
MEASUREMENT OF PAIN

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Pain is a personal, subjective experience influenced by cultural learning, the meaning of the situation, attention, and other psychological variables.⁷⁷ Pain processes do not begin with the stimulation of receptors. Rather, injury or disease produces neural signals that enter an active nervous system that (in adults) is the substrate of past experience, culture, anxiety, and depression. These brain processes actively participate in the selection, abstraction, and synthesis of information from the total sensory input. Pain, then, is not simply the end product of a linear sensory transmission system; rather, it is a dynamic process that involves continuous interactions among complex ascending and descending systems.

DIMENSIONS OF PAIN EXPERIENCE

Since the beginning of this century, research on pain has been dominated by the concept that pain is purely a sensory experience. Yet pain also has a distinctly unpleasant, affective quality. It becomes overwhelming, demands immediate attention, and disrupts ongoing behavior and thought. It motivates or drives the organism into activity aimed at stopping the pain as quickly as possible. To consider only the

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sensory features of pain and ignore its motivational-affective properties is to look at only part of the problem. Even the concept of pain as a perception, with full recognition of past experience, attention, and other cognitive influences, still neglects the crucial motivational dimension.

These considerations led Melzack and Casey⁷³ to suggest that three major psychological dimensions of pain are (1) sensory-discriminative, (2) motivational-affective, and (3) cognitive-evaluative. They proposed, moreover, that these dimensions of pain experience are subserved by physiologically specialized systems in the brain: the sensory-discriminative dimension of pain is influenced primarily by the rapidly conducting spinal systems; the powerful motivational drive and unpleasant affective characteristic of pain are subserved by activities in reticular and limbic structures that are influenced primarily by the slowly conducting spinal systems; and the neocortical or higher CNS processes, such as evaluation of the input in terms of past experience, exert control over activity in both the discriminative and motivational systems.

These three categories of activity are assumed to interact with one another to provide perceptual information on the location, magnitude, and spatiotemporal properties of the noxious stimuli, motivational tendency toward escape or attack, and cognitive information based on past experience and probability of outcome of different response strategies.⁷³ All three forms of activity could then influence the motor mechanisms responsible for the complex pattern of overt responses that characterize pain.

LANGUAGE OF PAIN

Clinical investigators have long recognized the varieties of pain experience. Descriptions of the burning qualities of pain after peripheral nerve injury, or the stabbing, cramping qualities of visceral pains frequently provide the key to diagnosis and may even suggest the course of therapy. Despite the frequency of such descriptions and the seemingly high agreement that they are valid, descriptive words, studies of their use and meaning are relatively new.

Anyone who has suffered severe pain and tried to describe the experience to a friend or doctor may find himself or herself at a loss for words. The reason for this difficulty in expressing pain experience is not that the words do not exist. An abundance of appropriate words can be used, but, fortunately, they are not words that people use often. Another reason is that the words may seem absurd. We may use descriptors such as splitting, shooting, gnawing, wrenching, or stinging, but no external objective references exist for these words in relation to pain. If we talk about a blue pen or a yellow pencil, we can point to an object and say "that is what I mean by *yellow*," or "this color of the pen is blue." But what can we point to to tell another person precisely what we mean by smarting, tingling, or rasping? A person who suffers terrible pain may say that the pain is "burning" and add that "it feels as if someone is

shoving a red-hot poker through my toes and slowly twisting it around." These "as-if" statements are often essential to convey the qualities of the experience.

If the study of pain in people is to have a scientific foundation, the pain must be measured. If we want to know how effective a new drug is, we need numbers to say that the pain decreased by some amount. But, although overall intensity is important information, we also want to know whether the drug specifically decreased the burning quality of the pain or whether the especially miserable, tight, cramping feeling is gone.

APPROACHES TO THE MEASUREMENT OF PAIN

Until recently, the methods that were used for pain measurement treated pain as though it were a single, unique quality that varies only in intensity.² These methods include the use of verbal rating scales (VRSs), numerical rating scales (NRSs), and visual analogue scales (VASs). These simple methods have been used effectively in hospital clinics and have provided valuable information about pain and analgesia. VRSs, NRSs, and VASs provide simple, efficient, and minimally intrusive measures of pain intensity that have been used widely in clinical and research settings in which a quick index of pain intensity was required and to which a numerical value can be assigned.

Verbal and Numeric Rating Scales

Verbal rating scales typically consist of a series of verbal pain descriptors ordered from least to most intense (e.g., no pain, mild, moderate, or severe).⁴⁷ Patients read the list and choose the word that best describes the intensity of their pain. A score of 0 is assigned to the descriptor with the lowest rank, a score of 1 is assigned to the descriptor with the next lowest rank, and so on. Numeric rating scales typically consist of a series of numbers ranging from 0 to 10 or 0 to 100, with endpoints intended to represent the extremes of the possible pain experience and labeled "no pain" and "worst possible pain," respectively. Patients choose the number that best corresponds to the intensity of their pain. Although VRSs and NRSs are simple to administer and have demonstrated reliability and validity, the advantages associated with VASs (see subsequent discussion) make VASs the measurement instrument of choice when a unidimensional measurement of pain is required; however, this may not be true when assessing chronic pain in elderly patients. One study indicated that elderly patients make fewer errors on VRSs than on VASs.

