

# An Outpatient Program in Behavioral Medicine for Chronic Pain Patients Based on the Practice of Mindfulness Meditation:

## Theoretical Considerations and Preliminary Results

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**Abstract:** *The practice of mindfulness meditation was used in a 10-week Stress Reduction and Relaxation Program to train chronic pain patients in self-regulation. The meditation facilitates an attentional stance towards proprioception known as detached observation. This appears to cause an "uncoupling" of the sensory dimension of the pain experience from the affective/evaluative alarm reaction and reduce the experience of suffering via cognitive reappraisal. Data are presented on 51 chronic pain patients who had not improved with traditional medical care. The dominant pain categories were low back, neck and shoulder, and headache. Facial pain, angina pectoris, noncoronary chest pain, and GI pain were also represented. At 10 weeks, 65% of the patients showed a reduction of  $\geq 33\%$  in the mean total Pain Rating Index (Melzack) and 50% showed a reduction of  $\geq 50\%$ . Similar decreases were recorded on other pain indices and in the number of medical symptoms reported. Large and significant reductions in mood disturbance and psychiatric symptomatology accompanied these changes and were relatively stable on follow-up. These improvements were independent of the pain category. We conclude that this form of meditation can be used as the basis for an effective behavioral program in self-regulation for chronic pain patients. Key features of the program structure, and the limitations of the present uncontrolled study are discussed.*

### Introduction

This paper presents the theoretical underpinnings and reports on the structure and outcome of an outpatient service in an academic medical center

piloted to explore the clinical effectiveness of meditation as a self-regulatory coping strategy for long-term chronic patients for whom the traditional medical treatments have been less than successful. In its first two years it has been attended by patients referred for a wide range of chronic conditions. This report presents only the summary outcome for the chronic pain patients; the complete outcome data for the pain patients, and the results with other classes of patients are presented elsewhere (1, 2). These results have recently been reported in abstract form (3).

The service, known as the Stress Reduction and Relaxation Program (SR&RP), utilizes training in a form of meditation known as mindfulness or awareness meditation as the major self-regulatory activity. All meditation practices used in the SR&RP were taught independent of the religious and cultural beliefs associated with them in their countries and traditions of origin.

### Rationale

In the hospital, the SR&RP functions as a "net" to catch patients who tend to "fall through the cracks" in the health care delivery system, neither improving in their primary medical condition over time nor feeling satisfied with the results of the traditional

medical management of their problem(s). The SR&RP is based on the systematic development of the internal resources of the patient. It provides a welcome alternative for motivated patients and a useful referral outlet for staff physicians. Many chronic pain patients ultimately receive the verdict that "you're going to have to learn to live with this." The SR&RP helps patients teach themselves the *how* of living with chronic pain. Self-regulation is promoted and learned via the directed attention characteristic of mindfulness meditation. The choice of mindfulness meditation was based on the author's experience of meditation, on reports in the traditional meditation literature concerning how to handle pain during intense meditation practice (4, 7), and on theoretical considerations of pain perception, attention, and their interaction. Since mindfulness meditation is intellectually and experientially unfamiliar in our culture, it is described here in some detail to clarify the rationale for its use in promoting self-regulation.

## Mindfulness Meditation

Meditation can be defined as the intentional self-regulation of attention from moment to moment [modified from Goleman and Schwartz, (5)]. It is neither contemplation nor rumination, as in thinking about a conceptual theme. There are two major classes of meditation practice: concentration meditation and mindfulness meditation (6). The latter is also referred to as awareness meditation and for present purposes the two terms are used here interchangeably.<sup>1</sup> They differ radically in the way in which attention is utilized.

Concentration methods, the most widely known and studied of which is Transcendental Meditation (TM), involve the restriction of attention to a single point or object, commonly a mantra (mental sound), the experience of breathing, a visual object, or a Koan (in the Rinzai Zen tradition) and holding it in the mind for extended periods (commonly 20–60 min). Any other mental activity is perceived as a distraction from the object of concentration.

Mindfulness meditation has roots in Theravada Buddhism where it is known as *sattipatana vipassana* or Insight Meditation (7), in Mahayana Buddhism in Soto Zen practices (8), and in the yogic traditions as expressed in the contemporary writings of J. Krishnamurti (9, 10), Vimila Thakar (11), and

Nisargadatta Maharaj (12). The practice of mindfulness meditation presupposes concentration to maintain steady attention. Rather than restricting attention to one object, however, this approach emphasizes the detached<sup>2</sup> observation, from one moment to the next, of a constantly changing field of objects. This flexibility is achieved by concentrating on one primary object (commonly the successive flow of inbreaths and outbreaths), until attention is relatively stable, and then allowing the field of objects of attention to expand (usually in stages) to include, ultimately, all physical and mental events—body sensations, thoughts, memories, emotions, perceptions, intuitions, fantasies—exactly as they occur in time. Expansion of the field of attention is taught gradually over a number of sessions.

Detached self-observation is not a trivial task. The mind has a strong tendency to wander and invariably becomes preoccupied with the content of thoughts and emotions, which often take form as memories, anticipations, ideas, opinions, and desires. The result is a reduction or complete loss of moment to moment attention and observation. When recognition of this drift from awareness occurs, the meditator simply brings attention to a detail of momentary reality, usually the breath or a sensation, to (re)anchor the attention in the present. When the faculty of detached observation becomes stable, the field of awareness is allowed to expand again. With practice, any event that arises in the field of one's awareness momentarily becomes the object of meditation until the next event (which may also be the experience of "absence of event") arises. In awareness meditation practice, no event is considered a distraction (not even the wandering of the mind); it is simply another object of observation. Moreover, no mental event is accorded any relative or absolute value or importance in terms of its content. All thoughts are treated the same: they are simply noted as they arise. The state achieved by adopting this stance towards self-observation is referred to in the meditation literature variously as bare attention (7), choiceless awareness (9), *shikan-taza* [Japanese for "just sitting," see Kapleau (13)], and "just like this mind" [see Seung Sahn, (14)].

