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Reporting Chronic Pain Episodes on Health Surveys

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The recall of chronic physical pain on health surveys may be influenced by several sources of error. This report describes a program of research exploring three factors that potentially influence pain reporting: (1) the complexity of the lexicon used to describe pain, (2) the focus of surveys on either recall of pain severity or on changes in daily activities and observable behaviors brought on by pain, and (3) ongoing mental states such as experienced pain and transient moods.

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Contents

Background 1
Language and pain assessment 1
Memory and pain 2
Summary 3

Overview of present experiments 4

Issue I: Language and pain 5
Experiment 1: Use of language to describe the consequences of painful life experiences 5
Experiment 2: Multivariate study of group differences in use of pain language 7

Issue II: Recall of pain versus pain behaviors 10
Experiment 3: Recall of pain and pain behaviors 10
Experiment 4: Stability of self-report pain severity, interference with life tasks, and interviewer ratings of pain behavior 13

Issue III: Mental states, pain reporting, and pain recall 16
Experiment 5: Recalling past pain when present pain fluctuates 16
Experiment 6: Mood congruent recall of and judgments about pain 18
Experiment 6A: College student subjects 19
Experiment 6B: Subjects recruited from community 24

Conclusions 26

References 27

Appendixes

I. Further analyses of experiment 3 data 31
II. Materials used in experiments 33

Text tables

A. Experiment 1—Most frequently generated painful incidents in response to pain terms 6
B. Experiment 2—Four-dimensional solution: Healthy subjects, nonmetric multidimensional scaling 8
C. Experiment 2—Four-dimensional solution: Pain patients, nonmetric multidimensional scaling 8
D. Experiment 2—Interpreting canonical variates: Loadings of the dimensions of the scaling solution on their canonical variates 8
E. Experiment 2—Canonical correlation analysis between healthy subjects and pain patients: Four-dimensional solution 8
F. Experiment 2—Four-dimensional solution: Healthy subjects and pain patients combined using INDSCAL 9
G. Experiment 2—INDSCAL dimension weights for four-dimensional solution 9
H. Experiment 3—Recalled-versus-actual pain intensity and pain behaviors 11
J. Experiment 3—Recall by diary condition 12
K. Experiment 3—Actual and recalled behaviors by condition 13
L. Experiment 4—Pain behavior rating form 14
M. Experiment 4—Descriptive statistics on measured variables at two points in time 15

N. Experiment 4—Pearson correlations from time 1 to time 2 15
O. Experiment 5—Descriptive statistics for measured variables 17
P. Experiment 5—Pearson correlations between diary scales and recall measures 17
Q. Experiment 5—Predicting recalled usual levels of pain from actual mean during diary phase, variability during diary phase, and current level of pain 18
R. Experiment 6A—Means on mood and symptom scales prior to mood induction by mood and gender 20
S. Experiment 6A—Ratings of recent painful experiences after mood induction by mood and gender 21
T. Experiment 6A—Pain ratings of hypothetical stories by mood and gender 21
U. Experiment 6A—Recall of frequency of painful episodes from previous year by mood and gender 22
V. Experiments 6A and 6B—Correlations of baseline (noninduced) mood and pain ratings across all experimental conditions 22
W. Experiment 6B—Means on mood and symptom scales prior to mood induction by mood and gender 23
X. Experiment 6B—Recall of frequency of painful episodes from previous year by mood and gender 23
Y. Experiment 6B—Ratings of recent painful experience after mood induction by mood and gender 24
Z. Experiment 6B—Pain ratings of hypothetical stories by mood and gender 25

Symbols

- - -	Data not available
. . .	Category not applicable
-	Quantity zero
0.0	Quantity more than zero but less than 0.05
Z	Quantity more than zero but less than 500 where numbers are rounded to thousands
*	Figure does not meet standard of reliability or precision (estimate is based on fewer than 20 births in numerator or denominator)

Reporting Chronic Pain Episodes on Health Surveys

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Background

Chronic pain is the most universal form of human stress (1). Millions of Americans suffer from pain-related problems, often resulting in partial or complete disability. The social and economic impact of chronic pain is staggering (reviewed in more detail by (1), pp. 73–74). For example, in the United States every year, 600,000 people develop pain from arthritis for the first time (2). Twenty-five million Americans experience the painful consequences of migraine headache on a regular basis (3). Low back pain, another common complaint, disables approximately 7 million citizens and accounts for over 8 million physician office visits annually (4).

The costs of these and other pain complaints are enormous. Fully 80 percent of all physician consults are pain related (5). Each year, Americans purchase about 20,000 tons of aspirin, 225 tablets for every resident (6). Patients suffering from various chronic pain problems submit to multiple medical treatments and surgical procedures. Often, these medical interventions are not helpful, and by 1980, the American Pain Society (7) reported that over 800 pain clinics in the United States treat what might be described as failures of the traditional health care system.

The medical and scientific communities as well as government agencies such as the Public Health Service all recognize the need for data of better quality on the prevalence and severity of chronic pain in the population. These data are used by government agencies to assess health-care needs and by epidemiologists to explore relationships between health status and assorted psychological, social, and economic variables (8). The quality of survey data on experiences with pain is threatened if there are systematic sources of error in the recall of the intensity and quality of painful episodes or biases in judgments about the nature of present and past pain.

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Despite the pervasiveness of pain, accurate statistical accounts of the personal and societal impact of it may be plagued by problems of language and recall accuracy (9). Recall of pain experiences, episodes, and intensity may not be accurate, with chronic pain sufferers often reporting more severe pain in retrospect than at the time of the actual painful experience (although in certain situations, as we will discuss, they report less pain in retrospective accounts). Self-report instruments and surveys suffer from difficulties in matching descriptive language to the perceptual qualities of pain experiences. These kinds of problems with language use and recall accuracy pose formidable challenges to the National Center for Health Statistics and other designers of health surveys.

Language and pain assessment

One source of error in the recall of pain episodes on health surveys may be rooted in the complexities of using language to describe the subjective quality of painful experiences. In particular, it is possible that individuals who experience pain chronically use pain-relevant language differently than pain researchers, survey designers, and others who have had considerably less experience ruminating about ongoing pain and describing pain to other people.

The classic study of the language of pain was Melzack and Torgerson's (10) well-cited work in which they categorized words used to describe pain and then attempted to scale them on a common intensity dimension. Although others have examined the language of pain using more sophisticated scaling methodologies (11), the idea that individuals suffering from pain use pain language differently from nonpain respondents has not been examined extensively. Even Melzack and Torgerson (10), who originally collected ratings of pain words from patients, students, and physicians, did not look specifically at group differences in these ratings or in the way words were organized.

Enhancing our understanding of the descriptive language of pain can facilitate the construction of surveys and the understanding of survey data. Traditionally, only the intensity of pain (e.g., mild, moderate, severe) was elicited from respondents. Later, Melzack and Torgerson (10)

suggested that (a) the English language offers a rich vocabulary for describing pain experiences, (b) there is high agreement on the dimensions underlying particular classes and subclasses of these words, and (c) despite individual differences in background and pain problems, most of these pain words are used similarly across individuals.

In a series of studies using the scaling techniques available at the time, Melzack and Torgerson identified three general aspects of pain experience: sensory (temporal, spatial, punctate pressure, incisive pressure, constrictive pressure, traction pressure, thermal, brightness, dullness), affective (tension, autonomic, fear, punishment), and evaluative (intensity).

This effort led to the design of a multidimensional pain inventory, and the ability to assess pain on more than a simple intensity dimension. The widely used McGill Pain Questionnaire (MPQ) (12) was thus developed, based on these aspects of pain experience. Although the MPQ measures a variety of aspects of the pain experience, its Pain Rating Index (PRI) most directly attempts to separate and quantify three distinct components of pain: sensory-discriminative, motivational-affective, and cognitive-evaluative. These three components are measured using ratings from 20 adjective subclasses of from 2 to 6 pain descriptors ranked according to pain intensity.

Although the Pain Rating Index of the MPQ has demonstrated adequate reliability, validity studies of its three-dimensional structure have yielded more equivocal results (13, 14, 15). Turk, Rudy, and Salovey (16) employed confirmatory factor analysis to examine the stability of the tricomponent structure of the PRI in two different hospital samples. Although the three-component structure was supported, the components were also highly intercorrelated and so did not display adequate discriminant validity. Turk et al. recommended that only a full-scale PRI score (representing global pain intensity) be used.

One issue relevant to the design of national health surveys is whether there are group differences in the use of pain language. In particular, do individuals who experience a considerable amount of pain (e.g., chronic pain patients) use pain language differently than individuals with more acute experiences with pain? A second but related issue is whether there is any agreement on pain terms. That is, could a commonly used pain vocabulary be developed? If so, the designers of surveys might wish to draw from this lexicon in composing questions.

Difficulties in the use of pain language (as well as more traditional weaknesses with self-report instruments of all kinds) have led pain researchers to suggest two other approaches to eliciting pain-relevant information from pain sufferers. The first approach is to evaluate pain based on its impact on the life of the pain patient and those around him or her (17). The second is to abandon self-report of pain altogether and instead assess only observable pain behaviors (18–21). Finally, researchers have combined these two approaches into what is called a "comprehensive assessment" (22).

Memory and pain

No matter how pain is measured, there is considerable concern that survey respondents may provide biased accounts of the intensity and quality of their pain experiences, especially when these accounts are made retrospectively (9, 23). However, the degree (and even the direction) of bias has been the source of considerable controversy. Whereas some investigators claim that individuals generally inflate the amount of pain experienced at a given time when asked to report about it later (24), others claim that people can accurately report their pain experiences, at least for several days after the original episode (25).

A closer examination of some of these studies, however, reveals a more consistent pattern of difficulties in accurately reporting past pain experiences. A study by Hunter et al. (25) is often cited as an example of the accuracy of memory for pain (see 24, p. 282). Yet, Hunter et al.'s data do not support this conclusion. They divided 16 headache patients into two groups. One reported pain after 5 days and the other after 1 day and then again after 5 days.

Using various subscales of the McGill Pain Questionnaire, these researchers found that the intensity and quality of pain reported after 5 days was similar to that reported by the patients at the time of their initial interview while experiencing the headache. Five days, however, is not a long time interval during which much decay in vivid pain relevant memories should be expected. Yet, even after just 5 days, patients described their pain on the McGill Pain Questionnaire using only about 70 percent overlap in pain terms as compared with the initial assessment. Further, 5 of the 16 patients, labeled "shifters," recalled only 30–50 percent of their initial pain ratings.

Hunter et al. note that this level of accuracy is "similar to that for the recall of incidental material" (p. 43) such as the interviewer's name. Yet, a pain experience, such as an intense headache, is much more salient, vivid, personally relevant, and affectively charged than incidental information such as the interviewer's name. Hence, it should be recalled with exceptional accuracy (26).

Similar studies using the MPQ as the instrument on which pain is reported, and comparing initial reports to later memories, have generally yielded low correlations. After only 7 days, reports of pain by rheumatoid arthritis patients on the MPQ were only modestly correlated with initial reports, although reports of a single experience of ischaemia pain were more accurately recalled (27).

Other studies also provide evidence that retrospective recall of pain is often inaccurate and usually exaggerated. Linton and Melin (24) studied 12 back and joint pain patients undergoing a 3–11 week treatment and found that ratings of pain at the initiation of treatment were higher when estimated at termination compared with ratings

actually made prior to the beginning of the program. Of course, patients may have been motivated to inflate their estimates of pretreatment pain in order to feel that the effort expended in the treatment program was justified.

In a similar study, Linton and Götestam (28) had patients rate their pain on both a verbal scale (0–5 with each point labeled) or on a visual analog scale (100-mm line). After 4–9 weeks, 12 of the 15 patients recalled their pain at baseline as more intense than they had actually reported it to be, and the biggest discrepancies were noted on the visual analog scale. This latter effect is probably due to the retrieval cue provided by the verbal content of the 5-point scale.

Kent (29) asked dental patients to rate pain expected prior to a dental procedure, actual pain experienced as a result of the procedure, and then to recall the amount of pain they had experienced 3 months after the dental appointment. Only modest correlations between recalled and actual pain were obtained, indicating that factors other than the initial pain experience accounted for most of the variance in pain recall after 3 months. Interestingly, among individuals who were not anxious about dental work, the recalled/experienced correlation was much higher, but there was virtually no correlation between the two among highly anxious individuals. In general, recall drifted in the direction of anxiety; that is, highly anxious individuals remembered the pain experience as much more severe than it actually was. These results are only suggestive, however, as the reliability of the reported correlations was compromised by the small sample (15 low-anxious and 8 high-anxious subjects).

In contrast to these examples, there are occasions when retrospective accounts of pain may be underestimates of actual pain. This outcome seems most likely when the consequences of pain produce considerable positive affect. For example, an athlete straining to win a gold medal at the Olympics might complete a marathon despite intense pain and later report that she had not experienced much pain at all. Perhaps the prototype of this sort of pain is childbirth. Labor is quite painful, yet most mothers are unlikely to dwell on the intensity of such pain after the child is born. Guerra (30) noted that "the parturient will tolerate much more pain and discomfort than will other surgical patients" (p. 77). In fact, Norvell, Gaston-Johansson, and Fridh (31) found that pain ratings on visual analog scales made during three phases of labor revealed considerably more intense pain than retrospective ratings made 2 days postpartum. It may be that when pain intensity is low, for example, several days after the birth of a child, memory for the original experience of pain is underestimated; but that when existing pain intensity is high or can be high, as in a chronic pain patient, memory for the original pain experience is augmented (32). Alternatively, the affective state of the mother during labor (fearful, anxious) and her affective state after the birth of the child (joy, relief) are so incongruent that there may be considerable interference with recall of material in the latter state that was encoding during the former (i.e., there will be no state-dependent memory facilitation) (33).

Summary

The literature reviewed suggests that pain may not be recalled with great accuracy and that in the chronic pain populations in which pain recall is often studied, retrospective accounts of pain generally yield elevated intensity ratings. On the other hand, in certain special populations who experience acute pain of shorter duration, especially when followed by positive affect or relief from this pain, retrospective recall of pain can actually produce attenuated pain estimates. The literature suggests several sources of systematic bias in pain recall:

- respondents with different levels of experience in dealing with and reporting pain may organize pain-relevant language differently; it is also not clear whether there is a common pain language used to report painful experiences.
- whether pain intensity and quality is assessed verbally through self-report measures or by rating pain-related behaviors and pain-related life changes.
- mental states such as whether respondents continue to experience pain at the time of the retrospective rating and respondents' affective state at the time the pain rating is made.

Overview of present experiments

This report describes findings from six experiments that investigate factors influencing accurate judgments about and recall of pain and painful experiences. Three specific factors associated with the judgment and recall of pain are explored: (a) complexities in the language used by respondents to describe pain and painful experiences, (b) the relative susceptibility to cognitive biases of recall of pain intensity versus pain behaviors, and (c) the influence of ongoing mental states, such as present pain and mood, at the time of recall.

As with other kinds of subjective experience, the clear use of language to communicate painful present or past experiences is fraught with difficulty. The first two experiments deal with language specifically used by respondents to describe their pain. The first experiment investigates how episodes of pain are characterized and how different patterns of pain are described by subjects with varying pain experiences. Results from this study can suggest the terms that might be included or avoided in the preparation of health surveys. In addition, if group differences in language use are found, instruments especially tailored to specific populations may be recommended. In experiment 2, we ask whether there are any commonalities in the use of pain language to describe similar painful experiences. This experiment explores whether individuals who vary in their experiences with pain also vary in their use of pain language and in the way pain language is represented in memory.

If recall of the intensity and quality of pain episodes is subject to the kinds of biases described earlier, might there be other ways in which prior experiences with pain can be assessed that are less prone to error? Experiments 3 and 4 address this issue. Pain researchers have begun to focus on two alternatives to simply questioning respondents about pain severity directly. The first is to examine changes in activities of daily living that are (or were) concomitants of the pain experience. For example, questions can be formulated about changes in the amount of time spent working around the home, taking care of lawn and garden, attending recreational activities such as sporting events or dances, or the curtailing of certain job responsibilities and sexual activities.

A second approach to improving the accuracy of survey information regarding pain is to question respondents about specific behaviors associated with pain (e.g., change in use of analgesics, number of days on which crutches were used) and to consider observable behaviors that accompany the actual experience of pain (e.g., facial expressions, verbal utterances, abnormal gait, shifting weight while sitting). The questions asked in experiments 3 and 4 are concerned with whether the recall of past behavioral changes is more accurate than the recall of prior pain severity and whether interviewer ratings of pain behaviors and life changes are more stable over time than recall of prior pain per se.

The fifth experiment examines whether differences in survey respondents' present levels of pain are associated with the recall of previous painful experiences. The natural fluctuation of pain intensity among chronic pain patients at a pain clinic is exploited in order to study whether the ebb and flow of their present pain influences their recall and ratings of past painful episodes. Clinical research suggests that, in fact, when present pain intensity is high, prior pain is reported to have been more severe than when present pain intensity is low (32).

The sixth experiment concerns biases in recall and judgments of pain attributable to respondents' moods. Although often overlooked, there is increasingly strong evidence that mood affects the manner in which information is encoded, organized in memory, and ultimately retrieved (33, 34). The role of moods and emotions in the accuracy of judgments about and recall of painful experiences has only recently been studied directly (35), despite the fact that it has been suggested for quite some time as the key variable mediating the accuracy of pain recall (25, 27, 29, 31, 32, 36).

Issue I: Language and pain

Experiment 1: Use of language to describe the consequences of painful life experiences

Background

We cannot know another person's experience of pain directly. What we can do is describe, in language that is as objective as possible, episodes that might generally be expected to result in pain (e.g., receiving an injection, surgery, having a tooth pulled). Do people share descriptive terms for painful episodes of this sort? Such a shared language would seem necessary as it is through language that we obtain reports of pain on surveys.

The purpose of experiment 1 was to determine whether common pain descriptors are linked consensually to particular kinds of painful episodes. Additionally, we explored the actual language used to define and describe various pain episodes and whether these descriptions vary depending on whether one has had personal experience with the particular pain problem. In this experiment, we attempted to generate pain vocabulary using a set of open-ended tasks, responses to which were then categorized. Our goal was to ask subjects to generate pain language in a spontaneous (as opposed to reactive) manner, as our purpose was rather exploratory. Because this experiment was the first in a rather lengthy sequence of experiments, all of which relied on pain language to some extent, we wanted to obtain a better understanding of the pain lexicon. Put simply, How do people describe pain when unconstrained by the structure of surveys?

Design and procedure

Twenty-one native speakers of English randomly selected from the New Haven, Connecticut, area and 22 pain patients from the Pain Evaluation and Treatment Institute of the University of Pittsburgh Medical Center served as subjects in this study and were paid $10 for their participation. As much as possible, we tried to match the two samples in terms of gender ratio, socioeconomic status, education, and age.

