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Difference in Experience of Pain

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The International Association for the Study of Pain (IASP) updates the definition of pain as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."[1]

Chronic pain is a major health issue worldwide and has a profound effect on the quality of life. Data from the world Health Organization estimate that 22% of primary care patients report persistent pain.[2] The pain system can be altered by injury, disease and genetic factors and like other sensory systems this can lead to disturbed functioning.[3] The two major types of pain, nociceptive and neuropathic.[4] Distinguishing between is important because the causes and treatment are different.

Nociceptive pain results from tissue damage and is further subdivided into somatic and visceral pain. The pain is usually experienced as sharp, dull or aching. There may be radiation of the pain but it will not be in the distribution of the nerve.

Neuropathic pain may occur when there is either damage or dysfunction of nerve in the peripheral or central nervous system. Neuropathic pain frequently coexists with nociceptive pain. Neuropathic pain is often described as having a burning or electrical quality. Sometimes stimulus that usually does not cause pain such as light touch may elicit a paroxysm pain. Neuropathic pain in the peripheral nervous system frequently follows a nerve distribution.

Pain can also be classified into acute or chronic pain.[4] Physiologic responses to acute pain include tachycardia, tachypnea and sweating due to discharge of sympathetic nervous system. Chronic pain is very different from acute pain. Chronic pain frequently coexists with depression, making it difficult at times to distinguish between the two.

There are a few experimental pain procedures that have been used to determine pain threshold and pain tolerance, such as thermal pain, ischemic pain, cold pressure pain and pressure pain.

The large magnitude of the individual differences in the perception of pain has been recognized for centuries.[5] In general, heat pain is strongly and significantly correlated with pain assessed via other modalities such as pressure.[7] Heat pain threshold and tolerance were assessed using an ascending method of limits.[8]

Ischemic pain is induced when a tourniquet is applied and reported when pain becomes intolerable.[5,8,9] Cold pressure pain is assessed by having the subjects immerse their left hand up to the wriest in 5°C water.[10,11] The pressure pain threshold (PPT) is a concept that has been used to study muscular pain since the 1950's, with the goal of identifying the point at which pressure applied over a muscle becomes painful.[12]

Algometry has long been used to measure soft tissue pain associated with trigger points and has been used to assess the effectiveness of treatment which attempt to alleviate these specific tender sports. The algometer has been shown to be an effective way of quantifying the pressure pain threshold (PPT) relating well to other clinical pain measures and there is evidence to support the reliability of algometry to measure the PPT of trigger points.[13]

Pressure is applied at a constant rate of approximately 1 kg/s. Subjects are instructed to say "yes" as soon as the sensation of pressure changes to pain.[14,15]

Experimentally –induced pain in healthy human subjects under controlled laboratory conditions often yields sex-differentiated results, with women reporting more pain than men.[16] It was found that relative to men, women reported lower pain threshold and lower pain tolerance, with effects consistent in magnitude and direction with the findings of a recent meta-analysis of sexrelated differences in experimental pain perception.[17] They also suggest that efforts should continue to investigate biological, physiological, psychological, and cultural influences on pain responding. It is likely that all of these factors contribute to the observed sex-related differences in pain.[18]

Pain perception is characterized by substantial inter-individual variability. Although some proportions of this variability reflect measurement error, there is evidence that between-subject differences in pain perception are at least partially explained by true differences in nociceptive processing. Recently, it has been reported greater pain-related activation in several cortical regions in pain-sensitive compared with pain-insensitive subjects, suggesting that individual differences in pain sensitivity are associated with disparate central processing of noxious stimuli rather than with response bias or measurement error.[19] Individual differences in pain perception are inevitably determined by multiple variables, including genetic factors. It was found that women had significantly lower heat pain and pressure pain threshold and tolerance compared with men.[5] Women also reported significantly higher heat pain ratings during the temporal summation procedures. The pattern of associations between genotype and pain perception varied across pain assays should not be surprising. Indeed, previous findings reveal only low-to moderate correlation among responses to different pain assays, which suggest that disparate factors account for the variability observed in different pain modalities.[20,21] The findings indicate that subjects with one or more rare alleles exhibited lower sensitivity to pressure pain compared with wild-type subjects. Also, a significant interaction between sex and genotype emerged for heat pain ratings at 49°C, indicating that the rare allele genotype was associated with lower pain ratings among men but higher pain ratings among women. A similar pattern of results for emerged for heat pain tolerance but did not reach statistical significance.[5]