Visual Analogue Scales

The most common VAS consists of a 10-cm horizontal^{45, 50} or vertical⁹⁹ line with the two endpoints labeled "no pain" and "worst pain ever" (or similar verbal descriptors). Patients are required to place a mark on the 10-cm line at a point that corresponds to the level of pain intensity they feel. The distance in centimeters from the low end of the VAS to the patient's mark is used as a numerical index of the severity of pain.

VASs for pain have been developed in an effort to include domains of measurable pain experience other than the sensory intensity dimension. Patients are asked to rate the unpleasantness of the pain experience (i.e., how disturbing it is). Endpoints are labeled "not bad at all" and "the most unpleasant feeling imaginable."^{68, 89}

VASs are sensitive to pharmacologic and nonpharmacologic procedures that alter the experience of pain^{3, 14, 89} and correlate highly with pain measured on verbal and numeric rating scales.^{25, 59, 81} Instructions to patients to rate the amount or percentage of pain relief using a VAS (e.g., following the administration of a treatment designed to reduce pain) may introduce unnecessary bias (e.g., the expectancy for change and reliance on memory) that reduces the validity of the measure. Some physicians have suggested,¹⁰ therefore, that a more appropriate measure of change may be obtained by having patients rate the amount of pain at different points in time, such as before and after an intervention (but see article by Ekblom and Hanson²⁵).

A major advantage of the VAS as a measure of sensory pain intensity is its ratio scale properties.^{86, 87, 90} In contrast to many other pain-measurement tools, equality of ratios is implied, making it appropriate to speak meaningfully about percentage differences between VAS measurements obtained at multiple points in time or from independent samples of subjects. Other advantages of the VAS include its ease and brevity of administration and scoring⁴⁸; minimal intrusiveness; and, providing that adequately clear instructions are given to patients, its conceptual simplicity.^{11, 45}

Standard visual analogue scales also have several limitations and disadvantages. These include difficulty with administration in patients who have perceptual-motor problems, impractical scoring method in a clinical setting in which immediate measurement of patients' responses may not be possible, and some patients who cannot comprehend the instructions. These limitations and disadvantages of VAS rating scales have been remedied by Choinière and Amsel¹³ in their development of a visual analogue thermometer (VAT). The VAT consists of a rigid, plasticized, white, cardboard strip with a horizontal black opening 10 cm long by 2 cm wide. The ends of the opening are labeled "no pain" and "unbearable pain." A red, opaque band covers the opening and slides from left to right using a tab operated from the back of the thermometer. The red strip is moved from left to right across the black opening until the patient stops at a point that corresponds to the inten-

sity of his or her pain. The back of the VAT also shows a 10-cm ruler to facilitate scoring. The VAT correlates well with a standard paper-and-pencil VAS and a numeric rating scale, is sensitive to changes in pain levels, and is preferred over standard VASs by many patients.¹³

The major disadvantage of VASs is the assumption that pain is a unidimensional experience that can be measured with a single-item scale.⁷⁰ Although intensity is, without a doubt, a salient dimension of pain, the word *pain* clearly refers to an endless variety of qualities that are categorized under a single linguistic label, not to a specific, single sensation that varies only in intensity or effect. The development of VASs to measure pain effect or unpleasantness has partially addressed the problem, but the same shortcoming applies within the affective domain. Each pain has unique qualities. Unpleasantness is only one such quality. The pain of a toothache is obviously different from that of a pin-prick, just as the pain of a coronary occlusion is uniquely different from that of a broken leg. To describe pain solely in terms of intensity or effect is like specifying the visual world only in terms of light flux without regard to pattern, color, texture, and the many other aspects of visual experience.

McGill Pain Questionnaire

Development and Description

Melzack and Torgerson⁷⁶ developed procedures to specify the qualities of pain. In the first part of their study, physicians and other university graduates were asked to classify 102 words, obtained from the clinical literature, into small groups that describe distinctly different aspects of pain. On the basis of the data, the words were categorized into three major classes and 16 subclasses (Fig. 1). The classes are words that describe the *sensory qualities* of the experience in terms of temporal, spatial, pressure, thermal, and other properties; words that describe *affective qualities* in terms of tension, fear, and autonomic properties that are part of pain; and *evaluative* words that describe the subjective, overall intensity of the pain. Each subclass, which was given a descriptive label, consists of a group of words that were considered by most subjects to be qualitatively similar. Some of these words are undoubtedly synonyms, others seem to be synonymous but vary in intensity, and many provide subtle differences or nuances (despite their similarities) that may be of importance to patients who are trying desperately to communicate to their physicians.