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<sup>2</sup>In this context, the word "detached" means that the objects of observation are intentionally regarded with an effort to avoid judgment or interpretation or, with an effort to be aware of judgment or interpretation or categorizing if they occur. It should be emphasized that it does *not* mean lack of empathy, interest, compassion or caring, nor neurotic or pathological distancing or withdrawal.

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<sup>1</sup>Strictly speaking, the practice of mindfulness can and should lead to greater awareness if practiced correctly.

## Pain and Meditation

Pain is the result of the functioning of a normally adaptive neurological pathway. Pain alerts the organism to somatic damage via an arousal and alarm reaction and usually produces an appropriate motor response. In its chronic pathological form, however, pain is of no benefit to the organism and imposes severe emotional, physical and economic stresses on the patient and the patient's family (15).

Sternbach recently emphasized that psychological and behavioral strategies for pain control may provide a more therapeutic and satisfactory long-term solution than either surgery or drugs for most chronic pain patients (16). A decade ago, Melzack and Wall (17) stressed that motivational and cognitive contributions to the complex phenomenon of pain needed to be considered on an equal footing with sensory pathways and mechanisms if adequate and appropriate strategies for chronic pain relief were to be developed. The gate control theory provided a psychophysiological model for conceptualizing and explaining the long-known modulating effects that attention, distraction, suggestion, trance, anxiety, depression, and other emotional states, past experience, cultural tradition, family attitudes, and countless other higher nervous system behaviors can have on the perception and interpretation of pain (18). There is at present anatomical and physiological evidence for three interacting dimensions of the pain experience, termed sensory-discriminative, motivational-affective, and cognitive-interpretative (19). The gate control theory suggests that activity in the cognitive and/or motivational modes can modulate sensory transmission at the spinal cord entry level via descending pathways, thereby influencing the sensory dimension of the pain experience.

Meditation practice can be accompanied by intense pain in some ways resembling chronic pain. Dedicated western meditators practicing in the Zen and Vipassana traditions periodically engage in extended periods of meditation practice lasting weeks, and in some cases months, during which they may sit cross-legged on a cushion on the floor a total of 12 or more hr a day. The meditation periods are usually motionless and last from ½ hr to 1½ hr, with 1 hr being common. During such rigorous meditation practice, extreme forms of pain invariably arise. The body can ache and hurt day after day. Traditional meditation texts are replete with recommendations for cultivating detachment to intense pain through the specialized use of attention and careful self-observation which characterizes

mindfulness meditation [see (4, 7)]. It therefore seemed reasonable to hypothesize that insights stemming from the observation of pain arising during meditation might serve as a model for developing a testable intrapsychic strategy that patients may use for coping with chronic pain. Note that mindfulness requires focusing on unpleasant and painful sensations when they are present and discourages efforts to escape them by distraction or by absorption in some other object of attention. Although this specialized use of attention can be used for the purpose of coping with pain in meditation sessions, it did not develop historically for that purpose. It is the essence of mindfulness meditation *per se* (7, 10).

The potential benefit of using meditation for the self-regulation of chronic pain would depend on the patient's developing an ability to observe intense feeling in the body as bare sensation. By repeated practice the patient might learn to assume intentionally an attitude of detached observation toward a sensation when it becomes prominent in the field of awareness, and to observe with similar detachment the accompanying but independent cognitive processes which lead to evaluation and labeling of the sensation as painful, as hurt. By maintaining a perspective during periods of formal meditation (see Methods) in which no mental event (including perceptions) is accorded any content value, the strong alarm reaction (the interpretation of the sensation as pain, i.e., "It's killing me", often accompanied by future thinking, i.e., the thought that it will last for a long time or forever) can lose considerable power and urgency *simply by being observed as separate*. This is because the associated thoughts can be perceived simply as events in the mind, not necessarily any more accurate or important than any other thoughts passing through the mind (such as the memory of yesterday's dinner). In effect, assuming this attentional stance appears to produce a spontaneous (and momentary) uncoupling of the sensory component of the pain from the affective and cognitive dimensions (alarm reaction). If assumed regularly in the presence of pain, the attentional stance of detached observation can result in a specific deconditioning of alarm reactivity to primary sensation. This amounts to a learned *recognition* of primary sensation. The nociceptive signals (sensory) may be undiminished, but the emotional and cognitive components of the pain experience, the hurt, the suffering, are reduced.

Uncoupling as defined would be an event associated with higher brain centers. We may speculate that in some cases this event may generate

descending signals to close or "narrow" the spinal gate, resulting in reduction in the primary sensory dimension as well. Both outcomes have been observed in patients [see Kabat-Zinn et al. (1)].

The uncoupling hypothesized here does not involve a hypnotic trance state of reduced sensitivity or reduced awareness, but a refinement of awareness. The patient's altered relationship to primary sensation relies on a simple method of observation, and therefore need not be restricted to periods of formal meditation. It becomes accessible in everyday life via the conscious utilization of the learned attentional and attitudinal shift. We refer to this phenomenon as "carry-over" [see (20)] to suggest that the self-regulating benefits of the meditation continue beyond the period of formal practice (see Discussion).

There exist dramatic accounts in the literature of the complete uncoupling of the sensory from the affective and interpretive components of pain, with resulting loss of alarm reactivity and pain behavior. It can be achieved surgically (21, 22). It was reported for strong motivation in the classical observations of Beecher (23, 24). The experience of practitioners of mindfulness meditation suggested that a similar uncoupling is learnable via voluntary attentional control initiated from internal and intentional cues within the nervous system. The choice of mindfulness meditation as the modality on which to base a strategy of self-regulation for chronic pain patients followed logically from the above considerations.

