pain were present. So if pain isn't synonymous with injury, what exactly is it waving its red flag about?

NO BRAIN, NO PAIN

'Pain is a message or a "need state" (like hunger or thirst), which compels protective action,' says Stace. 'There is a need to be met and our attention is drawn to a particular part of the body. We must then decide whether there really is a threat or danger in the area that we're feeling the pain.'

So why, in my case, the hip and not another part of my body? 'The brain makes a best guess,' explains Stace. 'If there's enough evidence to suggest that there could be a problem at the hip, that's all that's needed for protection to kick in.' The threat or danger could be the result of an excessive training load, altered biomechanics or a reduction in strength, rather than what we'd typically think of as an injury.

There is much research to support the contention that pain is a construct of the brain. As Professor Lorimer Moseley, who specialises in investigating pain in humans, points out, the widespread phenomenon of phantom-limb pain in amputees would not exist if pain were truly and solely representing physical damage. How can your left leg hurt if you don't even have one? In one of Moseley's experiments, people who had a prosthetic limb arranged in front of them as if it were their own experienced pain when that leg was attacked.

However, it's important to stress that while pain is produced by the brain and not the body, it doesn't mean tissue damage – or the pain arising from it – isn't real. 'It is real, but the relationship is complicated,' says Paul Ingraham, creator of the online resource Pain Science (painscience.com). Modern pain science is based on what's known as the biopsychosocial model – which takes into account the biological, psychological and social factors affecting our experience of pain. 'It doesn't imply that there are no physical factors, but how it differs from the traditional view is that it recognises injury and pain are not in lockstep with each other,' says Ingraham. 'That is what nearly everyone assumed for a long time. And many professionals, even though they know better, often forget how powerfully pain is influenced by perception.'

Stace agrees. 'Looking for a purely physical solution for pain tends to result in poorer outcomes. We have to remember it's a whole person who experiences pain, not a body part.' He offers an analogy: imagine you are at the cinema and the screen goes blank. The attendant comes in and shakes the screen. 'Does that restore the film? No. The problem isn't with the screen, it's elsewhere. No matter how often you shake the screen it's not going to help.'

Regardless of whether the pain you're feeling in your knee is a result of damage there (what Ingraham calls a 'tissue issue') or not, its intensity can be greatly influenced by your state of mind, including mood, stress levels and, says physiotherapist Tom Goom, thoughts about the pain itself and what it means.

'For most runners, the sport goes far beyond being a form of exercise,' says Goom. It's our social network, our stress relief and our arena for experiencing mastery, enjoyment and a sense of purpose. So losing it is a big deal, creating stress and anxiety, which, in turn, can magnify the pain experience. A study of violin players offers a great example of this. Researchers found that the musicians' 'playing' hands had greater sensitivity to pain than their non-playing hands, because of the importance attached to the former.

'If running forms a large part of your social life, it's important to stay involved in other ways if you can't run,' says Goom. Perhaps you could still go to the clubhouse to do your rehab exercises, participate in the warm-up and cool-down, or volunteer. Being a coach was a godsend for me, enabling me to experience fulfilment through others' success. Many studies have shown that positive mood states (contentment, calm, joy) can reduce pain sensitivity. But, says Greg Lehman, a physio who specialises in applying pain science to biomechanics (greglehman.ca), the connection between pain and mental state works both ways. 'Irrational or disproportional beliefs and deep feelings of worry or fear can intensify pain,' he says. A study at the University of Malaga, Spain, found high levels of emotional distress and anxiety were associated with greater levels of pain.

MIXED SIGNALS

The healing process itself can also be affected by external factors. 'Sensitising factors like stress and sleep deprivation can cause injuries to hurt sooner, worse and longer,' says Ingraham. A study at Kings College, London found elevated levels of the stress hormone cortisol slowed healing. It's a cruel twist: you love running, pain forces you to stop, and the distress you feel by stopping intensifies and prolongs the pain.

