

MEASUREMENT OF PAIN: PATIENT PREFERENCE DOES NOT CONFOUND PAIN MEASUREMENT*

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SUMMARY

Chronic pain patients reported pain intensity on each of 3 pain intensity scales, the visual analog, numerical and adjectival scales, and then ranked the scales in order of perceived best communication of pain intensity. All patients were able to complete an adjectival scale but 11% were unable to complete a visual analog scale and 2% failed at a numeric scale. The intensity of the pain ratings on the 3 scales were significantly correlated and there were no reliable differences in reported intensity as a function of preference. Pain intensity was reliably higher on each scale for depressed-anxious patients as compared to non-depressed/non-anxious patients. Patients completing all 3 scales indicated a significant preference for the adjectival scale but the basis for this preference did not appear related to sex, etiology of pain, affective variables nor selected psychological variables. These data indicate that pain scale preference does not influence pain intensity report. Nevertheless, there are some clinical situations in which a numeric scale is likely to yield a better measure of pain intensity.

INTRODUCTION

Perceived pain intensity is multidimensional. Melzack [7] has reported sensory, affective and evaluative dimensions to the pain experience. Black and Chapman [2] suggest that the SAD index, a mathematical formula relating the somatic components of pain, anxiety and depression represents

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the best measure of the pain experience. Furthermore, considerable evidence demonstrates that expectancy [10], the meaning of the pain [1] and cultural variables [12] also influence report of pain intensity.

Pain intensity measurement within any individual patient ideally would address each variable known to influence pain intensity report. Though such heroic efforts have been made [e.g., 4], more often simple measurement devices that are psychometrically sound and not obviously confounded by psychosocial variables are used. The visual analog scale (VAS) is acknowledged as the best paper and pencil instrument for assessing clinical pain intensity [cf. 5], based on the following observations: (1) patients produce a uniform distribution of pain intensity estimates on a VAS [5, 8], (2) pain estimates on a VAS are reliable over time [9], (3) variance due to psychomotor factors is small [9], (4) the VAS is sensitive to pain change [3], and (5) the VAS does not force quantum changes in pain intensity as occur with category scales [8].

The VAS has an important limitation diminishing its clinical and research usefulness. Some patients cannot understand how to report pain on this scale, an inability involving as much as 7% of some study populations [9] depending on orientation and labeling of the scale. There are no data that precisely define the reason for failure on the VAS; it is plausible to assume, however, that it is related to deficits in abstract thinking. This limitation would exclude from testing several important populations with pain problems, including geriatric patients and medically ill patients with organic brain syndrome. If these patients could use an alternative scale, it would be important to know the relationship between the intensity estimates on the alternative scale and the VAS.

The present study was designed to gather data on the relationship of pain intensity estimates with a VAS, a numeric scale and an adjectival scale. The study attempted to answer the following questions:

- (1) What is the failure rate on a VAS relative to a numeric or adjectival scale?
- (2) Do the 3 scales yield comparable intensity estimates?
- (3) Are the 3 scales differentially influenced by mood variables?
- (4) Do patients feel one scale is more accurate than the alternatives?
- (5) Given a reliable preference for one scale based on accuracy or validity of pain expression, what is the basis for this preference?
- (6) Does etiology of pain influence scale preference?

The study elicited pain intensity estimates from chronic pain patients on a VAS, a numeric and an adjectival scale and asked each patient to rank order the scales by overall preference and perceived accuracy of communication of pain intensity. Comparison of intensity measures among the 3 scales will indicate whether idiosyncracies of each scale inflate or deflate pain estimates. Comparison of intensity estimates by anxious-depressed patients relative to non-anxious/non-depressed patients will indicate whether the scales are differentially influenced by affective variables.

METHOD

Subjects

Fifty-six patients were recruited to the UCSD Pain Clinic from consecutive referrals and by screening of consecutively scheduled patients in the UCSD Medical Oncology Clinic. Data from 6 patients were discarded as they were unable to complete one or more of the pain measurement scales.

Procedure

All patients were asked to rate their present intensity of pain in each of 3 ways: (1) placing a vertical mark on a 10 cm visual analog scale which was bounded by "no pain" on the left and "pain as bad as it could be" on the right end; (2) choosing a number between 0 and 100 where 0 was "no pain" and 100 was "pain as bad as it could be"; and (3) indicating the word which best described their present pain from *no pain*, *mild*, *moderate*, *horrible* and *excruciating*. The 3 scales were included within either of two modified versions of the McGill Pain Questionnaire [7] and the order of presentation was balanced across subjects. On completion of the questionnaire, the 3 scales were presented to the subject and he was requested to "indicate the scale which you think best allowed you to let us know what your present pain intensity is." The patient was then requested to choose between the two remaining scales again using the criterion of best communication of pain intensity. Patients were considered to have failed on a particular scale if they could not provide an estimation of their pain intensity within the constraints of the instructions and metric of each scale.