The second part of the study by Melzack and Torgerson⁷⁶ was an attempt to determine the pain intensities implied by the words within each subclass. Groups of physicians, patients, and students were asked to assign an intensity value to each word, using a numeric scale ranging from least (or mild) pain to worst (or excruciating) pain. When this was done, several words within each subclass seemed to have the same

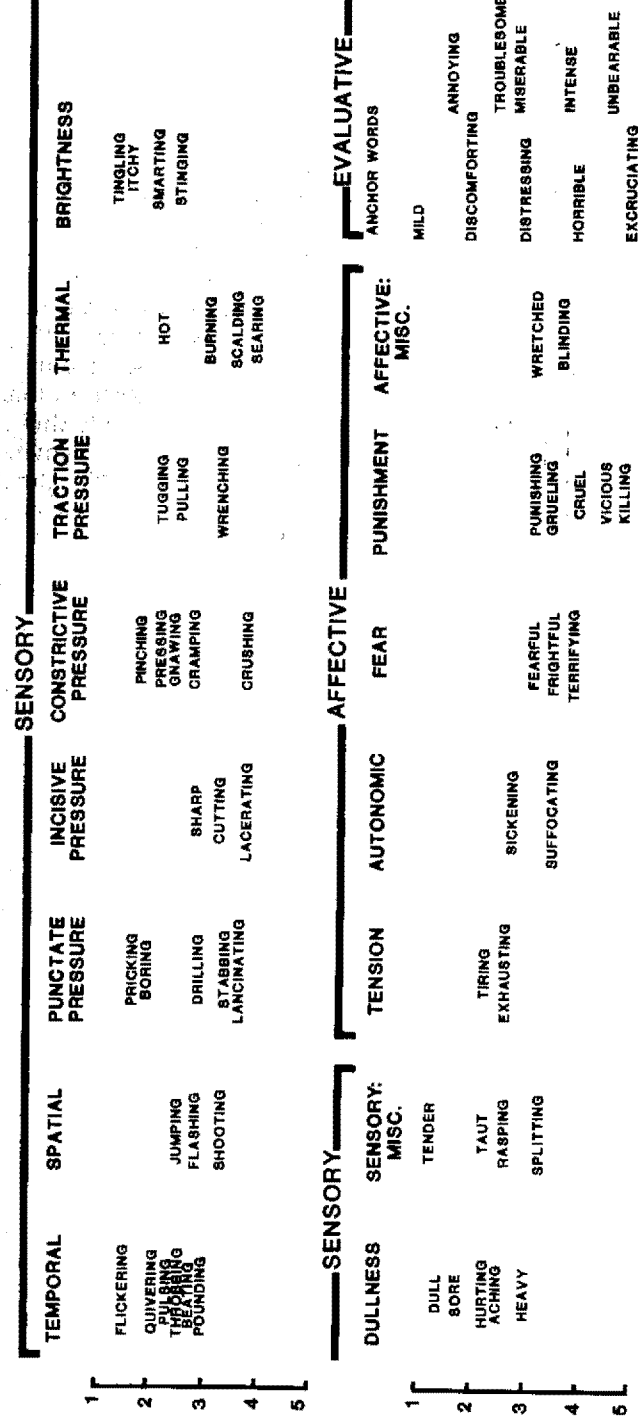


Figure 1. Pain descriptors based on intensity ratings by patients. The intensity scale values range from 1 (mild) to 5 (excruciating). (Adapted from Melzack and Torgerson, 1971, with permission.)

relative intensity relationships in all three sets. For example, in the spatial subclass, "shooting" was found to represent more pain than "flashing," which in turn implied more pain than "jumping." Although the precise intensity scale values differed for the three groups, all three agreed on the positions of the words relative to each other. The scale values of the words for patients, based on the precise numeric values listed in the study by Melzack and Torgerson,⁷⁶ are shown in Figure 1.

Because of the high degree of agreement on the intensity relationships among pain descriptors by subjects who have different cultural, socioeconomic, and educational backgrounds, a pain questionnaire (Fig. 2) was developed as an experimental tool for studies of the effects of various methods of pain management. In addition to the list of pain descriptors, the questionnaire contains line drawings of the body to show the spatial distribution of the pain, words that describe temporal properties of pain, and descriptors of the overall present pain intensity (PPI). The PPI is recorded as a number from 1 to 5, and each number is associated with the following words: 1, mild; 2, discomforting; 3, distressing; 4, horrible; 5, excruciating. The mean scale values of these words, which were chosen from the evaluative category, are approximately equally far apart so that they represent equal scale intervals and thereby provide "anchors" for the specification of the overall pain intensity.⁷⁶

In a preliminary study, the pain questionnaire consisted of the 16 subclasses of descriptors shown in Figure 1, as well as the additional information deemed necessary for the evaluation of pain; however, many of the patients found certain key words to be absent. These words were then selected from the original word list used by Melzack and Torgerson,⁷⁶ categorized appropriately, and ranked according to their mean scale values. Another set of words—cool, cold, and freezing—was used by patients only on rare occasions but was indicated to be essential for an adequate description of some types of pain. Thus, four supplementary—or "miscellaneous"—subclasses were added to the word lists of the questionnaire (Fig. 2). The final classification, then, seemed to represent the most parsimonious and meaningful set of subclasses without losing subclasses that represent important qualitative properties. The questionnaire, which is known as the McGill Pain Questionnaire (MPQ),⁷⁰ has become a widely used clinical and research tool.^{71, 93, 111}

Measures of Pain Experience

The descriptor lists of the MPQ are read to patients with the explicit instruction that they choose only those words that describe their feelings and sensations at that moment. Three major indices are obtained:

1. The pain rating index (PRI) based on the rank values of the words. In this scoring system, the word in each subclass implying the least pain is given a value of 1, the next word is given a value of 2, and so on. The rank values of the words chosen by

