Unraveling the Barriers to Reconceptualization of the Problem in Chronic Pain: The Actual and Perceived Ability of Patients and Health Professionals to Understand the Neurophysiology

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Abstract: To identify why reconceptualization of the problem is difficult in chronic pain, this study aimed to evaluate whether (1) health professionals and patients can understand currently accurate information about the neurophysiology of pain and (2) health professionals accurately estimate the ability of patients to understand the neurophysiology of pain. Knowledge tests were completed by 276 patients with chronic pain and 288 professionals either before (untrained) or after (trained) education about the neurophysiology of pain. Professionals estimated typical patient performance on the test. Untrained participants performed poorly (mean ± standard deviation, 55% ± 19% and 29% ± 12% for professionals and patients, respectively), compared to their trained counterparts (78% ± 21% and 61% ± 19%, respectively). The estimated patient score (46% ± 18%) was less than the actual patient score ($P < .005$). The results suggest that professionals and patients can understand the neurophysiology of pain but professionals underestimate patients' ability to understand. The implications are that (1) a poor knowledge of currently accurate information about pain and (2) the underestimation of patients' ability to understand currently accurate information about pain represent barriers to reconceptualization of the problem in chronic pain within the clinical and lay arenas.

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Key words: *Education, neurophysiology, treatment, evidence-based medicine.*

A basic tenet of evidence-based medicine (EBM) is that every effort is made to consider in the clinical process the best available evidence from basic and clinical sciences.[15] Pursuit of EBM principles in clinical practice means that previously accepted etiologies, diagnostic and treatment regimes are sometimes discarded.[8] When popular regimes are discarded, health professionals must engage their patients in reconceptualization of the problem. Reconceptualization of the problem is particularly important in areas in which the conventional approach is entrenched in robust beliefs and attitudes. One such area is chronic nonspecific pain.

Explanations for chronic pain are often based on a structural-pathology model. This model considers chronic nonspecific pain to be caused by either unresolved tissue damage or a psychologic disorder.[12] Such a model assumes that the nervous system is comprised of robust modality-specific pathways and that a stable and isomorphic relationship exists between injury and pain.[19] However, there is a vast body of evidence to the contrary; nociception is neither sufficient nor necessary to evoke pain[20] and psychosocial factors are more important than physical factors in the development of chronic nonspecific pain.[3] The latter finding is reflected in management guidelines for spinal pain throughout the world.[1,4,10,11,16,18]

Attempts have been made to reconceptualize the problem of chronic pain from a behavioral perspective.[2,17] However, with few exceptions, no attempts have been made to increase patient understanding of the neurophysiology of pain. Considering the progress that has recently been made in the pain sciences, this is intriguing. Perhaps health professionals are unable to understand currently accurate information about the neurophysiology of pain. Alternatively, perhaps health professionals can understand the neurophysiology of pain but their patients cannot. Finally, perhaps both health professionals and patients can understand the neurophysiology of pain, but health professionals perceive that their patients cannot.

The aims of this study were to evaluate (1) whether health professionals and patients can understand currently accurate information about the neurophysiology of pain and (2) whether health professionals accurately estimate the ability of patients to understand currently accurate information about the neurophysiology of pain.

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Table 1. Neurophysiology of Pain Test

	T	*F*	*U*
Receptors on nerves work by opening ion channels (gates) in the wall of the nerve.	#		
When part of your body is injured, special pain receptors convey the pain message to your brain.		#	
Pain only occurs when you are injured.		#	
The timing and intensity of pain matches the timing and number of signals in nociceptors (danger receptors).		#	
Nerves have to connect a body part to your brain in order for that body part to be in pain.		#	
In chronic pain, the central nervous system becomes more sensitive to nociception (danger messages).	#		
The body tells the brain when it is in pain.		#	
The brain sends messages down your spinal cord that can increase the nociception (danger message) going up your spinal cord.	#		
The brain decides when you will experience pain.	#		
Nerves adapt by increasing their resting level of excitement.	#		
Chronic pain means that an injury hasn't healed properly.		#	
Nerves can adapt by making more ion channels (gates).	#		
Worse injuries always result in worse pain.		#	
Nerves adapt by making ion channels (gates) stay open longer.	#		
Second-order nociceptor (messenger nerve) post-synaptic membrane potential is dependent on descending modulation.	#		
When you are injured, the environment that you are in will not have an effect on the amount of pain you experience.		#	
It is possible to have pain and not know about it.		#	
When you are injured, chemicals in your tissue can make nerves more sensitive.	#		
In chronic pain, chemicals associated with stress can directly activate nociception pathways (danger messenger nerves).	#		

NOTE. Terms in parentheses were used for patients.
Hash mark denotes the correct answer.
Abbreviations: T, true; F, false; U, undecided.

