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# The Clinical Use of Mindfulness Meditation for the Self-Regulation of Chronic Pain

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*Ninety chronic pain patients were trained in mindfulness meditation in a 10-week Stress Reduction and Relaxation Program. Statistically significant reductions were observed in measures of present-moment pain, negative body image, inhibition of activity by pain, symptoms, mood disturbance, and psychological symptomatology, including anxiety and depression. Pain-related drug utilization decreased and activity levels and feelings of self-esteem increased. Improvement appeared to be independent of gender, source of referral, and type of pain. A comparison group of pain patients did not show significant improvement on these measures after traditional treatment protocols. At follow-up, the improvements observed during the meditation training were maintained up to 15 months post-meditation training for all measures except present-moment pain. The majority of subjects reported continued high compliance with the meditation practice as part of their daily lives. The relationship of mindfulness meditation to other psychological methods for chronic pain control is discussed.*

**KEY WORDS:** meditation; pain; self-regulation; coping; stress.

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## INTRODUCTION

Achieving improvement in the quality of life for individuals suffering from chronic pain presents a profound dilemma for the clinician, perhaps reflecting a deep dilemma in the paradigm of medicine itself (Cassel, 1982; McCue, 1982). In spite of the modern armamentarium for directly treating persistent pain with analgesics, narcotics, and surgery, reliable relief from chronic pain in many cases remains an elusive goal. With this has come the recognition of the need to intervene to treat the psychological dimensions of chronic pain (Melzack and Wall, 1970; Sternback, 1978). This view has led to a range of psychological interventions, many emphasizing strategies of self-regulation. The latter have included biofeedback, relaxation training, hypnosis, and cognitive-behavioral therapies (see Melzack and Wall, 1983; Turk *et al.,* 1983). Studies employing psychological modalities in the treatment of chronic pain have been recently reviewed and critically discussed by Turner and Chapman (Turner and Chapman, 1982a,b). All the modalities reviewed have proven useful in certain circumstances, and all have particular limitations in perspective (Turner and Chapman, 1982a,b).

In an even more recent development, meditative practives from oriental traditions such as Zen Buddhism, Vipassana, and Yoga, without their original religious, cultural, and ideological forms, have been introduced into some therapeutic settings as strategies for self-regulation (Shapiro, 1980; Deatherage, 1975; Shapiro and Giber, 1978; Kutz *et al.,* 1985a,b) and have also become the focus of systematic research efforts (Benson, 1975; Burns and Ohayv, 1980; Davidson, 1976; Maliszewski, 1981; Walsh, 1977, 1978, 1983; Woolfolk, 1975). It has been suggested that these practices, collectively termed "consciousness disciplines," are based on assumptions about human nature which differ in fundamental ways from the paradigms upon which Western psychology and behavior science rest (Walsh, 1980). These assumptions include (1) that "our usual state of consciousness is severely suboptimal" and (2) that "through intensive mental training it is possible to attain states of consciousness and psychological well-being beyond those currently described by traditional Western psychologies, as well as profound insight into the nature of mental processes, consciousness, and reality" (Walsh, 1980). Commenting on methods of psychological transformation, C. G. Jung once remarked that the "methods and philosophical doctrines [that] have been developed [in the East] simply put all Western attempts along these lines into the shade" (Jung, 1969). If such views have any substance, they suggest that the meditative traditions may have important and unique viewpoints and methods to offer behavioral science in general and clinical behavioral medicine in particular (Deikman, 1982). It is also plausible that the relaxation exercises and cognitive and behavioral therapies developed within the Western

psychological paradigm might be further developed and deepened via exposure to rigorous meditation practice and a systematic study of its empirical effects (Burns, 1973). There is no doubt that the Eastern traditions can also benefit from the psychological sophistication of the West (see, e.g., Butler, 1983) and that both paradigms can be enriched by cross-fertilization. It was with these notions in mind that we chose to create a behavioral medicine clinic based on training in meditation.

This paper describes the clinical use of relatively intensive training in the consciousness discipline known generically as *mindfulness* or *awareness meditation* in a hospital outpatient stress reduction program and the outcome for 90 patients referred to it for chronic pain conditions in its first 2 years of operation. Preliminary results have been reported (Kabat-Zinn and Burney, 1981; Kabat-Zinn, 1982). Initial observations suggested that training in meditation is acceptable to a broad spectrum of medical outpatients and can be effective in reducing pain and pain-related behaviors for a range of chronic pain conditions.

Mindfulness meditation has roots within Theravada Buddhism, where it is known as *satipatana vipassana* or insight meditation (Nyanaponika, 1962), in Mahayana Buddhism in Soto Zen practices (Suzuki, 1970), and in the Yogic traditions as expressed in the contemporary writings of J. Krishnamurti (1979), Vimila Thakar (1977), and Nisargadatta Maharaj (1973). This form of meditation is a highly developed, coherent, systematic, and multimodal utilization of attention. One of its primary goals is the development of "insight" into the actuality of phenomena, achieved by the cultivation of what the Buddhists refer to as "bare attention" or "detached observation" (Nyanaponika, 1962). This is a moment-to-moment effort to perceive a phenomenon and to allow it to register with full awareness, as it is, without gross distortion of the bare percept from associated and second-order meanings to the ego of the observer (see Naranjo and Ornstein, 1971). The meditation instructions themselves are an active support in minimizing distortion of this kind.

In the case of pain perception, the cultivation of detached observation of the pain experience may be achieved by paying careful attention to and distinguishing *as separate events* the actual primary sensations as they occur from moment to moment and any accompanying thoughts about pain. The rationale for the choice of this form of meditation and a description of its use in the stress reduction program have been presented elsewhere (Kabat-Zinn, 1982).