All patients regardless of recruitment source completed the depression and anxiety scales from the Profile of Mood States (POMS). In addition, as part of routine clinical assessment a number of patients completed the Brief Symptom Inventory (BSI).

RESULTS

The failure rate with the VAS was 11% ($n = 6$), with the numeric scale, 2% ($n = 1$), and with the adjectival scale, 0 ($n = 0$). The mean age of failures on the VAS was significantly greater ($\bar{x} = 75.3$ years) than the mean age of successful patients ($\bar{x} = 54.4$ years) ($t(53) = 3.36, P < 0.01$).

Intercorrelation of intensity measures on the 3 scales are presented in Table I. Note that all correlations are high, positive and statistically significant. In order to determine whether the intensity estimates were comparable in magnitude, all estimates were transformed to a 0–100 scale. These data are presented in Fig. 1. As can be seen in the figure, the 3 scales yielded very similar mean pain intensity estimates. Analysis of these data with a one-way ANOVA did not indicate any reliable difference ($F < 1$).

In order to assess whether the 3 scales were differentially influenced by affective variables, two groups of patients were formed by taking the 10 patients who had the highest scores (High Affect) on depression and anxiety

TABLE I

INTERCORRELATION OF PAIN INTENSITY REPORT FOR THE 3 PAIN MEASUREMENT SCALES

	VAS	Numeric	Adjectival
VAS	—	0.86*	0.64*
Numeric		—	0.59*
Adjectival			—

* $P < 0.05$.

scales of the POMS and comparing their intensity estimates with the 10 patients who had the lowest scores (Low Affect). The High Affect group had mean scores of 71.3 and 70.4 for depression and anxiety, respectively, while the Low Affect patients had mean scores of 39.1 and 35.1 for depression and anxiety, respectively. The two groups differed reliably on both measures (depression, $t(28) = 12.44$, anxiety, $t(18) = 11.42$, $P_s < 0.01$). Fig. 2 presents pain intensity estimates for the High Affect group and the Low Affect group. As can be seen in the figure, mean pain estimates using each of the 3 scales were higher for the High Affect group as compared to the Low Affect group. Subjecting these data to 2×3 ANOVA yielded a reliable groups effect ($F(1, 54) = 22.18$, $P < 0.01$) but neither the main effect of measurement scale nor the interaction was reliable. Thus, the 3 scales do not appear differentially influenced by dysphoric mood.

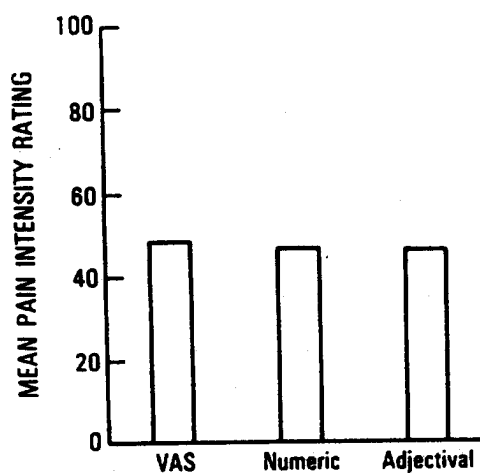


Fig. 1. Mean pain intensity rating for each pain measurement scale.

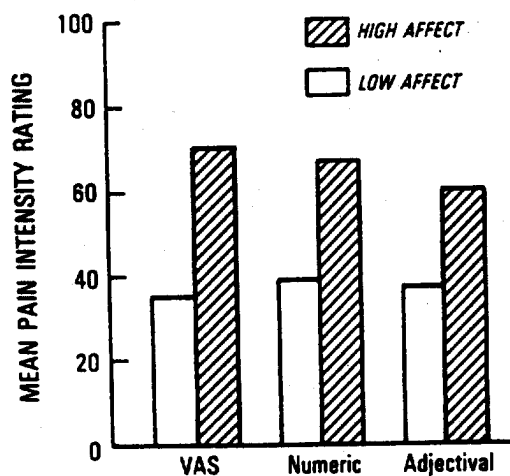


Fig. 2. Mean pain intensity rating for each pain measurement scale for High Affect group and Low Affect group.

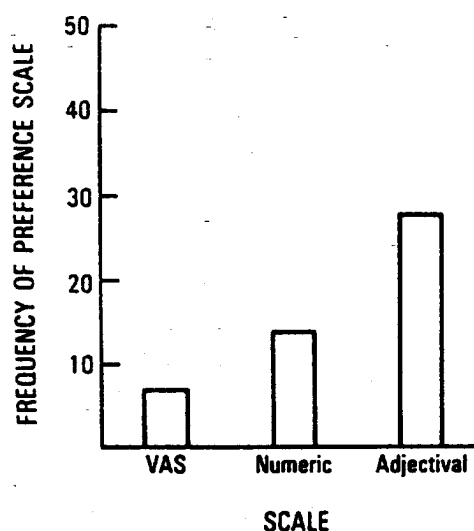


Fig. 3. Frequency of preference for each pain measurement scale.