In a single session, subjects completed two tasks:

(a) Subjects were asked a series of questions designed to elicit spontaneous pain descriptions. Sample questions included: "Describe the most painful experience you have ever had"; "What did it feel like?"; "Specifically, what was the pain like?"; "Can you generate a set of five words that really captures for you the painful experience?"; "Describe your most recent painful experience." Another question asked in order to define an upper limit on painful episodes was, "Describe the most painful situation imaginable."

In addition, for the pain patient subjects, a "think aloud" component was added to the interview. In the course of these interviews, subjects were asked to rate their pain for that day. They were then asked to describe what was going through their minds as they made these ratings. After thought listing, they were asked a series of more structured questions to obtain additional information concerning how pain ratings are made, such as How did you go about making your pain rating? Did your pain vary much during the course of the day? If so, how did you arrive at a final number? Imagine a day in which your pain was excruciating in the morning but then gradually improved during the day until it was barely noticeable; How would you go about rating your pain for that day? What if your pain was bad, you took some medication, and it got better; How would you go about rating your pain for that day? And so forth.

(b) The corpus of pain terms most commonly used in surveys is the one provided in the McGill Pain Questionnaire. These 72 terms have been used as descriptors for clinical pain syndromes, but subjects have not been asked to generate memories of painful episodes in response to them. In this second task, we presented subjects with a subset of 15 of these terms suggested as an MPQ short-form by Melzack and asked them to describe painful experiences that could best be characterized by the provided term. So, for example, subjects were asked, "describe a painful experience in which the pain was cramping," or "describe a painful experience in which the pain was heavy."

Results

When asked to describe a recent painful incident, the healthy subjects came up with 18 discrete types of episodes (e.g., cut, headache, burn), and the pain patients, 10. We then asked subjects to generate five words to describe the pain. If every subject generated five unique words and no subject generated words on another sub-

ject's list, 105 different words would have been generated by the healthy group and 110 words by the pain group. In fact, 74 different words were generated by the healthy group and 60 by the pain group, an enormous and heterogeneous assortment of terms. Words most frequently generated by the healthy subjects were "sharp," "throbbing," and "annoying"; those most frequently mentioned by the pain patients were "sharp," "aching," and "severe."

This pain term generation task was repeated for "the most painful experience you have ever had" and for "the most painful experience imaginable" with similar results. "The most painful experience you have ever had" was likely to be either a broken bone or surgery for healthy subjects and for pain patients. Healthy subjects described this pain using 73 different terms; most frequent were "sharp," "excruciating," and "annoying." Pain patients generated 53 different terms, most commonly "sharp," "excruciating," and "numb."

"The most painful experience imaginable" for healthy subjects was being burnt. Eighty-three different terms were used to describe the most painful experience imaginable; most frequent were "helpless," "intense," and "sharp." "The most painful experience imaginable" for pain patients was amputation (burning and child birth tied for second), and they used 50 different terms to describe it. Most commonly mentioned were "agonizing," "numb," and "excruciating."

In the next section of the interview, the pain clinic sample (only) described how they use numbered scales to make different kinds of pain ratings. Some of the observations culled from these data were: (a) patients are more likely to use the odd numbers on a 0–9 pain scale, especially 7, (b) patients have great difficulty introspecting about how they chose from among scale alternatives (e.g., the most frequent reason is "I just considered how much pain I was in"), (c) when pain shifts from excruciating to barely noticeable in the course of a day, for whatever reason, patients overwhelmingly choose the number 3 to represent their average amount of pain for that day, but they (d) have little understanding about how or why they did so.

In the final section of the interview, subjects were asked to generate pain episodes that might involve pain described by a particular term from the MPQ. Table A summarizes the most common pain episodes generated in response to these cues. In table A, "number of nominations" indicates the number of subjects who mentioned the most frequently generated incident. "Number of different incidents" refers to the number of different types of painful incidents nominated for each term by the healthy and pain samples, respectively. What is most interesting about these results is that there is considerable diversity in applying these pain terms to painful episodes. With the exception of a few items in which semantic associations are obvious (e.g., splitting—headache), there is not considerably high agreement in term application. These findings indicate that individuals have some difficulty mapping terms onto specific pain instances.

Table A. Experiment 1—Most frequently generated painful incidents in response to pain terms

Term	*Healthy sample*	*Pain sample*
Throbbing	Headache	Headache
Nominations	9	9
Different incidents	9	9
Shooting	Muscle	Abdominal
Nominations	4	5
Different incidents	13	11
Stabbing	Stabbing, injection, cramp	Back
Nominations	3 each	5
Different incidents	13	10
Sharp	Stomach, head	Back
Nominations	3 each	5
Different incidents	11	11
Cramping	Menstrual	Leg
Nominations	7	7
Different incidents	6	9
Gnawing	Dental	Dental
Nominations	8	6
Different incidents	7	10
Hot	Burn	Burn
Nominations	13	7
Different incidents	7	11
Aching	Exertion	Head
Nominations	7	5
Different incidents	8	10
Heavy	Muscle, head, crush	Abdominal
Nominations	3 each	5
Different incidents	12	10
Tender	Bruise, blister, joint	Muscle
Nominations	4 each	4
Different incidents	12	14
Splitting	Headache	Headache
Nominations	14	21
Different incidents	7	2
Tiring	Fatigue	Fatigue
Nominations	5	7
Different incidents	11	8
Sickening	Nausea	Nausea
Nominations	10	16
Different incidents	9	6
Fearful	Stomach, surgery, heart, bone	Nerves, illness
Nominations	2 each	3 each
Different incidents	16	15
Punishing	Beat, torture	Beat, accident
Nominations	5	4 each
Different incidents	12	11

Note: n = 21 healthy subjects, n = 22 chronic pain subjects.

Discussion

The purpose of this first experiment was to explore the complexities of the pain lexicon in an open-ended and unstructured way rather than to test specific hypotheses about pain language. We can draw a number of conclusions about the vocabulary of pain. First, the lexicon is enormous. When asked to generate pain descriptors, subjects use a plethora of words. Second, subjects are unlikely to use the same words to describe experiences with pain. Although a few descriptors, like "sharp", are rather frequently used, there is little consensus in adjectives that describe pain. Each subject generally thought up a set of unique descriptors.

Similarly, when subjects were asked to generate pain episodes that might result in pain that could be described by a particular adjective (e.g., tender), overwhelming consensus in episode generation was not discovered. Rather, subjects generated an array of possible scenarios. (There were some exceptions to this lack of consensus. About half the sample produced headache in response to throbbing, burn in response to hot, headache in response to splitting, and nausea in response to sickening.)

We detected few differences in the use of pain language in pain patients compared with healthy subjects. But this question is better explored in a more structured study. In experiment 2, we examined use of pain language in these two groups of individuals more systematically. We asked whether, despite the enormity of the pain lexicon, there might be a subset of terms that is used rather consensually across a wide range of people.

Experiment 2: Multivariate study of group differences in use of pain language

Background

As revealed in experiment 1, pain assessment can involve the use of an enormously large set of terms. Because the purpose of communication is to arouse, within the mind of a recipient, a representation that is the same as the representation in the mind of the sender, it is important to select, for use in surveys, a set of pain descriptors understood similarly by survey designers, utilizers of survey information, and respondents.

The purpose of this experiment was twofold: First, we wanted to investigate the corpus of commonly used pain terms to determine whether pain can be reduced sensibly to a set of terms with clear unambiguous meaning. Second, we wanted to determine if individuals with varying life experiences involving pain differ in their use of pain language.

Two different groups of subjects, one suffering from chronic pain and the other healthy, made direct similarity ratings among pain terms. With the aid of several analytic procedures to identify structure in multivariate data, we attempted to identify terms that have common meanings. The nature of the pain lexicon for the two groups of subjects was also compared.

Method

The following sequence of steps constituted the procedure for experiment 2:

1. A group of 15 pain terms comprising the short form of the McGill Pain Questionnaire (and used in experiment 1) was selected for analysis.

2. Two groups of subjects—(a) patients with chronic, intractable nonmalignant pain (e.g., back pain) or patients with acute recurrent pain (e.g., headache), and (b) healthy individuals with no documented pain complaints—were asked to rate the similarity of all possible pairs of pain terms according to their meanings. They were provided a list of the 105 pairs of descriptors in a random order and asked to indicate on a 5-point scale how similar in meaning the two terms were. These subjects were native speakers of English. Twenty healthy subjects sampled randomly from the New Haven community participated, and 40 pain patients from the Pain Evaluation and Treatment Institute at the University of Pittsburgh Medical Center volunteered for this study. Each was paid $10 for participating.

3. Before analyzing these data using multidimensional scaling (MDS), we assessed the correspondence in similarity ratings made by pain patients and healthy subjects directly. For this analysis, we used equal numbers of pain patients (randomly selected) and healthy subjects (20 from each group). The average similarity rating for each pair of descriptors was calculated separately for two halves of each of the two samples of subjects, and the correlation across these 105 similarity ratings was computed between the two halves of the pain patient sample and between the two halves of the healthy sample. We also computed the correlation between these mean ratings for the half samples of pain and healthy subjects. This procedure was repeated 500 times; each time, the two samples were split into two equal subsamples randomly, using a computer program written for this purpose. The average within sample and between sample "split-half" correlation was then computed as an index of overlap in similarity ratings within healthy and pain subjects and, more importantly, between the two groups.

4. For the MDS analysis, matrices of similarity ratings were converted to dissimilarities by subtraction from a constant and were submitted to two separate nonmetric multidimensional scaling analyses for the two samples using the ALSCAL algorithm (37).

5. The similarity of the two scaling solutions was then evaluated using canonical correlation analysis. The coordinates of the items on the dimensions in one sample were related to the corresponding coordinates in the other sample (this procedure was developed by A.F. Smith (38)).

6. Then, a multidimensional scaling analysis using the INDSCAL model was carried out (39). Common group spaces in two through four dimensions were examined. Based on obtained stress and proportion of variance accounted for, a solution was selected for further study.

7. The INDSCAL analysis also yields dimension weights for each group. These weights represent the tendency of subjects in each group to utilize that dimension in making their similarity ratings (40). Dimension weights are analogous to partial correlation coefficients, and the square of a weight on a particular dimension indicates the proportion of variance in a specific group's proximity data that can be accounted for by that dimension. Thus, these weights indicate how important each dimension is to subjects in making their similarity ratings (41).

Table B. Experiment 2—Four-dimensional solution: Healthy subjects, nonmetric multidimensional scaling

Term	*Dimension 1*	*Dimension 2*	*Dimension 3*	*Dimension 4*
Throbbing	–.15	1.07	.48	–.85
Shooting	–2.02	–.60	.25	–.36
Stabbing	–1.80	–.34	.27	.01
Sharp	–1.52	–.14	–.27	.20
Cramping	.04	.24	.66	1.28
Gnawing	.74	1.45	.42	1.08
Hot	–.55	.22	–1.62	–1.52
Aching	.96	.82	.78	–.20
Heavy	1.51	–.87	.71	–.32
Tender	–.28	2.35	–1.28	.44
Splitting	–1.30	–.53	1.42	.10
Tiring	2.20	.01	.61	–.41
Sickening	1.28	–1.04	–.63	.47
Fearful	.12	–1.65	–1.59	1.27
Punishing	.79	–1.00	–.21	–1.20

Note: Stress = .12; R^2 = .83.

Table C. Experiment 2—Four-dimensional solution: Pain patients, nonmetric multidimensional scaling

Term	*Dimension 1*	*Dimension 2*	*Dimension 3*	*Dimension 4*
Throbbing	.52	.22	.39	–.64
Shooting	1.85	.00	.36	.21
Stabbing	1.66	.25	.06	–.18
Sharp	.95	.39	.05	.08
Cramping	–.44	1.40	.34	–.54
Gnawing	–.96	.42	–.38	–1.58
Hot	.61	–1.53	–1.76	.81
Aching	–.83	.29	.46	–.40
Heavy	–.59	1.15	–1.16	1.50
Tender	–1.46	–.76	1.72	–.52
Splitting	1.40	–.79	–.61	–.61
Tiring	–2.26	.73	–.19	.78
Sickening	–.43	–.93	–1.02	–.89
Fearful	–.03	–2.58	–1.86	.04
Punishing	.03	.16	.08	1.95

Note: Stress = .12; R^2 = .85.

Results

The correlational analysis (Step 3, above) revealed that the mean correlation between 500 randomly selected halves of the pain patient sample across the 105 similarity ratings of descriptor pairs was .65. For the healthy subjects, the mean correlation was .40. And the mean correlation in similarity ratings between any half of the pain patient sample and any half of the healthy sample was .58. These correlations suggest that there is a strong overlap in the similarity ratings generated by pain patients and healthy subjects. They also suggest that the correspondence in ratings between the two samples is more or less comparable to the reliability of these ratings within each sample.

Table B reports the dimension coordinates for the MDS analysis with healthy subjects. After examining stress values (using Kruskal's Formula 1) for 1 through 4 dimensional solutions (.49, .26, .17, .12) and corresponding R^2 (.29, .62, .75, .83), the four-dimensional solution was chosen as most appropriate for these data (Stress = .12, R^2 = .83). Additional dimensions resulted in only small increases in R^2 with almost no further reduction in stress. There was no attempt to formally interpret the dimensions, as this was not the focus of the experiment. However, visual inspection of the four-dimensional maps suggested they might represent dimensions of intensity, emotion/physical, suddenness of onset, and location, respectively.

Table C reports the dimension coordinates for the MDS analysis with pain patients. A similar four dimensional solution also seemed appropriate. The stress for 1 through 4 dimensions, respectively, was .52, .27, .19, and .12, and the variance accounted for by the solution (R^2) was .26, .57, .73, and .85. Visual inspection of the four-dimensional solution suggested that these dimensions were quite similar to those derived from the healthy sample. It should be noted that dimension 2 in this solution most resembles dimension 3 in the healthy subjects' solution and vice versa.

Table D. Experiment 2—Interpreting canonical variates: Loadings of the dimensions of the scaling solution on their canonical variates

Sample	*Variate I*	*Variate II*	*Variate III*	*Variate IV*
Patient				
Dimension 1	–.83	.51	.02	–.23
Dimension 2	.31	.81	.18	.47
Dimension 3	–.25	–.31	.86	.32
Dimension 4	–.36	–.23	–.48	.76
Healthy				
Dimension 1	.73	–.40	–.38	.41
Dimension 2	.33	–.19	.92	.06
Dimension 3	.26	.91	.04	–.32
Dimension 4	.48	.16	–.13	–.85

Note: Underlined weights indicate highest loading dimension on each variate.

Table E. Experiment 2—Canonical correlation analysis between healthy subjects and pain patients: Four-dimensional solution

Canonical variate	*Canonical R*	*Approximate F*	*p*
1	.99	21.17	.0001
2	.95	14.39	.0001
3	.92	11.55	.0001
4	.70	9.50	.01

Note: Total mutually explained variance in two sets of ratings: .80.

Canonical correlation analysis was used to investigate overlap in the MDS solutions for the healthy subjects and pain patients. Table D reports the correlations of dimensional coordinates with canonical variates. The four canonical variates for the healthy subjects correspond, roughly, to the four MDS dimensions, in order. For the pain patients, the four canonical variates correspond to the four dimensions as well, although variate 2 represents primarily dimension 3 and variate 3 represents dimension 2.

Table E shows the correlations between the canonical variates for the two solutions. As can be seen, there is substantial and significant overlap in the two solutions.

Table F. Experiment 2—Four-dimensional solution: Healthy subjects and pain patients combined using INDSCAL

Term	Dimension 1	Dimension 2	Dimension 3	Dimension 4
Throbbing	.19	1.06	.31	.19
Shooting	1.75	.11	.14	–.37
Stabbing	1.42	.13	.28	–.72
Sharp	1.06	.20	.14	–.50
Cramping	–.49	.40	1.24	–.68
Gnawing	–1.24	.76	.42	–1.21
Hot	.86	.60	–1.84	1.36
Aching	–.93	.58	.36	.23
Heavy	–.63	–1.32	1.13	1.11
Tender	–.73	2.23	–1.03	.35
Splitting	1.10	–.21	1.18	–.98
Tiring	–1.61	–.60	.65	1.48
Sickening	–.76	–1.35	–.79	–.30
Fearful	–.20	–1.46	–2.18	–1.65
Punishing	.21	–1.13	–.01	1.70

Note: Average stress = .14; R^2 = .79.

For example, the first variates correlate .99, the second, .95, the third, .92, and the fourth, .70. Given the interpretation of variates provided by the previous tables, these canonical correlations indicate that the first dimension of each solution is largely the same, the second dimension of the healthy subjects' solution is largely the same as the third dimension of the pain patients' solution, the third dimension of the healthy subject's solution is largely the same as the second dimension of the pain patient's solution, and the fourth dimension of each solution, although not completely the same, shares significant common variance.

The INDSCAL model was used to generate a third MDS solution combining the two subject samples into the same analysis. A single scaling map was thus generated, but the differential importance of the recovered dimensions to the two groups could be evaluated by examining the weights associated with each dimension. Table F reports the coordinates of the INDSCAL solution. Once again, examination of stress and R^2 suggested that a four-dimensional solution was most appropriate (stress for 2 to 4 dimensions was .28, .18, and .14, respectively, and R^2 for 2 to 4 dimensions was .53, .72, and .79), although a three-dimensional solution also provided a fairly good solution for the combined sample data.

Table G. Experiment 2—INDSCAL dimension weights for four-dimensional solution

Sample	Dimension 1	Dimension 2	Dimension 3	Dimension 4
Healthy	.62	.48	.31	.28
Pain	.52	.37	.47	.39

The dimension weights for the healthy and pain patient samples are reported in table G. The raw weights in table G suggest that healthy subjects primarily used the first two dimensions in making their similarity ratings but that pain subjects used all four dimensions about equally. Perhaps the additional expertise regarding pain afforded the patient sample results in a larger set of relevant dimensions employed while making judgments about the meaning of pain words.

Discussion

Although the four dimensions that seem to organize the pain lexicon (or, at least the words studied here) may be differentially important to healthy subjects and pain patients, what is most striking about these data is the substantial overlap in the similarity ratings and scaling solutions generated by the two different samples. It seems that healthy people who may not think often about pain, and pain patients, who consider pain on a daily basis, mentally represent the pain lexicon in substantially similar ways.

The 15 terms chosen for the short form of the MPQ and used here seem to capture a substantial amount of the possible variance in the use of pain terms, and their meanings (relative to each other) seem to be agreed upon consensually. At this point we might be bold enough to suggest that when pain is questioned on health surveys, these 15 descriptors might be reasonable ones to use as there seems to be considerable consensus regarding their relative meanings.

