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A perspective review on pain, pain theory & it's diagnosis

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ABSTRACT

Pressure, a dynamic sensation consisting of a physiological reaction to a noxious stimulus and a psychological reaction. Pain is a alert mechanism that protects an organism from harmful stimuli by causing it to withdraw; pain is generally associated with injury or the possibility of injury. Several theoretical theories have been suggested to clarify the physiological basis of pain, but the experience of pain is not yet completely accounted for by all. A variety of theories were postulated to explain processes that underlie the perception of pain. In this analysis, we are reviewing the basic pain data, pain theories and their treatment, presenting the key facts supporting the titles. We believe there is a need for a clear definition of pain, pain theories and its diagnosis, especially considering the huge global burden of this condition. Indeed, understanding pain as a definite medical disorder is critical for raising awareness of this overlooked public health problem and encouraging the development of new unique therapeutic approaches.

Keywords: Pain, Noxious stimulus, Theories, Diagnosis, Pathologic state

INTRODUCTION

Pain is "an unpleasant sensory and emotional experience associated with, or described in terms of, actual or potential tissue damage." [1] It is the feeling common to experiences such as stubbing a toe, burning a finger, putting iodine on a cut and bumping the" funny bone Pain motivates us to withdraw from potentially dangerous circumstances, protect a damaged part of the body while recovering and prevent these situations in the future. It is initiated by stimulation of nociceptors in the peripheral nervous system, or by peripheral or central nervous system pathology, damage, or malfunction. Most pain recovers rapidly after the painful stimulation has been removed and the body has healed, but often pain continues following the removal of stimuli and obvious healing of the body; and often pain arises in the absence of any detectable stimulation, injury or pathology. [2] Pain is the most common cause for physician therapy in the US. In many medical conditions it is a major symptom, and can significantly interfere with the quality of life and general functioning of a person. Social support, hypnotic suggestion, sport or war excitement, distraction and appraisal can all significantly modulate the intensity or unpleasantness of the pain [3].

Classification

The classification system of the International Association for the Study of Pain (IASP) describes pain according to five categories: duration and severity, anatomical location, involved body system, cause, and temporal (intermittent, constant, etc.). Woolf and others have criticized this system as inadequate for guiding research and treatment, and they have proposed an additional category based on neuro-chemical mechanisms [4].

Duration

Pain is typically transitory, lasting only until the noxious stimulus is removed or the underlying damage or disease has resolved, although certain painful disorders, such as rheumatoid arthritis, peripheral neuropathy, cancer and idiopathic pain, may continue for years. The long-lasting pain is called chronic, and the pain that quickly resolves is called acute. The distinction between acute and chronic pain has traditionally relied on an arbitrary time interval from the outset; the two most commonly used thresholds are 3 months and 6 months from the onset of pain [4], although some experts and researchers place the transition from acute to chronic pain at a period of 12 months. Others refer acute pain with a period of less than 30 days, chronic pain with a period of more than six months and subacute pain with a duration of one to six months. A common alternative definition of chronic pain that does not require arbitrarily defined durations is 'pain that persists beyond the normal healing period.'[4] Chronic pain can be categorized as 'cancer' or 'benign'

Region and system

Pain can be classified according to its position in the body, such as headache, low back pain and pelvic pain; or depending on the body system involved, such as myofascial pain (from the skeletal muscles or the fibrous sheath surrounding them), rheumatic pain (from the joints and surrounding tissue), neuropathic pain (from damage, inflammation or failure of any part of the nervous system).

Cause

The crudest example of causal classification simply distinguishes "somatogenic" pain (which arises from body disturbance) from psychogenic pain (which arises from mental disturbance: when a thorough physical examination, imaging, and laboratory testing fails to detect the cause of pain, it is assumed to be the product of psychological conflict or psychopathology) (4). *Somatogenic pain is broken down into "nociceptive" (caused by nociceptor activation) and "neuropathic" (caused by pathology, nervous system damage or malfunction).*

Nociceptive pain

Nociceptive pain is caused by stimulation of peripheral nerve fibers that respond only to stimuli that reach or exceed harmful intensity (nociceptors), and may be categorized according to the mode of noxious stimulation; the most common categories are "thermal" (heat or cold), "mechanical" (crushing, tearing, etc.) and "chemical" (iodine in a cut, chili powder in the eyes). Likewise, nociceptive pain can be categorized into "visceral," "deep somatic" and "superficial somatic." *Visceral* pain originates in the viscera (organs) and often is extremely difficult to locate, and nociception from some visceral regions produces "referred" pain, where the sensation is located in an area distant from the site of the stimulus. *Deep somatic pain is triggered in ligaments, tendons, bones, blood vessels, fasciae, and muscles by stimulating nociceptors, and is dull, unpleasant, poorly located. Examples include broken bones and sprains. Superficial pain is caused by skin or superficial tissue activation of nociceptors and is sharp, well-defined and clearly located. Examples of superficial somatic pain injuries include minor wounds and minor (first-degree) burns [5].*

