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Psychological Aspects of Pain

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Abstract

Introduction. Pain is defined "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage". Pain is a sensation of the body, and is always an unpleasant emotional experience. The role of psychology is auxiliary and supplemental to medicine. This is an aid addressed to the patient, physician and patient's caregivers: professional caregivers, family members and significant others. At each stage of the diagnostic and therapeutic process, psychology offers help, both from the cognitive and practical aspects.

Objective. The objective of the article is to present important psychological aspects of studies concerning pain, and the psychological methods and techniques of pain treatment.

State of knowledge. Pain is the leading reason for patients seeking medical care and is one of the most disabling, burdensome, and costly conditions. Pain accompanies many diseases, each one of which generates unique/separate diagnostic, therapeutic and research problems.

Depression and related psychical disorders. There is a significant relationship between depression and pain symptoms, as well as between pain and suicidal thoughts. Patients with a long history of pain disorders also have increased depression and anxiety symptoms, as well as suicidal thoughts. Patients with more severe depression and anxiety symptoms also have an increase in pain problems. The intensity of pain correlates with the intensity of psychopathological symptoms – both with mood lowering and with anxiety symptoms and worry.

Active pain coping strategies strive to function in spite of pain, or to distract oneself from pain, are associated with adaptive functioning. **Passive strategies** involve withdrawal or relinquishing control to an external force or agent and are related to greater pain and depression. **Pain catastrophizing** is a negatively distorted perception of pain as awful, horrible and unbearable. Catastrophizing is strongly associated with depression and pain. Studies in which functional magnetic resonance imaging (fMRI) was used showed that pain catastrophizing, independent of the influence of depression, was significantly associated with increased activity in brain areas related to anticipation of pain, attention to pain, emotional aspects of pain and motor control. **Pain behaviour** is a conditioned pain. Care and concern on the part of others, secondarily enhance a patient's pain behaviours, which lead to an increase in the intensity of the pain experienced. A history of **early life adversity** (ELA) – rejection, neglect, physical or sexual abuse is related to the development of irritable bowel syndrome (IBS) in adulthood. Ovarian hormones have been shown to modulate pain sensitivity.

Imaging of the human brain in chronic pain. Acute pain and chronic pain are encoded in different regions of the brain. Chronic pain can be considered a driving force that carves cortical anatomy and physiology, creating the chronic pain brain/mind state.

Cognitive-behavioural methods of pain treatment in domains of pain experience, cognitive coping and appraisal (positive coping measures), and reduced pain experience are effective in reducing pain in patients.

Key words

pain, coping, cognitive-behavioural therapy

INTRODUCTION

Pain is defined by the International Association for the Study of Pain (IASP), as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" [1].

In note to the definition, authors clearly pointed out, that: pain is always subjective, it is that experience we associate with actual or potential tissue damage. It is unquestionably a sensation in a part or parts of the body, but it is also always unpleasant and therefore also an emotional experience. Experiences which resemble pain but are not unpleasant, e.g., pricking, should not be called pain. Unpleasant abnormal experiences (dysesthesias) may also be pain but are not necessarily so because, subjectively, they may not have the usual sensory qualities of pain. Many people report pain in the absence of tissue damage or any likely pathophysiological cause; usually this happens for psychological reasons. There is usually no way to distinguish their experience from that due to tissue damage if we take the subjective report. If they regard their experience as pain, and if they report it in the same ways as pain caused by tissue damage, it should be accepted as pain. Activity induced in the nociceptor and nociceptive pathways by a noxious stimulus is not pain, which is always a psychological state, even though we may well appreciate that pain most often has a proximate physical cause [1].

The theory of pain published in 1965 by Wall and Melzack was of crucial importance for the understanding of the pain phenomenon [2]. In the light of this theory, the experience of pain is a multidimensional phenomenon that is influenced by multiple factors, such as affect, previous experience and cultural beliefs, in addition to sensory input [2]. It provided an impulse for a wider consideration of psychosocial factors

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in the studies of pain, and being subject to modifications and supplementations in the course of progress in knowledge, it has stood the test of time [3].