Issue II: Recall of pain versus pain behaviors

Earlier, we described some of the issues involved in the recall of painful experiences. We suggested that pain might be measured more accurately by either examining concomitant changes in pain sufferers' lives or when possible by studying observable pain behaviors rather than by eliciting self-report ratings. In this section, we suggest that the recall of pain episodes might be more accurate if the impact of pain on daily activities is assessed or pain-related behaviors are observed, rather than asking respondents to report on past levels of pain intensity and quality. Moreover, from the perspective of health surveys, the data provided by an assessment of pain-related activities and behaviors may be more meaningful than subjective assessments of intensity and quality.

The questions that concern us here are (a) whether recall of the daily life consequences of pain and pain-related behaviors is better than of the intensity and quality of pain itself and, consequently, (b) whether pain is more accurately assessed if questions are focused on the behavioral and life consequences of past pain experiences.

Fordyce et al. (42) noted that there is little relationship between self-reports of pain and the physical activities one is capable of performing. They suggested greater attention be paid to observable pain behaviors with less reliance on self-reports of pain intensity. At present, however, the issue of whether pain behaviors more accurately capture the experience of pain than do intensity ratings is largely unaddressed. Researchers, in fact, still debate whether observed pain behaviors and self-reported pain ratings are highly correlated (19, 43) or nearly independent (44).

Experiment 3: Recall of pain and pain behaviors

Background

It is possible that more accurate assessments of previous experiences with pain could be collected if survey questions focused not on the intensity and quality of painful experiences but instead on the consequences of pain: pain behaviors and changes in activities of daily living. For example, a 27-year-old man may remember much more accurately that a painful leg injury last winter prevented him from skiing or caused him to use a crutch for 14 days than that the painful experience was an 8 on a 10-point scale or could be characterized as "cramping" or "burning."

This experiment addressed directly the memory of respondents for consequences of pain. Chronic pain patients were asked to keep one of three types of daily diaries: (a) pain intensity ratings, (b) behaviors engaged in that day, and (c) both pain intensity and behaviors. (A control group of subjects kept no diary.) Some of the behaviors were directly relevant to pain (e.g., took aspirin, took prescription pain medication, used a heating pad), and some were control behaviors (e.g., paid a bill, talked on the telephone). After keeping the diary for 1 month, subjects were then asked to recall their average level of pain during the diary period and the frequency with which they engaged in each behavior. These data can thus inform us about the accuracy with which people remember pain-relevant versus less relevant behaviors and how recall accuracy for these behaviors compares with memory of pain intensity.

Design and procedure

Adults suffering from chronic pain problems were recruited through newspaper advertisements in the New Haven community and through the Pain Evaluation and Treatment Institute in Pittsburgh. All 107 subjects had to have experienced pain on a daily basis for more than 6 months but could not be receiving treatment for their pain while participating in the study. Subjects were each paid $35 for their participation.

Subjects were randomly assigned to one of four conditions: (a) pain and behavior diary (n = 23), (b) pain only diary (n = 23), (c) behavior only diary (n = 26), or (d) no diary (n = 35). Subjects in the first three conditions were asked to complete a daily record for a month. Those in the first condition indicated which of a variety of behaviors they engaged in each day; these behaviors included both those associated with pain and other daily experiences from a list provided them. Subjects in this condition also rated their usual level of pain for the day on a 10-point scale. Subjects in the pain-only diary condition just completed this latter task, and subjects in the behavior-only condition just completed the behavior diary.

The pain behaviors included on the daily checklist diaries were: took two or more aspirins, took another

Table H. Experiment 3—Recalled-versus-actual pain intensity and pain behaviors

			Pain		Nonpain	
	Actual intensity	*Recalled intensity*	*Actual behaviors*	*Recalled behaviors*	*Actual behaviors*	*Recalled behaviors*
Mean	6.11	6.23	89.23	96.62	66.99	66.25
Standard deviation	1.71	1.70	42.59	45.22	24.06	24.58

Note: $n = 107$.

over-the-counter remedy, took a prescription pain remedy, used a heating pad, used a hot water bottle, took a nap, used a crutch or other device to assist in walking, asked a member of the family to do something I usually do myself, complained about my pain to another person, and avoided routine physical activities. The nonpain (control) behaviors elicited by the diaries included: paid a bill, read the newspaper, ate chicken for lunch or dinner, talked on the telephone, used a postage stamp, and wrote a letter.

Subjects returned their diary records daily on postage paid and addressed postcards. At the end of the 1-month recordkeeping period, the subjects were telephoned and asked to recall the number of days during which they engaged in each of the behaviors. In addition, they were asked about the number of days during which they experienced, on average, various levels of pain (greater than 2, greater than 5, greater than 8) and to estimate on 10-point scales their usual amount of pain during the diary period. The order of recall was counterbalanced with half of the subjects recalling pain behavior frequency first and the other half recalling intensity first.

Results

Table H presents grand means for the recall of pain intensity, combined pain behaviors, and combined nonpain behaviors collapsed across all 107 subjects. In addition, actual mean pain intensity during the diary period, and mean aggregated pain and control behaviors are provided collapsed across all subjects assigned to diary conditions in which such information was collected. At this very gross level, recall of all three types of information seems very good. According to one-way analyses of variance (ANOVAs) comparing all "actual" versus "recalled" ratings (including all subjects who provided data in each cell, even though some subjects cannot contribute data to all cells), there is remarkable agreement. For instance, the actual mean level of pain intensity during the 30-day period was 6.11, and the mean recalled "usual" level of pain was 6.23. For pain behaviors, the actual mean of the sum of all behaviors across 30 days was 89.23 and the recalled summed frequency was 96.62. Nonpain control behaviors occurred in 66.99 instances and were recalled as 66.25. None of the comparisons between recalled-versus-actual ratings was close to being statistically significant.

In table J, means are presented by diary condition for the measures collected at recall including the aggregate behavior scores. These means were subjected to two different ANOVAs. In the first, we explored whether subjects in the four diary conditions differed in terms of their recalled usual pain intensity; frequency of days during which pain was greater than 2, 5, and 8; as well as frequency of pain and control behaviors. There were no significant differences due to diary condition on any of these measures. Inspecting the means in table H reveals very similar scores on all recalled dependent variables across the four diary conditions. Moreover, when we compared actual ratings from the diaries with recalled ratings, in the conditions where such comparisons were possible, there were no significant differences between a recalled and actual mean. Once again, inspecting the means in table H reveals remarkably accurate recall, at least aggregated over items, on all measures.

There are two reasons why accuracy could be so high on these kinds of aggregate ratings. One is that, indeed, subjects simply recall their pain intensities and behaviors accurately, and so the sums of such reports are also accurate. Another is that on an item-by-item basis, recall is actually quite poor. But the error on each item is random, so that the mean across all items yields the expected value for that item. The next set of analyses, reported in table K, explored which of these two explanations for the relative accuracy elicited by this experiment is more likely the case. In table K, actual and recalled frequencies by diary conditions are reported for each of the 16 pain and control behaviors.

Two analyses were conducted on these means. First, using one-way ANOVAs, we examined whether the subjects assigned to the four cells differed in their recall of the frequency of each variable. Even though such a univariate analysis tends to maximize Type I error, none of the analyses produced a significant result. (It should be noted that within-cell standard deviations were quite high.) In other words, no matter to what diary condition subjects were assigned, they all recalled the frequency of each pain and control behavior approximately equally. For example, the number of days recalled for taking an aspirin ranged from 6.20 in the no diary condition to 8.92 in the behavior diary condition, but these differences were not statistically significant ($F(3, 103) = 0.41$, n.s.).

Our second analysis of these data involved comparing, in the diary conditions where this was possible (i.e., behavior diary, both diaries), recalled-versus-actual frequencies for the 16 behaviors. Using two-way ANOVAs, with the two diary conditions as a between subjects IV and

Table J. Experiment 3—Recall by diary condition

Measure	*Behavior diary (n = 26)*	*Pain diary (n = 23)*	*Both diaries (n = 23)*	*No diary (n = 35)*
Pain intensity				
Average pain intensity:				
Recall:				
Mean	6.00	6.09	5.91	6.71
Standard deviation	1.60	1.50	2.00	1.64
Actual:				
Mean	...	6.18	6.07	...
Standard deviation	...	1.44	1.95	...
Days of pain greater than 2:				
Recall:				
Mean	24.50	25.96	26.74	24.26
Standard deviation	6.81	6.43	6.40	8.07
Actual:				
Mean	...	27.17	26.78	...
Standard deviation	...	3.49	6.04	...
Days of pain greater than 5:				
Recall:				
Mean	17.81	18.09	17.30	18.20
Standard deviation	9.10	7.37	10.25	9.07
Actual:				
Mean	...	18.43	17.78	...
Standard deviation	...	8.04	10.31	...
Days of pain greater than 8:				
Recall:				
Mean	7.96	4.91	5.95	9.29
Standard deviation	9.03	6.75	7.75	9.06
Actual:				
Mean	...	3.22	4.52	...
Standard deviation	...	6.25	6.94	...
Pain behaviors				
Recall:				
Mean	90.92	92.91	99.17	101.46
Standard deviation	45.90	41.64	49.08	45.68
Actual:				
Mean	83.82	...	95.36	...
Standard deviation	39.01	...	46.42	...
Other behaviors				
Recall:				
Mean	68.38	67.13	66.17	63.80
Standard deviation	29.14	22.70	23.03	23.81
Actual:				
Mean	71.83	...	61.52	...
Standard deviation	26.85	...	19.61	...

actual versus recall as a within subjects IV, there were no significant differences either due to condition or in actual versus recalled frequencies. There was but one significant condition x actual/recall interaction. Subjects in the behavior diary-only condition recalled complaining more than was actually reported in their diaries. But this was the only difference between a recalled and actual mean that was statistically significant in all of table K. In other words, among the subjects for whom we could compare actual versus recalled frequencies of pain and control behaviors, recall appeared to be quite accurate on virtually every (i.e., all but one) item. These issues are further addressed in the analyses of these data presented in appendix I.

Discussion

Three general conclusions can be drawn from experiment 3: (a) both pain intensity and pain-related behaviors are recalled rather accurately, (b) what error there is in recall of pain intensity and behavior is generally unsystematic (neither consistent inflation nor deflation), and (c) the actual keeping of a pain intensity and/or pain behavior diary does not seem to affect subsequent recollections of pain intensity or pain behaviors. Additional data supporting conclusions (b) and (c) are described in appendix I.

To detect small but systematic biases in recall, a power analysis conducted prior to the start of the experi-

ment suggested that a sample size of approximately 80 subjects would have been sufficient. With the larger sample recruited for this experiment, we can be confident that our conclusions supporting the accuracy of pain reporting are at least not due to low power.

There are a couple of other interesting aspects of experiment 3. When diarykeeping did have an effect on subsequent recall (and even this effect was small, see appendix I), it tended to be on the nonpain relevant behaviors like eating chicken (cf. Smith, Jobe, and Mingay (45), who did not find diarykeeping effects on the subsequent recall of dietary information across a much larger set of foodstuffs), talking on the telephone, or writing a letter. If any recall inaccuracies were revealed (and there were not many), they were located primarily on pain behaviors like "complaining" that were rather vague and unspecific (Exactly what constitutes a complaint?) compared with the other behaviors (e.g., taking a prescription drug, using a heating pad, using a crutch, etc.). But again, the dominant findings were (a) little effect on subsequent responses of diarykeeping and (b) few systematic inaccuracies in the recall of pain intensity or behaviors.

In essence, asking about rather concrete pain-related behaviors (and pain intensity) seems more or less free, at least in the present context, from the systematic biases that have plagued other studies (reviewed at the beginning of this report). Of course, our pain subjects were not being treated for their pain problems (and, hence, their pain experiences and behaviors may have been rather stable over time, yielding better recall later).

Experiment 4: Stability of self-report pain severity, interference with life tasks, and interviewer ratings of pain behavior

Background

Recall of how pain interferes with life activities and the ratings of pain behaviors by observers may be more stable over time than an individual's recall of pain intensity. The present experiment examined whether an interviewer can elicit fairly stable information about the impact of pain on an individual's life and observe and rate pain behaviors. In this study, individuals who experience chronic, daily pain rated their typical level of pain intensity and amount of interference caused by pain at two points in time. At these same two points in time, an interviewer observed and coded their pain behaviors. These sources of data were compared to determine the relative stability of self-reports of pain, interference, and observed pain behaviors. We examined whether there is greater test–retest reliability in observed pain behaviors and recall of activity interference than in recall of pain intensity.

The West Haven—Yale Multidimensional Pain Inventory (WHYMPI) is one attempt to assess pain by examining its impact on the life of the patient rather than by relying exclusively on pain descriptors (17). The WHYMPI consists of three sections. The first contains measures of (a) pain severity and suffering; (b) pain-related life interference (interference with family and marriage, work, and

Table K. Experiment 3—Actual and recalled behaviors by condition

	Behavior diary (n = 26)		*Pain diary (n = 23)*		*Both diaries (n = 23)*		*No diary (n = 35)*	
Behavior	*Actual*	*Recalled*	*Actual*	*Recalled*	*Actual*	*Recalled*	*Actual*	*Recalled*
Pain behaviors								
Take aspirin	7.16	8.92	...	5.78	8.52	7.09	...	6.20
Take other over-the-counter medication	6.45	5.85	...	7.70	6.83	9.43	...	4.54
Take prescription medication	14.79	13.73	...	14.39	19.29	19.43	...	16.37
Use a heating pad	9.96	10.00	...	7.00	6.64	7.30	...	8.71
Use a hot water bottle	1.12	1.00	...	1.17	0.84	0.74	...	2.11
Take nap	11.14	10.54	...	12.43	12.21	10.39	...	11.43
Use crutch	2.65	1.85	...	6.13	9.22	9.30	...	5.20
Ask for help	8.22	9.88	...	10.78	9.72	11.74	...	14.89
Complain	11.05	14.69	...	18.00	10.89	11.87	...	17.94
Avoid physical activities	11.27	13.08	...	9.52	11.19	11.87	...	14.00
Other behaviors								
Pay bill	6.47	5.35	...	4.91	5.40	5.30	...	4.33
Read news	20.71	21.31	...	20.70	19.74	19.61	...	20.69
Eat chicken	6.79	7.00	...	5.43	5.40	7.70	...	5.00
Talk on the phone	24.64	24.77	...	27.78	21.89	22.87	...	25.77
Use a postage stamp	9.23	7.00	...	7.35	6.64	7.83	...	7.03
Write letter	3.99	2.96	...	0.96	2.45	2.87	...	1.23

recreational activities); (c) dissatisfaction with present levels of functioning; (d) appraisal of support from spouse, family, and others; (e) perceived life control, problem-solving ability, and feelings of mastery and competence; and (f) affective distress. The second part of the WHYMPI was designed to evaluate patients' perceptions of the range and frequency of responses by significant others to displays of pain and suffering and contains three scales: punishing responses, solicitous responses, and distracting responses. The third part is a set of 30 common domestic activities, household chores, social activities, and recreational activities about which individuals can indicate their level of participation. Kerns et al. (17) reported adequate internal consistency and stability for all of the subscales. In its final form, the WHYMPI contains 60 items. At present, no empirical work has examined accuracy of recall for information reported on the WHYMPI, especially the scales in parts 1 and 3 (which concern us here), compared with recall of the intensity and quality of experienced pain.

A second approach to attenuating the biases inherent in the self-report of pain intensity and quality is to rely on ratings of observable pain behaviors instead. The interest in pain behaviors is usually traced to Fordyce's (18) influential work on operant learning factors in the pain experience. Fordyce proposed that patients display a range of pain behaviors that serve to communicate to others that they are experiencing pain and suffering. According to Fordyce, these might include verbal complaints, paraverbal sounds (e.g., moans), body posturing and gesturing, display of functional limitations or impairments, and medication use and other pain-attenuating behaviors. Other studies of pain behavior have been reported in the literature as well. For example, Turk, Wack, and Kerns (21), using multidimensional scaling and cluster analysis, identified two primary dimensions around which pain behaviors could be organized: audible-visible and affective-behavioral. Four clusters of pain behaviors were superimposed on these dimensions and labeled (a) distorted ambulation and posture, (b) negative affect, (c) facial/audible expressions of distress, and (d) avoidance of activity.

The accurate observation and measurement of pain behaviors by health care professionals and other interviewers is somewhat complicated. According to Turk and Flor (46), the most systematic approach to the quantification of pain behaviors is that of Keefe and his colleagues. For example, Keefe and Block (19) developed an observer coding system for five pain behaviors typically displayed by back pain patients. Patients were videotaped while performing a structured task, and the frequency of their pain behaviors counted. These behaviors seem to be observed reliably, are correlated with patients' and observers' subjective pain ratings, and are specific to pain patients (compared, for example, to depressives and normals (47–50)). Other pain behavior rating systems have been developed that do not require videotaping and can be more easily performed by lay observers (e.g., 20, 51).

Table L. Experiment 4—Pain behavior rating form
[0 = present; 1 = not present]

Behavior	*Rating*	
Verbal behaviors		
1. Mentions having pain	0	1
2. Complains about pain	0	1
3. Gives lively descriptions of pain	0	1
4. Groans, moans, or sighs	0	1
5. Cries	0	1
6. Asks for help from others	0	1
Grimaces and rubbing		
7. Grimaces	0	1
8. Rubs painful parts of body	0	1
Sitting and standing		
9. Braces while sitting down into chair	0	1
10. Changes positions while sitting	0	1
11. Braces while rising after sitting	0	1
12. Stands in an unusual posture	0	1
Walking		
13. Moves rigidly and stiffly	0	1
14. Walks with an abnormal gait	0	1
15. Walks guardedly and carefully	0	1

Design and method

Forty adult volunteers from the New Haven community with chronic pain problems of at least 6 months duration were asked to complete the West Haven—Yale Multidimensional Pain Inventory (WHYMPI). This measure assesses pain intensity and consequent suffering, but also examines the impact of pain on patients' lives and the extent to which patients participate in common daily activities.

Subjects were also interviewed by two research assistants. The interview provided an opportunity for pain behaviors to be elicited. On the way to the interview room, subjects walked up two flights of stairs and opened a sticky door. Once in the room, they sat in a chair, bent down to pick up a dropped pen, and at the termination of the interview rose from their chairs and walked out of the room. The interviewers coded 15 pain behaviors on 2-point scales (present/not present).