Material and Methods

Participants

Two hundred ninety-seven consecutive patients with chronic pain and two hundred ninety health professionals were asked to participate in the study. Twenty-two patients and 2 professionals declined. Thus, 276 patients and 288 professionals participated in the study. Seventy of the patients also participated in 1 of 2 other studies.[13]

Protocol

The project was approved by the institutional ethics committee and was in accordance with the Declaration of Helsinki. After giving informed consent, each participant completed a test on the neurophysiology of pain (Table 1). The items on the test were based on examination papers given to postgraduate pain medicine students. Thirty items were initially selected on the grounds that they directly related to the material that was presented in the education sessions and could be modified into a true-false format. Ten items were removed because it was difficult to phrase them for both patients and professionals without losing meaning in either group. Two items were removed because they appeared to replicate other items. Finally, each item was checked for accuracy according to the current text.[20]

The tests given to patients and professionals were identical apart from semantic points (eg, "nociception" for professionals was "danger reception" for patients). Patients were drawn from those who participated in a one-to-one education session about the neurophysiology of pain, for which they had been referred by a medical or rehabilitation provider and were funded by a third party. The education session was developed as a precursor to an intensive multidisciplinary pain management program and involved a direct lecture from a specially qualified physiotherapist. The lecture consists of a relatively standardized program of material, with hand-drawn pictures. The material has been discussed elsewhere. Although the educators were not blinded to the test items, the material was not specifically aimed at the test questions and participants were not trained to help correctly complete the test. Most patients (n = 144) completed the test after participating, but to compare test scores before and after education, the remainder of patients (n = 142) were randomly allocated to complete the test either before (n = 65) or after (n = 67) the education session. In all, 65 and 208 tests were administered before and after the education session, respectively.

The majority of health professionals (n = 151) completed the test after attending a group seminar on the neurophysiology of pain (duration ~ 3 hours, audiovisual presentation) for which they, or their employers, paid $45.00 Australian and which was part of ongoing professional education. The material was not aimed at specific items on the test, and participants were not

trained how to successfully complete the test. To compare test scores before and after the seminar, the remainder of health professionals were randomly allocated to complete the test either before (n = 66) or after (n = 71) the seminar. In all, 66 and 222 tests were administered before and after the seminar, respectively.

Material was based on current knowledge of the neurophysiology of pain, according to the relevant sections in Wall and Melzack.[20] There was no material on the cognitive or behavioral responses to pain, not because these factors are not considered important but because the current study was limited to the neurophysiology of pain. The only differences between the material presented to patients and to professionals were semantic.

After the professionals completed the test, they were advised that the average score for trained health professionals was 80%. This figure was obtained from a pilot study of 53 health professionals, in which the mean ± standard deviation (SD) score on the test after an education seminar was 80% ± 14% (G.L.M., unpublished data, 1998). Professionals were advised about the semantic differences in the patient material and test and then asked "If a typical chronic pain patient was presented with the same material as that presented today, what percentage do you think they would score on this test?"

Statistical Analyses

With Statistica 5.1 (Statsoft, Tulsa, OK), the following analyses were performed. A 2-factor analysis of variance (score × group) was used to identify differences between trained patients, untrained patients, trained professionals, untrained professionals, and estimated patient scores. A regression analysis was used to evaluate the relationship between professional score and estimated patient score. Two multivariate analyses of variance were used to evaluate the variance in (1) the score or estimated patient score between professional groups and (2) the score, or estimated patient score, between those with and without discipline-specific or pain medicine/pain science postgraduate qualifications. A multiple linear regression analysis was used to determine the effect of age, years of experience with pain patients, and number of pain patients per week on estimated patient score. With a Bonferroni correction, significance was set at .01. Data were explored post hoc by using Newman-Kuels tests.

Results

Participants

Five patients and 1 health professional returned incomplete tests, leaving complete data for 205 trained (65 untrained) and 221 trained (66 untrained) patients and professionals, respectively. There were no differences in descriptive data between those subjects randomly allocated to complete tests before or after education ($P < .35$ for all). Consequently, data from this subgroup of trained participants were pooled with the data from the remainder of trained participants. Pooled descriptive data for the patients (Table 2) and professionals (Table 3) are presented. In the pooled data, the proportion of patients with spinal pain was smaller in the untrained patient group than in the trained patient group (Fisher exact test, $P < .01$). There were no other differences between groups in the pooled data.