Neuropathic pain

Neuropathic pain is caused by nervous system injury, failure, or disease, and is divided into 'peripheral' (originating in the peripheral nervous system) and 'central' (originating in the brain or spinal cord). Peripheral neuropathic pain is often characterized as "burning," "tingling," "electrical," "stabbing" or "pins and needles." [6] Peripheral neuropathic pain is caused by bumping the" funny bone

Psychogenic pain

Psychogenic pain, also called psychalgia or somatoform pain, is caused by mental, emotional, or behavioral factors that cause, increase, or prolong pain. Sometimes headache, back pain and stomach pain are diagnosed as psychogenic. Sufferers are often stigmatized, because both the medical professionals and the general public tend to think that psychological pain is not "real." Specialists, however, find it to be no less real or hurtful than any other cause of pain [7].

People with long-term pain often exhibit psychological disturbance, with high scores of hysteria, depression, and hypochondriasis (the "neurotic triad") on the Minnesota Multiphasic Personality Inventory scales. Some researchers have argued that this neuroticism is what causes acute injuries to turn chronic, but clinical evidence points the other way, to chronic neurotic pain. When therapeutic intervention relieves pain in the long term, scores on the neurotic triad and anxiety often fall to normal levels. In chronic pain patients, self-esteem is still poor, and also shows striking progress once pain has resolved [7].

"The term 'psychogenic' assumes that medical diagnosis is so perfect that it can detect all organic causes of pain; unfortunately, we are far from such infallibility.. The diagnosis of neurosis as the cause of pain all too often hides our ignorance of many aspects of pain medicine.

Phantom pain

Phantom pain is pain from a missing portion of the body, or from which the brain is no longer receiving signals. It's one kind of neuropathic pain. Pain with the phantom limbs is a common experience of amputees. One study found that 72 percent of patients had phantom-limb pain eight days after amputation and 65 percent reported it six months later. Several amputees feel constant pain, which varies in severity or quality; others experience multiple bouts a day, or it may occur only once a week or two. It is often described as being shot, crushed, burned or cramped. If the pain is persistent for a long period of time, parts of the intact body may become sensitized to invoke pain in the limb of the phantom, or the pain of the limb may accompany urination or defecation [8].

Local anesthetic injections into the nerves or sensitive areas of the stump can relieve pain for days , weeks or, sometimes permanently, despite the drug wearing off in a matter of hours; and small injections of hypertonic saline into the soft tissue between the vertebrae cause local pain that radiates into the phantom limb for 10 minutes or so and can be followed by hours, weeks or even longer In some patients, vigorous vibration or electrical stimulation of the stump, or current from electrodes surgically implanted on the spinal cord, all produce relief. [8] Paraplegia, loss of sensation and voluntary motor function following serious injury to the spinal cord, can be followed by girdle pain at the level of damage to the spinal cord, abdominal pain evoked by a filling bladder or intestine or, in five to ten per cent of paraplegics, phantom body pain in areas of complete sensory loss. Initially described as burning or tingling, phantom body pain can develop into severe crushing or pinching pain, fire running down the legs, or a twisting knife in the flesh. The onset may occur immediately or not until years after the disabling injury. Surgical care offers never lasting relief. [8]

Pain asymbolia

Although unpleasantness is an essential part of the IASP definition of pain, it is possible to induce a condition described as intense pain free of unpleasantness in some patients with morphine injection or psychochirurgy. [7] Such patients report having pain but are not bothered by it, they recognize the pain sensation but suffer little, or not at all.

Insensitivity to pain

The ability to feel pain is important to protect against injury, and to identify injury. In exceptional conditions, such as in the excitement of sport or war, episodic analgesia may occur: a soldier on the battlefield can experience no pain from a traumatic amputation or other severe injury for several hours. However, pain insensitivity may also be acquired under conditions such as injury to the spinal cord, diabetes mellitus, or more rarely leprosy. A small number of people suffer from congenital analgesia ("congenital insensitivity to pain"), a genetic disorder that puts those people at constant risk as a result of the consequences of unrecognized injury or illness. Children with this condition suffer

repetitive careless damage to their tongue, eyes, joints, skin and muscles. They may reach adulthood but they have a decreased life expectancy.