The pain behavior coding scheme used here was a substantially modified version of the University of Alabama at Birmingham (UAB) Pain Behavior Scale (20, p. 393) and can be found in table L. Interrater reliability for the UAB scale has been reported to be between .94 and .96, and test–retest reliability within individual pain patients on consecutive days is .89. The validity of this pain behavior rating scale with outpatients has been demonstrated by Feuerstein et al. (52). After several rounds of practice, our two raters were able to achieve adequate reliability in the present experiment (kappa ranged from .81 to .90 in several different subsamples).

One month later, subjects returned to the laboratory and were asked to complete the WHYMPI pain intensity

Table M. Experiment 4—Descriptive statistics on measured variables at two points in time

Variable	*Time 1*	*Time 2*
WHYMPI ratings of pain intensity		
Pain severity:		
Mean	3.18	3.14
Standard deviation	1.26	1.40
Range	0.67–5.67	0.67–6.00
WHYMPI ratings of life tasks		
Pain interference:		
Mean	3.45	3.18
Standard deviation	1.37	1.26
Range	0.64–6.00	0.73–6.00
Household chores:		
Mean	3.51	3.43
Standard deviation	1.27	1.48
Range	0.80–6.00	0.80–6.00
Outdoor work:		
Mean	1.54	1.48
Standard deviation	1.19	1.06
Range	0–4.20	0–4.00
Activities away from home:		
Mean	3.01	2.77
Standard deviation	1.19	1.18
Range	0.25–6.00	0–6.00
Social activities:		
Mean	2.69	2.41
Standard deviation	1.02	1.16
Range	0.75–4.67	0–6.00
Observed behaviors		
Summed pain behavior ratings:		
Mean	4.68	4.33
Standard deviation	4.19	4.36
Range	0–19	0–13

Note: $n = 40$.

and interference measures. In addition, the interviewers recorded their pain behaviors. During the intervening month, none of the patients had initiated any treatment for the pain problem. Subjects were paid $5 for each of the two visits to our laboratory.

Results

Descriptive statistics for the WHYMPI subscales and interviewer ratings of pain behaviors as the two points in time are provided in table M. In general, the mean ratings on all measures—pain severity, interference with life tasks, and observed pain behaviors—were rather stable across the 1-month time frame. There were no significant differences due to time on any of the measures.

Correlations between ratings made at time 1 and those made 1 month later are provided in table N. The

Table N. Experiment 4—Pearson correlations from time 1 to time 2

Variable	*R*
WHYMPI ratings of pain intensity	
Pain severity	***.74
WHYMPI ratings of life tasks	
General pain interference	***.86
Household chores	***.82
Outdoor work	***.82
Activities away from home	***.78
Social activities	**.46
Observed behaviors	
Pain behavior ratings	***.71

Note: $n = 40$.
*$p < .05$
**$p < .01$
***$p < .001$

largest correlations, representing the most stable measures, are those that concern interference with life tasks, both the general measure and four of the five specific activities (e.g., $r(40) = .86$ for the general interference scale). Moreover, the observed behaviors were quite stable over 1 month as well ($r(40) = .71$). Pain severity ratings at the two points in time were also significantly correlated ($r(40) = .74$). These three correlations did not differ significantly from one another.

Discussion

The fairest conclusion from experiment 4 is that all three measures of pain—self-reported intensity, self-reported interference, and observed pain behaviors—represent equally stable sources of information about pain. Perhaps it is remarkable that interference and behavioral ratings are about as stable as self-reported pain severity given the complexities involved in measuring such constructs reliably. Moreover, these measures of pain may represent potentially more useful information to survey researchers than intensity data.

It seems reasonable to conclude that if more information than mere recollections about pain intensity is desired, information that is as stable over time as intensity can be elicited through questions concerning pain's interference with life activities or by asking survey takers to score observed pain behaviors. This last suggestion may not be as impractical as it might seem at first blush. Our two pain raters were students not pain professionals, and they were able to rate pain behaviors with considerable reliability without substantial training. Perhaps this would be true as well for the interviewers administering national health surveys.

Issue III: Mental states, pain reporting, and pain recall

Experiment 5: Recalling past pain when present pain fluctuates

Background

Pain researchers have long been concerned that retrospective ratings of pain made after pain has been relieved (or changed in intensity in other ways) are most likely inaccurate (12, 25). The biasing effects of present pain levels on past pain recall were explored in experiment 5.

In the same way that happy-versus-sad moods facilitate the recall of positive-versus-negative material from memory (e.g., 33), ongoing pain experiences may have similar assimilative effects on memory. Eich, Reeves, Jaeger, and Graff-Radford (32) have noted that because affect is an integral component of pain behavior and experience, pain may produce assimilative effects on memory that parallel those engendered by emotions. This line of theorizing suggests that prior pain is remembered as more severe than it actually was when the intensity of present pain is high, but as less severe when the present pain is low (32, p. 376).

Eich and his colleagues asked 57 headache patients to maintain pain diaries during a treatment program by asking them to record hourly ratings of pain on a 10-point scale. In addition, during weekly scheduled appointments, they were asked to rate their present pain intensity on the usual visual analog scale. They were then asked to recall the "maximum," "usual," and "minimum" levels of pain experienced since their last visit. Patients' ratings of present level of pain strongly associated with their recall of maximum, usual, and minimum pain levels since the last visit. When present pain was high, patients' recalled pain levels were higher than their pain diaries indicated. When present pain was low, their recalled-pain ratings were less severe than indicated by the diaries. Eich et al.'s results suggest that studies of pain recall in which currently pain-free subjects are asked to recall past pain episodes should result in underestimations of past pain (e.g., 25), but that when subjects who are still experiencing pain are asked to recall past pain, they should overestimate it (e.g., 24).

Thus, respondents may use easily available information about their present pain as a basis for judging past pain episodes, and present pain may make memories for previous painful situations more available (cf. 53–55). If present pain does influence survey responses, then the designers of health surveys may wish to include questions that assess present pain intensity.

Design and method

Eighty patients undergoing pain assessment at the Pain Evaluation and Treatment Institute served as subjects in this experiment. All subjects had experienced pain for at least 6-months duration but were not yet undergoing active treatment at the time of the study. Subjects were paid $10 for their participation.

Each subject was asked to provide a rating of their pain on an hourly basis for 2 weeks. Subjects were asked to circle a number between 0 (no pain at all) and 9 (pain as bad as it could be) hourly on a postcard for each day during the 14-day diarykeeping period. At the end of each day, subjects were asked to mail in the postcard.

At the conclusion of the diary period, patients were contacted by phone and asked to (a) rate their present pain intensity on a 10-point scale and (b) complete the Pain Rating Index of the McGill Pain Questionnaire, (c) rate on 10-point scales their estimates of the usual amount of pain they experienced during the 2-week diary period, (d) rate the maximum and minimum amount of pain experienced during the diary period, and (e) estimate the number of days during the diary period that their pain exceeded various predetermined criteria.

Results

Table O provides means and standard deviations for the major variables collected through diaries and at the time of recall. A daily mean of the hourly pain ratings was computed and then for each subject a mean of these daily means across the 14-day diary period was calculated. As a measure of variability in a subject's hourly pain ratings, we computed the standard deviation in hourly ratings each day and then calculated the mean of these standard deviations across the 14-day period. The mean daily pain rating was 5.53 on the 0–9 scale with a mean daily standard deviation of 0.92.

Means collected at recall could be compared with those calculated from the diary reports. Subjects remembered their "usual" level of pain as 5.61, which is quite close to the actual diary average of 5.53. However, on frequency-oriented questions, subjects showed some tendency to recall pain as more severe than indicated by the

Table O. Experiment 5—Descriptive statistics for measured variables

Variable	*Mean*	*Standard deviation*	*Range*
Diary scales			
Mean pain reported/day	5.53	1.97	0.1–9.0
Mean standard deviation/day	0.92	1.38	0–7.9
Number of days greater than 2	12.84	2.47	0–14
Number of days greater than 5	7.86	5.51	0–14
Number of days greater than 8	1.95	4.19	0–14
Recall measures			
Current level of pain (at recall)	5.61	2.47	0–9
Usual level of pain	5.95	1.93	1–9
Worst level of pain	7.96	1.33	3–9
Least level of pain	3.30	2.23	0–9
Number of days greater than 2	12.14	3.58	0–14
Number of days greater than 5	9.00	4.85	0–14
Number of days greater than 8	3.62	4.38	0–14

Note: $n = 80$.

diaries. Subjects remembered 3.62 days with an average pain rating above 8, but in reality there were only 1.95. Similarly, they recalled 9 days on which their pain averaged more than a 5, but in fact there were only 7.86 such days. Discrepancy scores created by subtracting recalled ratings from diary ratings for these two measures were significantly different from zero ($t(79) = 5.31$, $p < .01$ and $t(79) = 2.49$, $p < .05$, respectively).

Another way of understanding these data is to note that only 8 of 80 subjects underestimated the number of days of pain intensity greater than 8, 30 subjects estimated them correctly, and 42 subjects overestimated such days. Estimates of days averaging greater than a pain rating of 2 were more accurate (12.14 recalled, 12.84 in diary), but for most subjects virtually every day averaged greater than 2 and so the recall task regarding this item is probably much too easy to show systematic inaccuracies.

In table P, Pearson correlations are provided between ratings from the diary scales and the recall measures. Associations between pain level at the time of recall and the other recall measures are listed as well. Obviously, people experiencing more intense pain at the time of recall are more likely to be those individuals who experienced more intense pain during diarykeeping. So, it is not surprising that there are many positive correlations between pain intensity on the diaries and pain intensity at recall. Once again, recalled average pain seems fairly accurate; there is a .83 correlation between average pain ratings on the diaries and estimates of "usual" pain at recall. Similarly, recall of days greater than 8 was correlated with the actual number of such days at .75, and for days greater than 5, the correlation was .71. The range for days greater than 2 was too restricted for large correlations to emerge on this measure (e.g., more than half of the subjects indicated that their pain was greater than 2 on all 14 days).

Finally, multiple regression analysis was used to test the magnitude and direction of influence that pain at time of recall has on remembered pain intensity. The criterion for this analysis, which is presented in table Q, was recalled "usual" amount of pain. We entered into the analysis as predictors (a) actual mean daily pain from the diaries, (b) the mean standard deviation of daily pain from the diaries (to control for amount of pain fluctuation— we were concerned that if pain rarely fluctuated, its intensity is easier to recall), and (c) pain at the time of recall. Not surprisingly, the best predictor of recalled pain was actual mean pain during the diary period. But, after entering this variable and controlling for fluctuation (mean standard deviation), pain at the time of recall contributed significant variance to recalled "usual" level of pain in a positive direction. Subjects who were in greatest pain at the time of recall, were most likely to inflate their recall of pain intensity.

Discussion

Present levels of pain do influence recollections of past pain. Subjects who experienced more pain at the time of recall, remembered pain during a prior diarykeeping period as more severe than subjects who experienced less pain at recall, controlling for actual levels of pain during the diary phase and fluctuations in this level of pain.

Table P. Experiment 5—Pearson correlations between diary scales and recall measures

	Diary scales					
Recall measures	*Mean pain*	*Mean standard deviation*	*Days greater than 2*	*Days greater than 5*	*Days greater than 8*	*Current level of pain*
Current pain	.74	–.16	.36	.66	.46	...
Usual pain	.83	.01	.42	.71	.59	.73
Worst pain	.68	.19	.45	.58	.33	.58
Least pain	.87	–.28	.30	.78	.66	.61
Days greater than 2	.36	–.12	.36	.35	.06	.29
Days greater than 5	.70	–.13	.35	.71	.30	.55
Days greater than 8	.62	–.07	.25	.47	.75	.44

Note: $n = 80$.
$|r| .22$; $p < 0.05$.
$|r| .29$; $p < 0.01$.
$|r| .36$; $p < 0.001$.

Table Q. Experiment 5—Predicting recalled usual levels of pain from actual mean during diary phase, variability during diary phase, and current level of pain

Predictor	*Beta*	*T*	*p*
Mean pain/day (diary)	0.54	5.27	.0001
Mean standard deviation/day (diary)	0.12	1.80	.08
Current pain (at recall)	0.38	3.62	.0006

Note: $R^2 = .73$; $F(3,76) = 55.43$; $p < .0001$.

In this study, there was a bit more evidence for bias in the recollection of pain intensities as compared with experiment 3. Although average intensity ratings tended to be remembered reasonably accurately, ratings regarding the number of days on which pain of different levels was experienced tended to be overestimated. This was not the case in experiment 3, but the standard deviations for both the diary ratings and the recalled estimates for these variables tended to be higher in that study (perhaps due to the longer recordkeeping interval) and may have masked the significance of mean differences.

In a recent article, Eich, Rachman, and Lopatka (35) claimed that the impact of present levels of pain on memory for autobiographical information may be mediated by mood. In a well-designed study, they found that female undergraduates experiencing menstrual pain retrieved more negative life events from memory than when they were pain free only if menstrual pain was accompanied by an increase in sad mood. With this finding in mind, we turn to our final experiment, which tested whether induced mood biases recall and judgments about pain.

Experiment 6: Mood congruent recall of and judgments about pain

Background

The most frequently cited causes of inaccuracy in the recall of pain episodes are affect related. Respondents who experienced fear of going to the dentist remembered dental pain as more severe than it actually was. Mothers experiencing the joy of giving birth to a new baby tended to underreport the intense pains of labor after the baby was born. On the other hand, individuals experiencing depressed moods, perhaps because their pain problems had not been alleviated, tended to overestimate the intensity of previous painful experiences. Each of these situations exemplifies the important role played by affect in the recall of pain. Despite its common endorsement as an important factor resulting in inaccurate pain reporting, survey researchers have tended to give scant attention to affect in the design of surveys and in the interpretation of their results. Yet, in the past decade, cognitive and personality/social psychologists have become intrigued by the role played by moods and emotions in the processing of information (reviewed in 34, 56–58).

There are different ways in which ongoing affective states might bias the recall of pain experiences. One could be called "mood congruent pain reporting," in which individual's current mood state, perhaps by influencing the accessibility of positive-versus-negative memories, directly biases ratings in a direction consistent with this mood state. The second bias may occur when mood at the time of the pain rating does not match the individual's initial mood during the pain experience. This mismatch in affective context does not allow the individual to experience the memorial benefits of state-dependent learning and recall. These two roles for affect in biasing pain recall correspond to what has been termed "thought congruity" (or "mood congruent recall") and "state-dependent recall" in the memory literature (59). Thought congruity or mood congruent recall can be described as the phenomenon whereby respondents' thoughts, free associations, fantasies, interpretations, and judgments are thematically congruent with their mood states. State-dependent recall describes the superior accuracy observed when mood state during test matches mood state during learning than when these mood states do not match.

Let us examine the direct impact of mood on pain ratings first. An observation made by mental and physical health care professionals alike is that patients reporting psychological distresses also complain of a variety of physical symptoms (60). In particular, complaints of diffuse aches and pains are especially likely among patients experiencing dysphoric moods. Perceived health status varies directly with degree of dysphoria (61). Of course, the causal direction of the relationship between psychological distress and physical symptoms is not always clear.

Croyle and Uretsky (62) reported a study in which they induced happy and sad moods in the laboratory and noted that sad subjects perceived themselves to be less healthy following negative mood induction. Salovey and Birnbaum (63) asked 66 individuals suffering from influenza to experience either happy, sad, or neutral laboratory-induced moods. They later assessed the aches, pains, and other symptomatic discomforts experienced by these individuals. Two relevant findings emerged. The first was that mood had its most powerful impact on measures of aches and pains as compared with other symptoms of the flu (e.g., nasal congestion, gastrointestinal distress, sleepiness). The second finding was that reports of aches and pains varied depending on subjects' assignment to mood condition. Subjects induced into mildly sad affective states in the laboratory reported considerably greater pain than neutral mood (control) subjects. Conversely, happy subjects reported fewer aches and pains.

Results consistent with these have been reported in the pain recall literature. For example, Hunter et al. (25) identified a group of "shifters," subjects whose recall of headache pain was most biased after 5 days. Shifters tended to have higher levels of pain intensity and to use significantly more negative affective words to describe their pain than the other patients. Similarly, Kent (29) noticed the most memorial distortion for dental pain among his subjects who reported the greatest dysphoric

affect associated with dental procedures. His subjects tended to distort their recall for dental pain in a direction consistent with their anxiety.

The second way in which mood may affect pain-related memory is that accurate recall is promoted when mood at the time of initial encoding matches mood at time of recall, the state-dependent memory effect (33). In any kind of state-dependent memory phenomenon (e.g., 64, 65), contextual factors (in this case, mood) serve as discriminative cues, such that when learning and recall contexts match, memory is facilitated, and when the two contexts differ, memory is inhibited. Several studies have indicated, although the effect is not always obtained, that mood can act as such a contextual cue in learning and recall (66, 67).

Studies of mood state-dependent memory lead to the hypothesis that when mood at the time of the initial experience of pain matches mood at the time of pain recall, recall should be more accurate than when there is a mismatch. So, for example, in the Hunter et al. (25) study, higher levels of dysphoric affect at assessment were more strongly associated with "shifting" than any other variable. Similarly, the positive affect associated with the birth of a new baby does not match the negative affect associated with the actual pain of labor, and recall of labor pain postpartum can be expected to be quite poor (31). Moreover, the poor recall of preoperative pain following surgery for rheumatoid arthritis among Roche and Gijsbers's patients (27) has been explained (by them) as perhaps due to their much improved affective state following successful surgery. Many other studies showing poor recall of pain often relied on initial ratings of pain at a time of heightened dysphoric affect and then later recall when individuals were feeling much better (e.g., 23, 24).

In addition to these two memory-based consequences of sad mood, negative mood has a second effect that also predicts it should cause pain estimations to be exaggerated. Sad moods result in a tendency to focus attention on the self and away from external stimuli (68–77). Individuals experiencing negative affect should thus be more attentive to physical symptoms and other bodily changes. Because of this bodily preoccupation brought on by sad mood in combination with the ease with which negative events and experiences are brought to mind when sadness is induced, judgments of present levels of pain should be more severe among sad subjects, even if the sadness is transient.

The literature reviewed suggests that judgments about present pain and recall of prior pain episodes are influenced by mood. In particular, survey responses regarding pain may be rendered less accurate when respondents are experiencing reasonably intense moods and emotions, or when their current moods are quite different from their dominant affect at the time of the painful experience. The purpose of experiment 6, then, was to evaluate whether acute mood states influence reports of pain. In the first version of the present experiment (called experiment 6A), 94 college student subjects were assigned to each of three mood induction conditions, happy, sad, and neutral (control). The experiment was then replicated (experiment 6B) with 89 adult subjects recruited from the local community.

Experiment 6A: College student subjects

Method

Ninety-four undergraduates (51 males and 43 females) enrolled in an introductory psychology course served as subjects and received course credit for their participation. Subjects were between the ages of 18 and 23.