Patient's Name _____ Date _____ Time _____ AM/PM
 PRI: S (1-10) A (11-15) E (16) M (17-20) PRI(T) (1-20) PPI

1 FLICKERING QUIVERING PULSING THROBBING BEATING POUNDRING	11 TIRING EXHAUSTING	BRIEF MOMENTARY TRANSIENT	RHYTHMIC PERIODIC INTERMITTENT	CONTINUOUS STEADY CONSTANT
2 JUMPING FLASHING SHOOTING	12 SICKENING SUFFOCATING			
3 PRICKING BORING DRILLING STABBING LANCINATING	13 FEARFUL FRIGHTFUL TERRIFYING			
4 SHARP CUTTING LACERATING	14 PUNISHING GRUELING CRUEL VICIOUS KILLING	COMMENTS:		
5 PINCHING PRESSING GNAWING CRAMPING CRUSHING	15 WRETCHED BLINDING			
6 TUGGING PULLING WRENCHING	16 ANNOYING TROUBLESOME MISERABLE INTENSE UNBEARABLE	COMMENTS:		
7 HOT BURNING SCALDING SEARING	17 SPREADING RADIATING PENETRATING PIERCING			
8 TINGLING ITCHY SMARTING STINGING	18 TIGHT NUMB DRAWING SQUEEZING TEARING	COMMENTS:		
9 DULL SORE HURTING ACHING HEAVY	19 COOL COLD FREEZING			
10 TENDER TAUT RASPBING SPLITTING	20 NAGGING HAUSEATING AGONIZING DREADFUL TORTURING	COMMENTS:		
	PPI 0 NO PAIN 1 MILD 2 DISCOMFORTING 3 DISTRESSING 4 HORRIBLE 5 EXCRUCIATING			

Figure 2. McGill Pain Questionnaire. The descriptors fall into four major groups: sensory, 1 to 10; affective, 11 to 15; evaluative, 16; and miscellaneous, 17 to 20. The rank value for each descriptor is based on its position in the word set. The sum of the rank values is the pain rating index (PRI). The present pain intensity (PPI) is based on a scale of 0 to 5. PRI (T) = total pain rating index; S = sensory; A = affective; E = evaluative; M = miscellaneous. (*Reprinted from Pain*, 1, Melzack R, The McGill Pain Questionnaire: Major properties and scoring methods, 280-281, 1975, with permission from Elsevier Science.)

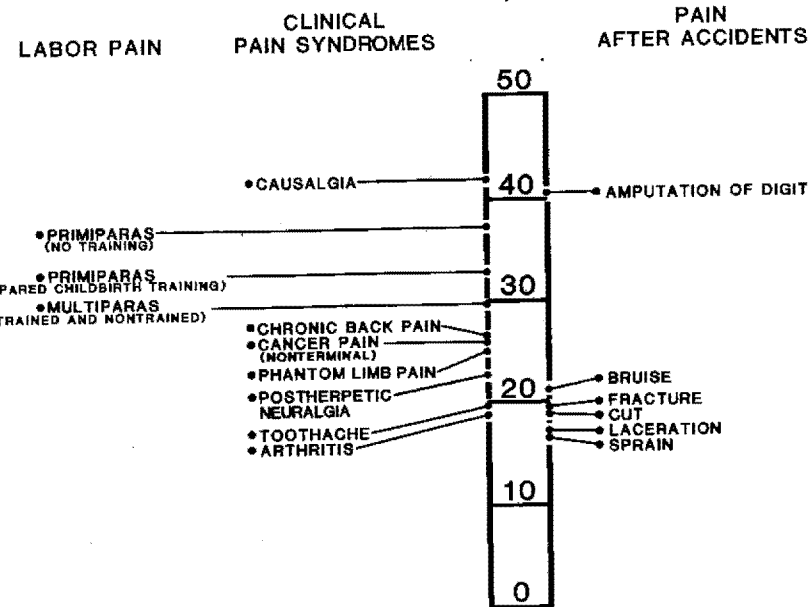


Figure 3. Using the McGill Pain Questionnaire, comparison of pain scores obtained from women during labor, patients in a general hospital pain clinic, and patients in an emergency department. The pain score for causalgic pain is reported. (*Data from references 70, 74, 76, and 102.*)

patients are summed to obtain a score separately for the sensory (subclasses 1-10), affective (subclasses 11-15), evaluative (subclass 16), and miscellaneous (subclasses 17-20) words, in addition to providing a total score (subclasses 1-20). Figure 3 shows MPQ scores (total score from subclasses 1-20) obtained by patients with a variety of acute and chronic pain.

2. The number of words chosen (NWC).
3. The PPI, or the number-word combination chosen as the indicator of overall pain intensity at the time of administration of the questionnaire.