In this outcome study, we sought to address the specific questions listed below. For clarity, after each question the indices which measure the relevant parameters in this study are listed in parentheses (see Methods).

Can mindfulness meditation training in the context of stress reduction effectively

(1) reduce pain levels over an extended period of time (10 weeks)? (PRI, BPM);
(2) lead to improvement in body image and reduced somaticizing? (BPPA, SOM scale of SCL-90-R);
(3) help in coping with persistent pain so that it will interfere less with the performance of routine activities of normal living? (TLI);
(4) reduce the characteristically elevated negative affective states in chronic pain patients, in particular depression, hostility, low self-esteem, and anxiety? (POMS, SCL-90-R);
(5) compare favorably in outcome with more traditional and more expensive medical treatments for the same pain conditions? (comparison with nonmeditating Pain Clinic patients);
(6) produce positive long-term improvements in pain, coping behaviors, and affect? (follow-up questionnaire); and
(7) lead to a continued, voluntary practice of the meditation following training? (follow-up questionnaire).

## METHODS

### Program Design

The meditation training took place in a 10-week Stress Reduction and Relaxation Program (SR&RP). The SR&RP is a clinical service of the Division of Preventive and Behavioral Medicine in the Department of Medicine at the University of Massachusetts Medical Center. Chronic pain is one reason for referral to this program. Approximately 60% of the patients are referred for stress-related medical problems having nothing to do with pain. This report concerns only those patients referred in the first 2 years of the program with a diagnosed pain condition of greater than 6 months' duration, well substantiated by medical history, who had not improved with traditional medical care. All patients were physician referred.

Each individual was seen initially in an evaluation interview which included a detailed description of the program. The description emphasized that the program was educational in nature and that a high degree of discipline on the patient's part was required. It was explained that the SR&RP was based on intensive, daily practice of meditation and on the practical application of meditation for coping with stress and pain. The program was explicitly differentiated from behavior modification programs and from group therapy. If the patient chose to enroll, a battery of interviewer-administered

and self-report questionnaires (see below) was given. The information from these instruments constituted the pre-meditation-training data base (pre).

The SR&RP courses are conducted in cycles three times a year. Each cycle consists of ten 2-hr classes, one per week, in which a variety of forms of fulness meditation are taught and practiced [for details see Discussion and Kabat-Zinn (1982)].[5] All subjects in this study were required to meditate formally for a minimum of 45 min per day, 6 days per week, for homework, using an audiocassette tape in the beginning weeks for guidance. Instruction and practice of Hatha Yoga were included as a form of meditative exercise for those who could do it. It functioned primarily to improve musculoskeletal strength and flexibility and reduce disuse atrophy. The Yoga was taught emphasizing mindfulness (Kabat-Zinn, 1982).

Each SR&RP course was conducted by an instructor on the SR&RP staff. The instructors have practiced mindfulness meditation regularly for many years and continue to engage in periodic retreats for intensive training and practice.

Following the course, each patient was seen individually in a second evaluation interview, during which post-meditation-training data (post) were obtained.

## Patient Characteristics

The subjects in this study were trained in meditation in five consecutive 10-week cycles of the SR&RP in 1980 and 1981. Referrals were from four major sources within the hospital: the Pain Control Center (Pain Clinic; PC) [low back, neck, shoulder, arm, leg, and facial pain and multiple-site pain (chronic pain syndrome) ($N$ = 21); the Orthopedic Clinic (similar to the PC profile)] ($N$ = 18); the Neurology Clinic (headaches, including migraine and tension; low back pain; and peripheral nerve problems) ($N$ = 8); and the Adult Primary Care Clinic (headaches and chest pain) ($N$ = 23). The remaining 20 subjects in this study were referred for pain problems from medical subspecialists such as gastroenterologists and cardiologists, from psychiatrists, or from physicians outside the hospital.

All patients were enrolled if they met the entry criteria for the SR&RP and agreed to make the necessary commitment of time and effort. Over 90% of the patients contacted after referral came for an initial evaluation interview, and 80 to 90% of those enrolled in the program. Of the patients beginning the program, 80-90% completed it. These percentages varied within these limits for different cycles of the program. Data from all the cycles have been

[5]The SR&RP was recently changed to an 8-week course including an additional 8-hr intensive "retreat" session.

pooled and averaged in reporting the results except for the follow-up study, in which each cycle is plotted separately. The patient characteristics are shown in Table IA. The majority had long histories of medical treatment for their conditions, with little or no improvement in either pain status or affective and cognitive/behavioral status prior to enrolling in the SR&RP.

*Subsequent Intervention.* The SR&RP offers as a sequel an "advanced" course to deepen the process begun in the initial mediation training. This graduate SR&RP is an 8-week course with a format similar to that the of basic SR&RP. The periods of meditation are longer and less guided. Some of the patients in this study had taken one or more graduate courses at the time some of the follow-up data were obtained (see Results).

## Follow-Up

Follow-up data were solicited from all patients who completed the SR&PR by periodic mailing of questionnaires at approximately 2.5, 4.5, 7, 12, and 15 months after completion of the program. In addition to follow-up information on pain and psychological status, detailed information was obtained about whether and how much individuals were meditating and about the techniques they had found the most useful.