I would probably think it far-fetched that my mental state can affect the pain-intensity dial if I didn't have personal experience. In that year of my hip injury, my dad was dying of a brain tumour. In his final days, we gathered around his bedside, sharing memories through tears and laughter. My hip was so stiff I limped each time I stood up to walk and at night it throbbed unbearably if I lay on my side. Yet a week after his suffering ended, I ran a 10K with no pain. It wasn't the end of the injury, but it offers a snapshot of how pain can be affected by seemingly unconnected things.

'Remember that the brain does not have actual access to the body,' says Stace. 'It only receives signals, from which it infers what's going on and ▶

FIND FAULT Locating the source of a pain is not as easy as we might think

creates a perception.' In the biopsychosocial model of pain, the accuracy of this perception is based on all the things we 'bring' to our experience of pain.

'What do you need to have knee pain?' Stace asks me. 'A knee,' I say. 'Yes, and what else?' 'A brain?' 'Yes, and a nervous system, an ego, a history...all of these will be used by the brain to assess how to respond to the signals it receives.' And when it comes to running injuries, one of the most significant factors in shaping that response is previous injury.

FIND THE SOURCE

"Once burned, twice shy" is a very basic pain principle,' says Ingraham. 'The brain remembers and is paranoid, so a runner's second case of IT band syndrome or plantar fasciitis kicks in at a lower threshold. They think they've overloaded the tissue again, but the chances are that load is much less of a factor this time round: still a factor, just no longer the only one. And the more they get reinjured, the more this is true.'

I can relate. Since my hip injury, I seem to have an over-zealous health and safety officer lurking in my brain. Given that the most common predictor of a running injury is a previous injury, it's intriguing to wonder whether this is a result not of faulty biomechanics or insufficient rehab, but of a brain primed by past experience to over-amplify pain. And if that's the case, how do we break free from this vicious circle?

'The first step is finding out what's really going on,' says Lehman. A thorough assessment by a physio and/or osteopath who specialises in chronic pain or pain management will ascertain if there are physical factors contributing to your pain. 'You need to know if the pain is something sinister requiring a specific fix (such as a ligament tear), if it means you need to rest or back off, or whether continuing with the activities that are meaningful to you is ultimately more helpful,' says Lehman. For example, a runner could have tendinopathy that seems related to pain. 'They will certainly want to modify their training and perhaps add exercises to address the tendon, but they could also keep running with a little bit of discomfort. Some pain and niggles are normal when training.'

From a purely physical point of view, running through pain sounds like bad advice. But increasingly, pain science is steering us away from the 'rest is best' protocol, which could unwittingly be reinforcing the brain's perception that there's 'something bad' going on in the body that needs protection. 'Provided serious pathology has been ruled out, most people can keep running or walking to some degree with most injuries,' says Lehman.

'Pain science is steering us away from the "rest is best" protocol'

Research has shown that isometric exercises (see *Easing the pain*, right) can give immediate pain relief in cases of patellar and Achilles tendinopathy. 'Actually, almost any type of exercise seems to modulate the tissue-irritation signals that get sent from the body,' says Lehman. Stace agrees: 'Pure rest won't help in instances of chronic and persistent pain, because nothing has changed when you go back to exercise. Motion is lotion.'

BAD CONNECTION Chronic pain could be caused by a misfiring central nervous system

ILLUSTRATIONS: KENJI TOMA/TRUNK ARCHIVE

So where does this leave the traditional therapies we turn to when addressing pain and injuries, such as deep-tissue massage and foam rolling?

'These approaches may have a small, short-term effect on reducing pain,' says Goom. 'They're not great long-term strategies, however, and can aggravate symptoms in some. And we can become dependent on them rather than looking for long-term solutions, so they usually work best as an adjunct to more active management of pain – exercise, education, lifestyle change.'

This isn't carte blanche to plough blindly on with your training in the face of pain and possible tissue damage. It's about finding out where you stand and recognising that you cannot assume that the extent – or even the presence – of pain is always a true reflection of what is going on in your body.