Table 2. Descriptive Data for Patients

Patients	Trained patients (n = 205)	Untrained patients (n = 65)
Height	170 ± 11	169 ± 14
Weight	68 ± 6	68 ± 13
18-item Roland Morris Disability Questionnaire (n = 100)	13 ± 5	11 ± 7
VAS pain intensity	5 ± 2	5 ± 3
Female	61%	68%
Normal work or home duties	6%	21%
Reduced work or home duties	42%	64%
Not working or minimal home duties	52%	15%
Years of formal education	9 ± 4	8 ± 5
Duration of pain (yr)	4 ± 1.5	3 ± 1
Spinal or other area of pain*	84% spinal pain	57% spinal pain
Age (yr)	43 ± 9	37 ± 17

NOTE. *Asterisk denotes difference between trained and untrained patients ($P < .01$).
Abbreviation: VAS, Visual Analogue Scale.

Test Scores for Patients and Professionals

Trained professionals performed best, followed by trained patients and non-trained professionals ($P < .005$ for both), and then non-trained patients ($P < .001$ for all) (mean ± SD [95% confidence interval (CI)], 78% ± 21% [74% to 81%], 61% ± 19% [57% to 64%], 55% ± 21% [52% to 59%], and 29% ± 12% [26% to 32%] for trained professionals, trained patients, non-trained professionals, and non-trained patients, respectively) (Fig 1).

Exercise therapists, medical practitioners, occupational therapists, and physical therapists scored ~85% and nurses, psychologists, and rehabilitation counselors scored ~65%. Each of the professions in the first group performed better than each of the professions in the second group ($P < .01$) (Fig 2).

There was no relationship between professional score and age, years of experience with pain patients, or number of pain patients per week ($P = .42$). Professionals who had a postgraduate qualification in pain medicine or pain science performed better than those who did not ($P < .005$ for both) (Fig 3). There was no difference in performance between participants with and without a discipline-specific postgraduate qualification in their field.

Table 3. Descriptive Data for Professionals

	Trained professionals			*(untrained professionals)*			
	ExT	*MED*	*Nurse*	*OT*	*Psych*	*PT*	*RrhC*
	n = 21	*n = 30*	*n = 36*	*n = 44*	*n = 44*	*n = 57*	*n = 28*
	(5)	*(6)*	*(10)*	*(12)*	*(8)*	*(18)*	*(7)*
Age (yr)	28 ± 5 *(24 ± 3)*	43 ± 3 *(48 ± 8)*	45 ± 5 *(39 ± 9)*	32 ± 5 *(34 ± 8)*	39 ± 7 *(35 ± 9)*	34 ± 6 *(33 ± 6)*	42 ± 8 *(40 ± 8)*
Female	37% *(60%)*	54% *(67%)*	94% *(90%)*	65% *(50%)*	60% *(75%)*	66% *(50%)*	100% *(100%)*
Yr experienced pain, patients	4 ± 2 *(5 ± 3)*	12 ± 2 *(12 ± 3)*	19 ± 7 *(14 ± 8)*	7 ± 3 *(9 ± 4)*	8 ± 4 *(8 ± 6)*	7 ± 3 *(5 ± 3)*	12 ± 4 *(14 ± 6)*
Pain patients per wk	10 ± 2 *(8 ± 4)*	16 ± 9 *(21 ± 9)*	18 ± 9 *(18 ± 9)*	6 ± 3 *(10 ± 6)*	15 ± 5 *(10 ± 7)*	15 ± 7 *(14 ± 7)*	12 ± 5 *(10 ± 5)*
Postgraduate qualification	37% *(60%)*	67% *(33%)*	50% *(20%)*	7% *(0%)*	68% *(88%)*	29% *(11%)*	100% *(100%)*
Pain qualification	0% *(0%)*	17% *(0%)*	23% *(10%)*	7% *(0%)*	23% *(13%)*	16% *(11%)*	22% *(0%)*

NOTE. Descriptive data for exercise therapists (ExT), medical practitioners (MED), nurses, occupational therapists (OT), psychologists (Psych), physical therapists (PT), and rehabilitation counsellors (RehC), obtained either before (roman font) or after (italic font) the neurophysiology seminar.

Trained Professionals' Estimates of Patient Scores

The mean ± SD (95% CI) estimated patient score was 46% ± 18% (43% to 48%), which was less than the mean patient score ($P < .005$). Occupational therapists made higher estimates than nurses and rehabilitation counselors ($P < .01$ for both), and psychologists made lower estimates than all other health professions ($P < .01$ for all) (Fig 2). There was a weak relationship between trained professional score and estimated patient score ($r = 0.16$, $P < .01$).

