PSY1013, Neural pathways and Pain

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Pain

Pain is a cultural thing. In the sense that culture affects the perception of pain greatly. In some cultures hanging from metal hooks, through the skin on your back, sends the practitioner into an exalted state. In more sexual sub cultures pain is used to relief and care. The pain is more of a tool to connect to one another.

The main objective of pain is to keep humans alive, and safe. Touching something warm we have to be able to remove ourselves from heat that is to hot for our body to handle. Or we have to stop working out when we are injured. Normal pain indicators for humans to relax more are, among others, headaches, backaches and stomachaches.

Pain is registered through the somatosensory system. This system registers touch, temperature and pain. Neurons are triggered in the system when stimulus is present. The neuron triggered signal is passed to the brain. More specifically the part of the brain that deals with this kind of input. Each body part has it's own section in the brain.

Receptors of pain are called nociceptors. Nociceptors sense change in heat or pressure. If you touch hot objects the receptors fire. Or if you cut yourself on knives or other sharp objects. Nociceptors respond to mechanical, thermal, and chemical stimulation. The chemical stimulation is typically after a work out session, where the lactic acid burns in you muscles, and the brain registers soreness.

Pathways to the brain

Pain is transferred to the brain in two ways, the fast and the slow one. Both are through fibres. The fast fibres are called myelinated A fibres. A transfer

short sharp pains, where response time is critical. C fibres, unmyelinated, transfer slower pain, such as aches and other dull pain.

The pain signals are sent through the dorsal root in the spinal cord. In the spinal cord the fibres synapse in the substantia gelatinosa. These synapses release glutamate and are capable of releasing a neurotransmitter substance called 'substance P' in the dorsal horn. Substance P stimulates change in the substantia gelatinosa, which might explain how people adapt to pain.

From the substantia gelatinosa the fibres join the spinothalamic pathway that runs, along the spinal cord, to the brain. The fibres terminate in the thalamus in the brain. Pain and temperature information travel along the trigeminal nerve and synapse in the spinal trigeminal nucleus.

The thalamus is also connected to the anterior cingulate cortex(ACC). The somatosensory cortex is also connected to the thalamus, but to a lesser degree. ACC helps with the emotional part of pain. If we expect low levels of pain ACC is less active, and if we expect much pain ACC is more active.

Reward circuits, such as nucleus accumbens, have been observed active in relation to pain. Nucleus accumbens is essential to addictive behaviours. Aversive, and positive stimuli are analysed in in reward circuits and have an impact on survival.

Pain management

A negative side of pain is it's persistence. Some people feel so much pain that they cannot function in society. Endogenous opioid receptors along with individual differences and culture affects how people experience pain. A person with high levels of opioid receptors experience less pain.

We try to stop pain from reaching the brain and affecting us. If we hit our elbow, we might rub it to lessen the pain. What we in essence do is that we block the nociceptors from sending signals. This phenomena is often referred to as the 'gate theory of pain'. In essence it's the activation of touch fibres that reduces the amount of information the reaches the brain.

Periaqueductal gray(PAG) is a central place for pain reception. PAG has a high density of opiate receptors. PAG is like a load balancer. It has possibility to change incoming data, and selectively relaying information to the brain.

Chronic pain is a troubling type of pain. It doesn't go away, and many types of medicine have little effect on it. Chronic pain is said to be more of a memory problem than a sensory one. It is believed that the problem is forgetting the pain.

Further we have pain during stress. In very stressful situations the feeling

of pain is reduced. This is done by the increased levels of opioids in the brain, mainly endorphins.

Attitudes towards pain also plays a big role in how we handle it. As an example athletes and nonathletes experience pain very differently, although their pain thresholds can be the same. The sense of control reduced how much pain a person feels. Or rather how much pain a person can live with. Self medication for pain results in less medication.

References

Lecture slides.

Discovering Biological Psychology, Second edition, published by Wadsworth, ISBN-13: 978-0-547-17795-3, pages: 202-223.