A tape-recorded mood induction procedure based on one developed by Wright and Mischel (78) and previously used in this laboratory (63, 79) was employed. Subjects were told that the focus of the study was on their ability to imagine vividly a past event and therefore they would be asked to try to visualize a scene as earnestly as possible. Once seated in private cubicles, subjects listened through headphones to a tape-recorded message. Subjects were instructed by a taped female voice to imagine a previously experienced event during which they felt either happy, sad, or neither happy nor sad. The specific instructions were as follows:

> I would like for you to begin imagining a situation that would make you feel (happy, sad, or neutral). Imagine the situation as vividly as you can. Picture the events happening to you. See all the details of the situation. Picture in your "mind's eye" the surroundings as clearly as possible. See the people or objects; hear the sounds; experience the event happening to you. Think the thoughts you would actually think in this situation. Feel the same (happy, sad, neutral) feelings you would feel. Let yourself react as if you were actually there.

Subjects were then given approximately 3 minutes to visualize the event and experience the feelings. This procedure, called Self-Generated Imagery, has been shown effective in inducing various mood states (63, 78, 79).

The following measures were completed before the mood induction procedure was administered:

(a) Happiness subscale of the Differential Emotions Scale (DES; 80). Subjects rated on 7-point Likert-type scales 16 different adjectives that loaded on the happiness factor of the DES.

(b) Present symptoms and pain questionnaire. Subjects were asked to check on a list of 33 symptoms (e.g., sore throat, headache) whether they had experienced the sensation (a) in the previous 7 days, (b) in the previous 24 hours, and (c) if experienced, how much discomfort they endured due to the symptom (0–4 scale). This symptom list was based on the Wahler (81) Physical Symptoms Inventory.

The following questionnaire was completed after the mood induction procedure and served as a check on effectiveness of mood induction:

Mood manipulation check. On 7-point scales, subjects were asked to rate their feelings using a list of six adjec-

Table R. Experiment 6A—Means on mood and symptom scales prior to mood induction by mood and gender

	Assigned mood condition					
	Happy		Neutral		Sad	
Scale	Male (n = 15)	Female (n = 15)	Male (n = 17)	Female (n = 14)	Male (n = 19)	Female (n = 14)
Differential emotions scale:						
Mean	4.48	4.36	4.24	4.84	4.22	4.30
Standard deviation	.95	1.10	1.05	1.06	.83	1.27
Present symptoms and pain—past 24 hours:						
Mean	8.57	7.47	7.24	6.29	6.63	8.79
Standard deviation	7.63	4.66	5.89	3.34	4.30	3.62
Present symptoms and pain—past week:						
Mean	11.60	10.73	12.00	9.29	9.89	12.14
Standard deviation	7.33	4.85	5.83	4.89	4.01	3.70
Present symptoms and pain—discomfort:						
Mean	.94	.70	.65	.62	.56	.72
Standard deviation	.93	.37	.51	.45	.40	.33

tives (e.g., not happy–very happy, not content–very content). This measure has been used previously as a brief but reliable check on laboratory induced joy and sorrow (e.g., 82).

The following measures served as the primary dependent variables in this experiment:

(a) Recall of painful incident. Subjects were asked to recall a recent event (from the past year) in which they experienced physical pain. Subjects were then asked several questions concerning the pain. They were to describe briefly the incident, report how long the pain lasted and when it occurred. Subjects were asked to rate the maximum level of pain experienced during this incident by marking an X on a 100-millimeter (mm) visual analog scale (VAS) ("no pain" to "pain as bad as it can be"). Similarly, they were asked to rate on the 100-mm VAS the "average" amount of pain experienced, how much this pain interfered with daily activities, and how vividly the incident could be recalled. Subjects also reported on the pain's temporal qualities (e.g., constant, rhythmic, or brief) and its severity using the Pain Rating Index (PRI) and pain adjectives of the McGill Pain Questionnaire (MPQ) (12).

(b) Pain scenarios and judgments. Subjects read six scenarios describing hypothetical situations in which pain was experienced by the protagonist. After reading each scenario, subjects rated the intensity of the hypothetical pain (on a 100-mm VAS) one would experience immediately following the incident, the intensity of pain that would be experienced 10 minutes later, and the quality of pain on the MPQ pain adjectives. The order of presentation of the six stories was randomized and responses averaged across them.

(c) Pain during past year. Subjects indicated which of seven types of pain they had experienced in the past year: headaches, backaches, stomach aches, joint pains, muscle pains, dental pains, and pain for other reasons. For each type of pain, subjects estimated the number of days on which it was experienced in the previous 12 months, the usual severity of the pain (on a 0–5 scale), and the maximum pain experienced (also on a 0–5 scale).

Results

A two-way (gender x assigned mood induction condition) multivariate analysis of variance (MANOVA) was conducted across the variables that were measured prior to the mood induction procedure. These included the Differential Emotions Scale, the measures of present symptoms, symptoms from the past week, and discomfort due to symptoms. The purpose of this analysis simply was to demonstrate that prior to mood induction, there were no differences in either mood or symptom reporting across the three groups. Neither the main effect for mood, gender, nor the mood by gender interaction approached significance. Means for these measures are provided in table R.

A two-way ANOVA (gender x mood) was conducted on the six-item mood check to ensure that happy and sad moods had been properly induced. As can be seen in table S, subjects reported the most positive affect in the happy condition and the least in the sad condition ($F(2,88) = 42.00$, $p < .0001$). According to Tukey's Multiple Comparison Procedure, both the happy and sad conditions produced significantly more and less positive affect, respectively, than the neutral condition. Neither the main effect for gender nor the mood x gender interaction was significant.

Subjects next recalled a recent painful episode, rated its intensity on the several visual analog scales and rated the quality of the painful experience on the McGill Pain Questionnaire adjectives. The means for these ratings are also displayed in table S. A two-way MANOVA across this set of dependent variables revealed no main effect for mood (Wilks's lambda = 0.84, $F(16, 162) = 0.92$), but a significant main effect for gender (Wilks's lambda = 0.70, $F(8,81) = 4.42$, $p < .0005$). The mood x gender interaction was not significant (Wilks's lambda = 0.80, $F(16, 162) = 1.22$).

Table S. Experiment 6A—Ratings of recent painful experience after mood induction by mood and gender

Measure	Mood induction condition					
	Happy		Neutral		Sad	
	Male	Female	Male	Female	Male	Female
Mood check:						
Mean	30.67	28.07	23.76	27.07	15.47	13.29
Standard deviation	8.36	9.22	5.38	5.64	6.40	3.79
Pain maximum (100-mm VAS):						
Mean	78.53	68.87	53.47	76.57	68.53	60.21
Standard deviation	25.05	23.07	29.04	18.26	22.72	20.49
Pain average (100-mm VAS):						
Mean	56.27	48.87	35.18	51.64	54.53	35.71
Standard deviation	24.34	23.39	23.04	23.05	23.56	20.27
Pain interference (100-mm VAS):						
Mean	47.33	54.13	25.88	58.43	45.37	45.86
Standard deviation	35.82	37.69	27.18	36.89	30.91	27.98
Pain vividness (100-mm VAS):						
Mean	81.93	67.27	55.71	77.79	68.79	64.50
Standard deviation	24.87	24.47	33.27	32.55	27.98	31.33
MPQ sensory adjectives:						
Mean	16.47	12.73	12.76	14.71	18.47	14.64
Standard deviation	7.31	6.36	5.34	7.93	8.25	5.00
MPQ affective adjectives:						
Mean	3.47	3.87	1.24	3.29	3.68	1.43
Standard deviation	3.34	4.16	1.95	2.76	3.56	1.28
MPQ evaluative adjectives:						
Mean	2.67	3.13	1.76	3.50	2.42	2.21
Standard deviation	1.45	1.41	1.39	1.34	1.26	1.19
MPQ total score:						
Mean	30.13	24.26	20.82	25.79	31.47	22.14
Standard deviation	13.84	11.92	8.62	13.18	14.33	6.71

Table T. Experiment 6A—Pain ratings of hypothetical stories by mood and gender

Measure	Mood induction condition					
	Happy		Neutral		Sad	
	Male	Female	Male	Female	Male	Female
Pain now:						
Mean	59.54	57.93	60.93	63.60	61.85	59.64
Standard deviation	15.70	14.48	14.20	13.80	14.06	12.25
Pain 10 minutes later:						
Mean	50.49	43.00	42.89	49.19	47.08	54.75
Standard deviation	13.63	12.49	16.33	14.19	15.50	8.04
MPQ sensory adjectives:						
Mean	15.06	12.04	13.26	13.81	16.72	15.64
Standard deviation	6.05	4.47	5.11	4.65	5.87	4.50
MPQ affective adjectives:						
Mean	3.32	1.38	2.11	2.55	2.66	2.63
Standard deviation	2.09	1.20	1.36	1.65	2.50	1.66
MPQ evaluative adjectives:						
Mean	2.80	2.28	2.68	2.69	2.55	2.80
Standard deviation	.54	.81	.47	.55	.67	.40
MPQ total score:						
Mean	26.84	19.57	22.84	23.33	27.45	26.71
Standard deviation	9.23	7.04	8.26	7.61	10.68	6.92

Table U. Experiment 6A—Recall of frequency of painful episodes from previous year by mood and gender

Measure	Mood induction condition					
	Happy		Neutral		Sad	
	Male	Female	Male	Female	Male	Female
Types of painful experiences during past year (0–7):						
Mean	4.40	4.73	4.59	4.36	4.53	4.93
Standard deviation	1.24	1.10	1.28	1.50	1.40	0.92
Sum of number of painful days during past year:						
Mean	227	170	112	197	175	272
Standard deviation	353	129	100	224	178	283
Mean rating of "usual" pain intensity:						
Mean	1.50	1.41	1.35	1.36	1.36	1.42
Standard deviation	.83	.41	.56	.58	.48	.24
Mean rating of "maximum" pain intensity:						
Mean	2.35	2.38	2.24	2.27	2.35	2.32
Standard deviation	1.23	.61	.76	.97	.85	.52

Followup two-way ANOVAs revealed that the main effect for gender was due to women rating their recalled pain experience as more interfering with daily routines than men ($F(1, 88) = 3.80, p < .05$), and, on the McGill Pain Questionnaire, women chose more evaluative adjectives than men ($F(1, 88) = 5.70, p < .05$). However, there were no other significant differences on ratings of the recalled painful episode.

There were no systematic differences for story version on the ratings of the six hypothetical stories so data were averaged across them. Means by mood and gender for these averaged ratings are displayed in table T. A two-way (mood x gender) MANOVA was conducted across the six story ratings. There was no mood main effect (Wilks's lambda = 0.88, $F(12,166) = 0.87$), nor a significant gender main effect (Wilks's lambda = 0.96, $F(6,83) = 0.64$), but there was a borderline significant mood x gender interaction (Wilks's lambda = 0.80, $F(12, 166) = 1.59, p < .10$).

Two-way univariate ANOVAs revealed significant or close to significant mood x gender interactions on the following variables: level of pain expected after 10 minutes ($F(2, 88) = 2.81, p < .06$), affective adjectives on the McGill Pain Questionnaire ($F(2, 88) = 3.62, p < .05$), and evaluative adjectives on the McGill Pain Questionnaire ($F(2, 88) = 3.38, p < .05$). On these variables, there were no systematic trends across the mood conditions among men. However, for women, significant linear trends (representing mood congruent pain reporting with lowest pain reported in the happy condition and highest in the sad condition) emerged for level of pain expected after 10 minutes ($F(1, 40) = 7.09, p = .01$) and on all of the MPQ adjective scales ($F(1,40) = 4.56$, 4.97, and 5.13, respectively, for sensory, affective, and evaluative adjectives, all $p < .05$). (These results should be interpreted with caution. Recall that the interaction term in the MANOVA was only significant at .10 in the first place, and we have not adjusted the alpha level here for the multitude of tests conducted.) Finally, subjects were asked to indicate whether they had experienced each of seven different kinds of pain during the past year (yes/no), to estimate the number of days on which the pain was experienced (0–365), to rate the usual level of intensity associated with each pain type (0–5), and to rate the maximum level of pain associated with each pain type (0–5). The ratings across the seven kinds of pain were then summed into indices for the first two measures and averaged for the latter two. Means on these indices by mood condition and gender are depicted in table U.

A two-way (mood x gender) MANOVA revealed no systematic effects for mood, gender, nor a significant mood x gender interaction. Inspection of the means for the sum of the number of painful days during the past year reveals

Table V. Experiments 6A and 6B—Correlations of baseline (noninduced) mood and pain ratings across all experimental conditions

Measure	Experiment 6A ($n = 94$)	Experiment 6B ($n = 89$)
Recent pain experience ratings		
Pain maximum	–.01	*–.23
Pain average	–.12	–.15
Pain interference	–.01	–.06
Pain vividness	–.06	**–.28
MPQ sensory	–.15	–.13
MPQ affective	–.10	–.03
MPQ evaluative	.04	–.12
MPQ total	–.10	–.08
Pain story ratings		
Pain now	–.11	.06
Pain later	.00	.02
MPQ sensory	–.02	.06
MPQ affective	–.11	.05
MPQ evaluative	.01	.01
MPQ total	–.03	.03
Frequency of pain episodes		
Types of pain	–.03	*–.21
Number of pain days	.01	–.12
Usual pain intensity	–.07	–.13
Maximum pain intensity	.01	*–.23

Note: $*p < .05$; $**p < .01$.

Table W. Experiment 6B—Means on mood and symptom scales prior to mood induction by mood and gender

	Assigned mood condition					
	Happy		Neutral		Sad	
Scale	Male (n = 15)	Female (n = 15)	Male (n = 14)	Female (n = 15)	Male (n = 15)	Female (n = 15)
Differential emotions scale:						
Mean	4.74	4.75	4.54	4.47	4.55	4.40
Standard deviation	1.24	0.93	0.87	1.21	0.92	1.05
Present symptoms and pain—past 24 hours:						
Mean	6.93	11.20	14.14	5.07	5.67	7.67
Standard deviation	6.37	15.99	17.54	3.47	4.61	5.29
Present symptoms and pain—past week:						
Mean	13.20	18.07	15.36	8.33	10.80	9.47
Standard deviation	15.46	19.34	16.19	5.43	5.52	5.00
Present symptoms and pain—discomfort:						
Mean	.62	.68	.58	.45	.59	.70
Standard deviation	.56	.57	.26	.33	.32	.40

Table X. Experiment 6B—Recall of frequency of painful episodes from previous year by mood and gender

	Mood induction condition					
	Happy		Neutral		Sad	
Measure	Male	Female	Male	Female	Male	Female
Mood check:						
Mean	30.33	31.07	25.79	24.53	17.40	13.13
Standard deviation	7.57	7.82	5.91	7.78	5.15	5.91
Types of painful experiences during past year (0–7):						
Mean	4.00	4.60	4.07	3.53	3.60	3.80
Standard deviation	1.41	2.61	1.69	1.55	1.92	1.61
Sum of number of painful days during past year:						
Mean	345	113	150	237	196	234
Standard deviation	438	199	165	303	244	281
Mean rating of "usual" pain intensity:						
Mean	1.10	1.00	1.11	1.09	.98	1.30
Standard deviation	.84	.70	.66	.61	.74	.69
Mean rating of "maximum" pain intensity:						
Mean	1.67	1.19	1.91	1.69	1.55	1.87
Standard deviation	1.10	.89	1.12	1.05	1.17	1.04

weak support for mood congruent recall among the women (i.e., sad high, happy low) for these ratings, but, these differences, alas, were not significant.

We were able to explore one other issue in the present study. Others have conjectured that induced mood might have a differential impact on pain judgments depending on the "baseline" mood in which subjects entered the experimental situation. We examined whether baseline mood correlated with pain ratings across mood induction conditions. As shown in table V, it did not. Multiple regression analyses were conducted to determine the contribution of baseline mood and induced mood to pain ratings. An interaction term was included in these analyses to test whether induced mood has differential impact on pain judgments depending on the level of baseline mood. R^2 was not significant for any of these regression equations, nor were any of the betas for individual independent variables significant. The interaction terms were also not statistically significant.

Discussion

We hypothesized that pain ratings, whether based on autobiographical incidents or in reaction to fictitious vignettes, should be mood sensitive. In particular, we expected that sad moods would inflate pain ratings of all kinds and happy moods would suppress them. We had no a priori expectations regarding gender differences in these processes.

The data collected in this experiment revealed a somewhat disappointing pattern of results. First of all, although mood seemed to be adequately induced, it did not have systematic effects on pain ratings. Moreover, what few significant differences were revealed indicated

Table Y. Experiment 6B—Ratings of recent painful experience after mood induction by mood and gender

Measure	Mood induction condition					
	Happy		Neutral		Sad	
	Male	Female	Male	Female	Male	Female
Pain maximum (100-mm VAS):						
Mean	62.07	63.47	71.93	68.87	63.26	75.60
Standard deviation	31.51	27.63	28.77	24.83	28.49	26.45
Pain average (100-mm VAS):						
Mean	50.13	51.87	43.29	54.53	45.33	61.20
Standard deviation	31.96	34.56	20.84	29.87	26.06	21.83
Pain interference (100-mm VAS):						
Mean	49.13	42.47	36.64	42.27	51.27	51.53
Standard deviation	33.71	30.76	33.93	33.78	32.75	33.73
Pain vividness (100-mm VAS):						
Mean	72.67	69.67	72.07	72.00	64.93	77.53
Standard deviation	30.77	26.41	31.97	30.65	32.03	30.71
MPQ sensory adjectives:						
Mean	18.00	16.93	18.14	15.87	15.00	19.87
Standard deviation	9.67	7.69	9.04	7.88	5.11	9.03
MPQ affective adjectives:						
Mean	5.53	3.67	3.07	2.93	2.73	4.93
Standard deviation	3.34	4.24	3.67	3.51	3.03	3.45
MPQ evaluative adjectives:						
Mean	3.33	1.93	2.50	2.07	2.20	3.20
Standard deviation	1.63	1.49	1.70	1.44	1.57	1.37
MPQ total score:						
Mean	35.27	29.40	30.43	26.93	24.87	35.47
Standard deviation	17.85	16.50	16.70	14.18	11.07	13.23

that men and women differed in the way in which mood influenced their pain ratings. Women, for example, showed a weak trend in the direction of the predicted mood congruent pattern of pain ratings when they judged hypothetical pain vignettes. Men, however, showed no consistent influence of mood on these or any other ratings.

Experiment 6B: Subjects recruited from community

Because the results of experiment 6A were so weak, the experiment was replicated with 89 subjects recruited from the New Haven community and randomly assigned to the three mood induction conditions. Dependent variables were measured in the same way, however, the frequency ratings were moved closer to the mood induction procedure, and only half as many hypothetical stories were utilized in order to minimize deterioration of induced mood.