## Comparison Group

One of our objectives was to compare the outcome of this nontraditional approach with that of a more traditional medical, pain-specific approach with similar patients. To this end we compared outcomes between pain patients trained in meditation and pain patients undergoing treatment but who were not trained in any form of self-regulation. This was possible because the same battery of data instruments given to the meditators pre and post was also employed with all outpatients in the Pain Clinic at the initial visit and at a clinic visit 10 weeks later. A cohort of 21 consecutive patients who were being treated by the traditional methods of the PC (which include nerve blocks, TENS, physical therapy, analgesics, antidepressants) and who had not been referred to the SR&RP at the time of the comparison was monitored over a 10-week period (PC comparison group). The outcome for these individuals was compared with that for those patients ($N = 21$) referred to the SR&RP from the Pain Clinic (PC referrals). During the meditation training some, but not all, of the PC referrals received periodic treatments at the Pain Clinic and continued to take prescribed medication. The remainder had completed their treatmentcourse in the pain Clinic. In all cases, however, individuals were referred to the SR&RP because they had continued to have pain without improvement at the time of referral.

It is important to note that this is not a prospective randomized study but a descriptive comparison of two functioning hospital clinics. In both clinics, referral includes elaborate placebo concomitants such as enthusiastic referral to a special program and high expectation of pain relief. It was hypothesized that both cohorts in the comparison would show positive changes in pain status associated with these placebo elements to a similar extent and that quantitative differences due to the specific interventions might be distinguishable in the comparison. However, the fact that the patients were not distributed randomly to the two interventions to be compared means that conclusions based on the observations must be limited (see Discussion). The relevant differences between the comparison groups are cited in Table IB.

## Pain Indices and Psychological/Behavioral Measures

A number of different self-report indices was used to assess the multiple aspects of pain and certain pain-related behaviors of interest to us in addressing the questions posed in the Introduction. The McGill–Melzack Pain Rating Index (PRI) (Melzack, 1975) measured present-moment pain; the Body Parts Problem Assessment (BPPA) Scale (Kabat-Zinn, 1983) measured how problematic the patient viewed various body parts; the Table of Levels of Interference (TLI) measured how pain affected activities of normal living (Kabat-Zinn, 1982); and the three-color Body Pain Map (BPM)[6] assessed changes in pain distribution, intensity, and frequency (Kabat-Zinn, 1982). In addition, the total number of symptoms reported in the preceding month was monitored using a medically oriented symptom checklist (MSCL) (Kabat-Zinn, 1982). These indices measure overlapping aspects of pain and are not completely independent of each other.

Affective status was assessed using the Profile of Mood States (McNair *et al.,* 1971) and is represented in the results by the summary Total Mood Disturbance (TMD) score.

Psychological symptomatology was assessed using the revised Hopkins Symptom Checklist (SCL-90-R). The SCL-90-R is a validated 90-item inventory (Derogatis, 1977) consisting of nine symptom dimensions: Somatization (perceptions of bodily dysfunction), Obsessive-Compulsive, Interpersonal Sensitivity (feelings of personal inadequacy and inferiority, lack of self-esteem); Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism. The summary score, termed the General Severity Index (GSI), combines information on numbers of symptoms and intensity of per-

[6]Previously used with dermatomes and referred to as the Dermatome Pain Map (DPM).

**Table I.** Patient Characteristics

| | | | | | | | Major diagnostic category | | |
|---|---|---|---|---|---|---|---|---|---|
| | No. of males | No. of females | Mean age (years) | Mean chronicity (years) | No. of surgeries for pain | LBP | Headache | Neck/shoulder | Other |
| (A) Total population ($N$ = 90) | 30 | 60 | 44 | 8.1 | – | 31 | 24 | 15 | 20 |
| (B) PC referrals ($N$ = 21) | 5 | 16 | 48 | 8.0 | 1.95 | 13 | – | 2 | 6 |
| PC comparison group ($N$ = 21) | 13 | 8 | 37 | 4.6 | 1.10 | 9 | – | 9 | 3 |

ceived distress (Derogatis, 1977). The SCL-90-R has been shown to correlate well with comparable scales on the MMPI (Derogatis *et al.*, 1976).

The POMS and the SCL-90 (R) were employed together to obtain profiles of affective status and psychological symptoms since chronic pain is known to cause or be accompanied by severe mood disturbance as well as by depression, loss of self-esteem, irritability, and anxiety. These instruments have been shown to have independent predictive variance (Haskell *et al.*, 1969).

A Summary Outcome Questionnaire was used with the SR&RP patients both post-meditation training and at follow-up. This instrument was designed to yield a single number representative of the average degree of change in 10 relevant symptom and behavioral parameters since taking the SR&RP. It consisted of 10 questions pertaining to pain frequency, severity, use of drugs to control pain, activity levels, attendance at work, energy levels, feelings in general, ability to cope with stress, frequency of physician visits, and blood pressure. The rating scale was from 1 to 5, where 3 represented "no change," 5 "great improvement," 4 "some improvement," 2 "worse," and 1 "much worse," with the exact wording of each scale topic appropriate. Ratings for the 10 questions were averaged to give the Summary Outcome Score. If certain items were not applicable, the patient circled an option to that effect, and the average was calculated for the number of questions answered.

### Data Analysis

Data were analyzed using standard SPSS programs. The matched $t$ test was used to determine significance for paired pre–post or pre–follow-up results for the same subjects over time. The unmatched $t$ test was used to determine significance in the comparison of outcomes for the PC patients trained in meditation with the patients in the PC comparison group. The Bonferroni adjustment was then applied to the $P$ values from all $t$ tests as recommended by Ingelfinger *et al.* (1983) to reduce the risk of type 1 error from multiple comparisons. Further analyses to identify possible predictors of outcome were undertaken using linear regression and discriminatory analysis (unpublished results).