## Methods

### *Structure of the Stress Reduction and Relaxation Program*

The program was a 10-week course which patients attended once a week for 2 hr. Three mindfulness meditation practices were taught. These were:

- A. Sweeping: a gradual sweeping through the body from feet to head with the attentional faculty, focusing on proprioception, and with periodic suggestions of breath awareness and relaxation. This was usually practiced in the supine position.
- B. Mindfulness of breath and other perceptions. This form was practiced sitting in a chair or on a cushion on the floor.
- C. Hatha Yoga postures. The yoga introduced a dimension of meditative exercise designed to reverse disuse atrophy of the musculoskeletal system while developing mindfulness during

movement. Although hatha yoga *per se* is not a traditional mindfulness technique, it was taught emphasizing mindfulness.

As in traditional monastic teaching, mindfulness meditation was also taught using the activities of walking, standing, and eating. The use of a range of objects of meditation helps to develop an ability to bring mindfulness into the varied circumstances of daily living.

Meditation instructions were as follows:

1. Bring your attention to the primary object of observation.
2. Be aware of it from moment to moment.
3. When you notice that the mind has drifted into thought, revery, and so forth, bring it back to awareness of the present moment, to the observation of what is dominant in that moment. In the sweeping meditation, the primary object is that region of the body through which one is moving at any moment.
4. When a strong feeling or emotion arises (i.e., a state of fear, pain, anger, anxiety), direct your attention to the feeling as it occurs and just be with it, observing it. When it subsides, return to the primary object of observation. Distinguish between observation of the experience itself and thoughts and interpretations of the experience.
5. Observe the thinking process itself. Avoid becoming involved in the content of individual thoughts. Observe them as impermanent mind events and not necessarily accurate. Treat all thoughts as equal in value and neither pursue them nor reject them.

For the first four weeks, sweeping was practiced for homework. A 45-min guided sweeping meditation on one side of a homework audio cassette tape was used at least once per day 6 days per week. In the weekly hospital sessions patients were taught mindfulness of breath and sensation during this period and were encouraged to supplement the tape by using it for 5 min each day while sitting formally, and as much as possible at other times. After 4 weeks, hatha yoga was introduced and the patients began to alternate the sweeping with the yoga (sides 1 and 2 of the tape) for homework each day. The guided yoga sequence was also 45 min. In weeks 7 and 8 patients were instructed to practice for 30-45 min per day, alternating either lying or sitting forms with the yoga but *not* using the tape for guidance. And in weeks 9 and 10, they were encouraged to practice any form they wanted for 30-45 minutes per day, either using the tape or not.

Instructions were given before and during

guided group meditations in the hospital sessions and were expanded upon and refined in the discussions. The questions and difficulties raised by individual patients about the homework were used to illustrate and fine-tune the meditation instructions. This approach made the meditation more understandable and personal, and minimized the tendency to approach meditation by mechanically pursuing a set formula.

Didactic material on the physiology of stress and on methods of coping with stress was presented during hospital sessions and discussed. Mindfulness coping strategies were frequently assigned for homework in addition to formal meditation.

### *Key Elements of the Program*

Care was taken to incorporate features which were thought to be important for a successful program. Some of these are meditation-specific, while others are common sense features of any optimal learning environment.

**1. A group format.** The group format increases the efficiency of patient education. Fifteen to twenty patients were taught in each group. The patients helped each other by sharing their experiences. Group support enhanced individual motivation and compliance.

**2. Expectation of relief.** Meditation was presented with the suggestion that the techniques are powerful and that regular practice can bring relief from pain in many cases. In this way the positive placebo effect was maximized.

**3. Non-goal orientation.** Since the practice of mindfulness meditation is fundamentally one of awareness in each moment, the appropriate attitude to cultivate is one of non-striving (8). This attitude (appreciated by the American Transcendentalists, Thoreau and Emerson) is the only way to practice this meditation correctly and, paradoxically, the best way to derive benefit from it. Non-striving was emphasized repeatedly in the hospital sessions and on the audio cassette tape used for homework. A byproduct of this orientation is that performance anxiety is minimized at the beginning stages.

**4. Self-responsibility.** It was repeatedly emphasized that internal resources for self-healing can only be developed by sustained work on the part of the individual.

**5. High demand characteristics.** The amount of work required of the patients in the program was impressed upon the patients in the initial evaluation interviews. A sense of satisfaction and accomplishment usually accompanied compliance.

**6. Spectrum of meditation techniques.** A number of different techniques were offered by which the patients might experience and cultivate detached observation. This approach underscores that there is no one right way to meditate or to relax and that any method is only a tool. The spectrum of meditative activities was provided to accommodate a range of somatic and cognitive dispositions among the patients (25). The gentle full-body conditioning introduced through the hatha yoga appeared to help many of the patients reduce musculoskeletal disuse atrophy and feel better about their bodies. It also demonstrated in a tangible way that one's perceived limits can recede with disciplined work at those limits.

**7. Didactic material.** Didactic material was presented on the relationship of stress to illness, the consequences of suppression of the Flight or Fight Response, and the Relaxation Response as a balance to autonomic arousal. Such material strengthened the belief that meditation can have significant physiological effects. It also served to encourage the patients to think about the functioning of their bodies. Homework assignments encouraged the patients to bring mindfulness to stressful situations in their daily lives. This facilitated the discovery of new personal resources for coping.

**8. Finite duration.** The course was long enough for most patients to grasp the principles of self-regulation and to develop skill and some autonomy in the meditation practice. It was also short enough to discourage dependency on the program and on the group support. The goal was for patients to achieve self-reliant well-behavior.

**9. Long-term perspective.** Patients were encouraged to view their experience in the SR&RP as a first step towards optimizing their health: a direct experience of the influence one can have on one's own health and well-being.

**10. "Advanced" program.** A 10-week "graduate" cycle was instituted for patients who wanted to continue the work begun in the SR&RP. The structure and outcome of this program has been reported elsewhere (1).