Results

A two-way (gender x assigned mood induction condition) MANOVA was conducted across the variables that were measured prior to the mood induction procedure. These included the Differential Emotions Scale, the measures of present symptoms, symptoms from the past week, and discomfort due to symptoms. Once again, there were no differences in either mood or symptom reporting across the three groups prior to mood induction. Neither the main effect for mood, gender, nor the mood by gender interaction approached significance. Means for these measures are provided in table W.

A two-way ANOVA (gender x mood) was conducted on the six-item mood check to ensure that happy and sad moods had been properly induced. As can be seen in table X, subjects reported the most positive affect in the happy condition and the least in the sad condition ($F(283) = 39.80, p < .0001$). According to Tukey's Multiple Comparison Procedure, both the happy and sad conditions produced significantly more and less positive affect, respectively, compared with the neutral condition. The main effect for gender and the mood x gender interaction were not significant.

In this version of the study, subjects completed the pain frequency measures first. They were asked to indicate whether they had experienced each of seven different kinds of pain during the past year (yes/no), to estimate the number of days on which the pain was experienced (0–365), to rate the usual level of intensity associated with each pain type (0–5), and to rate the maximum level of pain associated with each pain type (0–5). The ratings across the seven kinds of pain were then summed into indices for the first two measures and averaged for the latter two. Means on these indices by mood condition and gender are depicted in table X.

A two-way (mood x gender) MANOVA revealed no systematic effects for mood, gender, nor a significant mood x gender interaction across the frequency measures. As the means in table X indicate, the sum of the number of painful days during the year varied quite a bit both within

Table Z. Experiment 6B—Pain ratings of hypothetical stories by mood and gender

	Mood induction condition					
	Happy		Neutral		Sad	
Measure	Male	Female	Male	Female	Male	Female
Pain now:						
Mean	56.67	57.33	44.25	44.13	42.90	50.77
Standard deviation	22.51	17.74	21.85	25.24	22.18	29.79
Pain10 minutes later:						
Mean	30.63	30.07	21.21	24.30	14.87	25.83
Standard deviation	15.34	18.58	15.22	23.99	13.10	20.14
MPQ sensory adjectives:						
Mean	16.47	14.70	12.18	10.03	10.47	14.57
Standard deviation	9.65	8.13	6.14	5.90	5.40	6.84
MPQ affective adjectives:						
Mean	3.53	2.87	1.89	2.47	1.53	3.57
Standard deviation	4.09	2.92	2.25	3.44	2.05	2.95
MPQ evaluative adjectives:						
Mean	2.20	1.67	1.64	1.77	1.63	2.37
Standard deviation	1.15	.86	.72	.84	.81	1.39
MPQ total score:						
Mean	27.63	23.23	18.96	17.37	16.60	26.97
Standard deviation	17.94	14.39	10.84	12.52	10.23	13.43

and across conditions. Happy women reported relatively fewer painful days, but happy men reported the most, though we should not make too much of these findings given the nonsignificant MANOVA (the ANOVA for this variable revealed a marginally significant mood x gender interaction ($F(283) = 2.69$, $p < .08$). Little support for any mood congruent trend in these data, however, was revealed.

Subjects next recalled a recent painful episode, rated its intensity on the several visual analog scales and rated the quality of the painful experience on the McGill Pain Questionnaire adjectives. The means for these ratings are displayed in table Y. A two-way MANOVA across this set of dependent variables revealed no main effect for mood, gender, nor a significant interaction.

The final task presented to subjects was the ratings of pain in the hypothetical stories. There were no systematic differences for story version so data were averaged across them. Means by mood and gender for these ratings are displayed in table Z. A two-way (mood x gender) MANOVA was conducted across the six story ratings. Neither mood nor gender main effects nor the interaction was significant.

As in our first mood study, we also explored whether pain ratings were related to baseline (preinduction) levels of mood, as shown in table V. By and large they were not, although sadder subjects did report pain memories that were more vivid and whose maximums were rated as more intense. Also, sadder subjects recalled more types of painful days during the previous year. However, given the number of correlations calculated (and the number that were not significant), the importance of these effects seems rather limited. Multiple regression analysis did not reveal any interactions between baseline and induced mood in influencing pain ratings.

Discussion

In terms of demonstrating a systematic influence of mood on pain ratings, the only fair conclusion is that this experiment was a dismal failure. Despite adequate sample sizes based on power analyses conducted prior to the start of the experiment, no reliable evidence for mood congruent pain reporting was demonstrated by this study. The lack of influence of mood on judgments about pain in experiments 6A and 6B is surprising. The influences of mood on judgment are fairly robust (a whole volume dedicated to such effects was recently published, for example, 83). Mood has been shown to affect judgments about the likelihood of future catastrophic events (84), becoming sick in the future (63, 85), one's athletic and romantic prowess (86), the quality of consumer products (87), and impressions of other people (88). However, at least for the kinds of pain ratings measured here, induced mood does not have a significant impact on them, and naturally occurring mood seems to affect them rather minimally as well.

Conclusions

The accurate reporting of information about physical pain on health surveys was the focus of this program of research. Three potential sources of error in such self-reports were explored in six experiments: (a) the complexity of the lexicon used to describe pain, (b) the focus of survey questions on recollections about the intensity and severity of pain versus changes in daily activities brought on by pain or observable pain related behaviors, and (c) ongoing mental states such as experienced pain at the time of the survey itself and transient mood states during recall.

On the basis of these experiments, several conclusions and recommendations can be offered:

- The pain lexicon is enormous and relatively vague. There is considerable variability in how pain descriptors are assigned to painful experiences. Yet, there seems to be considerable consensus in the understanding of the meaning of a subset of pain descriptors across individuals with varying levels of experience with pain. Fifteen descriptors that show considerable stability in the way in which they are organized mentally are throbbing, shooting, stabbing, sharp, cramping, gnawing, hot, aching, heavy, tender, splitting, tiring, sickening, fearful, punishing. Although we have no way of knowing whether these descriptors are more or less stable than any other set of 15, we feel confident that the relative meaning of these words is shared widely by most potential survey respondents.
- Compared with the literature reviewed at the start of this paper, which reported, for the most part, considerable inaccuracy in recall of pain among small samples of patients undergoing treatment in pain clinics, recall among our subjects across most of the studies would be better characterized by its accuracy. Overall, we were impressed by how well subjects could report on their pain retrospectively. When biases in retrospective accounts were observed, they tended to be in the direction of overestimating rather than underestimating prior levels of pain.
- Keeping a diary in which individuals track daily severity of pain, pain-related behaviors, or both seems to have little impact on subsequent accuracy in recall of pain. Hence, studies (and clinics) using diarykeeping procedures are probably not compromising the accuracy of subsequent pain data collected from these subjects.
- The severity of prior pain, its impact on daily activities, and behaviors related to the pain problem are all recalled approximately equally well and seem to be equally stable over time among individuals with chronic pain problems. Survey researchers who seek more informative data than that provided by mere intensity ratings should feel comfortable querying respondents about these other pain related behaviors (or even consider rating respondents' observable pain behaviors).
- One systematic source of bias in pain ratings is created by severity of pain at the time of recall. Controlling for original levels of pain and the amount that pain fluctuates during the applicable time period, greater pain at recall was associated with overestimating of prior pain experience. Survey researchers asking questions about prior experiences with pain may wish to include questions about current levels of pain as well.
- Although transient (induced) mood states have a systematic effect on various kinds of judgment tasks explored in other contexts, they did not affect the recall of painful experiences, frequency of painful days, or judgments about other people's pain among the healthy subjects tested in our experiments. Moreover, ongoing, naturally occurring mood states were not associated with judgments about pain either. Mood may not be a major influence on pain recall, at least not under the specific conditions investigated here.

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Appendixes

Contents

I. Further analyses of experiment 3 data 31

II. Materials Used in Experiments 33
Experiment 1 materials 33
Experiment 2 materials 41
Experiment 3 materials 43
Experiment 4 materials 46
Experiment 5 materials 57
Experiment 6 materials 60

Appendix tables

I. Experiment 3: Recall of behaviors collapsed across diary-versus-no diary conditions 31

II. Experiment 3: Mean deviation scores (actual-recalled) by diary condition (net error) 31

III. Experiment 3: Mean absolute deviation scores (absolute value of actual-recall) by condition (gross error) 32

Appendix I
Further analyses of experiment 3 data

The purpose of this appendix is to extend the behavior-by-behavior analysis reported for experiment 3. Recall that in that experiment the reporting of pain intensity and pain behaviors was revealed to be quite accurate. There were simply no significant discrepancies between actual and recalled levels of pain or pain behaviors. The only way we could produce a few significant differences, and we were clearly capitalizing on chance to some extent in order to do so, was to combine the two conditions in which behavior diaries were kept and compare them to the two conditions, combined, in which such diaries were not kept. These means are provided in table I. There were significant differences in the absolute level of recall on one pain behavior and three control behaviors. Subjects who did not keep diaries recalled complaining about pain more frequently than subjects who kept diaries ($F(1,105) = 4.75$, $p < .05$). They remember eating chicken and writing letters less frequently ($F(1,105) = 3.72$, $p < .06$ and $F(1,105) = 5.48, p < .05$, respectively), and talking on the phone more frequently ($F(1,105) = 4.14, p < .05$). There seems to be no particular pattern to these four differences, and they occur in the context of 12 comparisons in which no significant differences were found (in fact, a multivariate analysis of variance (MANOVA) across all 16 behaviors was not significant, Wilks's lambda = 0.78, $F(16,89) = 1.49, p = .12$).

Another way of thinking about these data is provided in table II. Here, each entry in the table is the mean difference score between subjects' actual and recalled pain intensity and behavior frequencies. These difference scores can be considered the net error for each item. We were interested in two aspects of these means. Do they differ according to diary condition? Are they significantly different from zero? The only entry significantly different from zero (by t-test) was complaining about pain by subjects in the behavior only diary condition, as described

Table I. Experiment 3—Recall of behaviors collapsed across diary-versus-no diary conditions

Behavior	Condition: Behavioral diary (n = 49)	Condition: No behavioral diary (n = 58)
Pain behaviors		
Take aspirin	8.06	6.03
Take other	7.53	5.79
Take prescription	16.41	15.59
Use heating pad	8.73	8.03
Use hot water bottle	0.88	11.83
Take nap	10.47	1.74
Use crutch	5.35	5.57
Ask for help	10.76	13.26
Complain about pain	13.37	*17.97
Avoid physical activity	12.50	12.26
Other behaviors		
Pay bill	5.33	4.57
Read newspaper	20.51	20.69
Eat chicken	7.33	*5.18
Talk on phone	23.88	*26.57
Use postage stamp	7.39	7.16
Write letter	2.92	*1.12

*$p < .05$ (the two conditions differ significantly).

Table II. Experiment 3—Mean deviation scores (actual-recalled), by diary condition (net error)

Behavior	Behavior diary (n = 26)	Pain diary (n = 23)	Both diaries (n = 23)	All diary conditions
Pain intensity				
Average pain	...	0.09	0.16	0.12
Pain behaviors				
All pain behaviors	[1]–5.51	...	–3.81	–4.70
Take aspirin	–1.77	...	1.44	–0.26
Take other	0.60	...	–2.60	–0.90
Take prescription	1.06	...	–0.15	0.49
Use heating pad	–0.04	...	–0.66	–0.33
Use hot water bottle	0.12	...	0.11	0.11
Take nap	0.60	...	1.82	1.17
Use crutch	0.81	...	–0.09	0.39
Ask for help	–1.66	...	–2.02	*–1.83
Complain	*–3.64	...	–0.98	*–2.39
Avoid physical activity	–1.36	...	–0.68	–1.02
Other behaviors				
All other behaviors	3.45	...	–4.66	–0.36
Pay bill	1.12	...	0.10	0.64
Read news	–0.60	...	0.13	–0.26
Eat chicken	–0.21	...	–2.30	–1.19
Talk on phone	–0.13	...	–0.98	–0.53
Use stamp	2.23	...	–1.18	0.63
Write letter	1.03	...	–0.42	0.35

Note: Obviously, there are no "actual" scores for the no diary condition, so deviation scores cannot be calculated for this cell.

[1]Missing data in one subject's diary created a discrepancy between this score and the aggregated recall and actual scores reported in table J. If we eliminate this subject, the value for all pain behaviors would be –7.10. Neither this value nor the one reported above is statistically significant.

*Deviation score is significantly different from zero; $p < .05$.

in the main text. When we combined all diarykeeping subjects together, there was also a significant tendency to recall asking for help more frequently than reported in the diary. But once again, the more profound finding is the fact that these discrepancy scores are not significant on most of the behaviors or for the recall of pain intensity (where they are especially small). Moreover, diary condition did not have a significant effect on the magnitude of these discrepancy scores.

About the only challenge to the notion that recall of pain and pain behaviors is quite accurate can be mounted when recall error is compounded without attention to the direction of that error, an assessment of the gross error in each item. In table III, we report the mean absolute value recall-actual deviation scores. These scores represent the average subject's error in either direction in recalling pain intensities or behavior frequencies. Of course, absolute discrepancy scores are statistically significant by definition. But comparing the gross error reported in table III with the net error in table II suggests that this error in recall is generally not systematic. That is, recalled intensity and behaviors are as likely to be inflated as underestimated.

A final question: Is this gross error (absolute deviation) different depending on diary condition? A series of ANOVAs comparing diary conditions revealed that, indeed, it is not. (We would have been surprised to have observed diary condition effects; the only difference between subjects assigned to these conditions is whether, for instance, they had to track just the 16 behaviors daily for 30 days or the 16 behaviors plus a single pain intensity item.)

Table III. Experiment 3—Mean absolute deviation scores (absolute value of actual-recall), by condition (gross error)

Behavior	*Behavior diary (n = 26)*	*Pain diary (n = 23)*	*Both diaries (n = 23)*	*All diary conditions*
Pain intensity				
Average pain	...	0.74	0.57	0.66
Pain behaviors				
All pain behaviors	28.59	...	31.71	30.09
Take aspirin	3.08	...	2.83	2.96
Take other	3.37	...	7.06	5.10
Take prescription	2.75	...	1.29	2.06
Use heating pad	1.73	...	2.31	2.00
Use hot water bottle	0.27	...	0.72	0.48
Take nap	2.83	...	3.98	3.37
Use crutch	0.88	...	0.52	0.71
Ask for help	3.64	...	3.26	3.46
Complain	5.95	...	3.76	4.92
Avoid physical activity	3.26	...	5.98	4.57
Other behaviors				
All other behaviors	18.30	...	21.72	19.91
Pay bill	3.00	...	2.70	2.86
Read news	2.60	...	4.49	3.49
Eat chicken	2.45	...	4.01	3.18
Talk on phone	3.44	...	4.60	3.99
Use stamp	4.70	...	4.20	4.47
Write letter	2.10	...	1.73	1.92

Note: Obviously, there are no "actual" scores for the no diary condition, so deviation scores cannot be calculated for this cell.

Appendix II: Materials used in experiments

Experiment 1 materials

Interview Protocol

[For half of the subjects, ask questions 6-11 prior to questions 1-5]

We are going to ask you a series of questions about your health. There are no right or wrong answers, so you should feel free to be as honest as you possibly can. Some of our questions will concern your health directly. At other times we will ask questions concerning the thoughts and feelings you are having at that particular moment. Do you have any questions before we get started?

Section A

1. Describe an experience that happened to you recently in which you felt pain. What happened?

_____

_____

2. What did the pain feel like at first?

_____

_____

3. What did the pain feel like after a while?

_____

_____

4. If you had to use five words to describe what the pain felt like, what would those five words be?

_____ _____

_____ _____

_____

5. How did you go about choosing these particular words?

_____

_____

6. Now describe the most painful experience you have ever had. What happened?

_____

_____

7. What did the pain feel like at first?

_____

_____

8. What did the pain feel like after a while?

_____

_____

9. If you had to use five words to describe what the pain felt like, what would those five words be?

_____ _____

_____ _____

_____

10. How did you go about choosing these particular words?

_____

_____

11. How did you go about selecting this painful experience to tell me about?

_____

_____

12. Think for a moment and try to describe for me what you think would be the most painful experience imaginable?

_____

_____

13. If you had to use five words to describe what this pain might feel like, what would those five words be?

_____ _____

_____ _____

_____

Section B (for Pain Patients only)

14. Using a scale from 0 to 9 where 0 means no pain at all and 9 means the most excruciating pain you could imagine, what number would you use to rate the amount of pain you are feeling right now?

_____

15. How did you go about choosing this particular number? What was going through your mind?

_____

_____

16. Place an "X" on the following line to indicate this amount of pain.

very little pain ———————————————————————— excruciating pain

17. How did you go about choosing this particular spot to place your "X"? What was going through your mind?

_____

_____

18. Using the 0 to 9 scale again, what would you say is the average amount of pain you experienced during the past seven days?

_____

19. How did you go about choosing this particular number? What was going through your mind?

_____

_____

20. How did you figure out the "average"? What was going through your mind?

_____

_____

21. Did you find the question about average amount of pain easy or hard to answer?

_____

_____

22. Did your pain vary very much during the course of the past seven days?

_____

_____

23. How did the way in which your pain varied affect your final rating?

_____

_____

24. Imagine a day in which your pain was excruciating in the morning, but then gradually improved during the day until it was barely noticeable. Using the 0 to 9 scale, rate your average amount of pain for that day.

_____

25. How did you go about selecting this number?

_____

_____

26. Imagine a day in which your pain was excruciating so you took some medication and it got better. Using the 0 to 9 scale, rate your average amount of pain for that day.

_____

27. How did you go about selecting this number?

_____

_____

Section C

28. Now we are going to tell you some words that people sometimes use to describe their pain. After I tell you each word, I would like you to tell me about a time during which you experienced a pain of that type. So, for example, if I said, "a burning pain," you would tell me about a time in which you experienced a pain that felt like it was burning. If you have never experienced such a pain, think up a situation that could make a person experience a pain like the one described. Do you have any questions?

(a) A throbbing pain.

_____

_____

_____

_____

(b) A shooting pain.

_____

_____

_____

_____

(c) A stabbing pain.

_____

_____

_____

_____

(d) A sharp pain.

_____

_____

_____

_____

(e) A cramping pain.

(f) A gnawing pain.

(g) A hot pain.

(h) An aching pain.

(i) A heavy pain.

(j) A tender pain.

(k) A splitting pain.

(l) A tiring pain.

(m) A sickening pain.

(n) A fearful pain.

(o) A punishing pain.