Considerable evidence has demonstrated that the experience of clinical pain differ among ethics groups.[22,23] For instance, Africans American report higher levels of pain in clinical conditions such as glaucoma,[24] AIDS,[25] migraine headache,[26] jaw pain,[27] postoperative pain,[28,29] myofascial pain,[30,31] angina pectoris,[32] joint pain,[33] non-specific daily pain,[34] and arthritis[35,36] compared to whites. In contrast, others have reported no significant ethic differences in clinica pain severity.[37,38] While research has suggested greater severity and prevalence of temporomandibular disorder in African American,[27] recent research indicates higher frequency, earlier onset, and greater symptom severity among whites.[39] More recently, several investigators have noted ethnic differences in pain-related symptoms among patients with chronic non-cancer pain.

Zborowski's pioneering work in the 1950s and 1960s laid the groundwork for many of the more recent investigations of the relationship between ethnicity and the experience of pain. Ethnicity is a cultural term, implying a group of people with a shared distinctive culture and a common language, and as such represents a shared national identity. Race implies a genetic basis when considering differential health status, suggesting that differences identified between individuals are fixed or predisposed.[40,41]

As summarized,[42] Zborowski's work has led to new developments in definitions of pain, ethical considerations in pain treatment, the role of learning factors in the expression of pain, and advancing comprehension of cultural and racial factors in chronic pain and illness. With respect to this latter development, numerous clinical studies, investigating a wide variety of painful conditions, have suggested ethnic differences in pain perception. Several investigators have recently noted differences between African American and whites in various forms of clinical pain.

However, in contrast to the fairly rich clinical literature, relatively few experimental studies have examined differences between whites and African Americans in responses to experimental pain. racial differences in pain tolerance has been investigated by using mechanical pressure applied to the Achilles tendon; relative to African

Americans, whites demonstrated higher pain tolerances.[43] Similarly, it has been investigated by using the cold pressor test as the method of pain induction, reported greater pain tolerance among whites than among African Americans.[44] It is indicated that whites possessed greater heat pain thresholds and tolerances than did African Americans.[45]

Ethnic differences were found in responses to noxious thermal stimuli.[34] Specifically, although African Americans did not differ from whites on measures of warmth threshold, thermal pain threshold or supra-threshold magnitude estimates of pain intensity, group differences emerged for measures of thermal pain tolerance as well as magnitude estimates of pain unpleasantness at the lowest stimulus temperatures assessed. On these latter measures, African Americans had lower thermal pain tolerances and greater magnitude estimates of the unpleasantness of the 46°C and 47°C stimuli. It has been suggested that pain tolerance and supra- threshold ratings of pain unpleasantness reflect primarily the affective-motivational aspects of pain and that pain threshold and supra-threshold ratings of pain intensity load predominantly on the sensory-discriminative dimension.[46] Several difficulties of interpreting measures of pain threshold and pain tolerance have been discussed.[47] Specifically, pain threshold may be more representative of the sensory-discriminative dimension of pain, whereas tolerance may relate more strongly to affective-motivational dimension.

Additionally, recent research has indicated that African Americans described ischemic arm pain as more intense and unpleasant compared to whites when using standardized verbal descriptor scales, but not with individualized scale.[8] Thus, ethnic differences in responses to both clinical and experimental pain have been reported; however, most previous studies included only one form of experimental pain and varied considerably in their pain induction methods.