Usefulness of the McGill Pain Questionnaire

The most important requirements of a measurement of pain are that it be valid; reliable; consistent; and, above all, useful. The MPQ seems to meet all of these requirements^{11, 71, 93, 111} and provides a relatively rapid way of measuring subjective pain experience.⁷⁰ When administered to patients by reading each subclass, it can be completed in approximately 5 minutes. It can also be filled out by patients in a more leisurely way as a paper-and-pencil test, although the scores are somewhat different.⁵⁸

Because pain is a private, personal experience, physicians cannot know precisely what someone else's pain feels like. No man can know what it is like to have menstrual cramps or labor pain, nor can a psychologically healthy person know what a psychotic patient is feeling when he says he has excruciating pain.¹¹⁰ But the MPQ provides an insight into the qualities of pain that are experienced. Recent studies indicate that each kind of pain is characterized by a distinctive constellation of words. A remarkable consistency has been found in the choice of words by patients suffering the same or similar pain syndromes.^{39, 41, 51, 53, 74, 106} For example, in a study of amputees with phantom limb pain (group PLP) or nonpainful phantom limb sensations (group PLS), every MPQ descriptor chosen by 33% or more of subjects in group PLS was also chosen by 33% or more subjects in group PLP, although group PLP endorsed other descriptors with greater frequency.⁵³ These data indicated that the phantom limb experiences of the two groups have in common a paresthetic quality (e.g., tingling or numb), although painful phantoms consist of more than this shared component.

Reliability and Validity of the McGill Pain Questionnaire

Reading et al⁹⁴ investigated the reliability of the groupings of adjectives in the MPQ by using different methodologic and statistical approaches. Subjects sorted each of the 78 words of the MPQ into groups that described similar pain qualities. The mean number of groups was 19 (range, 7-31), which is remarkably close to the 20 groups of the MPQ. Moreover, distinct subgroups existed for sensory and affective-evaluative words. Because the cultural backgrounds of subjects in this study and in the study by Melzack and Torgerson⁷⁶ were different and because the methodology and data analysis were dissimilar, the degree of correspondence is impressive. More recently, Gaston-Johansson et al²⁸ reported that subjects with diverse ethnic-cultural and educational backgrounds use similar MPQ adjectives to describe commonly used words, such as *pain*, *hurt*, and *ache*. Nevertheless, interesting differences between the studies that suggest alternative approaches for future revisions of the MPQ were found.

Evidence for the stability of the MPQ was provided by Love et al,⁶³ who administered the MPQ to patients with chronic low back pain on two occasions (separated by several days) before receiving treatment. Their results showed strong test-retest reliability coefficients for the MPQ pain rating indices, as well as for some of the 20 categories. The lower coefficients for the 20 categories may be explained by the suggestion that many types of clinical pain show fluctuations in quality over time, yet they still represent the "same" pain to people who experience it.

Studies of the validity of the three-dimensional framework of the MPQ are numerous and have been reviewed by Reading.⁹³ In general, the distinction between sensory and affective dimensions has held up extremely well, but the separation of the affective and evaluative dimensions is still being debated. Nevertheless, several excellent studies^{44, 66,}

^{91, 92} have reported a discrete evaluative factor. The different factor-analytic procedures that were used undoubtedly account for the reports of four factors,^{44, 92} five factors,²⁰ six factors,⁷ or seven factors.⁶¹ The major source of disagreement, however, seems to be the different patient populations that are used to obtain data for factor analyses. The range includes brief laboratory pain, dysmenorrhea, back pain, and cancer pain. In some studies, relatively few words are chosen, whereas large numbers are selected in others. Therefore, that factor-analytic studies based on such diverse populations have confused rather than clarified some of the issues is not surprising.

Turk et al¹⁰⁷ examined the internal structure of the MPQ by using techniques that avoided the problems of most earlier studies and confirmed the three (i.e., sensory, affective, and evaluative) dimensions. Lowe et al⁶⁴ confirmed the three-factor structure of the MPQ using elegant statistical procedures and a large number of subjects. Finally, Chen et al¹² presented data on the remarkable consistency of the MPQ across five studies using the cold pressor task, and Pearce and Morley⁸² provided further confirmation of the construct validity of the MPQ using the Stroop color-naming task with chronic pain patients.

Sensitivity of the McGill Pain Questionnaire

Recent studies show that the MPQ is sensitive to interventions designed to reduce pain.^{5, 6, 24, 80, 85, 103} The relative sensitivity of the MPQ to change in postoperative pain following the administration of oral analgesics was evaluated by comparing it with VAS and VRS measures of pain intensity.⁴⁶ Although all three measures of pain revealed the same pattern of change over time, the magnitude of the effects for the MPQ were consistently related to self-reported, directly assessed changes in pain using a VRS. These findings probably underestimate the sensitivity of the MPQ to change because the benchmark for change was a VRS. In support of this, the MPQ seems to provide a more sensitive measurement of mild postoperative pain than does a simple VAS that assesses pain intensity only because patients can be more precise in describing their experiences by selecting appropriate descriptors.⁵² This increased ability of the MPQ to detect differences in pain at the low end of the pain continuum most likely is a function of the multidimensional nature of the MPQ and the large number of descriptors from which to choose.

Discriminative Capacity of the McGill Pain Questionnaire

One of the most exciting features of the MPQ is its potential value as an aid in the differential diagnosis between various pain syndromes. The first study to demonstrate the discriminative capacity of the MPQ was carried out by Dubuisson and Melzack,²² who administered the questionnaire to 95 patients suffering from one of eight pain syndromes: (1) postherpetic neuralgia, (2) phantom limb pain, (3) metastatic carci-

noma, (4) toothache, (5) degenerative disc disease, (6) rheumatoid arthritis or osteoarthritis, (7) labor pain, and (8) menstrual pain. A multiple group discriminant analysis revealed that each type of pain is characterized by a distinctive constellation of verbal descriptors. Furthermore, when the descriptor set for each patient was classified into one of the eight diagnostic categories, a correct classification was made in 77% of cases.