**Table 1.** Patient numbers and age range

	Cycle I		Cycle II		Cycle III	
Number screened	16		19		28	
Number starting	13		18		27	
Number finishing	11		16		24	
Number dropouts	2		2		3	

  

	Cycle I		Cycle II		Cycle III	
	Males	Females	Males	Females	Males	Females
Number	3	8	6	10	9	15
Mean age	41	47	44	47	46	48
Range	35-58		22-67		29-75	

**11. Low cost.** The cost for the 10-week program was \$100.00 per person.

### Subjects

Fifty-one patients, 18 males and 33 females ranging in age from 22 to 75, completed one of the three 10-week cycles of the Stress Reduction and Relaxation Program discussed here (Table 1). All were outpatients referred by their physicians to the SR&RP for a chronic pain condition or for another condition accompanied by chronic pain. Major presenting pain complaints and group profiles are presented in Table 2. Duration of the primary pain complaint at time of referral ranged from 6 months to 48 years with medians of 7, 6, and 2.5 years in the three cycles. The pain complaints ranged from those due to gross somatic pathology to those with no physical findings or diagnosis. Consistent with present thinking in the field of chronic pain, no formal distinction was made between "somatic" and "psychogenic" pain (26). In all cases, the patients had verified medical histories corroborating extended suffering. Few patients (less than 5%) were involved in pain-related disability litigation at the time they took the program.

### Classes of Pain

The largest classes of pain complaint were low back pain, upper back and shoulder pain, cervical pain, and headache (see Table 2).

### Pre- and Post-evaluation Interviews

All patients were seen individually in an initial screening and evaluation interview prior to admission to the program (pre). The purpose of this

**Table 2.** Medical Profile of Patients\*

	Cycle I N = 11	Cycle II N = 16	Cycle III N = 24
LBP	5	9	8
Migraine	3	4	0
Tension headache	2	1	3
Facial pain	1	1	0
Upper back/shoulder pain	1	1	9
Major extremity pain	3	2	1
Angina	2	1	0
NCP	0	1	2
Cervical pain	2	2	7
Cancer pain	0	1	0
Back/neck surgery	2	6	3
Arthritis	2	1	2
Stroke	1	1	0
Mastectomy	1	0	1
Pelvic pain	0	0	1
Abdominal pain	0	0	2
Mean # years with pain problem	11.2	10	4.3
Median # years with pain problem	7	6	2.5
Range (in years)	0.5-40	1-48	0.5-16

\*Legend: Numbers of patients in each cycle presented with the medical diagnoses and histories listed. Many patients had more than one condition. LBP is low back pain; NCP is noncoronary chest pain.

interview was to acquire baseline data on the patient's pain and psychological status before the intervention and to inform the patient of the high demand characteristics of the program as a screen for motivation. Any patient who chose to take the program after the initial interview was permitted to do so. As can be seen in Table 1, greater than 90% of those screened started the program, and greater than 85% of those starting completed the program.

A "debriefing" interview following the program was used to obtain similar data (post) to document outcome, and to make individual recommendations for the continued practice of the meditation.

### Pain Measures

A series of pain indices was used to probe diverse aspects of the pain experience as reported by the patient. These were:

1. The McGill-Melzack Pain Rating Index (PRI). The PRI is the best nontechnological method presently available for the measurement of pain. It has been shown to provide valid reliable scores which reflect the quality and intensity of clinical

pain experienced by patients (27). It is administered verbally in the "right now" time frame. The ratings are expressed as PRI(R) scores (27) by adding the rank values of the words chosen.

2. A Body Parts Problem Assessment scale (BPPA) (28). This measures the patient's view of how problematic his/her body parts are. The measure consists of a list of 53 body areas, each of which the patient rates on a scale of zero to 5 where zero is no problem and no discomfort, and where 5 represents great discomfort and very problematic. The time frame for this index is "this week, including today." The sum of ratings for the individual body parts gives the BPPA score. Normative values for this self-report are available (28).
3. A three-color Dermatome Pain Map (DPM) to visualize the areas and intensities of the pain. Red is used to depict intense pain; orange, pain of intermediate intensity; and brown a dull or aching pain. It is filled in while the interviewer observes. The colored areas are coded for frequency of occurrence by the interviewer after questioning the patient.
4. A Table of Levels of Interference (TLI) [modified from (29)]. This index asks the patient to report the frequency with which pain interferes with a variety of life activities (i.e., sex, eating, sleeping).
5. In cycle III, daily pain-related drug use and activity levels were assessed using home diaries (data not included).

### Non-Pain Measures

Several non-pain-related aspects of the patient's health were elicited along with the primary pain data. These were:

1. The number of medical symptoms checked as problems in the past month on a medical symptom checklist (MSCL) modified from Travis (30).
2. Change in emotional affect and mood were assessed using the Profile of Mood States (POMS) inventory (31). The results are expressed as a summary score known as the Total Mood Disturbance (TMD).
3. Change in psychological symptomatology was determined using the SCL-90-R inventory of Derogatis et al. (32, 33). Summary results for this index are expressed as the General Severity Index (GSI) score.
4. The Multidimensional Health Locus of Control

(MHLC) was used to determine change in the patient's health-related beliefs (data not shown).

5. A ten question outcome questionnaire (see follow-up) was included in the post battery of instruments.
6. Three target complaints (34) (patient-defined goals) were elicited in the pre interview. The patients were asked post-training to rate numerically the degree of progress towards their goals (data not shown).

### Follow-up

Follow-up questionnaires were mailed out at approximately 2.5, 7, and 11 months after completion of the SR&RP. Data are presented here for the 2.5 and 7 month follow-ups (Cycles II and I). Eleven month follow-up data obtained from members of the initial 10-week cycle of the SR&RP were rudimentary and qualitative (not reported here). The follow-up questionnaire consisted of two parts [see (1)]: the first was a series of 10 questions designed for the patient to score the degree of change for relevant parameters, with 5 being great progress or goal achieved, 3 signifying no progress or change, and 1 signifying considerable worsening. The average score was used to decide the therapeutic value of the SR&RP to the patient (1). Part II contained a range of questions pertaining to compliance (data not included). The mailed questionnaire was accompanied by the BPPA, the MSCL, the POMS and the SCL-90-R.

## Results

### Pain-Related Outcome

All pain-related data for the three cycles are summarized in Table 3. The PRI was not obtained in cycle I, and the TLI was not obtained in cycles I and II.