## RESULTS

### Pain Outcome

Outcome was first analyzed for the total group. For every pain index, the mean value was reduced significantly ($P < 0.003$) between pre- and postin-

**Table II.** Pain Outcomes for the Total Population

| | (A) Group means[a] | | |
|---|---|---|---|
| | PRI | BPPA | TLI |
| Pre | 19.3 | 41.6 | 11.8 |
| Post | 8.2 | 29.6 | 8.2 |
| % change in mean | 58* | 29* | 30* |
| *N* | 57 | 87 | 61 |

| | (B) Individual gains[b] | | | | |
|---|---|---|---|---|---|
| | ΔPRI | | ΔBPPA | | ΔBPM |
| Level of reduction | ≥33.3% | ≥50% | ≥33.3% | ≥50% | + +/+ + + |
| Number reaching this level | 41/57 | 35/57 | 48/86 | 36/86 | 42/87 |
| % of total patients | 72 | 61 | 56 | 42 | 48 |

[a]PRI, Pain Rating Index; BPPA, Body Parts Problem Assessment score; TLI, Table of Levels of Interference with daily activities.

[b]Fraction of individuals achieving the indicated level of reduction or improvement on each index. The TLI is not included. BPM, Body Pain Map; scored by comparison of pre and post drawings of the patient's pain (see Kabat-Zinn, 1982). The fraction represents the number of individuals in the population who were scored as either + + (moderate improvement) or + + + (great improvement). The PRI values have been corrected for zero values (Melzack, 1975).

*$P < 0.003$ in *t* test adjusted for multiple comparisons using the Bonferroni method (Ingelfinger *et al.*, 1983).

tervention assessments (Table IIA). Quantitatively similar results were obtained for the mean percentage change (Melzack and Perry, 1975) in each index (data not shown). The group mean value of the PRI was reduced 58%, that of the BPPA was reduced 29%, and that of the TLI was reduced 30%.

Outcome was also expressed in terms of individual achievements (Table IIB) following the format of Melzack and Perry (1975). By the end of meditation training, the large majority (72 and 56%, respectively) of the patients had achieved levels of pain reduction on the PRI and negative body image on the BPPA of greater than or equal to 33%, and 61 and 42%, respectively, achieved reductions of greater than 50%. The Δ BPM column in Table IIB shows that 48% achieved moderate to great improvement (+ +/+ + +) between initial drawings of their pain and drawings done following meditation training.

## Symptom, Mood, and Psychological Outcome

In parallel with the pain outcome, the mean scores for the number of symptoms reported for the preceding month (MSCL), mood disturbance

(TMD), and psychological symptomatology (GSI) were reduced by 35, 55, and 35%, respectively ($P < 0.003$) (Table IIIA). The majority (54 and 59%, respectively) achieved reductions of greater than 33% on the MSCL and the GSI,[7] and 37 and 39%, respectively, achieved reductions of greater than 50% (Table IIIB). There were significant mean reductions in all dimensions of the SCL-90-R; these were largest for anxiety and depression (unpublished data).

## Overall Outcome

The distribution of Summary Outcome Scores for cycles 3, 4, and 5 reflected these improvements. These subjects ($N = 59$) had filled out the Summary Outcome Questionnaire (see Methods) at the end of meditation training as part of the battery of post outcome measures. This measure has a scale from 1 to 5, where 3 represents no change, 1 represents a large negative change, and 5 represents a large positive change. The mean score was 3.9: 76% of the patients (45 of 59) scored 3.5 or above, and 61% (36 of 59) scored 3.8 or above. The range from 3.8 to 5.0 empirically reflects a moderate to great improvement in pain and in overall health status. One item asked for changes in medications for pain control. Of the patients in these cycles who were using drugs to control pain before taking the SR&RP ($N = 39$), 17 (44%) reported reduced drug dosages, and an additional 11 individuals (28%) reported rarely or never using medication for pain relief by the end of the SR&RP.

## Analysis by Pain Category

A comparison of outcomes for the three major diagnostic classes of pain among the patients was performed. These were (1) low back pain with or without leg pain ($N = 31$), (2) headache including migraine and tension headaches, ($N = 24$), and (3) neck and shoulder pain ($N = 15$). The results are presented in Table IVA. As expected, the mean initial levels for headache patients were consistently lower than those for patients with low back pain or neck and/or shoulder pain on all indices.[8] Patients in all three diagnostic categories achieved comparable degrees of improvement based on the Summary Outcome Scores available for cycles 3, 4, and 5 ($N = 59$). Mean Summary Outcome Scores were 4.0 for the low back-pain patients, 3.9 for the

[7]Due to negative scaling in the low range of the TMD scale, changes in an individual's TMD cannot be expressed readily as a percentage.

[8]The one exception was the number of symptoms reported in the previous month (MSCL pre mean, 23.3), which exceeded that for the low back-pain patients.

**Table III.** Symptom, Mood, and Psychological Outcomes for the Total Population

| | (A) Group means[a] | | |
|---|---|---|---|
| | MSCL | TMD | GSI |
| Pre | 22.3 | 47.8 | 0.77 |
| Post | 14.4 | 21.5 | 0.50 |
| % change in mean | 35* | 55* | 35* |
| *N* | 87 | 73 | 74 |

| | (B) Individual gains[b] | | | |
|---|---|---|---|---|
| | ΔMSCL | | ΔGSI | |
| Level of reduction (%) | ≥33.3 | ≥50 | ≥33.3 | ≥50 |
| Number reaching this level | 47/87 | 32/87 | 44/74 | 29/74 |
| % of total patients | 54 | 37 | 59 | 39 |

[a]MSCL, number of symptoms on a Medical Symptom Checklist; TMD, Total Mood Disturbance score on the Profile of Mood States (POMS); GSI, General Severity Index (SCL-90-R).

[b]The TMD is excluded because the percentage change could not be calculated due to negative scaling.