Discussion

The main finding of this work is that both health professionals and patients are able to understand the neurophysiology of pain but health professionals underestimate patients' ability to understand. This is evidenced by the higher scores obtained by trained participants compared to untrained participants and the low estimates of patient scores compared to the actual patient scores. The weak relationship between professional score and estimated patient score suggests the underestimation by professionals was not simply a reflection of their own ability to understand the information.

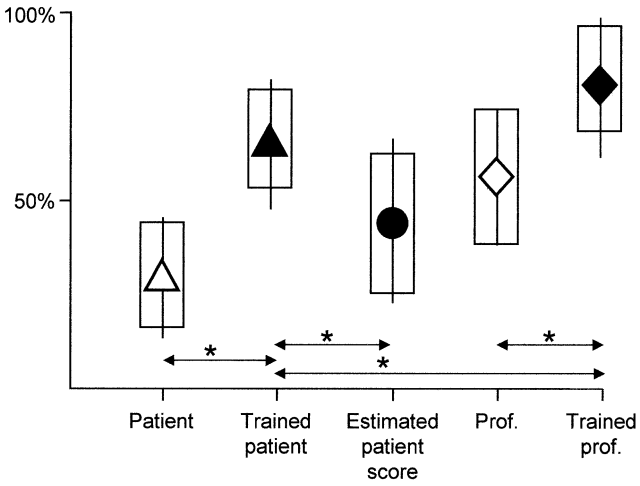

Figure 1. Mean, SD (error bar) and 95% CI (box) score for trained and untrained patients (triangle) and professionals (prof.) (diamond), and professionals' estimates of patients (estimated patient score) (circle). Asterisk denotes significant difference between groups ($P < .01$).

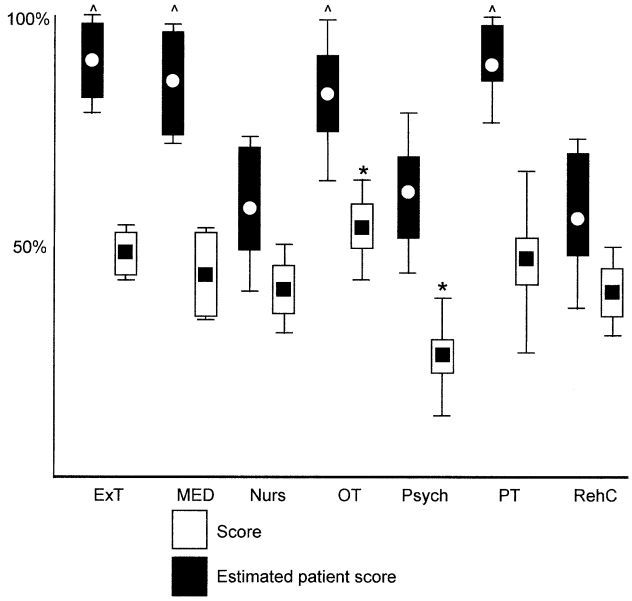

Figure 2. Mean, SD (error bars) and 95% CI (boxes) for health professional scores (circles) and their estimates of patient scores (squares) for exercise therapists (ExT), medical practitioners (MED), nurses (Nurs), occupational therapists (OT), psychologists (Psych), physical therapists (PT), and rehabilitation counselors (RehC). Asterisks denote that psychologists made lower estimates of patient score than any other professional group and occupational therapists made higher estimates of patient score than any other professional group ($P > .01$). Caret denotes that exercise therapists, medical doctors, occupational therapists, and physical therapists scored higher than nurses, psychologists, and rehabilitation counselors ($P > .01$).