### Pain Rating Index

In cycle II, the PRI decreased from a mean of 17.5 premeditation training to a mean of 7.9 postmeditation training for the 10 individuals for whom both pre and post questionnaires were obtained. This represents a 51% reduction and is highly significant in the matched (pre and post) *t*-test ( $P < .001$ ,  $df = 9$ , two-tailed). Of the remaining 6 individuals, for whom the PRI data were incomplete, four reported reduction in overall pain on other indices,

**Table 3.** Summary of outcome: Primary pain-related measures

Pain measure	Cycle I n = 11				Cycle II n = 16				Cycle III n = 24			
Total Pain Rating Index (PRI)					<i>Pre</i> <i>Post</i>				<i>Pre</i> <i>Post</i>			
Mean	—				17.5      7.9				16.7      9.9			
Mean $\Delta$					9.6				6.8			
SE					1.7				2.2			
% redn					51%				41%			
<i>P</i> <					.001 ( <i>df</i> = 9)				.01 ( <i>df</i> = 23)			
Body Parts Problem Assessment (BPPA)	<i>Pre</i>	<i>Post</i>	2.5 mo	7 mo	<i>Pre</i>	<i>Post</i>	4 mo		<i>Pre</i>	<i>Post</i>		
Mean	38.2	35.5	26.3	22	41.4	31.3	32.6 ( <i>n</i> = 11)		47.7	29.3		
Mean $\Delta$	2.7		11.9	16.2	10.1		8.0		18.4			
SE				2.9	6.4		7.5		5.0			
% redn	8%		31%	42%	24%		20%		39%			
<i>P</i> <	NS		NS	.001	NS		NS		.01			
Dermatome Pain Map (DPM)												
Pre-post $\Delta$	- 0	+ ++	+++		- +	0 + ++	+++		- ± 0 + ++	+++		
# patients	0 3	2 2	3		1 1	2 1 4	6		1 2 2 5 5	8		
Improved: +/+/+/+/+	7/10	70%			11/15	73%			18/23	78%		
++/+/+/+	5/10	50%			10/15	67%			13/23	57%		
Table of Levels of Interference (TLI)									<i>Pre</i>	<i>Post</i>		
Mean	—				—				12.4	8.1		
Mean $\Delta$									4.1			
SE									1.3			
% redn									34%			
<i>P</i> <									.001			

\*Legend: Mean scores, differences in mean scores (mean  $\Delta$ ) and standards errors (SE) are listed for all pain (Table 3) and non-pain (Table 4) indices used in each cycle. Pre represents before the SR&RP, post represents after the SR&RP, and 2.5, 4, and 7 mo means follow-up, measured from the end of the SR&RP with times indicated in months. Percent reductions of the group mean values were calculated between the time in question and the mean Pre scores. *P* values represent two-tailed *t*-test statistics, with the degrees of freedom (*df*) as noted. Change in DPM was rated by visual inspection on a scale from - to +++ (see text) and the number of patients in each category is listed below it. Where follow-up returns were not complete, the mean  $\Delta$ 's and *t*-tests were calculated only for the individuals for whom complete data was available.

one was illiterate and could not respond validly, and one experienced an increase in pain over 10 weeks. Thus the missing cases probably do not invalidate the generality for the group of the mean PRI reduction observed in the cohort of patients for whom complete data were available.

In Cycle III, pre and post data on all 24 individuals in the cycle were obtained. The initial mean level was 16.7 and decreased to 9.9 post, a reduction of 41% (*P* < .01, *df* = 23, two tailed). Pooling the individual results for the two cycles, 22 out of 34 subjects (65%) achieved pain reduction of 33% or



**Table 4.** Summary of Outcome: Secondary Symptom Measures

Measure	Cycle I n = 11				Cycle II n = 16			Cycle III n = 24	
Medical Symptom Checklist (MSCL) (# of symptoms)	Pre	Post	2.5 mo	7 mo	Pre	Post	4 mo	Pre	Post
Mean #	24.3	13.1	11.3	10.8	18.7	13.2	15.8	23.9	16.4
Mean $\Delta$		11.1	13.0	13.5		5.5	2.73		7.5
SE		3.6	3.8	3.6		1.7	2.9		1.4
% redn		46%	54%	56%		29%	16%		31%
P <		.02	.01	.01		.005	NS		.001
Total Mood Disturbance (POMS)					Pre	Post	4 mo	Pre	Post
Mean score	—				42.1	16.8	21 <i>n</i> = 11 <sup>a</sup>	51.5	20.2
Mean $\Delta$						25.3	18.1		31.3
SE						8.7	9.2		6.2
% redn						60%	46%		61%
P <						.02	NS		.001
General Severity Index (SCL-90-R)					Pre	Post	4 mo	Pre	Post
Mean score					.74 <i>n</i> = 16	.49 <i>n</i> = 14 <sup>a</sup>	.47 <i>n</i> = 10 <sup>a</sup>	.82 <i>n</i> = 23	.51 <i>n</i> = 23
Mean $\Delta$						.25	.22		.31
SE	—						.09		.06
% redn						34%	.32%		38%
P <						.05	.05		.001

<sup>a</sup> Mean  $\Delta$ 's and t-test for these are calculated using matched pre and post or follow-up results.

greater, and 17 out of 34 (50%) achieved pain reduction of 50% or greater over the 10-week period during which they practiced mindfulness meditation (Table 5).

#### Body Parts Problem Assessment

In Cycle I (*N* = 11), the BPPA did not show a significant reduction until 7 months follow-up, at which time the reduction was 42% and was highly significant. All 11 patients (100%) returned follow-up questionnaires on both occasions. Several patients in Cycle I had very elevated post scores on the BPPA due to pain from acute episodes unrelated to their primary pain complaints. These scores initially obscured the progress the majority had made on the BPPA when averaged in.

Reductions relative to the pre level in Cycle II (*N* = 16) were 24% at 10 weeks and 20% at 4 months follow-up (11 responders). Neither reached statistical significance.