*$P < 0.003$ in $t$ test adjusted for multiple comparisons using the Bonferroni method (Ingelfinger *et al.*, 1983).

headache patients, and 3.9 for the patients with neck and shoulder pain. These differences were not statistically significant. Patients with neck and shoulder pain had higher mean pre and post values than the low back-pain patients on the BPPA, MSCL, TMD, and GSI. Neck and/or shoulder pain was consistently reported as more severe and more debilitating than low back pain.

## Analysis by Gender

The female-to-male ratio for the population was 2:1 (Table IVB). Males consistently had higher initial mean levels of mood disturbance (TMD) and of psychological symptomatology (GSI) than females. They were also less successful in lowering the mean scores on these indices than the females during meditation training. SCL-90-R profiles for the males showed higher levels of Somatization, Depression, Anxiety, Hostility, and Phobic Anxiety than those for the females both before and after meditation training (unpublished data).

The mean Summary Outcome Score for the females in cycles 3, 4, and 5 ($N = 41$) was 4.0, and that for the males ($N = 18$) was 3.8 (Table IVB). This difference was not statistically significant. Forty-four percent of the males and sixty-eight percent of the females were in the 3.8 to 5.0 range, reflecting a moderate to great overall improvement.

**Table IV.** Group Mean Values Pre- and Post-Meditation Training: Breakdown by (A) Diagnosis and (B) Sex[a]

| | PRI | | BPPA | | BPM | TLI | | MSCL | | TMD | | GSI | | Mean post Summary Outcome Score[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | | Pre | Post | Pre | Post | Pre | Post | Pre | Post | |
| (A) | | | | | | | | | | | | | | |
| LBP ($N$ = 31) | 17.6 | 8.7 | 41.2 | 27.2 | 1.3 | 14.5 | 11.1 | 20.8 | 13.1 | 51.2 | 18.8 | 0.78 | 0.47 | 4.0 ($N$ = 16) |
| Headaches ($N$ = 24) | 12.5 | 3.4 | 34.8 | 33.6 | 1.3 | 8.6 | 4.7 | 23.3 | 14.8 | 39.4 | 19.8 | 0.71 | 0.47 | 3.9 ($N$ = 13) |
| Neck/shoulder ($N$ = 15) | 16.9 | 8.0 | 57.5 | 37.6 | 1.6 | 12.1 | 9.7 | 25.5 | 20.9 | 58.7 | 33.4 | 1.0 | 0.74 | 3.9 ($N$ = 14) |
| (B) | | | | | | | | | | | | | | |
| Males ($N$ = 30) | 16.1 | 7.3 | 45.8 | 33.1 | 1.3 | 10.9 | 8.1 | 19.4 | 12.5 | 51.0 | 33.1 | 0.84 | 0.60 | 3.8 ($N$ = 18) |
| Females ($N$ = 60) | 16.1 | 6.4 | 40.0 | 27.2 | 1.6 | 12.3 | 8.3 | 23.8 | 15.2 | 45.1 | 18.3 | 0.75 | 0.45 | 4.0 ($N$ = 41) |

[a]PRI, Pain Rating Index; BPPA, Body Parts Problem Assessment score; BPM, Body Pain Map. BPM group outcomes are expressed as the numerical averages of individual change scores. Numerical values were assigned as follows: − = −1; 0 = 0; + = +1; ++ = +2; +++ = +3. TLI, Table of Levels of Interference with daily activities; MSCL, number of symptoms on a Medical Symptom Checklist; TMD, Total Mood Disturbance score on the Profile of Mood State (POMS); GSI, General Severity Index (SCL-90-R).

[b]For patients in cycles 3, 4, and 5 only. $N$ = 59, of whom 43 were in the three dominant pain categories.

### Comparison of Pain Clinic Meditators with Other Pain Clinic Patients

The reductions in pain and pain-related affect and symptoms observed consistently on the self-report indices the patients filled out before and after the program were paralleled by clinical improvements in many cases. These took the form of an increased capacity to sit, stand, or walk and an improvement in appearance and affect. The combined weight of these observations suggested a clinically important change in overall health status for the majority of patients trained in the meditation. To address the question of how these results might compare with the effects of a more traditional medical intervention, we compared as a cohort the mediators who had been referred for meditation training from the Pain Clinic with a cohort of 21 consecutive patients receiving the standard treatment course in the Pain Clinic (see Methods and Table IB).

Table VA shows that the patients undergoing the traditional treatment course showed little improvement in pain, symptoms, or affect. The meditators had large mean decreases on all the test measures, which reached significance in four of six cases. In no case did the change in the mean value of any index reach statistical significance for the PC comparison group.

The mean percentage change for each index was also calculated to compare outcomes for the two groups. The mean percentage changes in the PRI, BPPA, MSCL, and GSI were negative and close to zero for the PC comparison group. The mean percentage change in the TLI was positive and approximated one-third the value of the mean percentage change for the PC referrals to the SR&RP. The mean percentage changes in the PRI and the GSI were statistically significantly different between the two comparison groups in the unpaired $t$ test corrected for multiple testing ($P < 0.005$ for the PRI; $P < 0.05$ for the GSI).

The initial mean PRI for the PC comparison group was 9 points higher than the mean PRI for the PC referrals to the SR&RP. This was not a significant difference. The initial (pre) mean scores on all indices for both groups were similar in spite of the major differences in group composition (see Methods).

Comparison of the subdimensions of the GSI showed that the Pain Clinic meditators were reporting major reductions in Anxiety (65%), Depression (59%), Hostility (57%), and Somatization (30%), while the Pain Clinic comparison group reported mean reductions of 29% for Anxiety, 18% for Depression, 7% for Hostility, and 0% for Somatization. The reduction in interpersonal Sensitivity (lack of self-esteem) was 45% for the meditators and 34% for the nonmeditators.