Descriptor patterns can also provide the basis for discriminating between two major types of low back pain. Some patients have clear physical causes, such as degenerative disc disease, whereas others suffer low back pain even though no physical causes can be found. Using a modified version of the MPQ, Leavitt and Garron⁶⁰ found that patients with physical—"organic"—causes use distinctly different patterns of words from patients whose pain has no detectable cause and is labeled as "functional." A concordance of 87% was found between established medical diagnosis and classification based on the patients' choice of word patterns from the MPQ. Along similar lines, Perry et al^{83, 84} report differences in the pattern of MPQ subscale correlations in patients with and without demonstrable organic pathology.

Further evidence of the discriminative capacity of the MPQ was furnished by Melzack et al,⁷⁵ who differentiated between the pain of trigeminal neuralgia and atypical facial pain. Fifty-three patients were given a thorough neurologic examination that led to a diagnosis of either trigeminal neuralgia or atypical facial pain. Each patient rated his or her pain using the MPQ, and the scores were submitted to a discriminant analysis. Ninety-one percent of patients were correctly classified using seven key descriptors. To determine how well the key descriptors were able to predict either diagnosis, the discriminant function derived from the 53 patients was applied to MPQ scores obtained from a second, independent validation sample of patients with trigeminal neuralgia or atypical facial pain. The results showed a correct prediction for 90% of the patients.

Specific verbal descriptors of the MPQ have also been shown recently to discriminate between reversible and irreversible damage of the nerve fibers in a tooth,⁴¹ and between leg pain caused by diabetic neuropathy and leg pain arising from other causes.⁶⁵ Jerome et al⁴⁹ further showed that the MPQ discriminates between cluster headache pain and other vascular (migraine and mixed) headache pain. Cluster headache pain is more intense and distressing than the others and is characterized by a distinct constellation of descriptors.

The discriminative capacity of the MPQ seems to have limits, however. High levels of anxiety and other psychologic disturbance, which may produce high affective scores, may obscure the discriminative capacity.⁵⁹ Moreover, certain key words that discriminate among specific syndromes may be absent.⁹⁵ Nevertheless, appreciable and quantifiable differences exist in the way various types of pain are described, and patients with the same disease or pain syndrome tend to use remarkably similar words to communicate what they feel.

Short-Form McGill Pain Questionnaire

The short-form MPQ⁷⁰ (SF-MPQ; Fig. 4) was developed for use in specific research settings when the time to obtain information from patients is limited and when more information is desired than that provided by intensity measures, such as the VAS or PPI. The SF-MPQ

PATIENT'S NAME: _____ DATE: _____

	NONE	MILD	MODERATE	SEVERE
THROBBING	0) _____	1) _____	2) _____	3) _____
SHOOTING	0) _____	1) _____	2) _____	3) _____
STABBING	0) _____	1) _____	2) _____	3) _____
SHARP	0) _____	1) _____	2) _____	3) _____
CRAMPING	0) _____	1) _____	2) _____	3) _____
GNAWING	0) _____	1) _____	2) _____	3) _____
HOT-BURNING	0) _____	1) _____	2) _____	3) _____
ACHING	0) _____	1) _____	2) _____	3) _____
HEAVY	0) _____	1) _____	2) _____	3) _____
TENDER	0) _____	1) _____	2) _____	3) _____
SPLITTING	0) _____	1) _____	2) _____	3) _____
TIRING-EXHAUSTING	0) _____	1) _____	2) _____	3) _____
SICKENING	0) _____	1) _____	2) _____	3) _____
FEARFUL	0) _____	1) _____	2) _____	3) _____
PUNISHING-CRUEL	0) _____	1) _____	2) _____	3) _____

NO PAIN |-----| WORST POSSIBLE PAIN

P P I

0 NO PAIN _____

1 MILD _____

2 DISCOMFORTING _____

3 DISTRESSING _____

4 HORRIBLE _____

5 EXCRUCIATING _____

Figure 4. The short-form McGill Pain Questionnaire. Descriptors 1 to 11 represent the sensory dimension of pain experience and 12 to 15 represent the affective dimension. Each descriptor is ranked on an intensity scale of 0 = none, 1 = mild, 2 = moderate, and 3 = severe. The present pain intensity (PPI) of the standard long-form McGill Pain Questionnaire and the visual pain analog scale also are included to provide overall pain intensity scores. (Reprinted from Pain, 30, Melzack R: The short-form McGill Pain Questionnaire, 191, 1987, with permission from Elsevier Science.)

consists of 15 representative words from the sensory ($n = 11$) and affective ($n = 4$) categories of the standard long-form MPQ. The PPI and a VAS are included to provide indices of overall pain intensity. The 15 descriptors composing the SF-MPQ were selected on the basis of their frequency of endorsement by patients with a variety of acute, intermittent, and chronic pain. An additional word, *splitting*, was added because it was reported to be a key discriminative word for dental pain.⁴¹ Each descriptor is ranked by the patient on an intensity scale of 0 = none, 1 = mild, 2 = moderate, 3 = severe.

