



Pain Relief Foundation

Does the brain change in response to chronic low back pain?

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Up to 80% of us will experience low back pain at some point in our lives. Without any clinical intervention, more often than not, this ‘acute’ pain will get better within 6-8 weeks. If the pain persists beyond this period i.e., it becomes ‘chronic’; a natural response is to suspect there may be something seriously wrong with the back.

Fortunately, less than 1% of low back pain is due to serious disease and these causes are very easily recognised using techniques such as Magnetic Resonance Imaging (MRI). In those cases where no obvious underlying structural cause in the spine can be found, despite the very real and persistent experience of pain, is it possible that investigation into the brain may provide the answers?

Pain is felt in the brain

When a person stubs their toe or burns their hand on the cooker, several miles of nerves send messages to the brain telling them that a harmful stimulus has occurred on that part of the body. Indeed, the reason why it can take a couple of seconds to register the pain of a stubbed toe as compared with a burnt hand is precisely because the information has to travel further to the pain regions of the brain which

interpret the signals. Once this information has reached the brain, we more often than not execute an immediate and appropriate behavioural response to the danger to avoid further injury.

It is through this mechanism of ‘cause and effect’ that we learn through our childhood to avoid harmful objects in the world around us. This is due solely to the fact that our brains are flexible and quick to adapt, change and learn in response to cues in our environment. Often this serves to protect us from harm, as in the example above, but what if the system which signals pain in the brain goes awry. What if the brain’s interpretation of the pain signals sent from the periphery is wrong?

Heightened response to normal pain signals

A remarkable feature of the central nervous system (i.e., the brain and spinal cord) is its flexibility and its ability to form new connections and circuits. This is the basis of learning and memory on which we are all reliant. However, it is possible that new circuits are formed in response to pain that are maladaptive and, rather than providing a role of warning or protection, cause endless, needless suffering by

exacerbating the normal pain response. So, for example, it may be possible that the normal acute low back pain that has a transient time course is maladaptively 'maintained' in those individuals who develop chronic low back pain.

This theory would propose that a normal response to pain from the periphery is altered in someone with chronic lower back pain and this leads to physiological changes in the brain. It is precisely these physiological changes that are so amenable to measurement with human brain imaging techniques, and specifically functional magnetic resonance imaging (fMRI). fMRI allows us to measure the neural activity in a person's brain when they experience visual, tactile or painful stimuli.

We know from research work in healthy volunteers that certain areas of the brain respond reliably to a painful stimulus applied to the body. The challenge now is to measure the degree to which these same areas respond in someone with chronic pain. Current thinking suggests there may be a hyperactive response in these areas in individuals with chronic low back pain. This would support the idea that these areas in the brain have become hyper-sensitised to painful information from the periphery. Subsequently, drug therapies which target central generators of pain may be more beneficial than those targeted for peripheral pain.

The psychology of pain

In reality of course, behaviour, attitudes and beliefs about pain can have a substantial role to play in contributing to learning about pain. For example, it is now well known that lying or sitting still will not help reduce the intensity of back

pain, whereas gentle exercise will. Being able to manage the pain well at home by medication and being aware of what exacerbates it can help greatly to improve a chronic pain patient's daily life.

Treatments such as the Pain Management Programme, which is a programme of rehabilitation, uses a combination of group therapy, exercises, relation and education about pain to reduce the impact pain has on a persons life and allow them to take control again. There is no doubt that psychology plays an important role in our dealing with pain. Often, when we see 'cause and effect' type pain (such as burning your hand on the cooker) we can deal with the pain much more effectively than if we feel pain for which there is no obvious cause.

The latter type of pain is more psychologically disabling because it sets into motion a cycle of fear and negative cognitions about the possible cause of the pain. It may be several weeks before we are able to see a Doctor or specialist consultant to put our minds at ease that serious disease is not the underlying cause of the pain. During this time, we may have already started the process of changing our behaviour in response to the pain. Avoiding activity, immobilisation and guarded movements are all natural responses to lower back pain but which may be ultimately maladaptive.

Unfortunately, this cycle of events can lead many to feel anxious and depressed, which serves only to increase negative thoughts about the pain and so the cycle continues. Many current treatments can use this information to try and change a person's beliefs and attitudes towards pain using cognitive-behavioural

therapies in settings such as pain management programmes.

Research may give us the answers

All of what has been discussed above may be a very familiar story to some and yet does not answer the fundamental question of 'why does the pain persist?' What chain of events leads simple acute back pain into chronic back pain in absence of any noticeable pathology at the periphery? Is it all just to do with negative thinking ('Catastrophizing') about the pain, which leads to an exacerbated response to pain and a vicious cycle of continuing pain signals?

Through research we are attempting to answer some of these questions with the help of selfless

and committed volunteers with lower back pain who are willing to have their brains scanned. By collecting data which allows us to measure the response to pain in the brain of a chronic lower back pain sufferer, we hope to be able to categorise, measure and ultimately understand whether the pain of chronic pain is maintained by the brain. Through research and understanding it may be one day possible to develop better medication, advice and therapies for those with chronic pain. Ultimately, by understanding the mechanisms of chronic pain, we aim to prevent patients with acute lower back pain ever becoming chronic pain sufferers.