Pain, as mentioned, is a psychological concept; however, the basic tasks: diagnosis of the causes of pain in an individual patient, planning of the implementation of an appropriate therapy, belong to the physician. The role of psychology is auxiliary and supplemental. This is an assistance addressed to a patient, physician, a patient's caregivers: professional caregivers, family members and significant others. At each stage of the diagnostic and therapeutic process, psychology offers help, both from the cognitive and practical aspects.

Objective. The objective of the article is the presentation of important aspects of studies concerning psychological conditioning of pain and psychological strategies and techniques supporting patients in their struggle with pain.

State of knowledge. Pain is the leading reason for patients seeking medical care and is one of the most disabling, burdensome, and costly conditions in the USA [4, 5]. Pain accompanies many diseases. In American studies [4] the following list of diseases has been considered, recognized as generating the greatest pain problems (in alphabetical order): 1) Ankylosing spondylitis, 2) Cancer pain, 3) Cervical radiculopathy, 4) Complex regional pain syndrome, 5) Diabetic neuropathy, 6) Fibromyalgia, 7) HIV-associated pain, 8) Interstitial cystitis, 9) Irritable bowel syndrome, 10) Low back pain, 11) Lumbar radiculopathy, 12) Migraine, 13) Multiple sclerosis associated pain, 14) Osteoarthritis, 15) Painful bladder syndrome, 16) Phantom limb, 17) Postherpetic neuropathy, 18) Psoriatic arthropathy, 19) Rheumatoid arthritis, 20) Spinal cord injury, 21) Stroke associated pain, 22) Surgically-induced pain, and 23) Trigeminal neuralgia.

Each of the above-mentioned diseases generates unique/separate problems from the aspect of loading a patient with the disease, costs of health care, and diversity of concomitant diseases. Also, each of them constitutes a separate area of diagnostic, therapeutic and research problems [4].

Depression and related psychical disorders. A sensitive early symptom of depression are pain disorders [6]. Relationships between depression and pain may be of a two-way character [6]. There is significant relationship between depression and pain symptoms, as well as between pain and suicidal thoughts. The patients with a long history of pain disorders also have an increase in depression and anxiety symptoms, and suicidal thoughts. Patients with more severe depression and anxiety symptoms also have an increase of pain problems [6]. In a detailed metaanalysis by Bair et al. [7], the frequency of reporting pain complaints by patients with depression ranged from 15–100%, mean value 65%. In the studies by Kirmayer et al. [8], among patients who satisfied the criteria for depressive disorders according to various self-assessment questionnaires, 75–80% of them mentioned such pain complaints as: headaches, stomach ache, neck and back pain, and non-specific pains. In the population of patients hospitalized due to severe depression, 92% reported at least one pain symptom, while 76% – many pain complaints. Nearly 60% of patients with depression reported pain at the moment of making the diagnosis [9]. The presence of depressive disorders increased the risk of occurrence of musculoskeletal pain, headache and pain in the chest within the subsequent 3 years [10, 11, 12]. Apart from severe depression, pain may also accompany other mood disorders: small depression, dysthymia, bipolar affective disorder, depression caused by somatic diseases or drugs, or an incomplete remission in a severe depression [13].

In the studies by Wasilewski it was found that the intensity of pain correlates with the intensity of psychopathological symptoms — both with mood lowering and with anxiety symptoms and worry. The stronger the pain, the worse the psychical status. With growing intensity of pain, patients more frequently had suicidal thoughts, and their intensity was higher [6]. In the MMPI test, individuals who suffered from chronic pain usually have high indicators of hypochondria, depression and hysteria.

Maladaptive coping strategies and beliefs. Coping is an effort to manage events that are perceived as stressful. Active coping strategies strive to function in spite of pain, or to distract oneself from pain, are associated with adaptive functioning. Passive strategies involve withdrawal or relinquishing control to an external force or agent are related to greater pain and depression [14].