Pain Word Task

Many different words have been used to describe pain. We are going to present you with pairs of some of these words. We would like you to use the scale below to indicate how similar in meaning the two words in each pair are. Please rate the similarity in meaning of the two words as follows:

5 = extremely similar in meaning
4 = moderately similar in meaning
3 = somewhat similar in meaning
2 = a little bit similar in meaning
1 = not at all similar in meaning

Rate each pair of words by placing a number from 1 to 5 in the blank space next to them.

First, here are a few practice words:

1 Tingling/Itchy	3 Annoying/Intense	1 Pinching/Pulling
3 Cool/Numb	1 Pricking/Tingling	1 Nagging/Cutting

Now, go ahead and rate the remaining word pairs:

1 Aching/Tender	1 Hot/Tiring	1 Gnawing/Punishing
1 Shooting/Tiring	1 Stabbing/Heavy	1 Tender/Fearful
3 Heavy/Sickening	5 Hot/Fearful	2 Stabbing/Splitting
4 Shooting/Stabbing	1 Cramping/Fearful	5 Sharp/Hot
5 Sharp/Cramping	4 Throbbing/Tender	1 Cramping/Splitting
1 Sickening/Punishing	1 Tiring/Fearful	4 Gnawing/Heavy
5 Cramping/Aching	1 Heavy/Tender	1 Stabbing/Cramping
1 Throbbing/Hot	4 Aching/Sickening	1 Aching/Punishing
4 Shooting/Cramping	1 Splitting/Fearful	5 Shooting/Hot
5 Heavy/Splitting	5 Stabbing/Sharp	3 Fearful/Punishing
1 Stabbing/Sickening	1 Gnawing/Tender	1 Throbbing/Stabbing
3 Sharp/Gnawing	1 Hot/Heavy	1 Shooting/Sickening
3 Sharp/Splitting	1 Tiring/Punishing	1 Throbbing/Punishing
1 Throbbing/Sickening	3 Gnawing/Hot	1 Sharp/Fearful
1 Shooting/Tender	1 Gnawing/Sickening	1 Hot/Splitting

1 Stabbing/Aching
2 Throbbing/Sharp
5 Cramping/Sickening
1 Cramping/Tiring
1 Stabbing/Fearful
4 Throbbing/Shooting
1 Tiring/Sickening
1 Shooting/Gnawing
1 Throbbing/Heavy
4 Cramping/Gnawing
3 Sharp/Heavy
1 Aching/Fearful
1 Cramping/Punishing
1 Tender/Sickening
1 Aching/Heavy
1 Shooting/Punishing
1 Throbbing/Splitting
1 Gnawing/Aching
2 Cramping/Hot
1 Stabbing/Gnawing

5 Sharp/Tender
3 Splitting/Tiring
4 Heavy/Punishing
3 Shooting/Heavy
1 Shooting/Aching
1 Sharp/Tiring
1 Tender/Punishing
3 Gnawing/Tiring
3 Hot/Aching
5 Heavy/Tiring
5 Cramping/Tender
1 Sharp/Punishing
1 Gnawing/Splitting
4 Throbbing/Aching
1 Throbbing/Cramping
4 Stabbing/Tender
1 Sharp/Aching
1 Heavy/Fearful
1 Stabbing/Tiring
1 Aching/Splitting

1 Stabbing/Punishing
1 Tender/Tiring
1 Sharp/Sickening
1 Throbbing/Tiring
2 Aching/Tiring
1 Splitting/Sickening
1 Shooting/Splitting
1 Hot/Sickening
1 Throbbing/Gnawing
1 Shooting/Fearful
5 Stabbing/Hot
5 Shooting/Sharp
1 Hot/Punishing
4 Cramping/Heavy
1 Splitting/Punishing
1 Sickening/Fearful
1 Hot/Tender
1 Throbbing/Fearful
1 Gnawing/Fearful
1 Tender/Splitting

Experiment 3 materials

Daily Rating Form Name:_____ Date:_____

At the end of the day, before going to bed, please answer the following questions:

The following is a list of behaviors. Please place a check mark on the line next to any behavior you engaged in at least once today:

_ Took 2 or more asprins
_ Took another over-the-counter remedy
_ Paid a bill
_ Took a prescription pain remedy
_ Read the newspaper
_ Used a heating pad
_ Ate chicken for lunch or dinner
_ Used a hot water bottle
_ Took a nap
_ Talked on the telephone
_ Used a crutch or other device to assist in walking
_ Asked a member of the family to do something I ususally do myself
_ Used a postage stamp
_ Complained about my pain to another person
_ Wrote a letter
_ Avoided routine physical activities

Use the scale below and circle a number that indicates the usual level of pain you experienced today.

9 excruiating, incapacitating intense, severe pain
8
7
6
5
4
3
2
1
0 none, no pain

Daily Rating Form Name:_____ Date:_____

At the end of the day, before going to bed, please answer the following question:

1. Use the scale below and circle a number that indicates the usual level of pain you experienced today:

9 excruciating, incapacitating, intense, severe pain
8
7
6
5
4
3
2
1
0 none, no pain

Daily Rating Form Name:_____ Date:_____

At the end of the day, before going to bed, please answer the following question:

The following is a list of behaviors. Please place a check mark on the line next to any behavior you engaged in at least once today:

_ Took 2 or more asprins
_ Took another over-the-counter remedy
_ Paid a bill
_ Took a prescription pain remedy
_ Read the newspaper
_ Used a heating pad
_ Ate chicken for lunch or dinner
_ Used a hot water bottle
_ Took a nap
_ Talked on the telephone
_ Used a crutch or other device to assist in walking
_ Asked a member of the family to do something I ususally do myself
_ Used a postage stamp
_ Complained about my pain to another person
_ Wrote a letter
_ Avoided routine physical activities

Think back to the past four weeks ending on _____. Please circle a number from 0 to 9 below to indicate:

(a) Your usual level of pain during the last four weeks.

9 excruciating, incapacitating, intense, severe pain
8
7
6
5
4
3
2
1
0 none, no pain

(b) Your pain at its worst during the last four weeks.

9 excruciating, incapacitating, intense, severe pain
8
7
6
5
4
3
2
1
0 none, no pain

(c) Your pain at its least during the last four weeks.

9 excruciating, incapacitating, intense, severe pain
8
7
6
5
4
3
2
1
0 none, no pain

Using the same 0 to 9 scale on which you rated your pain every day during the last four weeks, estimate the number of days during the last four weeks on which your pain:

Was ever greater than a 2: _____

Was ever greater than a 5: _____

Was ever greater than an 8: _____

On how many days during the last four weeks did you:

_____ Took 2 or more aspirins

_____ Took another over-the-counter pain remedy

_____ Paid a bill

_____ Took a prescription pain remedy

_____ Read the newspaper

_____ Used a heating pad

_____ Ate chicken for lunch or dinner

_____ Used a hot water bottle

_____ Took a nap

_____ Talked on the telephone

_____ Used a crutch or other device to assist in walking

_____ Asked a member of my family to do something I usually do myself

_____ Used a postage stamp

_____ Complained about my pain to another person

_____ Wrote a letter

_____ Avoided routine physical activities

The WHYMPI

CENTER FOR PAIN EVALUATION AND TREATMENT
UNIVERSITY OF PITTSBURGH

MULTIAXIAL ASSESSMENT OF PAIN
(AXIS II: PV)

Instructions. An important part of our evaluation includes examination of pain from your perspective because you know your pain better than anyone else. The information that you provide will be of great assistance in our evaluation and in helping us to plan a treatment program for you.

Please read each question carefully and then do your best to answer each one, Do not skip over any questions. If you believe that any question does not apply to you, rather than not answering it, please note that this question does not apply to you by circling the number of that question. After you have completed the entire questionnaire, check your responses to make sure that you have answered each question. Please use the last page to add any additional information or comments that you believe would be of help to us in better understanding you pain problem.

Section 1

1. Today's Date:_____

2. Name:_____
   Last First Initial

3. Address:_____
   No. Street

   _____
   City State Zip Code

4. Work phone:_____ Home Phone:_____
   (area code) (number) (area code) (number)

5. Age: (in years)_____

6. Date of Birth: Month:_____ Day:_____ Year:_____

7. Sex (check one): ____ Male ____ Female

8. Ethnic Group (check one):

   ____ White ____ Black ____ Asian American ____ Latin American
   ____ Other, specify _____

9. Education (check one):

   ____ 9th grade or less ____ 10th to 12th grade ____ High school graduate
   ____ College (number of years:_____) ____ Graduate or professional training

10. Living situation (check all that apply):

    ____ Live alone ____ Live with spouse/significant other
    ____ Live with children ____ Live with others, specify_____

11. Current marital status (check one):

____ Single - never married ____ Separated/Divorced - how long? _____yrs.
____ Married - how long? _____yrs. ____ Widowed - how long? _____yrs.

12. If married, how would you describe your current marital relationship (circle a number)?

0	1	2	3	4	5	6
Very poor						Very good

13. Yearly family income (check one):

____ Less than $10,000
____ From $10,000 to $20,000
____ From $20,000 to $35,000
____ Greater than $35,000

14. Current employment status, including homemaker (check all that apply):

____ Working full-time (over 30 hours per week)
____ Working part-time (less than 30 hours per week)
____ Unemployed and on social security disability or worker compensation
____ Unemployed and not on disability or receiving compensation
____ Currently enrolled in a job retraining program
____ Retired

15. If you are unemployed, or employed part-time, is this due to your present pain condition (check one)?

_____ Yes _____ No

16. If you are unemployed, or employed part-time, have you tried to return to full-time work within the past year (check one)?

_____ Yes _____ No

17. Compared to your ability to work before your pain began (including homemaking), can you (circle a number):

0	1	2	3	4	5	6
No longer work						Work as much as before

18. How did your pain begin (check one)?

____ Accident at work ____ Accident at home ____ Following surgery
____ Following an illness ____ Pain just began
____ Other reason, specify_____

19. When did you pain first start? Month:_____ Year:_____

20. How often do you have pain (check one)?

____ Daily, or almost every day ____ Two or three times a week ___ Once a week
____ Less than once a week but more than once a month ____ Less than once a month

21. On a day when you have pain, how long does the pain usually last (check one)?

____ 0-1 hours ____ 1-2 hours ____ 2-4 hours ____ 4-8 hours
____ 8-12 hours ____ More than 12 hours

22. Which of the following conditions makes your pain worse (check all that apply)?

___ Lying down ___ Standing ___ Bending/twisting ___ Sitting ___ Walking
___ Lifting ___ Reaching/Stretching ___ Other, specify_____

23. How often do you stay in bed because of your pain (circle a number)?

0	1	2	3	4	5	6
Never						Very often

24. How often do you take medicine other than aspirin or over-the-counter drugs for pain relief (check one)?

____ Never
____ Less than once a week
____ Once a week
____ Several times a week
____ Once a day
____ Several times a day (how often?_____)

25. What medicines are you now taking for pain and how often for each?

Pain Medication	How often	Pain Medication	How often

OTHER Medications - please indicate for what problem or illness

_____

_____

_____

26. Have you ever been operated on for this pain (check one)?

___ Never ___ Once ___ Twice ___ Three times ___ More than three times

Section 2

This part asks questions to help us learn more about your pain and how it affects your life. Under each question is a scale to mark your answer. Read each question carefully and then circle a number on the scale under that question to indicate how that specific question applies to you. An example may help you to better understand how you should answer these questions.

Example

How nervous are you when you ride in a car when the traffic is heavy?

0	1	2	3	4	5	6
Not at all Nervous						Extremely Nervous

If you are not at all nervous when riding in a car in heavy traffic, you would want to circle the number 0. If you are very nervous when riding in a car in heavy traffic, you would then circle the number 6. Lower numbers would be used for less nervousness, and higher numbers for more nervousness.

1. Rate the level of your pain at the present moment.

0	1	2	3	4	5	6
No pain						Very intense pain

2. In general, how much does your pain interfere with your day-to-day activities?

0	1	2	3	4	5	6
No interference						Extreme interference

3. Since the time your pain began, how much has your pain changed your ability to work?
(___ Check here, if you have retired for reasons other than your pain).

0	1	2	3	4	5	6
No change						Extreme change

4. How much has your pain changed the amount of satisfaction or enjoyment you get from taking part in social and recreational activities?

0	1	2	3	4	5	6
No change						Extreme change

5. How supportive or helpful is your spouse (significant other) to you in relation to your pain?

0	1	2	3	4	5	6
Not at all supportive						Extremely supportive

6. Rate your overall mood during the past week.

0	1	2	3	4	5	6
Extremely low						Extremely high

7. How much has your pain interfered with your ability to get enough sleep?

0	1	2	3	4	5	6
No interference						Extreme interference

8. On the average, how severe has your pain been during the last week?

0	1	2	3	4	5	6
Not at all severe						Extremely severe

9. How able are you to predict when your pain will start, get better, or get worse?

0	1	2	3	4	5	6
Not at all able to predict						Very able to predict

10. How much has your pain changed your ability to take part in recreational and other social activities?

0	1	2	3	4	5	6
No change						Extreme change

11. How much do you limit your activities in order to keep your pain from getting worse?

0	1	2	3	4	5	6
Not at all						Very much

12. How much has your pain changed the amount of satisfaction or enjoyment you get from family-related activities?

0	1	2	3	4	5	6
No change						Extreme change

13. How worried is your spouse (significant other) about you because of your pain?

0	1	2	3	4	5	6
Not at all worried						Extremely worried

14. During the <u>past week</u> how much control do you feel that you have had over your life?

0	1	2	3	4	5	6
No control						Extreme control

15. On an average day, how much does your pain vary (increase or decrease)?

0	1	2	3	4	5	6
Remains the same						Changes a lot

16. How much suffering do you experience because of your pain?

0	1	2	3	4	5	6
No suffering						Extreme suffering

17. How often are you able to so something that helps to reduce your pain?

0	1	2	3	4	5	6
Never						Very often

18. How much has your pain changed your relationship with your spouse, family, or significant other?

0	1	2	3	4	5	6
No change						Extreme change

19. How much has your pain changed the amount of satisfaction or enjoyment you get from work?
(___ Check here, if you are not presently working).

0	1	2	3	4	5	6
No change						Extreme change

20. How attentive is your spouse (significant other) to you because of your pain?

0	1	2	3	4	5	6
Not at all attentive						Extremely attentive

21. During the <u>past</u> <u>week</u> how much do you feel that you've been able to deal with your problems?

0	1	2	3	4	5	6
Not at all						Extremely well

22. How much control do you feel that you have over your pain?

0	1	2	3	4	5	6
No control at all						A great deal of control

23. How much has your pain changed your ability to do household chores?

0	1	2	3	4	5	6
No change						Extreme change

24. During the <u>past</u> <u>week</u>, how successful were you in coping with stressful situations in your life?

0	1	2	3	4	5	6
Not at all successful						Extremely successful

25. How much has your pain interfered with your ability to plan activities?

0	1	2	3	4	5	6
No change						Extreme change

26. During the past week how irritable have you been?

0	1	2	3	4	5	6
Not at all irritable						Extremely irritable

27. How much has your pain changed or interfered your friendships with people other than your family?

0	1	2	3	4	5	6
No change						Extreme change

28. During the past week how tense or anxious have you been?

0	1	2	3	4	5	6
Not at all tense or anxious						Extremely tense and anxious

Section 3

In this section, we are interested in knowing how your spouse (or significant other) responds to you when he or she knows that you are in pain. On the scale listed below each question, circle a number to indicate how often your spouse (or significant other) responds to you in that particular way when you are in pain. Please answer all of the 14 questions.

1. Ignores me.

0	1	2	3	4	5	6
Never						Very Often

2. Asks me what he/she can do to help.

0	1	2	3	4	5	6
Never						Very Often

3. Reads to me.

0	1	2	3	4	5	6
Never						Very Often

4. Gets irritated with me.

0	1	2	3	4	5	6
Never						Very Often

5. Takes over my jobs or duties.

0	1	2	3	4	5	6
Never						Very Often

6. Talks to me about something else to take my mind off the pain.

0	1	2	3	4	5	6
Never						Very Often

7. Gets frustrated with me.

0	1	2	3	4	5	6
Never						Very Often

8. Tries to get me to rest.

0	1	2	3	4	5	6
Never						Very Often

9. Tries to involve me in some activity.

0	1	2	3	4	5	6
Never						Very Often

10. Gets angry with me.

0	1	2	3	4	5	6
Never						Very Often

11. Gets me pain medication.

0	1	2	3	4	5	6
Never						Very Often

12. Encourages me to work on a hobby.

0	1	2	3	4	5	6
Never						Very Often

13. Gets me something to eat or drink.

0	1	2	3	4	5	6
Never						Very Often

14. Turns on the T.V. to take my mind off my pain.

0	1	2	3	4	5	6
Never						Very Often

Section 4 - Axis IIIa - Daily Behaviors

Listed below are 18 daily activities. Please indicate how often you do each of these by circling a number on the scale listed below each activity. Please complete all 18 questions.

1. Wash dishes.

0 1 2 3 4 5 6
Never Very Often

2. Mow the lawn (___ Check here, if you do not have a lawn to mow).

0 1 2 3 4 5 6
Never Very Often

3. Go out to eat.

0 1 2 3 4 5 6
Never Very Often

4. Play cards or other games.

0 1 2 3 4 5 6
Never Very Often

5. Go grocery shopping.

0 1 2 3 4 5 6
Never Very Often

6. Work in the garden (___ Check here, if you do not have a garden).

0 1 2 3 4 5 6
Never Very Often

7. Go to a movie.

0 1 2 3 4 5 6
Never Very Often

8. Visit friends.

0 1 2 3 4 5 6
Never Very Often

9. Help with the house cleaning.

0 1 2 3 4 5 6
Never Very Often

10. Work on the car (___ Check here, if you do not have a car).

0 1 2 3 4 5 6
Never Very Often

11. Take a ride in a car or bus.

0	1	2	3	4	5	6
Never						Very Often

12. Visit relatives
(___ Check here, if you do not have relatives within 100 miles).

0	1	2	3	4	5	6
Never						Very Often

13. Prepare a meal.

0	1	2	3	4	5	6
Never						Very Often

14. Wash the car (___ Check here, if you do not have a car).

0	1	2	3	4	5	6
Never						Very Often

15. Take a trip.

0	1	2	3	4	5	6
Never						Very Often

16. Go to a park or beach.

0	1	2	3	4	5	6
Never						Very Often

17. Do the laundry.

0	1	2	3	4	5	6
Never						Very Often

18. Work on a needed household repair.

0	1	2	3	4	5	6
Never						Very Often

19. Engage in sexual activities.

0	1	2	3	4	5	6
Never						Very Often

Pain Behavior Rating Form

0 = Present

1 = Not Present

Verbal Behaviors	Rating	
1. Mentions having pain	0	1
2. Complains about pain	0	1
3. Gives lively descriptions of pain	0	1
4. Groans, moans, or sighs	0	1
5. Cries	0	1
6. Asks for help from others	0	1
Grimaces and Rubbing		
7. Grimaces	0	1
8. Rubs painful parts of body	0	1
Sitting and Standing		
9. Braces while sitting down into chair	0	1
10. Changes positions while sitting	0	1
11. Braces while rising after sitting	0	1
12. Stands in an unusual posture	0	1
Walking		
13. Moves rigidly and stiffly	0	1
14. Walks with an abnormal gait	0	1
15. Walks guardedly and carefully	0	1

Hourly Pain Diary Cards and Instructions

Instructions

Our goal is to more fully understand the nature of your pain. To achieve this goal, we would like you to keep an hourly record of your pain. Attached are 14 postcards, one card for each day during the next 2 weeks. The record-keeping is quite easy and straightforward. It consists of rating your pain each hour on the postcard. On the card you will see, first, the hours of the day are indicated on the top, going from 6 a.m. to 5 a.m. This covers the full 24 hours of one day.