In a study on ethnic responses to multiple experimental pain stimuli, found that African Americans did not differ from whites on threshold measures of heat pain, ischemic pain and cold pressor pain, but exhibited significantly lower tolerances for each of the stimulus modalities.[8] Group differences also emerged for ratings of the intensity and unpleasantness of supra-threshold heat pain, with African Americans providing higher ratings compared to whites. Differences in experimental pain responses among subgroups within larger ethnic categories have been reported,[45,48] however, others have reported no significant intraethnic differences in pain responding.[49,50]

It has been theorized that ethnic differences in pain responses may be most apparent for the effective-motivational dimension of pain.[32,34,51]

However, in a present study, African Americans reported supra-threshold heat pulses to be more intense and unpleasant at both 49°C and 52°C when compared to whites.[8] These findings suggest group differences in the sensory-discriminative aspects as well as the affective-motivational dimensions of pain perception. Taken together, these results are generally consistent with previous findings of ethnic differences in experimental pain.[32,34,43,44,45,47]

It was found that there were ethnic differences in the reported severity of chronic pain, in chronic pain-related disability, and in tolerance for controlled noxious stimulus. Specifically, ethnic group differences were observed on the factors measuring the reported severity of chronic pain and chronic pain-related disability, with African Americans reporting a somewhat greater severity of pain and slightly more pain-related disability than whites.[22] In addition, African Americans demonstrated lower ischemic pain tolerance than whites using a standard experimental pain procedure. On average, although white participants tolerated the ischemic arm pain for nearly 9 minutes, African Americans participants terminated the procedure at approximately 5 minutes. Collectively, the present results are consistent with previous investigations reporting ethnic differences in reported severity of chronic myofascial pain 31 and tolerance for experimental pain stimuli.[22] Additional findings suggested the clinical relevance of an experimental pain procedure; an inverse relationship emerged between ischemic pain tolerance and the perceived severity of clinical pain, suggesting that individuals reporting greater clinical pain tend to demonstrate lower ischemic pain tolerances.

The observed ethnic differences cannot be attributed to demographic factors, pain characteristics(pain duration, pain location, number of pain sites, and number of previous surgeries), or patterns of medication usage because the two groups were either comparable on these variables or the observed effects remained presents after statistically controlling for group differences. Furthermore, ethnic differences in clinical pain reports and experimental pain tolerance did not seem to be due to mood or emotional distress because African Americans and white participants did not differ on measures of depression, anxiety, or overall affective state. Collectively, the greatest difficulties seem to lie not in the measurement of ethnic differences in pain but in the explanation of these differences.[47] It has been suggested that ethnic differences in pain responses may emerge as a consequence of ethnic differences in one or more of these other variables.52 However, prior studies have suggested that the following factors do not account for differences between African Americans and whites in pain responses: personality,[31] anxiety,[30] education,[29] family history of pain,[34] attentional variables,[34] and peripheral mechanisms of nociception.[47]

In addition there is a study examined the influence of Virtual Humans' (VH) sex and race on participants' ratings of pain intensity, pain unpleasantness, pain-related negative mood, pain coping, and recommendations for medical help. Seventy-five undergraduates viewed a series of VHs and provided computerized visual analog scale (VAS) ratings for the five domains aforementioned above. Mixed model ANOVA analyses showed that participants of both sexes and races viewed female VHs as experiencing greater pain intensity, greater pain unpleasantness, a greater number of pain-related negative moods, poorercoping skills, and a greater need to seek medical help for their pain. Participants of both races rated Caucasian VHs as experiencing more negative moods and poorer coping skills do deal with their pain. The novel computerized VH technology used herein allowed for the standardization of pain expression across sexes and races of VH stimuli, thus allowing us to remove the influence of biases when creating the study stimuli.[53]

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