In cycle III (*N* = 24), the average pre score was higher (47.7) than for the previous cycles and the reduction at 10 weeks greater, 39%. This was highly significant in the *t* test. In total, 57% of the patients achieved a reduction of 33% or greater on the BPPA at 10 weeks, and 43% achieved a reduction of 50% or greater (Table 5).

#### Dermatome Pain Map

The DPM provided a visual dimension to the pain-assessment battery. The definitive and highly selective choices pain patients make when given lists of

pain descriptors to choose from, as noted by Melzack (27), were also observed in choice of color and areas when they were asked to draw in their pain on the DPM. As with all the outcome measures, the patients filled out the post DPM without access to their pre DPMs. They were specifically questioned as to its completeness and accuracy.

The DPM has potential as a quantitative assessment of pain. In the present study, however, its use was restricted to a qualitative assessment of the direction and degree of change between the pre and post results (scored by the author). The rating scale ranged from – (which signified that the change from the pre to the post evaluation indicated that the pain was either more intense, more frequent, occupied a greater area or some combination of the above) to +++ (which signified a highly visible reduction area, intensity, or frequency, or a combination of the above). Table 3 shows that greater than 70% of the patients in each cycle were in the +/+/+/+++ (“improvement”) class, and 50% or more in the ++/+/+++ (“moderate or great improvement”) class.

#### *Table of Levels of Interference*

In cycle III, the average score dropped from 12.4 to 8.1, or 34%. This represents a significant improvement in the ability to engage in ordinary life activities *while in pain*. This index does not take into account the frequency of occurrence of interfering pain. Many patients remarked that their scores on

this instrument did not reflect their improved pain status because it demanded the degree of interference only for those times when they had pain.

### **Non-Pain Related Outcome**

Summary data on the secondary dimensions of symptomatology and mood are found in Table 4.

#### *Medical Symptom Checklist*

In cycle I, the percent reduction in the mean total number of symptoms was 46% at 10 weeks, 54% at 2.5 months follow-up, and 56% at 7 months follow-up, all highly significant by matched *t* test.

In cycle II, the percent reduction of the mean was 29% at 10 weeks and was highly significant statistically. At 4 months follow-up, it was 16% and was no longer statistically significant.

In cycle III, the percent reduction of the mean number of symptoms was 31% at 10 weeks. The 46% reduction in number of medical symptoms in cycle I was impressive compared to the 29% and 31% reductions at 10 weeks recorded in cycles II and III. Whether this difference and the differences in direction and magnitude at follow-up are due to random group differences remains to be defined from subsequent cycles. Nevertheless, we may minimally conclude that on the average close to one-third of the medical symptoms present on initial referral were no longer problematic after the 10-week training in mindfulness meditation.

**Table 5.** Summary of patient achievement of fixed levels of improvement at 10 weeks

Cycle	PRI		BPPA		DPM	MSCL		TMD		GSI	
	≥33%	≥50%	≥33%	≥50%	mod/great improvement	≥33%	≥50%	≥33%	≥50%	≥33%	≥50%
I N = 11	ND	ND	6	5	5	7	4	ND	ND	ND	ND
II N = 16	7/10 <sup>a</sup>	5/10 <sup>a</sup>	9	8	10	7	5	11/14 <sup>a</sup>	9/14 <sup>a</sup>	7/14 <sup>a</sup>	5/14 <sup>a</sup>
III N = 24	15	12	14	9	13	14	8	17/23 <sup>a</sup>	14/23 <sup>a</sup>	14/23 <sup>a</sup>	7/23 <sup>a</sup>
Total N = 51	22/34	17/34	29/51	22/51	28/51	28/51	17/51	28/37	23/37	21/37	12/39
%	65	50	57	43	55	55	33	76	62	57	32

<sup>a</sup>where the entire group did not complete the pre and post questionnaires, the number who did answer is shown in the denominator.

*Legend:* Each column shows the number of individuals who achieved score reductions on a particular index of greater than or equal to 33% and greater than or equal to 50%. Totals are given in the bottom row and are expressed as the percentage of the total number of patients for whom complete data was available. ND means not done.

In total, 28 out of 51 patients (55%) reported a reduction on the MSCL of greater than or equal to 33%, and 17 out of 51 (33%) reported a reduction of greater than or equal to 50% at 10 weeks (Table 5).

#### *Total Mood Disturbance*

There was a substantial and highly significant reduction in negative affect in cycles II and III at 10 weeks (60%). For cycle II, for the 11 individuals responding (69%) to the 4 month follow-up questionnaire, the mean reduction from the mean pre level was 46%, below statistical significance.

In total, 28 out of 37 patients (76%) reported a reduction in TMD of greater than or equal to 33%, and 23 out of 37 (62%) a reduction of greater than or equal to 50% at 10 weeks (Table 5). This constitutes an impressive improvement in affect for the vast majority of the pain patients over the 10 weeks of the meditation training.

#### *General Severity Index*

In Table 4, it can be seen that in cycles II and III, 10 week mean reductions of 34% and 38% respectively were recorded, the former being stable at 4 months follow-up for the responders. All reductions reached high statistical significance. In total, 21 out of 37 patients (57%) in cycles II and III reported a reduction in GSI of greater than or equal to 33%, while 12 out of 37 (32%) reported a reduction of greater than or equal to 50% at 10 weeks (Table 4).

#### *Summary Outcome Score at Follow-up*

Part one of the Follow-up Questionnaire provided the opportunity to assign a mean summary outcome score to each individual on the basis of the response to 10 questions thought to be relevant to a clinical judgment of improvement [see (1)]. On a scale of 1 to 5 where 3 represents no change or improvement, 5 is great progress, and 1 is major worsening, an empirical cut off was set at a mean score for the 10 questions of 3.4. This served to separate those who could clearly be labeled as improving from those who clearly did not improve. The range of 3.0 to 3.4 contained a few individuals who we knew (from the other data and from personal discussions) had made more progress in some areas than the score indicated. For sake of consistency, however, all individuals scoring below 3.5 were assigned to the no improvement category.