Cognitive errors – pain catastrophizing. A cognitive error may be defined as a negatively distorted belief about oneself or one's situation Such errors are hypothesized to influence the severity and maintenance of depression and include catastrophizing (misinterpreting an event as a catastrophe), personalization (taking personal responsibility for negative events), and selective abstraction (selectively attending to the negative aspects of a situation), among others [15]. Pain catastrophizing is a perception of pain as awful, horrible and unbearable. Catastrophizing is also strongly associated with depression. It is also an important factor in the experience of pain. Among patients with soft-tissue injuries catastrophizing significantly correlated with patient's reported pain intensity, perceived disability and employment status. independent of the levels of depression and anxiety [13]. Studies in which functional magnetic resonance imaging (fMRI) was used showed that pain catastrophizing, independent of the influence of depression, was significantly associated with increased activity in brain areas related to anticipation of pain (medial frontal cortex, cerebellum), attention to pain (dorsal contralateral anterior, dorsolateral prefrontal cortex), emotional aspects of pain (claustrum, closely connected to amygdala) and motor control [16]. Analysis of video records revealed that high pain catastrophizers displayed communicative pain behaviours (e.g. facial displays, vocalizations) for a longer duration when an observer was present, compared to high pain catastrophizers who were alone during the pain procedure. High pain catastrophizers show a propensity to engage in strategies that more effectively communicate their pain, and are less likely to engage in strategies that might minimize pain [17]. Exclusively intrapsychic conceptualizations of pain catastrophizing a maladaptive cognition (e.g. cognitive errors) seems to be incomplete. Similar to pain behaviour, pain catastrophizing is enhanced by the social context. A full understanding of the functions and consequences of pain catastrophizing will require more attention to questions concerning communication goals, coping preference and coping efficacy, interpersonal needs,

and the social reinforcement contingencies that influence how, and to whom pain will be expressed [17].

Pain behaviour. Pain behaviour and conditioned pain. A patient who experiences pain after a sustained injury or a surgical procedure learns to assume a body position with which he/she feels less pain, or to avoid certain movements which intensify pain. Thus, a patient may avoid lying on a specified side if this causes an intensification of pain, may limp on one leg, because burdening of this leg causes pain. These behaviours are rewarding — cause a decrease in pain, and to the contrary – loading or irritation of the site of lesion leads to the occurrence or increase in pain — acts as a punishment. Verbal and behavioural manifestation of pain may be additionally strengthened by the behaviours of people from the patient's surroundings. Complaining, painful grimaces, changes in body posture, evoke in them concern and sympathy, and incline them to provide assistance. The reactions of the environment act as a prize, secondarily enhancing a patient's pain behaviours, which leads to an increase in the intensity of the pain experienced. It has been confirmed that patients who receive a higher level of social support show simultaneously an increased level of pain behaviours [27]. In one of the studies, the best predictor of the level of pain and the level of activity of patients with chronic pain, was an increased concern of the spouse in response to pain symptoms [19].

Early life adversity. A history of early life adversity (ELA) — rejection, neglect, physical or sexual abuse has health-related consequences that persist beyond the initial maltreatment and into adulthood. A relationship between ELA and the development of irritable bowel syndrome (IBS) in adulthood has been described in clinical literature and animal models. Childhood adversity is associated with abnormal glucocorticoid signalling within the hypothalamic-pituitary-adrenal (HPA) axis, and the development of functional pain disorders such as the IBS. IBS and many adult psychopathologies are more frequently diagnosed in women, and ovarian hormones have been shown to modulate pain sensitivity [20].

Imaging of the human brain in chronic pain. The first modern non-invasive brain imaging techniques were introduced to the study of humans in pain 20 years ago. This started the new field of studying the awake human brain in pain. To-date, the only tools available to study human chronic pain are clinical exams and psychological assessments. New techniques now make it possible to study brain activity while enduring pain and chronic pain. New techniques can extract information regarding anatomical, functional, metabolic and cognitive properties of the brain during pain. Electrical signals of the brain can be monitored by EEG, or magnetoencephalography (MEG), recording techniques, which provide very accurate information about the timing of nociceptive information transmission to the brain, albeit with poor spatial specificity. Blood and metabolism signals provided by functional magnetic resonance imaging (fMRI) and PET are currently the most popular means of examining the human brain in general, and also specifically for pain, yet they have lower temporal resolution than EEG, or MEG, but much better spatial information. Currently, the technique most commonly used to study the human brain remains fMRI [21].