Few individuals in the comparison group achieved the 33.3% improvement level (or the + +/+ + + level for the BPM) on any of the pain-related indices (PRI, BPPA, TLI, BPM) (see Table VB). Approximately 25% of

the patients achieved the greater than 33.3% reduction level in the number of medical symptoms (MSL) and in overall psychological symptomatology (GSI). These individuals constituted a much smaller fraction of their cohort than did those among the PC referrals trained in the meditation (Table VB). Individuals achieving greater than a 50% reduction level were far less evident in the traditional-care cohort than among the meditators.

## Follow-Up Studies on the SR&RP Patients

Three follow-up questionnaires were sent to these patients. Depending on when they took the program, the most recent follow-up to date, measured from the time the meditation training ended, was 15 months (cycle 1), 12 months (cycle 2), 4.5 months (cycle 3), or 2.5 months (cycle 4). Of the 72 questionnaires sent in the most recent survey to all subjects who completed the SR&RP in cycles 1 through 4, 56 were returned (78%). In three other cases partial information (the Summary Outcome Score) was obtained via telephone interviews. For the patients for whom 15 months of follow-up had elapsed, 80% (8 of 10) responded; at the 12-month follow-up, 69% (11 of 16) responded; at the 4.5-month follow-up, 67% (16 of 24) responded; and at the 2.5-month follow-up, 95% (21 of 22) responded.

A comparison of responders to nonresponders was undertaken to examine potential bias in the follow-up results, since one might assume that the individuals with more successful outcomes would be more likely to respond to the questionnaires. In the case of cycle 3, the first cycle in which post Summary Outcome Scores were obtained and also the cycle with the lowest percentage of returns (67%), the nonresponders (8 individuals) had a mean post score of 3.8; the 15[9] responders had a mean post score of 4.2. The difference is not statistically significant and both means were in the range empirically defined as successful (3.8–5.0). This suggests that nonresponders probably did not differ remarkably from responders in terms of successful outcome in the SR&RP itself. BPM scores were also compared for the responders and nonresponders in all cycles and no significant differences found.

Figure 1 plots the group mean values as a function of time for the (A) Pain Rating Index (PRI), (B) Body Parts Problem Assessment (BPPA) score, (C) number of symptoms (MSCL), (D) Total Mood Disturbance (TMD) score, and (E) General Severity Index for each cycle of the SR&RP for which follow-up data were obtained. The follow-up values are the means for those individuals in each cycle responding to that follow-up questionnaire. In all cases,[10] there was a pronounced and statistically highly significant reduction in the

[9]The post Summary Outcome Score was missing for one responder.
[10]The one exception was the BPPA for cycle 1.

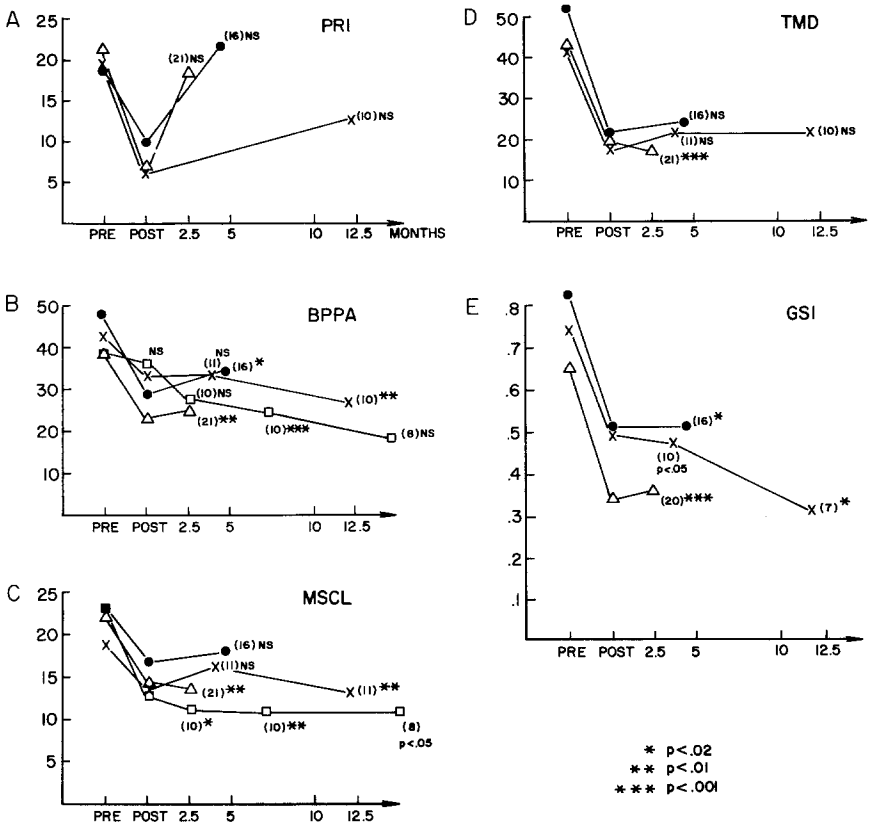


**Fig. 1.** Time dependency of outcome measures with follow-up. (A) Pain Rating Index; (B) Body Parts Problem Assessment score; (C) number of symptoms on a Medical Symptom Checklist; (D) Total Mood Disturbance score on the POMS; (E) General Severity Index on the SCL-90-R. Pre represents the initial mean levels for the patients in each cycle; post represents the mean levels after the 10-week meditation training. Follow-up times are expressed as months following the completion of the SR&RP. Open squares represent patients in cycle 1 ( $N$ = 10); crosses, patients in cycle 2 ($N$ = 16); filled circles, patients in cycle 3 ($N$ = 24); and open triangles, patients in cycle 4 ($N$ = 21). The numbers of individuals responding to follow-up questionnaires are given in parentheses next to the corresponding data points. The follow-up points represent the mean scores for the respondents. $P$ values for each follow-up point represent paired $t$-tests with pre values. Paired $t$ tests grouping 2.5- to 7-month returns together gave $P$ values of $< 0.0001$ on all indices except the PRI when comparing pre and follow-up levels for each responder. Similarly, $t$ tests for the 12- to 15-month returns gave $P$ values of $< 0.01$ for the BPPA and MSCL. All $P$ values are adjusted values after application of the Bonferroni correction for multiple tests. The PRI values have been corrected for zero values (Melzack, 1975).