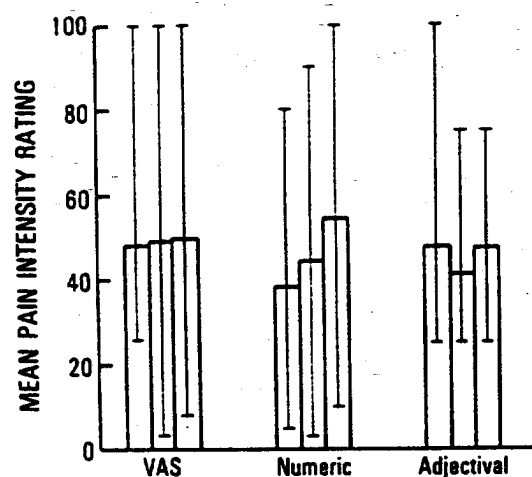


Fig. 4. Mean pain intensity rating for each rank position (first, second, third for left-most, middle, right-most) for each pain measurement scale.

The results of patient scale preference rankings are presented in Fig. 3. Note that patients overwhelmingly preferred the adjectival scale relative to the 0–100 scale and the VAS. Subjecting these data to a chi-square test indicated that preference for the adjectival scale was reliable ($\chi^2 = 7.56$, $P < 0.025$). This reliable preference, however, does not appear to distort pain intensity estimates. As can be seen in Fig. 4, there are some moderate differences in intensity estimates when estimates are transformed to a 0–100 scale. Note, however, that for each scale and each ranking there is considerable

TABLE II

PERCENTAGE OF MALE AND FEMALE PATIENTS AND PERCENTAGE OF CANCER PAIN AND BENIGN PAIN PATIENTS PREFERRING EACH PAIN MEASUREMENT SCALE

	Pain measurement scale		
	VAS	Numeric	Adjectival
Males (n = 32)	0.16	0.25	0.59
Females (n = 18)	0.19	0.28	0.53
Cancer pain (n = 32)	0.16	0.25	0.56*
Benign pain (n = 18)	0.17	0.25	0.58

* One patient in this group marked all 3 scales equally.

TABLE III

SELECTED DATA ON PSYCHOLOGICAL TEST MEASURES AND PREFERENCE FOR 3 PAIN MEASUREMENT SCALES

All scores and group means for normalized measures for normal population.

	Preferred scale		
	VAS (n = 7)	Numeric (n = 12)	Adjectival (n = 27)
<i>POMS</i>			
Depression	57.4	50.8	50.3
Tension	58.9	50.1	45.3
<i>BSI</i>	(n = 4)	(n = 6)	(n = 17)
Somaticization	69.5	47.2	67.4
Obsessive-compulsive	49.5	56.0	54.6
Depression	63.0	57.5	53.8
Anxiety	62.0	65.2	54.5

variability. Subjecting these data to a 2×3 ANOVA indicated that there were no reliable differences among the groups ($F_s < 1$).

A number of variables were analyzed in an attempt to assess the basis for the observed reliable preference for adjectival expression of pain intensity. Table II summarizes percent preference for males versus females and pain of malignant origin versus pain of non-malignant origin. As can be seen in the table, percent preference for each of the 3 scales was virtually identical for males and females. Similarly, percent preference for patients with pain of malignant origin and those with pain of non-malignant origin was virtually identical.

Table III presents selected scales from the Brief Symptom Inventory by pain scale preference. As can be seen in the table, there were no reliable differences among the groups on any of these dimensions.

DISCUSSION

The findings of this study indicate that 11% of a chronic pain patient study population could not complete a VAS. This failure might be related to a deterioration in abstract ability with age as (1) such deterioration is well documented [cf., 6], and (2) the group of patients who failed were significantly older than those who succeeded. The implications of these findings are clear. In patient populations comprised of elderly individuals (e.g., arthritic pain, cancer pain) a numeric scale or an adjectival-numeric scale should be used to measure pain intensity. For statistical analysis purposes, the 0-100 numeric scale would be preferred as it provides for a greater range of scores and is more sensitive to change. These same points must also

apply to any population of patients who would suffer less than optimal abstract ability, e.g., children, patients likely to be highly medicated, and those with multisystem disease.