Psychological and psychosocial functioning

Experimental subjects in chronic pain who are challenged by acute pain and patients experience impairments in attention control, working memory, mental flexibility, problem solving, and speed of processing information. It also associates acute and chronic pain with increased depression, anxiety, fear and anger. "If I have things right, the effects of pain will include direct physical distress, unemployment, financial difficulties, marital disharmony and concentration and attention difficulties"—Harold Merskey 2000 [9].

Pain Theory

René Descartes traced a pathway of pain in this 1664 Treatise of Man. "Water pieces" (A) activate a spot of the skin (B) attached by a fine thread (cc) to a valve in the brain (de) where this action opens the valve, allowing the animal spirits to escape from the cavity (F) into the muscles which then flinch from the stimulation, turn the head and eyes towards the affected part of the body, and move the hand and turn the body protectively. This model's underlying premise-that pain is the direct product of a noxious stimulus activating a dedicated pain pathway, from a receptor in the skin, along a thread or chain of nerve fibers to the pain center in the brain, to a mechanical behavioral response-remained the dominant perspective on pain until the mid-1960s.

Specificity theory

The specificity theory (dedicated pain receptor and pathway) was challenged by the theory, initially proposed by Wilhelm Erb in 1874, that a pain signal may be generated by stimulation of any sensory receptor, provided the stimulation is sufficiently intense: the stimulation pattern (intensity over time and area), not the type of receptor, determines whether nociception occurs. Alfred Goldscheider (1894) suggested that, over time, activity from many sensory fibers could accumulate in the spinal cord's dorsal horns and start signaling pain after a certain threshold of accumulated stimulation has been crossed. In 1953, Willem Noordenbos observed that a signal transported from the injury area along large diameter "touch, pressure or vibration" fibers could inhibit the signal transmitted by the thinner "pain" fibers-the ratio of large fiber to thin fiber signal determining pain intensity; hence, we rub a smack. This was taken as a demonstration that stimulation pattern (in this case, of large and thin fibers) modulates pain intensity.

Gate Control

Melzack and Wall introduced their pain theory "gate control" in the 1965 Science article "Pain Mechanisms: A New Theory" The authors suggested that thin (nociceptive) and large (inoccuous) nerve fibers carry information from the injury site to two destinations in the spinal cord's dorsal horn: the "inhibitory" cells and the "transmission" cells. The transmission cells are activated by signals from both thin and large diameter fibers, and when the transmission cells production reaches a critical point, pain begins. The inhibitory cells work to inhibit transmission cell activation. The transmission cells are the gate to pain, and the gate can be shut by inhibitory cells. If thin (pain) and wide (touch, etc.) fibers, stimulated by a noxious incident, excite a transmission cell in the spinal cord, they also function on its inhibitory cells. The thin fibers prevent the inhibitory cells (currently leaving the gate open) while the large diameter fibers excite the inhibitory cells (currently closing the gate). Therefore, the greater the fiber activity compared to thin fiber activity that comes from the receptive area of the inhibitory cell, the less pain is felt. A neural "circuit diagram" was developed by the authors to explain why we put a smack on.

We imagined not only a signal moving from the injury site to the inhibitory and transmission cells and up the spinal cord to the brain, but also a signal moving from the injury site directly up the cord to the brain (bypassing the inhibitory and transmission cells) where it may cause a signal back down the spinal cord to modulate inhibitory cell, depending on the brain state. This was the first theory to offer a physiological explanation for the psychology's previously reported effect on perception of pain.

Dimensions Theory

In 1968, Melzack and Casey defined pain in terms of its three dimensions: "Sensory-

discriminative" (sense of pain intensity, position, consistency and duration), "Effective-motivational" (unpleasantness and desire to avoid unpleasantness), and "Cognitive-evaluative" (cognitions such as assessment, cultural values, diversion, and hypnotic suggestion). They theorized that pain intensity (the sensory discriminative dimension) and unpleasantness (the affective-motivational dimension) are not simply determined by the magnitude of the painful stimulus but that "higher" cognitive activity (the cognitive-evaluative dimension) can influence perceived intensity and unpleasantness. Cognitive activities "may affect both sensory and affective experiences or may primarily alter the affective-motivational dimension. Thus, excitement in games or war appears to block both dimensions of pain, while suggestion and placebo can modulate the affective-motivational dimension and leave the sensory-discriminative dimension relatively undisturbed."

