FirstRand

The Mysteries of Pain

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Thought experiment: Take your left foot (bare) and secure it in place with some sturdy leather straps on a wooden board. Take a rusty drill bit; attach it to an electric drill. Plug the drill into the wall and, slowly, slowly, drill into your big toe until you can feel the drill has reached the wooden board. You'd be screaming in pain – of course. You can feel the drill as it moves down through your poor little big toe… millimetre by millimetre, making a mess as it tears and crushes and shreds.

Off course you're in pain – your toe is being mangled! But the pain does not exist in your toe, not really. The pain exists only inside your brain. That is, the pain exists far from the injury itself.

Or take a case from the British Medical Journal in 1995.

A 29-year-old builder, being careless on site, accidentally jumps on a 15cm nail. It sticks right through his boot – the sole, the foot, the steel-tipped toe of the boot, in fact. All the way through. The ambulance shows up; he is in agony. Every time the ambulance turns, every little bump in the road, and the pain jolts through him with cruelty. And he screams.
At the hospital, however, it is revealed that the nail wedged between his toes – it never pierced his foot.

Pain is such an intrinsic part of the human condition, that you would think there is little we don't know about it. However, the truth is that pain remains mysterious. Pain research continues to surprise scientists and, even after years of complex study, there is much we still don't understand.

The classic view of pain is that it is a direct response to damage. Damage your toe, or your foot, and you feel pain. The greater the damage, the greater the pain. Descartes, not using anatomy but using sheer speculation, was the first to propose the model of how this is transmitted to the brain. The toe receives the damage, sends the signal via nerves to the spine, and from there it travels to the brain. To an extent, pain is still understood to travel this way.

The only thing is, the link between damage and pain is no longer self-evident. Nowadays, the International Society for the Study of Pain defines it thus: "Pain is an unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in such language." It sounds a little on the convoluted side, but then, it does work. For when you say things like 'my heart is aching' or 'what you said hurt me', as well as 'ouch', you are expressing that you are feeling pain.

The big leap is that the emphasis of describing what pain is no longer depends on the stimulus. Rather, it is acknowledged that pain is a subjective experience, a response to the stimulus, and it varies between people.

For example, in multiple studies looking into the nature of pain, it was discovered that the experience of pain varies widely among different people, even if the stimulus is the same. Use a trigger, and some would describe the pain as being a 7 on a scale of 1 to 10, and others would say it was a 4, or a 9, or a 2. With no predictable pattern, it is clear that all kinds of non-physical factors influence the experience of pain. Anxiety, fear, previous experiences, even unrelated and general experiences just before the experiment could all account for differences – and no factors could be pinpointed that described variations between individuals at all.

Easy enough, one may be tempted to conclude: Pain is all in the brain.

That too, may be an oversimplification.

Dr Elliot Krane, head of Pain Management at the Packard Children's Hospital at Stanford, has observed what he calls a 'disease model' of pain. It turns out Descartes' understanding of trigger to nerve to spine to brain may indeed be oversimplified. Glial cells – once thought to have no function other than enable other cells to have space within a spine – may be the key to chronic pain. Pain signals do not run neatly from sender to receiver. Instead, pain is transmitted, picked up by receivers but also spills over to other receivers. And Glial cells pick up excess signals, which they in turn react to – producing proteins, affecting adjacent nerves – creating feedback loops.

Pain is the number one cause for doctor visits. And not all pains make sense: allodynia is when normal, non-painful things become painful. Wearing clothes, taking a bath, moving – all can cause the experience of pain.

Or consider phantom limb pain – an extreme neuropathic pain that is very difficult to treat. It occurs in patients who have lost limbs, and experience pain in the very limbs they no longer have.

Pain management can sometimes lead to problems in itself. The opioid crisis in the United States is certainly the result of the overzealous prescription of pain medication, with addiction as an unintended consequence. But neither can pain be ignored, and it can certainly be undertreated as well. After all, the subjective experience of pain is hard to convey or experience directly if you are not the patient.

Chronic pain in particular has devastating consequences for those who suffer from it. It is nearly always accompanied by depression and despair. One stat says that 100 million Americans suffer from pain (out of a total population of 360 million, that's quite a chunk).

The quest to treat pain is an important field of research, and biologists and medical scientists are working to develop pain management substances and techniques that have less serious side effects, are not addictive, and treat the root causes and not symptoms. But if we don't understand the nature of pain, finding these causes may prove difficult. And the truth is that, despite all we've learned, we don't. Not fully.

Breakthroughs also happen – sometimes in the least likely areas. Dr Sam Sharar, Professor of Anesthesiology and Pain Medicine at the University of Washington, for example, has shown non-diminishing long-term pain reduction – with a 40% reduction in the experience of pain in burn victims (alongside medication) – using Virtual Reality. Taking burn victims on regular trips to an immersive, virtual, fun, cool environment – with snowmen and penguins and arctic ice blocks – actually helps. It even helps them enjoy excruciating sessions of physical therapy up to 3 times more.

The human mind is a mystery. This is true, and well-known enough almost to be a cliché. What the study of pain reveals to us is that the human body is as mysterious as the human nervous system, human perception, and the individual and subjective experience of each human as they interact with the world.

There is much we don't know. Still, scientists continue to strive to learn more in perhaps the most ethical and humane of all biomedical endeavours: effective, harmless pain management.

The next decade may bring developments none of us can as yet anticipate.