Second, under each hour of the day are numbers from 0 to 9. These refer to the severity of your pain:

9 indicates excruciating, incapacitating, intense pain. The pain is so severe you can do almost nothing else.

0 represents no pain present.

We would like you to rate your pain each waking hour of the day. That is, at the end of each hour, rate the amount of pain you are experiencing at that moment on the 0 to 9 scale. If you forget to make a rating for a particular hour, leave it blank, do not go back and try to remember pain from an hour when you forgot to make your rating. However, try to remember to rate your pain every hour on the hour.

If your took a pain medication during that hour, in addition to circling a rating between 0 and 9, put an "X" through the number. You should only rate your pain for the hours during which you are awake. Just leave blank the hours during which you were asleep. Finally, be sure to put your name and date on each of the 14 cards. You should begin your ratings at 6:00 a.m. tomorrow, for the next 14 days. Please mail your postcards to us (they are already pre-addressed and pre-stamped) after completing them every day. Do not "save them up."

Daily Pain Diary Name _____ Date_____

AM							PM												AM				
6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Circle your level of pain each hour that you are awake:
9 indicates excruciating, incapacitating, intense pain.
0 represents no pain present.
Put an X through the times you take pain medication.

1. Thinking back on the last 14 days, please circle a number below to indicate:

(a) Your usual level of pain

9 = excruciating, incapacitating, intense, severe
8
7
6
(5)
4
3
2
1
0 = none, no pain

(b) Your pain at its worst

9 = excruciating, incapacitating, intense, severe
(8)
7
6
5
4
3
2
1
0 = none, no pain

(c) Your pain at its least

9 = excruciating, incapacitating, intense, severe
8
7
6
5
4
(3)
2
1
0 = none, no pain

2. Think about the 0 to 9 scale on which you rated your pain on the postcards during the last two weeks. Estimate the number of days during the last 14 on which your pain:

Was ever greater than a 2: 14

Was ever greater than a 5: 7

Was ever greater than an 8: 3

3. Using the same 0 to 9 point scale on which you rated your pain every hour for the past 14 days, please circle a number below to indicate the severity of pain that you are currently experiencing.

9 = excruciating, incapacitating, intense, severe
8
7
6
5
4
3
2
1
0 = none, no pain

4. Some of the following words describe your present pain. Circle the words that best describe it. Use at most a single word in each word group, the one that applies best. Leave out any word group that is not suitable.

1 Flickering	1 Jumping	1 Pricking	1 Sharp
2 Quivering	2 Flashing	2 Boring	2 Cutting
3 Pulsing	3 Shooting	3 Drilling	3 Lacerating
4 Throbbing		4 Stabbing	
5 Beating		5 Lancinating	
6 Pounding			
1 Pinching	1 Tugging	1 Hot	1 Tingling
2 Pressing	2 Pulling	2 Burning	2 Itchy
3 Gnawing	3 Wrenching	3 Scalding	3 Smarting
4 Cramping		4 Searing	4 Stinging
5 Crushing			
1 Dull	1 Tender	1 Tiring	1 Sickening
2 Sore	2 Taut	2 Exhausting	2 Suffocating
3 Hurting	3 Rasping		
4 Aching	4 Splitting		
5 Heavy			
1 Fearful	1 Punishing	1 Wretched	1 Annoying
2 Frightful	2 Gruelling	2 Blinding	2 Troublesome
3 Terrifying	3 Cruel		3 Miserable
	4 Vicious		4 Intense
	5 Killing		5 Unbearable
1 Spreading	1 Tight	1 Cool	1 Nagging
2 Radiating	2 Numb	2 Cold	2 Nauseating
3 Penetrating	3 Drawing	3 Freezing	3 Agonizing
4 Piercing	4 Squeezing		4 Dreadful
	5 Tearing		5 Torturing

Positive Affect Subscale of DES

Please circle the number on each of the scales below to indicate how you are feeling right now.

not exhilarated	1	2	3	4	5	6	7	very exhilarated
not joyful	1	2	3	4	5	6	7	very joyful
not sad	1	2	3	4	5	6	7	very sad
not downhearted	1	2	3	4	5	6	7	very downhearted
not delighted	1	2	3	4	5	6	7	very delighted
not lonely	1	2	3	4	5	6	7	very lonely
not happy	1	2	3	4	5	6	7	very happy
not discouraged	1	2	3	4	5	6	7	very discouraged
not excited	1	2	3	4	5	6	7	very excited
not upset	1	2	3	4	5	6	7	very upset
not energetic	1	2	3	4	5	6	7	very energetic
not distressed	1	2	3	4	5	6	7	very distressed
not warmhearted	1	2	3	4	5	6	7	very warmhearted
not blissful	1	2	3	4	5	6	7	very blissful
not self-reflective	1	2	3	4	5	6	7	very self-reflective

Present Sensations and Pain Questionnaire

Below is a list of physical troubles. Please indicate which of these you have experienced during the past week, and also which of these you have experienced in the last 24 hours. Then rate how much discomfort, on average, each of these symptoms has caused you during the past week.

The numbers of the discomfort ratings represent the following phrases:

0 = None 1 = Little 2 = Some 3 = Moderate 4 = Severe

	past 24 hours		past 7 days		amount of discomfort				
1. Nausea	yes	no	yes	no	0	1	2	3	4
2. Headache	yes	no	yes	no	0	1	2	3	4
3. Neck aches and pains	yes	no	yes	no	0	1	2	3	4
4. Flashes of hot or cold	yes	no	yes	no	0	1	2	3	4
5. Aches/pains in arms/legs	yes	no	yes	no	0	1	2	3	4
6. Shakiness	yes	no	yes	no	0	1	2	3	4
7. Difficulty in sleeping	yes	no	yes	no	0	1	2	3	4
8. Back aches	yes	no	yes	no	0	1	2	3	4
9. Stomach troubles	yes	no	yes	no	0	1	2	3	4
10. Nasal congestion	yes	no	yes	no	0	1	2	3	4
11. Sore throat	yes	no	yes	no	0	1	2	3	4
12. Excessive perspiration	yes	no	yes	no	0	1	2	3	4
13. Runny nose	yes	no	yes	no	0	1	2	3	4
14. Fever	yes	no	yes	no	0	1	2	3	4
15. Feeling tired	yes	no	yes	no	0	1	2	3	4
16. Itchy or watery eyes	yes	no	yes	no	0	1	2	3	4
17. Muscular weakness	yes	no	yes	no	0	1	2	3	4
18. Dizzy spells	yes	no	yes	no	0	1	2	3	4
19. Difficulty in breathing	yes	no	yes	no	0	1	2	3	4
20. Sleeping to excess	yes	no	yes	no	0	1	2	3	4

21. Difficulty swallowing	yes	no	yes	no	0	1	2	3	4
22. Muscular tension	yes	no	yes	no	0	1	2	3	4
23. Appetite changes	yes	no	yes	no	0	1	2	3	4
24. Bowel trouble	yes	no	yes	no	0	1	2	3	4
25. Vomiting	yes	no	yes	no	0	1	2	3	4
26. Chest pains	yes	no	yes	no	0	1	2	3	4
27. Recent burns or cuts	yes	no	yes	no	0	1	2	3	4
28. Strained/sprained muscles	yes	no	yes	no	0	1	2	3	4
29. Cramped muscles	yes	no	yes	no	0	1	2	3	4
30. Injured (bruised) joint	yes	no	yes	no	0	1	2	3	4
31. Soreness	yes	no	yes	no	0	1	2	3	4
32. Foot pain	yes	no	yes	no	0	1	2	3	4
33. Dental or mouth pain	yes	no	yes	no	0	1	2	3	4

Mood Induction Instructions

General Instructions (written)

The first part of this experiment involves an imagination exercise. You will receive specific instructions about this exercise by listening to a taped message in a few minutes. First, however, I would like to tell you what we are trying to accomplish in the imagination procedure. We are looking at the ability to become involved with a past event, to create a picture in your mind and to respond to it just as if it were real.

You will be listening to a tape that asks you to remember a specific event from your past. As you remember this event, try to recreate in your mind the thoughts and feelings that you had at the time. Try to experience the same feelings and react in the same ways. Right now, you don't have to do anything but listen to the tape. It is very important that you try to imagine the past event as vividly as possible, re-live the experience once again, and then respond as you might have at that time.

To a large extent, this imagination task is similar to techniques used in a school of drama called method acting. According to the method, actors try to immerse themselves in the characters they are playing to such a degree that they are almost the same people. That is what you should try to do here. It is up to you to immerse yourself in the past event; feel the feelings that you once felt. The situation may be powerful. Relax and forget that the rest of the world exists, and experience only the world that you create while listening to the tape.

We have found that people are better able to get into this imagination task when they are left alone. There aren't other people around to distract them from their own thoughts, or to hurry them along. For this reason, I'm going to leave you to finish the rest of the experiment at your own pace. I'll turn the tape on from another room and it will shut itself off. I don't want to interfere with you in any way, so I will not be seeing you again until you are finished with the experiment. The tape will instruct you about what to do next. When you are completely through with the experiment, exit through the door marked "EXIT HERE," and I will speak with you briefly and give you an experiment credit card.

When you have finished reading this, please place the headphones over your ears, and the tape will start within a few minutes. Remember, just relax and try to recreate the incident in your mind as vividly as possible. About five minutes after this tape ends, you will hear another taped message instructing you to begin working on the remaining tasks in this packet of papers.

PLEASE DO NOT TURN THIS PAGE UNTIL INSTRUCTED TO DO SO BY THE EXPERIMENTER.

Taped Mood Induction Instructional Set

Sit back. Close your eyes. Relax. Listen to the sound of my voice. Try to do the things I am telling you to do. I would like for you to begin imagining a situation which you think would make you feel [happy, sad, neutral]. Imagine the situation as vividly as you can. Picture the events happening to you. See all the details of the situation. Picture in your "mind's eye" the surroundings as clearly as possible. See the people or the objects; hear the sounds; experience the event happening to you. Think the thoughts you would actually think in this situation. Feel the same [happy, sad, neutral] feelings you would feel. Let yourself react as if your were actually there.

Post-Induction Mood Check

Please circle the number on each of the scales below to indicate how you are feeling right now.

not happy	1	2	3	4	5	6	7	very happy
not exhilarated	1	2	3	4	5	6	7	very exhilarated
not sad	1	2	3	4	5	6	7	very sad
not satisfied	1	2	3	4	5	6	7	very satisfied
not content	1	2	3	4	5	6	7	very content
not disappointed	1	2	3	4	5	6	7	very disappointed

Recall of Painful Incident Questions

Think for a moment about a recent experience that involved physical pain, an experience that you had some time during the past year. Imagine that experience for a moment and then answer the following questions:

1. In a sentence or two, describe this experience with pain:

   a) What happened? What caused the pain?

_____

_____

   b) How long did it last?

_____

   c) When did it happen to you?

_____

2. Please place an "X" on the following lines in order to indicate what this pain experience was like for you:

(a) Rate the maximum level of pain you experienced:

very little pain ---------- excruciating pain

(b) Rate the average amount of pain you felt during this experience:

very little pain ---------- excruciating pain

(c) How much did the pain interfere with your day to day activities?

no interference ---------- extreme interference

(d) How vividly could you recall this past painful experience?

not at all vividly ---------- very vividly

3. Choose the <u>one</u> word group that best describes the pain you experienced.

_____ Continuous, steady, constant
or
_____ Rhythmic, periodic, intermittent
or
_____ Brief, momentary, transient

4. The following words represent pain of increasing intensity:

1	2	3	4	5
Mild	Discomforting	Distressing	Horrible	Excruciating

Choose the number of the word that best describes:

_____ The average pain you experienced during this episode

_____ The worst pain you experienced during this episode

_____ The least pain you experienced during this episode

_____ The worst headache you ever had

_____ The worst stomach ache you ever had

_____ The worst toothache you ever had

5. Some of the following words describe the pain you experienced during the episode you described on the previous page. Circle the words that best describe it. Use at most a single word in each word group, the one that applied <u>best</u>. Leave out any word group that is not suitable.

1 Flickering	1 Jumping	1 Pricking	1 Sharp
2 Quivering	2 Flashing	2 Boring	2 Cutting
3 Pulsing	3 Shooting	3 Drilling	3 Lacerating
4 Throbbing		4 Stabbing	
5 Beating		5 Lancinating	
6 Pounding			
1 Pinching	1 Tugging	1 Hot	1 Tingling
2 Pressing	2 Pulling	2 Burning	2 Itchy
3 Gnawing	3 Wrenching	3 Scalding	3 Smarting
4 Cramping		4 Searing	4 Stinging
5 Crushing			
1 Dull	1 Tender	1 Tiring	1 Sickening
2 Sore	2 Taut	2 Exhausting	2 Suffocating
3 Hurting	3 Rasping		
4 Aching	4 Splitting		
5 Heavy			
1 Fearful	1 Punishing	1 Wretched	1 Annoying
2 Frightful	2 Gruelling	2 Blinding	2 Troublesome
3 Terrifying	3 Cruel		3 Miserable
	4 Vicious		4 Intense
	5 Killing		5 Unbearable
1 Spreading	1 Tight	1 Cool	1 Nagging
2 Radiating	2 Numb	2 Cold	2 Nauseating
3 Penetrating	3 Drawing	3 Freezing	3 Agonizing
4 Piercing	4 Squeezing		4 Dreadful
	5 Tearing		5 Torturing

Pain Scenarios and Judgments

Now we would like you to read several stories. After reading each story, please answer the questions on the page following it.

Story 1:

John wakes up one morning and goes to his kitchen to make some coffee. He turns the electric burner of his stove on, but then realizes that he has lent his coffee pot to his next door neighbor. So instead, he goes to the refrigerator and takes out a carton of orange juice. While holding the juice carton in his right hand, John accidentally places his left hand directly on the hot burner. He pulls his hand away and drops the carton of juice on the floor.

Questions for Story 1:

1. Rate the level of pain John experiences immediately:

very little pain ---------- excruciating pain

2. Rate the level of pain John experiences after ten minutes:

very little pain ---------- excruciating pain

3. Some of the following words describe the pain John experiences at the start of this episode. Circle the words that best describe it. Use at most a single word in each word group, the one that applies best. Leave out any word group that is not suitable.

1 Flickering	1 Jumping	1 Pricking	1 Sharp
2 Quivering	2 Flashing	2 Boring	2 Cutting
3 Pulsing	3 Shooting	3 Drilling	3 Lacerating
4 Throbbing		4 Stabbing	
5 Beating		5 Lancinating	
6 Pounding			
1 Pinching	1 Tugging	1 Hot	1 Tingling
2 Pressing	2 Pulling	2 Burning	2 Itchy
3 Gnawing	3 Wrenching	3 Scalding	3 Smarting
4 Cramping		4 Searing	4 Stinging
5 Crushing			
1 Dull	1 Tender	1 Tiring	1 Sickening
2 Sore	2 Taut	2 Exhausting	2 Suffocating
3 Hurting	3 Rasping		
4 Aching	4 Splitting		
5 Heavy			
1 Fearful	1 Punishing	1 Wretched	1 Annoying
2 Frightful	2 Gruelling	2 Blinding	2 Troublesome
3 Terrifying	3 Cruel		3 Miserable
	4 Vicious		4 Intense
	5 Killing		5 Unbearable
1 Spreading	1 Tight	1 Cool	1 Nagging
2 Radiating	2 Numb	2 Cold	2 Nauseating
3 Penetrating	3 Drawing	3 Freezing	3 Agonizing
4 Piercing	4 Squeezing		4 Dreadful
	5 Tearing		5 Torturing

Story 2:

After a long, hard day, John drives his car home, parks it, and turns off the motor. Unfortunately, John is tired and does not realize that while slamming the front door closed, his fingers are holding on to the frame around the door. The door slams shut, and all five of his fingers are caught between the door and the frame. He can't pull them out. He must open the door to release them.

Story 3:

Steve goes on a six-hour climb in the mountains with brand-new hiking boots. The next morning, he notices large, white blisters covering the balls and heels of both feet. They are broken and peeling. He wears thick socks and tennis shoes to work.

Story 4:

While Steve is working at his desk, a piece of paper floats down toward his feet. He pushes his chair back and reaches under the desk to grab the paper. He lifts his head up a little too soon and bangs it on the bottom of the desk drawer.

Story 5:

Bob flies home from a trip, and while the plane makes its final approach to land, pressure builds in his ears. He tries to yawn, even starts chewing some gum, but he can't seem to 'pop' his ears. The plane lands, and his ears still haven't 'popped'.

Story 6:

When riding his bicycle down a hill, Bob hits a bump and falls off. He slides a few feet down the hill on his shins and knees.

Pain During Past Year

For each of the following experiences, please indicate in the appropriate blank spaces:

1. Whether or not it happened to you in the past twelve months.

2. How many days during the past twelve months you experienced it (your best guess).

3. The intensity of the pain typically associated with the experience on average:

   0 = no pain
   1 = mild pain
   2 = discomforting pain
   3 = distressing pain
   4 = horrible pain
   5 = excruciating pain

4. The maximum intensity the pain reached, on the same 0-5 scale as in #3.

Experience	1. Happened? (yes or no)	2. # Days (0 to 365)	3. Usual Pain (0 to 5)	4. Max. Pain (0 to 5)
1. Headaches	_____	_____	_____	_____
2. Backaches	_____	_____	_____	_____
3. Stomach pains	_____	_____	_____	_____
4. Joint pains	_____	_____	_____	_____
5. Muscle pains	_____	_____	_____	_____
6. Dental pains	_____	_____	_____	_____
7. Pain for other reasons	_____	_____	_____	_____

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