Theory today

The early pattern theory hypothesis of Wilhelm Erb (1874), that a pain signal can be generated by the intense stimulation of any sensory receptor, was soundly disproved. The small (A-delta and C) peripheral nerve fibers bring information to the spinal cord concerning the state of the body. Some of these thin fibers do not distinguish noxious from non-noxious stimuli, while others, nociceptors, respond only to painfully intense stimuli.[10] Spinal cord fibers dedicated to carrying A-delta fiber pain signals have been identified, while others dedicated to carrying C fiber pain signals up the spinal cord to the brain thalamus. Pain-related activity in the thalamus spreads to the insular cortex (thought to embody, among other things, the feeling that distinguishes pain from other homeostatic emotions such as itch and nausea) and anterior cingulate cortex (thought to embody, among other things, the motivational element of pain); and pain that is distinctly located also activates the primary and secondary somatosensory cortices. One study showed that pain relief due to non-noxious contact or sensation would result from behavior within the cerebral cortex, with limited input at the spinal level. [11] Melzack and Casey's 1968 image of the pain dimensions is as influential today as ever, firmly framing theory and guiding research into functional neuroanatomy and pain psychology.

Diagnosis

An individual's self-report is the most accurate indicator of pain, with health care practitioners continuing to underestimate severity. [12] In 1968, Margo McCaffery proposed a concept of pain commonly used in nursing, stressing its subjective existence and the value of believing patient reports: "Pain is whatever the individual who is feeling thinks it is, it happens whenever he thinks it does" [13]. Having the patient complete the McGill Pain Questionnaire indicating which words best describe their pain can establish quality.

Multidimensional pain inventory

The Multidimensional Pain Inventory (MPI) is a questionnaire designed to assess the psychosocial state of a person with chronic pain. Analysis of Turk and Rudy's MPI results (1988) found three classes of chronic pain patients: '(a) dysfunctional, people who perceived the severity of their pain to be high, reported pain interfering with much of their lives, reported a higher degree of pain-related psychological distress and reported low levels of activity; (B) interpersonally distressed, persons with a common perception that significant others were not very supportive of their pain problems; and (c) adaptive copers, patients with high levels of social support, relatively low levels of pain and perceived interference, and relatively high levels of activity". [14] Combining the person's MPI characterization with their IASP pair of five categories.

Assessment in nonverbal patients

When a person is non-verbal and cannot disclose pain on his or her own, evaluation becomes important, and particular actions can be monitored as indicators of pain. Behaviors such as facial grimacing and guarding show pain, as well as an increase or decrease in vocalizations, changes in patterns of routine behavior and changes in mental status. Patients with pain may exhibit withdrawn social behavior and may experience a reduced appetite and nutritional intake. Potential pain indicators are also a change in condition which deviates from baseline such as moaning with movement or when manipulating a part of the body

and a restricted range of motion. In patients who have language but are unable to express themselves effectively, such as those with dementia, an increase in confusion or display of aggressive behaviors, including agitation, may indicate that there is discomfort and further evaluation is needed. Children experience pain but lack the vocabulary needed to express it, so they can convey distress by crying. There will be a non-verbal pain assessment involving the parents, who may note changes in the child that are not apparent to the health care provider. Premature infants are more sensitive to painful stimuli than full-term infants [15].

Other barriers to reporting

An aging adult cannot respond to pain as would a younger person. Illness or the use of multiple prescription drugs may blunt their ability to recognize pain. Depression can also keep the elderly from disclosing that they are in pain. Even the older adult can stop doing things that they enjoy because it hurts too much. Declines in self-care activities (dressing, grooming, walking, etc.) may also be indicators of pain experienced by the older adult. The older adult may refrain from reporting pain because they fear that they will have to undergo surgery or that they will be placed on a substance to which they become addicted. They may not want others to see them as weak, or may feel there is something impolite or shameful in complaining about pain, or they may feel the pain is deserved punishment for past transgressions. [16]

Cultural barriers also can prevent a person from telling someone that they are in pain. Religious beliefs can prevent a person from seeking help. We can believe the treatment of such pain is against their faith. They may not report pain as they feel that it is a sign that death is close. Many people are afraid of the stigma of addiction and avoid pain treatment so that addictive drugs are not prescribed. Many Asians do not want to lose respect in society by admitting that they are in pain and need help, believing that the pain should be borne in silence, while other cultures feel that they should report pain immediately and receive immediate relief [15]. Differences between the sexes are usually the result of social and cultural expectations, with women expected to be emotional and show pain and men stoic, keeping pain on their own.

As an aid to diagnosis

Pain is a symptom of many illnesses. Knowing the time of onset, location, severity, incidence pattern (continuous, sporadic, etc.), exacerbating and relieving causes, and pain quality (burning, painful, etc.) can enable the examining physician to diagnose the problem accurately. For example, pain in the chest described as extreme heaviness may indicate myocardial infarction, whereas pain in the chest described as tearing may indicate aortic dissection [17].

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