

OPTIMAL HEALTH UNIVERSITY™

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Chronic Pain Affects the Brain

The brain is a three-pound organ that's the source of qualities that define each person. It's the center for intelligence, emotion, interpreting the senses and controlling body movement and behavior.

However, for millions of people who suffer from chronic pain, the brain changes every day. Research shows that chronic pain rewires the brain and disrupts its natural equilibrium. These new findings add to past research demonstrating that pain shrinks the brain. Your doctor at Hickory Chiropractic Clinic wants you to be aware of this startling new information.



Chiropractic Care

Doctors of chiropractic, such as your doctor at Hickory Chiropractic Clinic, know that chronic pain can cause a host of problems. Unremitting discomfort is linked to depression, anxiety, insomnia, anger and a heightened risk of suffering from other illnesses. Fortunately, chiropractic care significantly reduces chronic pain — not just in the back and neck but throughout the body.

Your doctor at Hickory Chiropractic Clinic wards off pain by eliminating *vertebral subluxation*, a condition associated with limited range of motion and spinal dysfunction. This is accomplished through precise, gentle maneuvers called *chiropractic adjustments*.

Read on to find out why it's so important to address chronic pain.

Three-D Approach



How do researchers detect how pain affects the brain? Significant developments in the field of “neuroimaging” have pinpointed how the brain changes under chronic pain. Different types of images show that the brain alters in three domains: brain volume, brain state and brain chemicals.

“Taken together these three domains have already changed the way in which we think of pain — it should now be considered an altered brain state in which there may be altered functional connections or systems...,” write researchers (*Mol Pain* 2007;3:25).

Balance Skewed

A healthy brain exists in a state of equilibrium with a precise number of regions activated or “turned on.” At the same time, other brain structures are deactivated or “turned off.” Depending on what activity the individual is engaged in, certain brain locations “fire,” while other areas rest to maintain balance. This equilibrium is known as the resting state network of the brain.

Alarming, research shows that the brains of people in chronic pain are not so even-keeled. The cortex is the outer layer of gray matter that covers the surface of the brain. Long-term

pain alters the connectivity of regions in the cortex that are typically active during rest and inactive with certain activity.

This crucial phenomenon is known as the “default mode network” (DMN). In chronic pain sufferers, one part of the DMN remains active, when it should normally be turned off. This specific region of the brain is associated with mood and attention. Consequently, individuals in chronic pain are prone to mood and attention problems.

Mental Problems

This abnormal, unremitting brain activity wears out neurons and rewires nerve connections, boosting the risk of additional mental health issues. The brain is overtaxed with too many active areas. The rewiring forces the brain to allocate additional mental resources to perform everyday tasks. As a result, even a simple activity can feel like joyless drudgery.

One report documents that “chronic pain has a widespread impact on overall brain function, and suggest that disruptions of the DMN may underlie the cognitive and behavioral impairments accompanying chronic pain.” (*J Neurosci* 2008;28:1398-403.)

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50 Times More Activity

Just how overtaxed are chronic pain sufferers' brains? In one study, researchers compared the brains of chronic back pain (CBP) patients to pain-free volunteers' brains using magnetic resonance imaging (MRI).

Both groups tracked a moving bar on a computer screen, a task requiring minimal attention. CBP patients performed the task equally well, but had *50 times* more active regions in their brains than their pain-free counterparts. In essence, the CBP sufferers actually used their brains differently to perform the simple task (*J Neurosci* 2008;28:1398-403).

White Matter Wiring Error

Ever tried to hook up a DVD player and connect the wrong cables to the wrong inputs? Even if the system does turn on, it doesn't function correctly. A similar event occurs with the brain and chronic pain.

Research, appearing in the scientific journal *Neuron*, is the first to link pain with changes in white matter of the brain. White matter functions like a network of tiny "cables" that relay messages between the neurons. White matter is related to emotion, pain perception and sensing skin temperature. Gray matter, on the other hand, is the part of the brain that processes information and memory.

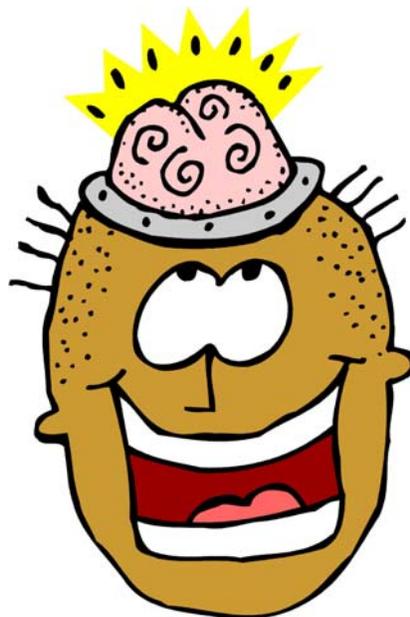
Scientists used two different types of MRIs to visualize the brains of 22 patients with a chronic pain condition known as complex region pain syndrome (CRPS). They compared these images to those taken of the brains of 22 pain-free individuals. They noted alterations in the CRPS patients' white matter directly related to the duration and intensity of pain and anxiety.

The researchers also detected a significant "disrupted relationship" between white matter and gray matter. Specifically, white matter "connectivity in these regions was characterized by branching pattern alterations." In addition, the CRPS patients' brains showed an atrophy (shrinkage) of gray matter (*Neuron* 2008;60:570-81).

Shrinking Gray Matter

Additional previously conducted research shows that individuals enduring chronic pain suffer brain loss in gray matter.

In one report, scientists used specialized MRI brain scans to compare the brains of 26 individuals with chronic back pain (CBP) with the brains of 26 pain-free control subjects. Results indicated that "patients with CBP showed 5 to 11 percent less neocortical gray matter volume than control subjects."



The study also showed that CBP patients had decreased density of their remaining gray matter. According to the scientists, "The magnitude of this decrease is equivalent to the gray matter volume lost in 10 to 20 years of normal aging." (*J Neuroscience* 2004;24:10410-5.)

Small Pain, Big Stress

Chronic pain also affects mental health by altering stress levels. Research links even low levels of everyday pain to elevated emotional stress. Researchers rated pain levels in 93 subjects suffering from unrelenting pelvic pain due to endometriosis. An additional 82 pain-free volunteers served as control subjects. Chronic sufferers were divided into three groups: low pain, moderate pain and high pain.

All three pain groups showed lower levels of a naturally occurring key hormone involved in stress response. And, patients with only moderate intensity pain reported elevated levels of perceived stress and poorer quality of life (*Stress* 2008;11:390-7).

Pain Not the Same

Research shows that, compared to acute pain, chronic discomfort is especially detrimental to areas of the brain responsible for cognition and emotion. To arrive at this conclusion, investigators pooled data from 92 studies published over a 15-year duration. Researchers opted to include only studies that used "well-designed" experimental procedures. All of the studies examined brain activity using chemical tests, or high-tech imaging tests, such as MRI (*Eur J Pain* 2005;9:463-84).

Don't Dismiss Pain

Masking chronic pain with over-the-counter or prescription painkillers does nothing to solve the underlying cause of the problem. Pain medication is also linked to a litany of short- and long-term side effects. In contrast, our chiropractic office focuses on determining the root of patients' discomfort, and eliminating it for good.

The longer you put off addressing the underlying source of your pain, the more your brain will be affected. But even if you have suffered from pain for years, scientists believe that it is possible to reverse the brain changes that may have ensued. Schedule an appointment with our office today. And, if you know anyone suffering from chronic pain, let them know how chronic pain affects the brain and please refer them to our office.

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