Acute pain stimuli in healthy subjects cause a consistent and reproducible activation of a set of brain regions. This activity pattern is labelled as acute nociceptive pain-related brain activity or, simply, as pain 'neuro matrix'. Imaging the brain's physiological properties in chronic chest pain (CBP) is more complicated than in acute pain. In contrast to acute pain, chronic pain is characterized by the presence of ongoing pain, and chronic pain patient populations are by nature inhomogeneous, use diverse modes of drug and other types of therapy, and most chronic pains are comorbid with other conditions [22]. Pain intensity for spontaneous CBP and thermal pain are encoded in different brain regions. Pain intensity for spontaneous pain of CBP is significantly positively correlated with the medial prefrontal cortex (mPFC; including rostral anterior cingulate) activity, which is known to be involved in negative emotions, response conflict, and detection of unfavourable outcomes, especially in relation to the self. Pain intensity for thermal pain in both CBP patients and normal subjects is best correlated with right insula activity encoding nociceptive information [22]. Moreover, chronic pain can be considered a driving force that carves cortical anatomy and physiology, creating the chronic pain brain/mind state [21].

Methods and techniques of pain treatment. Cognitive and cognitive-behavioural methods and techniques of pain treatment are aimed at helping a patient not only to limit the level of the pain experienced, but also to support his/her own activity, optimism, self-esteem, sense of control and self-efficacy [23]. In a comprehensive review of these techniques carried out by Siang-Yang Tan in 1988 [24], the author presented experimental, as well as clinical studies with the use of these techniques in order to assess, in the light of the results presented, their effectiveness in pain control.

(A) Cognitive methods.

(1) *Provision of preparatory information.* The provision of preparatory information about an impending event which may be discomforting or painful has often been used as a psychological strategy for pain control. This usually aims at altering an individual's cognitive appraisal of such an event which is more benign so that the pain eventually experienced during or after the event would be minimized. The preparatory information provided can be divided into two main types: procedural information about the objective aspects of the upcoming event, and sensory information about the specific sensations an individual is likely to experience during such an event. Comment. The efficacy of this method is questionable.

(2) *Cognitive coping skills.* The use of cognitive coping skills or strategies (e.g., distraction or attention diversion) for pain control has existed probably as long as people have experienced pain, but only recently have such techniques been subjected to controlled, experimental investigations regarding their efficacy for attenuating laboratory as well as clinical pain.

Turk has classified these various cognitive strategies into 6 main categories.

(a) *Imaginative inattention* — ignoring the pain by engaging in imagery which is incompatible with the experience of pain; for example, imagining oneself enjoying a pleasant day at the beach, at a party or in the country. Comment. The number of unequivocal studies showing that imaginative inattention was

more effective than control for increasing pain tolerance, or decreasing subjective reports of pain intensity was 6, whereas 3 studies unequivocally showed it was only equal to control.

(b) *Imaginative transformation of pain* — acknowledging the noxious sensations but interpreting them as something other than pain, or minimizing them as trivial or unreal. The number of unequivocal studies showing this strategy to be more effective than control was 3, and the number unequivocally showing it only equal to control was also 3.

(c) *Imaginative transformation of context* — acknowledging the noxious sensations but transforming or changing their setting or contextł for example, picturing oneself as "James Bond", having been shot in a limb, driving a car down a winding mountain road while being chased by enemy agents. One unambiguous study showed this strategy to be only equal to control for increasing pain tolerance.

(d) *Attention diversion (external)* — focusing attention on the physical characteristics of the environment for example, counting ceiling tiles, or studying articles of clothing. Comment. Only one study unequivocally showed this strategy to be more effective than control, while two studies clearly showed it to be no better than control.

(e) *Attention diversion (internal)* — focusing attention on self-generated (non-imagery produced) thoughts, for examples undertaking mental arithmetic or compiling a list of words of popular songs. Comment. One study clearly showed this strategy to be more effective than control, but 3 studies clearly showed it to be only equal to control.

(f) *Somatization* — focusing on the part of the body receiving the intense stimuIation but in a detached manner; for example, analyzing the intense stimulation and sensations as if preparing to write a biology report. Comment. Four studies unequivocally showed this strategy to be more effective than control, and none showed it to be equal to control. However, of these 4 studies, only one included an attention-placebo group. Hence, the efficacy of somatizatization for control of laboratory pain in the other studies could have been due to "placebo" effects.