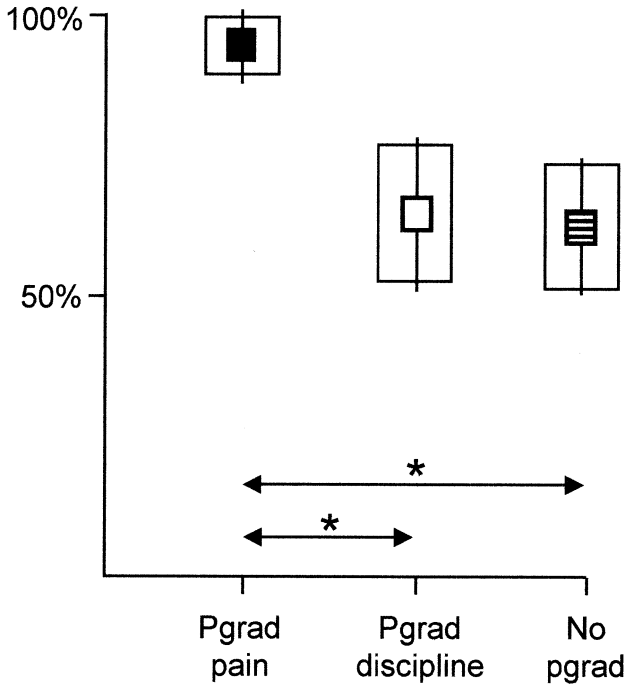

Figure 3. Mean, SD (error bar) and 95% CI (box) score for professionals with postgraduate qualifications in pain medicine or pain science (Pgrad pain), general postgraduate qualifications (Pgrad general), and no postgraduate qualifications (No pgrad). Asterisk denotes significance at $P < .005$.

The main finding is important because it suggests that health professionals' underestimation of patients' ability to understand may be a primary barrier to reconceptualization of the problem of chronic pain. It is reasonable to assume that if health professionals believe that their patients will not understand the information, they will not attempt to include it in their management or prevention approach. In this regard, it is particularly noteworthy that psychologists, who explicitly target reconceptualization of the problem, underestimated patient score by a greater amount than any other professional group. Exclusion of currently accurate information from management is contrary to EBM principles, which require that the best available evidence from basic and clinical sciences is incorporated into management.[15]

Failure to provide accurate information probably also limits efficacy. Conceptualization of chronic pain in terms of a structural-pathology model is thought to enhance the pain experience,[7,14] and provision of information based on this model increases health care consumption.[9] We have shown that providing currently accurate information about the neurophysiology of pain reduces inappropriate beliefs and attitudes about pain (G. L. Moseley and M. K. Nicholas, unpublished data, 2001) and, combined with physiotherapy, it improves functional and symptomatic parameters in people with chronic disabling pain.[13] Education strategies focusing on currently accurate information about the behavioral response to pain have also reported effectiveness within both a management and a prevention context.[2,5,17]

The current results may highlight a lack of pain science education in formal or professional training across the health professions. Trained and untrained professionals who had a postgraduate pain medicine/pain science qualification performed very well compared to untrained professionals who did not. The discrepancy in performance between professions probably reflects the content and nature of training programs for the respective professional groups. Notably, professionals who had completed discipline-specific postgraduate training did not perform better on the test, which suggests that shortcomings also exist at a postgraduate level.

Most participants in the professional group were practicing in the pain field, and there was no effect of experience or patient load on the parameters assessed. This finding supports the robustness of conventional cognitive schema about chronic pain within the clinical arena. It is important to note, however, that the external validity of this finding may be limited because the professionals used here worked in 1 of 2 Australian cities. It is unclear as to how representative of health professionals elsewhere the experience or training of these professionals is. The results also highlight the robustness of conventional schema in the lay arena; performance of the untrained patients (~29%) was less than the mean score due to chance (50%).

Several potential limitations of this work should be noted. First, it is possible that the patients assessed here were not representative of the typical chronic pain patient seen by the professional participants. Importantly, the patients were not highly educated (~9 years of formal education) and were similar in age, disability, and duration of symptoms to those used in clinical research elsewhere.[6] Second, the construct validity of the test used here has not been established. Although there is no gold standard, the fact that professionals with a specialist pain qualification had higher scores (~95%) than those without (~53%) corroborates the validity of the test. Third, it is not impossible that the different format for presentation and the semantic differences between the professional and patient education strategies may have led to lower estimates from the professionals. The impact of this issue was probably limited by emphasizing to the professionals that patients participated in one-to-one sessions rather than a group seminar. Finally, perceived ability to understand is a complex and multidimensional construct, and the information gained from the single question used here is obviously limited. Although the current approach yielded important information, full exploration of the construct of perceived ability to understand would probably offer more meaningful and informative results.

In summary, the current work found that although both health professionals and patients have a poor knowledge of the neurophysiology of pain, provision of the information results in significant improvement in both groups. Nonetheless, health professionals underestimate the capacity of their patients to understand the information. These factors probably mean that currently

accurate information about the neurophysiology of pain (1) does not form the theoretical basis of treatment and (2) is not presented to patients as part of a management approach. In addition to being contrary to EBM principles and probably limiting the efficacy of intervention, these factors are likely to be primary barriers to reconceptualization of the problem of chronic pain within the clinical and lay arenas.

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