level of each index between the initial assessment (pre-meditation training) and the immediate post meditation assessment, reflecting the pre/post results presented in Tables IIA and IIIA. Mean scores for each measure tended to remain at the postintervention level for periods of up to 15 months following completing of the SR&RP, with the notable exception of the PRI. The responses between 2.5 and 7 months postintervention were grouped together for each measure and tested for significance in the paired $t$ test, matching pre values with follow-up values for the responders and adjusting for multiple tests using the Bonferroni method. With the exception of the PRI, all were highly significant ($P < 0.0001$). Combining the 12- and 15-month follow-up results, the means of the MSCL and the BPPA also differed significantly from the pre but not from the post means using the same method ($P < 0.01$). In the case of the TMD and GSI, the mean values at the 1-year follow-up could not be shown to reach statistical significance compared to the mean pre levels. This appeared to be due to the smaller sample size because no data on these indices were collected in cycle 1. Nevertheless, the TMD and GSI means for the responders were always lower than the pre level at 1 year.

The Pain Rating Index (PRI) clearly differs from the other indices in its follow-up profile. In two of three cycles, on follow-up the PRI rose to levels exceeding the pre level, and in no case did the mean differ significantly from the pre mean value. The difference in behavior between the PRI and the other indices on follow-up is discussed below.

The results in Fig. 1 were not significantly affected when individuals who had taken a graduate SR&RP course were excluded from the follow-up analysis (data not shown). The finding that the mean improvements observed post-SR&RP are maintained over time (Figs. 1B through E) is thus not explainable solely by the additional training experienced by a minority of the responders.

## Compliance with the Meditation

The third follow-up questionnaire probed the frequency and duration of formal meditation practice with a set of three precise questions which made it difficult to exaggerate compliance without frank dissimulation. This format reinforced the face validity of this section of the questionnaire. On the basis of their responses, individuals were grouped in five classes: (A) regular meditation practice ($\geq 3\times$ per week and $\geq$ 15 min at a time); (B) sporatic practice ($< 3\times$ per week but $> 1\times$ per week and $\geq$ 15 min at a time or $\geq 3\times$ per week and $<$ 15 min at a time); (C) infrequent practice ($\leq 1\times$ per week and $\leq$ 15 min at a time); (D) no longer meditating; and (E) no information—did not answer the questions accurately or at all.

**Table V.** Comparison of Outcomes Between Pain Clinic Meditators (PC Referrals) and Nonmeditators (PC Comparison Group)

| | (A) Group means[a] | | | | | |
|---|---|---|---|---|---|---|
| | PRI[b] | BPPA | TLI | MSCL | TMD[c] | GSI |
| PC referrals (meditators) | | | | | | |
| Pre | 23.7 | 47.8 | 15.4 | 20.0 | 41.4 | 0.62 |
| Post | 15.2 | 30.1 | 11.2 | 13.6 | 8.4 | 0.33 |
| % change in mean | 36 (ns)[d] | 37* | 27 (ns) | 32** | 87*** | 47*** |
| *N* | 15 | 21 | 14 | 21 | 15 | 15 |
| | 42†† | 28 | 22 | 23 | — | 41† |
| PC comparison group (nonmeditators) | | | | | | |
| Pre | 32.5 | 44.4 | 17.7 | 22.9 | 51.1 | 0.74 |
| Post | 32.4 | 43.4 | 15.0 | 20.6 | 39.3 | 0.66 |
| % change in mean | 0 (ns) | 2 (ns) | 15 (ns) | 10 (ns) | 22 (ns) | 11 (ns) |
| *N* | 20 | 21 | 21 | 21 | 20 | 20 |
| Mean % change | −2 | −4 | 7 | −5 | — | −6 |

| | (B) Individual gains[e] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Δ PRI[b] | | ΔBPPA | | ΔBPM[f] | ΔMSCL | | ΔGSI | |
| | ≥33.3% | ≥50% | ≥33.3% | ≥50% | ++/+++ | ≥33.3% | ≥50% | ≥33.3% | ≥50% |
| PC referrals (meditators) | | | | | | | | | |
| Number | 10/14 | 8/14 | 10/21 | 10/21 | 7/19 | 10/21 | 6/21 | 11/15 | 6/15 |
| % | 71§§§ | 57§§§§ | 48 (ns) | 48§§ | 37§ | 48 (ns) | 29 (ns) | 73§§ | 40§ |

| PC comparison group (nonmeditators) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Number | 2/19 | 0/19 | 5/21 | 2/21 | 1/19 | 5/21 | 4/21 | 5/20 | 1/20 |
| % | 11 | 0 | 24 | 10 | 5 | 24 | 19 | 25 | 5 |

[a]PRI, Pain Rating Index; BPPA, Body Parts Problem Assessment score; TLI, Table of Levels of Interference with daily activities; MSCL, number of symptoms on a Medical Symptom Checklist; TMD, Total Mood Disturbance Score (POMS); GSI, General Severity Index (SCL-90-R).