The SF-MPQ correlates very highly with the major PRI indices (i.e., sensory, affective, and total) of the long-form MPQ^{23, 72} and is sensitive to clinical change brought about by various therapies—analgesic drugs,^{43, 72} epidurally or spinally administered agents,^{43, 72, 97} transcutaneous electric nerve stimulation,⁷² and low-power light therapy.¹⁰⁰ In addition, concurrent validity of the short form was reported in a study of patients with chronic pain caused by cancer.²³ On each of three occasions separated by at least a 3-week period, the sensory, affective, and total pain rating scores correlated highly with scores on the long-form MPQ.

Figure 5 shows SF-MPQ scores obtained by patients with a variety of acute and chronic pains. As can be seen, the SF-MPQ has been used in studies of chronic pain^{1, 9, 23, 27, 40, 100} and acute pain^{43, 57, 69, 72, 105} of diverse

causes and to evaluate pain and discomfort in response to medical interventions.^{26, 79} Furthermore, initial data⁷² suggest that the SF-MPQ may be capable of discriminating among different pain syndromes, which is an important property of the long form. Czech⁹⁸ and Swedish⁸ versions of the SF-MPQ have been developed.

One study of patients with chronic arthritis suggested that the SF-MPQ may be appropriate for use with geriatric pain patients.²⁷ In this study, the frequency of failing to complete the SF-MPQ appropriately did not differ among young, middle-aged, and elderly patients. In addition, the subscales showed high intercorrelations and consistency. Although elderly patients endorsed fewer adjectives than their younger counterparts, consistency was found among the three age groups in the most frequently chosen pain descriptors. These results suggest that most patients approach the SF-MPQ in a similar manner. Further studies are required to demonstrate the reliability and validity of the SF-MPQ when used with elderly patients.

The Descriptor Differential Scale

Recently, simple but sophisticated psychophysical techniques have been applied to the development of pain measurement instruments that have been used to assess clinical and experimentally induced pain.^{29, 31, 32, 35, 42, 86} The psychophysical approach uses cross-modality matching procedures³⁷ or a bimodality stimulus comparison²¹ to determine the relative magnitudes of the verbal descriptors of pain.

The Descriptor Differential Scale³⁵ (DDS) was developed by Gracely et al³⁷ to remedy several deficiencies associated with existing pain measurement instruments. The DDS was designed to reduce bias, assess separately the sensory intensity and "unpleasantness" (hedonic) dimensions of pain, and provide quantification by ratio-scaling procedures.³⁰ The DDS consists of two forms that measure separately the sensory intensity and unpleasantness qualities of pain. Both forms consist of 12 verbal descriptors, in which each descriptor is centered over a 21-point scale with a minus sign at the low end and a plus sign at the high end. The patients rate the magnitude of the sensory intensity or unpleasantness of the pain they are experiencing. The magnitude of pain endorsed by the patient in relation to each descriptor is assigned a score of 0 (minus sign) to 20 (plus sign), and a score of 10 represents pain intensity or unpleasantness equal to the magnitude implied by the descriptor. Total mean scores may be obtained for the sensory intensity and unpleasantness dimensions by averaging the patient's scores on each 12-item form.

The DDS has been demonstrated to be differentially sensitive to pharmacologic interventions that alter the sensory or unpleasantness dimensions of pain.^{34, 36, 38} Results point to the importance of using multidimensional measures of pain with clear instructions to rate separately the sensory intensity and unpleasantness aspects of pain as op-

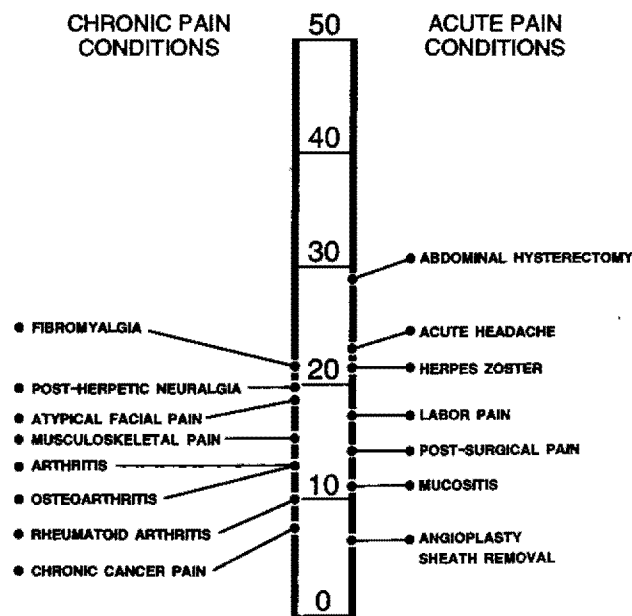


Figure 5. Comparison of total pain rating index scores using the short-form McGill Pain Questionnaire for acute and chronic pain conditions. (Data from references 1, 8, 23, 26, 27, 43, 57, 69, 72, 100, and 105.)

posed to the "painfulness" of the experience.³³ When used in conjunction with cross-modality matching techniques, the DDS has been shown to be a reliable and valid instrument with ratio-scaling properties.^{37, 38}

Gracely and Kwilosz³⁵ assessed the psychometric properties of the DDS for use as a clinical pain measurement among a sample of 91 dental patients after third-molar extraction. Sensory intensity and unpleasantness DDS forms were administered to all patients 1 and 2 hours after surgery. Total scores on both forms showed high test-retest reliability coefficients, as did scores derived from individual items. Correlation coefficients between individual items and the total score revealed a high degree of internal consistency for both forms of the DDS. One of the most useful features of the DDS is the potential to define a measurement of scaling consistency that can be used to identify invalid patient profiles obtained by inconsistent responding. The elimination of invalid profiles improved reliability and internal consistency of the DDS.