In cycle I, 3 out of 11 patients (27%) scored

between 2.7 and 3.4 at 7 months follow-up. The remainder (73%) scored above 3.5 on the outcome questionnaire. The mean score for all 11 patients was 4.2.

In cycle II, with 11 respondents out of 16 at 4 months follow-up, 2 out of 11 (18%) had scores below 3.5 (2.9 and 1.8). The mean score for all 11 patients was 3.7.

In cycle III, at the end of the 10-week training period, 5 patients out of 24 were in the no progress category (21%) with the rest (79%) scoring above 3.5. The mean score was 4.0.

In each cycle a number of individuals scored above 4.3, an indication of considerable progress towards less pain, greater energy, and improved coping. This suggested a substantial general improvement in health status remarkable for this difficult chronic population. This was confirmed for these individuals by their large change scores on at least some of the pain indices and non-pain measures.

## **Discussion**

The results presented above are a summary of the outcome data obtained in three sequential cycles of the Stress Reduction and Relaxation Program<sup>3</sup> in which a total of 51 chronic pain patients participated. The most striking observation was that the majority of patients experienced considerable improvement in their conditions over the course of the 10 week training program in mindfulness meditation. Improvement was observed for all categories of chronic pain. Most of the pain reduction and affect improvement was maintained on follow-up at 2.5, 4, and 7 months. The follow-up data, however, are limited at the time of writing to two of the three cycles and to only one pain measure (the BPPA)<sup>4</sup> in addition to the pain-related questions in the summary outcome questionnaire.

#### *Pain Outcome*

Because of the highly subjective nature of the pain experience and the difficulty in acquiring precise measurements of pain and suffering, a spectrum of pain indices was used to assess different but over-

<sup>3</sup>Cycle I, Winter 1980; Cycle II, Spring 1980; Cycle III, Fall 1980.

<sup>4</sup>The PRI and the DPM were not included in the follow-up mailing because of the need to administer them in the presence of an interviewer for reliability and accuracy.

lapping dimensions. The Pain Rating Index relies on linguistic/verbal discrimination and on the choice of pain descriptors. The Body Parts Problem Assessment probes feelings about body parts. The Dermatome Pain Map subserves visual, spatial, and tactile dimensions as the patient colors in his/her pain. The Table of Levels of Interference assesses a behavioral dimension of pain. Different time frames add to the breadth of the spectrum. The PRI was used to assess *present pain* while the others were used in a "past week including today" mode. For correlation studies on these indices, see (1).

In each cycle, more than 50% of the patients reported greater than or equal to 33% reduction in both present pain (PRI) and general body problems (BPPA), and approximately 50% were in the "moderate to great improvement" category as judged by their drawings on the DPM (Table 5). Between 35% and 50% of the patients in each cycle reported greater than 50% reduction on the PRI and the BPPA. These results suggest a pronounced decrease in severity and frequency of pain over a 10-week period. It is important to note that they do not represent reductions measured over a therapy session as in Melzack and Perry (20). The pain reductions reported here compare favorably with those reported by these authors for a similar but more stringently defined chronic pain population. In fact, if we had expressed our results as the mean percent change in PRI by summing the individual net percentage changes for each subject (pre - post/pre) and correcting for initial values of zero (27), the percent reductions would in most cases be considerably higher than the values listed in Table 3. This applies to all the other indices in Tables 3 and 4 as well, which are expressed as the percentage change of the group mean, giving more weight to those individuals reporting high scores, and thus making it more difficult to obtain a numerically impressive improvement.

Melzack and Perry noted that the duration of relief from pain in some individuals lasted for several hours after training sessions in which EEG- $\alpha$ -biofeedback combined with hypnosis was the therapeutic modality, and referred to this phenomenon as carry-over. Our data suggest a similar phenomenon of carry-over as a result of training in mindfulness meditation. Pre and post pain measures for individual meditation sessions were not elicited, because this would have contradicted the emphasis on non-striving and on direct observation and acceptance of the pain as experienced in each moment. The decreases in pain we observed over the 10-week

training period therefore represent a generalized pain reduction not restricted to the occasions of formal meditation practice. This suggests that the improvements in the majority of patients were profound. The observed pain reductions are consistent with the hypothesis (see Introduction) that the direct observation of pain as one of a number of objects of awareness can reduce the affective and cognitive dimensions of the experience. Evidence from the non-pain outcome measures (see below) suggests that the pain reductions are related to changes in attitudes and modes of perception of pain. An analysis of the sensory and affective components of the PRI may shed light on possible differential effects of the meditation strategy on the component dimensions of the pain experience.

In assessing the contribution of any self-regulatory intervention to an observed therapeutic result, it is important to cite the work of Holroyd and Andrasik (35). They observed, in carefully controlled experiments, that improvement in tension headache in patients following EMG-biofeedback training was a result of cognitive and behavioral changes in recognizing and coping with headache eliciting situations rather than from the learned self-control of muscle tension. They pointed out that when taught to recognize the onset of headache symptoms, their patients changed the ways they were coping with these stressful situations *even when no coping skills were taught*. They concluded that "it may be less crucial to provide clients with specific coping responses than to insure they monitor the insidious onset of symptoms and are capable of engaging in some sort of cognitive or behavioral response . . . this response need not be relaxation and in certain situations where . . . inappropriate . . . should not be relaxation." These observations imply that moment to moment mindfulness may itself be the underlying coping mechanism. The experience of patients practicing mindfulness meditation suggests that increased awareness and sensitivity to the attributes of pain and to stress reactions *in the moment*, lead to the spontaneous development of new cognitive and behavioral coping responses to pain and stress, replacing nonadaptive conditioned pain behaviors and knee jerk stress reactions (1, 2).