For patients who could complete all 3 pain measurement scales, there did not appear to be any scale idiosyncracies which distorted measurement. Intensity estimates on the 3 scales were significantly correlated and when transformed to a common metric (0-100), they yielded highly similar magnitudes. Finally, although each scale was influenced by affective variables, the scales were all influenced to the same degree. Patients who were highly depressed and/or anxious reported higher levels of pain on all 3 scales while non-depressed/anxious patients reported lower levels of pain on all 3 scales. One possible hypothesis would be that the adjectival-numeric scale provided a more facile expression of the affective dimension of pain and therefore would have yielded higher intensity estimates from the more depressed patients relative to the less expressive scales. The results of this study fail to support this hypothesis. This suggests either that the 3 scales were equally as "expressive" or, assuming the High Affect group was in fact in more pain, that patients can follow instructions and deconfound the intensive and affective dimensions of pain. In either event it appears that measurement of pain intensity between groups which differ in affective status would not be improved by the selection of one scale or the other.

A second important finding was that a large and statistically significant percentage of the study population preferred an adjectival scale. By experimenter instruction, the basis for this preference was that the adjectival scale "best allowed" them "to express what" . . . their . . . "pain intensity really was." Despite this reliable preference, pain intensity ratings were similar for all 3 scales. If preference were correlated with some systematic distortion of measurement, then comparison of intensity data across scales would be potentially confounded. The present data clearly indicate such confounding does not occur and patients estimate comparable intensities of pain on both preferred and non-preferred scales.

Attempts to determine the basis of preference for the adjectival expression of pain intensity were not fruitful. Preference was not related to sex, etiology of pain (malignant versus benign), affective status, somatization or obsessive-compulsiveness. Though failure to find some of these variables as reliable predictors would not be surprising (e.g., sex), it was somewhat perplexing that other variables (e.g., affective status, etiology of pain, etc.) were similarly unreliable.

Highly depressed or anxious patients might be expected to prefer the adjectival scale. Similarly, given the vast difference in "meaning" or evaluative component between pain of benign origin and pain of malignant origin, one might anticipate the malignant pain patient to prefer a scale which provides for communication of the affect associated with terminal illness. Again, however, the data fail to support such a hypothesis. As noted above, this result could occur either because the 3 scales fail to offer differential expression of affect or because patients are capable of deconfounding the

affective and intensive dimensions of pain when instructed to do so. This latter conjecture is suggested by the finding of Sternbach and Tursky [11] that the ethnic differences in pain intensity report do not occur when subjects are required to do magnitude estimation of experimental pain. It is only in less structured situations that cultural variables influence pain report. Similarly, in the present experiment, by explicitly instructing patients to report pain intensity or preference for a scale which best accommodated pain intensity report, patients might have ignored other variables which could have influenced pain intensity report and/or scale preference.

The present findings raise some question regarding the use of a VAS to assess pain intensity. There are at least two clinical situations where the numeric scale (1-100) would be indicated: first, in populations of patients where abstracting ability is likely to be low, and second, in situations where patient compliance is tenuous. The numeric scale requires less cognitive energy and, therefore, is less likely to produce frustration.

REFERENCES

- 1 Beecher, H.K., Relationship of significance of wound to the pain experienced, *J. Amer. med. Ass.*, 161 (1956) 1609-1613.
- 2 Black, R.G. and Chapman, C.R., SAD index for clinical assessment of pain. In: J.J. Bonica and D. Albe-Fessard (Eds.), *Advances in Pain Research and Therapy*, Vol. 1, Raven Press, New York, 1976, pp. 301-305.
- 3 Clarke, P.R.F. and Spear, F.G. Reliability and sensitivity in the self-assessment of well-being, *Bull. Brit. Psychol. Soc.*, 17 (1964) 55.
- 4 Duncan, G.H., Gregg, J.M. and Ghia, J.N., The pain profile: a computerized system for assessment of chronic pain, *Pain*, 5 (1978) 275-284.
- 5 Huskisson, E.C., Measurement of pain, *Lancet*, i (1974) 1127-1131.
- 6 Lezack, M.D., *Neuropsychological Assessment*, Oxford University Press, New York, 1976.
- 7 Melzack, R., The McGill Pain Questionnaire: major properties and scoring methods, *Pain*, 1 (1975) 277-299.
- 8 Ohnhaus, E.E. and Adler, R., Methodological problems in the measurement of pain: a comparison between the verbal rating scale and the visual analogue scale, *Pain*, 1 (1975) 379-384.
- 9 Revill, S.I., Robinson, J.O., Rosen, M. and Hogg, M.I.J., The reliability of a linear analogue for evaluating pain, *Anaesthesia*, 31 (1976) 1191-1198.
- 10 Sternbach, R.A., *Pain: a Psychophysiological Analysis*, Academic Press, New York, 1968.
- 11 Sternbach, R.A. and Tursky, B., Ethnic differences among housewives in psychophysical and skin potential responses to electric shock, *Psychophysiology*, 1 (1965) 241-246.
- 12 Zborowski, M., *People in Pain*, Jossey-Bass, San Francisco, Calif., 1969.