More recently, the intensity dimension of the DDS (DDS-I) has been found to fulfill three criteria of an ideal pain measurement tool. Doctor et al²¹ showed that the DDS-I is sensitive to small changes (1 mA) in electric stimulation applied to the skin. Because of relatively large error variance, VAS pain intensity ratings in response to the same stimuli lacked the degree of sensitivity found for the DDS-I. The study by Doctor et al²¹ also confirmed the ratio-scaling property of the DDS-I and provided evidence for its internal consistency.

Behavioral Approaches to Pain Measurement

Recent research into the development of behavioral measurements of pain has produced a wide array of sophisticated observational techniques and rating scales designed to assess objective behaviors that accompany pain experience.^{54, 106} Techniques that have demonstrated high reliability and validity are especially useful for measuring pain in infants and preverbal children who lack language skills,^{67, 68, 96} adults who have a poor command of language,⁹³ or when mental clouding and confusion limit patients' ability to communicate meaningfully.¹⁶ Under these circumstances, behavioral measures provide important information that is otherwise unavailable from patient self-reporting. Moreover, when administered in conjunction with a subjective, patient-rated measure, behavioral measures may provide a more complete picture of the total pain experience; however, behavioral measures of pain should not replace self-rated measures if the patient is capable of rating his or her subjective state and such administration is feasible.

The subjective experiences of pain and pain behaviors are, presumably, reflections of the same underlying neural processes; however, the complexity of the human brain indicates that although experience and behavior are usually highly correlated, they are far from identical. One person may be stoic so that his or her calm behavior belies his or her true subjective feelings. Another patient may seek sympathy (or analgesic

medication or some other desirable goal) and in so doing exaggerate his or her complaints without also eliciting the behaviors that typically accompany pain complaints of that degree. Concordance between patients' self-ratings of pain and ratings of the same patients by nurses or other medically trained personnel may be modestly low,^{14, 16, 62, 104, 109} but even in the presence of a significant correlation between physicians' and patients' ratings of patient pain, physicians significantly underestimate the degree of pain the patients reported experiencing.¹⁰¹ Moreover, when health care providers observe a discordance between nonverbal pain behavior and patients' verbal complaints of pain, the discrepancy often is resolved by disregarding patients' self-reports.^{18, 19} These studies point to the importance of obtaining multiple measures of pain and should keep physicians aware that because pain is a subjective experience, patients' self-reports are the most valid measures of that experience.

Physiologic Approaches to Pain Measurement

Profound physiologic changes often accompany the experience of pain, especially if the injury or noxious stimulus is acute.¹⁷ Physiologic correlates of pain may serve to elucidate mechanisms that underlie the experience and thus may provide clues that may lead to novel treatments.^{11, 86} Physiologic correlates of pain experience that are frequently measured include heart rate, blood pressure, electrodermal activity, electromyographic activity, and cortical evoked potentials. Despite high initial correlations between pain onset and changes in these physiologic responses, many habituate with time despite the persistence of pain.³¹ In addition, these responses are not specific to the experience of pain per se and occur under conditions of general arousal and stress. Studies that have examined the general endocrine-metabolic stress response to surgical incision indicate that, under certain conditions, different aspects of the stress response and pain can be dissociated.^{55, 56} Severe injury to a denervated limb produces a significant adrenocortical response,⁵⁵ but the use of general anesthesia clearly eliminates the conscious experience of pain in response to surgical incision without altering the subsequent rapid increase in plasma cortisol levels.^{4, 15} These studies indicate that, although many physiologic and endocrine events occur concurrently with pain, many seem to be general responses to stress and are not unique to pain.

SUMMARY

Pain is a personal, subjective experience influenced by cultural learning, the meaning of the situation, attention, and other psychologic variables. Approaches to the measurement of pain include verbal and numeric self-rating scales, behavioral observation scales, and physiologic responses. The complex nature of the experience of pain suggests that

measurements from these domains may not always show high concordance. Because pain is subjective, patients' self-reports provide the most valid measure of the experience. The VAS and the MPQ are probably the most frequently used self-rating instruments for the measurement of pain in clinical and research settings. The MPQ is designed to assess the multidimensional nature of pain experience and has been demonstrated to be a reliable, valid, and consistent measurement tool. A short-form MPQ is available for use in specific research settings when the time to obtain information from patients is limited and when more information than simply the intensity of pain is desired. The DDS was developed using sophisticated psychophysical techniques and was designed to measure separately the sensory and unpleasantness dimensions of pain. It has been shown to be a valid and reliable measurement of pain with ratio-scaling properties and has recently been used in a clinical setting. Behavioral approaches to the measurement of pain also provide valuable data. Further development and refinement of pain measurement techniques will lead to increasingly accurate tools with greater predictive powers.

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