#### *Non-Pain (Symptom and Affect) Outcome*

The overall health of the patients was monitored as part of the outcome determination. Meditation and yoga embody and reinforce well-behavior and

might presumably have an effect on symptoms and affect through generalized reduction in arousal, regular deep physiological relaxation, and insight into one's potential inner resources for growth and self-regulation. Ideally, measurements of ego development (Loevinger), self-actualization and improved coping would be appropriate for defining changes in this area. However, these have either technical or methodological shortcomings and therefore none was monitored. The analysis was confined to the number of medical symptoms reported, to a psychiatric symptom profile, and to a mood indicator profile (Table 4).

The mean number of medical symptoms was impressively lower after 10 weeks in every cycle of the SR&RP. Reductions ranging from 29% to 46% were recorded. For the patients in cycle I, the mean symptom reduction increased with time to reach 56% at 7 months follow-up. Combining the three cycles, 55% of the patients reported symptom reductions of 33% or greater at 10 weeks, and 33% reported reductions of 50% or greater (Table 5).

The mean Total Mood Disturbance (TMD) score on the Profile of Mood States decreased by approximately 60% at 10 weeks in cycles II and III (Table 4), reflecting a shift to greater vigor and reduced fatigue, confusion, depression and tension. At 4 months follow-up, the bulk of this reduction (46%) was still apparent. A total of 76% of the individuals in the three cycles combined recorded a reduction in TMD of 33% or greater, and 62% a reduction of 50% or greater (Table 5).

The mean summary measure of psychiatric symptomatology on the SCL-90-R, the GSI, decreased by between 34% and 38% ( $P < .05$ ,  $df = 14$ , two-tailed;  $P < .001$ ,  $df = 22$ , two-tailed) respectively in cycles II and III and was conserved at 4 months follow-up of the patients from cycle II. On the profiles, the largest mean reductions were in the dimensions of depression, anxiety, obsessive-compulsive behavior, and somatization (1). Fifty-seven percent of the patients in the three combined cycles reduced the General Severity Index by 33% or more, while 32% reduced it by 50% or more (Table 4). Mean GSI changes of this magnitude are impressive and were significant statistically.

The mean reductions in the non-pain indices suggest that the chronic pain patients responded to training in meditation on a variety of interrelated fronts. Symptoms were sufficiently reduced over the 10 weeks to conclude that the patients were in fact exercising self-regulation and wellness behaviors. This conclusion was supported by the large

reductions observed in negative mood states including depression, tension, anxiety, fatigue and confusion and by an increase in vigor. Nonquantifiable free-text statements by many patients claimed growth in areas of self-esteem, communication, and coping. These changes have been maintained in some cases for up to 1.5 years follow-up and in most cases improvement continues (1).

The SCL-90-R was used by Carrington et al. (36) to probe stress symptom changes in a working population as a function of on the job training in progressive relaxation and several concentration meditation techniques. They observed a remarkable decrease in GSI in the control population which did not undergo any intervention except pre and post testing and passage of time. The authors attributed this reduction to a nonspecific placebo effect associated with high expectations generated by the experimental design. Their finding underscores the caution necessary in interpreting the pain and symptom reductions we have observed until comparison controls are available. Nevertheless, it is highly unlikely that a chronic pain population would respond as dramatically as the Carrington et al. control group without a specific therapeutic intervention, and our recent work (1) clearly shows that the mean reductions reported here were *not* observed in a control group of patients receiving the traditional medical therapies in the Pain Clinic over a comparable period of time.

#### *Limitations of the Present Work*

1. The lack of matched comparison control groups makes a rigorous interpretation of the role of the meditation in the reported pain reduction impossible at this time.

2. Most of the data are based on paper and pencil patient self-reports, and are therefore subject to response sets and bias to some degree, motivated by denial, exaggeration, or desire to please. This problem is offset somewhat by use of the spectrum of pain indices, which averages out response biases to specific measures by individual patients. For most patients, reports of reduced pain and decreased pain-related behavior were reflected in observable changes in affect and reduced dependency on prescription medication and nerve blocks (1). We therefore assume that to a first approximation the patients were in fact reporting their status accurately.

3. Ideally the change in DPM should be rated by a panel of independent judges rather than by the author.

## Summary and Conclusion

The preliminary results from the Stress Reduction and Relaxation Program suggest that it is possible to structure and conduct a successful outpatient behavioral medicine clinic in a hospital setting, and that many chronic pain patients can benefit dramatically from such a program. The program structure incorporated common sense features for catalyzing behavioral improvement such as encouraging self-responsibility, positive placebo factors, a group setting, a short-course format, low cost, and a unified gamut of techniques for self-regulation. These features are probably essential ingredients for any successful behavioral medicine outpatient program. They were used to maximize the effectiveness of the specific intervention: mindfulness meditation.

Beyond the reduction in pain levels and pain-related behaviors, the majority of patients evidenced attitudinal and behavioral changes which can be attributed to the regular practice of mindfulness meditation: an ability to observe mental events, including pain, with a sense of detachment; cognitive changes which appear directly related to the experience of detachment; and an increased awareness of oneself in relationship to others and to the world. Deep personal insights, greater patience, a new ability to relax in daily life situations, and a willingness to live more in the present moment were commonly reported, as were increased awareness of stressful situations and improved ability to cope successfully. While this work does not prove that the meditation practice is directly responsible for these changes, it does suggest it. A methodologically stringent placebo controlled study is in the design stage to test the hypothesis that the major therapeutic benefits stem from the meditation practice itself.

## Acknowledgments

The author wishes to express his thanks to Drs. James E. Dalen, Joseph S. Alpert, Hugh Fulmer, Thomas Winters, Robert Burney, Michael Stanton-Hicks, Leslie Lipworth, and John Monahan for their support of the SR&RP and for their encouragement. He wishes to acknowledge his debt to Mr. Terry Hardy, R.P.T. for his hospitality and generous support, to Ms. Linda Czerniawski, R.P.T. for her kind support and to Dr. Daniel Brown for advice on outcome measures. Special thanks to Denise Keddy for typing the manuscript, and to Drs. Robert H. Singer, Elvin A. Kabat, Joseph S. Alpert, Ilan Kutz and Herbert Benson for their critical comments.

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