There are, however, likely to be some clues. If you fell off the kerb and wrenched your ankle, you probably can make a logical connection between the pain and injury: 'Simple pain experiences are usually exactly what they seem to be,' says Ingraham. 'By "simple" I mean in a specific anatomical location, affected by position and movement, with a clear relationship with trauma or loading.' This kind of 'acute' pain tends to correlate well with tissue damage (although your experience of it can still be modulated by other factors). But when pain persists long after body structures should theoretically have healed, things get more complex.

CENTRAL INTELLIGENCE

Chronic pain is defined as lasting or recurring for three to six months. It's ongoing pain that cannot – or can no longer – be explained by 'tissue issues.'

If, weeks after an injury, you're thinking 'But it still hurts! There must be something wrong,' even though you've been assured there is no major damage, the problem is probably not with your body, but with your central nervous system. 'This 'central sensitisation' can cause even a trivial tissue issue to cause disproportionately intense pain,' says Ingraham.

Lehman likens the response to a smoke alarm. 'A smoke alarm doesn't tell us how much smoke there is – it can go off even when there is no smoke at all and continue going off after the fire has been put out.'

Research has shown that highly sensitised pain sufferers can experience 'anticipatory' pain even before a stimulus is applied (such as 'feeling' the pain of an injection before the needle has touched the skin) as well as a heightened or disproportionate response to mild pain stimuli and even benign ones, like touch.

Let's say you've just started running after months battling plantar fasciitis. 'Even as you put on your shoes, your brain is wondering if this is safe, says Stace. 'If you should then step on a stone, you are likely to feel a disproportionately intense pain, because the brain is simply fulfilling the response it predicted.'

Once sensitisation occurs, the challenge is to retrain the brain to understand that movement is safe. 'Athletes and therapists tend to regard rehabilitation as a process of physical adaptation, but the longer you've had the problem, the more likely it is to be about neurology,' says Ingraham. 'If you've reached a stage where you suspect your nervous system is no longer giving you useful, sensible pain signals, be extra cautious about painful manual therapies, and sceptical of biomechanical explanations for your pain. Such factors are only part of the picture, and probably the least important part. A better focus is on desensitising and teaching the central nervous system that it's OK to use that anatomy again.'

Returning to the plantar fasciitis example, you might start by seeing if you can stand on one leg without pain and if so, can you rise up onto the toes? Can you jog a few steps on the spot? Still pain-free? Can you run for 20 seconds without pain? A minute? By finding out what you can do without pain, you can begin to move within that comfortable range – and as the brain dials down the alarm system, this range will gradually increase. The tips on this page (*Easing the pain*, left) can help the process.

The new pain science doesn't suggest that pain isn't real, or that it's 'all in your head'. But it does free us from looking at injuries solely as tissue issues, widening the scope of what we can do about them. Alongside our rehab exercises, we may need to consider our beliefs about running, our lifestyle and our overall mental and physical health.

Knowing there wasn't any sign of damage in my hip joint helped get me on the road to recovery. Though it still hurt, it freed me from two fears: one, that I was 'finished' and would never run pain-free again; and two, that by returning to running I might cause further damage.

It took that change in mindset – and finding a physio I believed in – to get me moving along that road. These days, I can even run past telephone exchange cabinets without a second glance. RW

Easing the pain

HOLD IT In an isometric contraction, a muscle is contracted without either shortening or lengthening. For example, the hamstrings and glutes contract isometrically during the bridge exercise. 'Isometrics are thought to have an inhibitory effect on pain, although the research highlights a varied response in individuals,' says Goom. One recent study, in the *British Journal of Sports Medicine*, found that with tendinopathies, isometric holds reduced pain for 45 minutes. 'In some, isometrics can reduce pain to allow a window of opportunity to facilitate rehab or continue sport, but they're not a cure-all,' cautions Goom.
BEST DONE Before rehab.

MOVE IT To see how pain is governed by the brain, try this tip from coach and Feldenkrais practitioner Jae Gruenke (balancedrunner.com). 'If you feel pain when running, imagine the pain is in the same location but on the other side,' she says. 'As you continue to run while imagining this, you'll usually feel your movement alter and your discomfort begin to fade.' Use sensibly – not to mask severe pain.
BEST DONE To quieten midrun niggles.