(B) Cognitive-behavioural methods.

(1) *Provision of preparatory information plus skills instructions or training.*

Several studies have investigated the efficacy of a combined cognitive-behavioural intervention consisting of the provision of preparation information plus behavioural or cognitive-behavioural instructions for coping skills or training for clinical pain control, particularly during or after noxious medical procedures. Comment. Combined interventions consisting of preparatory information, plus coping skills instructions or training for the reduction of stress or anxiety reactions during or after noxious medical procedures, are effective. However, the data for pain attenuation *per se* are not as convincing.

(2) *Prepared childbirth techniques.* Prepared childbirth techniques are really a special category of combined interventions consisting of preparatory information (about the process of childbirth) and coping skills training. The coping skills component usually includes training in deep breathing, relaxation and/or attention focusing (e.g., focusing attention on a spot on a wall or the ceiling). Comment. The data from both laboratory and clinical studies on the whole, provide some support, though not unequivocal, for the value of such techniques for pain control.

(3) *Multifaceted cognitive-behavioural treatment regimens.* Comment. The studies reviewed provide some support, albeit tentative, for the efficacy of multifaceted cognitive-behavioural treatment regimens for the control of clinical pain, e.g. low back pain, ulcer pain and headaches. More controlled studies, especially with attention-placebo and no treatment control groups, are needed before more definite conclusions can be drawn. More studies which attempt to identify the necessary or sufficient components of such combined, multifaceted treatment regimens are also needed.

(4) *Stress-inoculation training.* This method refers to a comprehensive cognitive-behavioural intervention with 3 main phases which has been used for the management not only of pain but also anxiety and anger. Unlike approaches that impose a specific cognitive strategy on all subjects, the skills oriented stress-inoculation training approach takes into account and capitalizes on the multidimensional nature and marked individual differences of pain reactions by providing subjects with the choice of a variety of coping skills. The first phase of the training for pain control is an educational phase in which subjects are provided with an explanatory scheme or conceptual framework (e.g., the Melzack-Wall gate control theory) for understanding pain experience. Next, is a rehearsal phase in which subjects are exposed to a variety of cognitive and u techniques for coping with pain, based on the conceptual framework (e.g., relaxation and deep breathing, distraction, imagery strategies and coping self-statements or "self-talk"). Subjects are allowed, however, to choose the coping techniques they wish to employ. The final phase of training is an application phase in which subjects are given an opportunity to test their newly acquired skills either by imagery-rehearsal and role-playing, or by exposure to an actual pain stressor (e.g., cold pressor task). Comment. External validity of stress-inoculation training for the reduction of more severe acute or chronic clinical pain has not been established [24].

A systematic review and meta-analysis made by Morley et al. in 1999 recovered 33 papers from which 25 trials suitable for meta-analysis were identified [25]. The following methods of exerting a therapeutic effect were noted: 1) biofeedback; 2) relaxation; 3) biofeedback and relaxation; 4) coping skills training; 5) cognitive restructuring; 6) education/bibliotherapy. For the needs of methaanalysis the above-mentioned methods were ordered within 8 domains of treatment, without specifying which particular methods and techniques were applied in individual domains. The list presented below contains the number and percentage of studies which comprised a given domain:

- pain experience 25 (100%);
- mood/affect 22 (88%);
- cognitive coping and appraisal 17 (68%);
- behavioural activity 17 (68%);
- biological 9 (36%);
- social role functioning 19 (76%);
- use of health care system 3 (12%);
- miscellaneous 5 (20%).

Three domains, biological, use of health care system, and miscellaneous, have been sampled by very few trials, and therefore did not include metaanalysis computations. Comparison with alternative active treatments revealed that cognitive-behavioural treatments produced significantly

greater changes for the domains of pain experience, cognitive coping and appraisal (positive coping measures), and reduced pain experience (behavioural expression of pain). Differences on the following domains were not significant; mood/affect (depression and other, non-depression, measures), cognitive coping and appraisal (negative, e.g. catastrophization), and social role functioning. The author concludes that active psychological treatments based on the principle of cognitive behavioural therapy are effective for treatment pain [25].

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