[b]Corrected for zero values (see Melzack, 1975).

[c]Mean percentage change not calculated.

[d]Not significant ($P > 0.05$).

[e]Fraction of individuals achieving the indicated level of reduction or improvement on each index.

[f] Body Pain Map. The fraction represents the number of individuals in the population who were scored as either + + (moderate improvement) or + + + (great improvement).

*$P < 0.012$; significance of pre/post $t$ tests of group means corrected for multiple comparisons.

**$P < 0.006$.

***$P < 0.003$.

†$P < 0.05$; significance of unpaired $t$ test comparing the mean percentage change of PC referrals and the PC comparison group, corrected for multiple-comparisons.

††$P < 0.005$.

§$P < 0.05$ comparing PC referrals to the PC comparison group in the chi-square test (1df) or Fisher's Exact Test applied following the guidelines of Cochrane cited by Armitage (1971).

§§$P < 0.025$.

§§§$P < 0.01$.

§§§§$P < 0.001$.

More than 70% of the respondents in each cycle described themselves as still meditating (up to 15 months) following the end of the meditation training. Patients in classes A and B together constituted 54% (30/56) of all respondents (23 in class A, 7 in class B). Of the regular meditators (class A), 14 of 23 reported that they were "meditating everyday (almost)." Twenty-nine percent of the responders (16/56) were in the class of infrequent practice. Those who reported not meditating at all constituted 13% (7/56) of the respondents. The remaining 5% (3/56) either did not answer this section or answered ambiguously.

Seventy percent of the individuals with Summary Outcome Scores below 3.5 also claimed that they were still meditating. Thus, in many cases in which marginal or no improvement was detectable on the outcome indices, some factor appears to have motivated these individuals to continue to practice the meditation. The percentage of individuals in classes A and B among this cohort was lower (40%) than for those who had Summary Outcome Scores above 3.8 (53%).

The follow-up questionnaire also measured informal use of the meditation in addition to assessing the level of compliance with the formal practice. Patients were asked to rate the frequency with which they used awareness of breathing in daily life and to rate its utility as a coping strategy in stressful situations. This mindfulness strategy was used by more patients and more frequently than any of the formal techniques. Patients with Summary Outcome Scores above 3.5 rated awareness of breathing much higher in usefulness and reported using it more regularly in daily life activities than did individuals with scores below 3.5 (data not shown).

## DISCUSSION

The data suggest that mindfulness meditation training in the context of a Stress Reduction and Relaxation Program can be highly effective in reducing self-reports of both pain and pain-related behaviors in the majority of the patients referred to it for chronic pain. Significant group improvements were recorded over the 10 weeks of the program for present-moment pain (PRI), negative body image (BPPA), degree of inhibition of everyday activities by pain (TLI), medical symptoms (MSCL), mood and affect (TMD), and psychological symptomalolgy (GSI) including somatization, anxiety, depression, and self-esteem.

The specific outcome measures employed were chosen to assess the physical and psychological dimensions of chronic pain and appeared to reflect accurately our clinical impressions of the patients. Each index was reduced significantly when the results were averaged over the entire population and high proportions of individuals made major improvements on all indices.

This combined assessment of group and individual outcomes suggests a profound change in the majority of the patients due to the SR&RP intervention. How much of this improvement is placebo related, i.e., due to the *fact* of intervention rather than to the *nature* of the intervention, can be investigated only using placebo control groups in a prospective, randomized study. However, the mean chronicity of this population (8 years) and the fact that these patients had received extensive medical treatment without attaining this level of improvement speaks against a simple placebo effect, as does the lack of significant improvement in the comparison group of Pain Clinic patients, who were exposed to strong positive placebos in the form of enthusiastic referral to a specialty service, high expectation of relief, and pain-specific medical treatment protocols.

Thus, within the limits inherent in a descriptive outcome study, the specific questions posed in the Introduction concerning the empirical effectiveness of mindfulness meditation in the context of a stress reduction program have been answered in the affirmative both qualitatively and quantitatively.

A number of observations merit explicit discussion.

(1) The relative degree of improvement was independent of the referral source, pain severity, diagnosis (Table IVA), and gender (Table IVB). Thus the mechanism(s) which underlies the observed pain reductions is elicitable by individuals with different types of pain and over a wide range of intensities. This suggests a generalized applicability of the method for pain reduction and coping.

(2) The mean improvements observed on all indices during the intervention were maintained in the period from 2.5 to 7 months postintervention, with the exception of the PRI, with a high degree of statistical significance for the responders. Mean improvements in negative body image (BPPA) and symptoms (MSCL) were maintained at a significant level for the period of 12 to 15 months postintervention as well. Improvements in mood (TMD) and psychological symptomatology (GSI) tended to be maintained but did not reach statistical significance. The responders represented the majority of the study subjects. Since these indices in combination measured important aspects of a person's well-being, their coordinated improvement suggests a fundamental and long-lasting improvement in health status.

(3) The mean PRI tended to return to the original (pre) level by the time of follow-up. This finding can be interpreted in two ways: either (a) the PRI cannot be used effectively by mail in conjunction with previous PRI scores obtained in interviews (the pre and post data were obtained in individual interviews) and the rise is

an artifact of mixing the modes of administration of the instrument or (2) the rise on follow-up in the PRI above the postintervention level is real and reflects a worsening of the pain status. If we assume the latter, it is important to note that the increased PRI levels on follow-up were apparently no longer interpreted in the original (pre) way, because the mean BPPA score remained low on follow-up for the same patients. We believe that the stable reduction in the BPPA score reflects a newly developed ability to live with and cope with pain and reinterpret its meaning. Many of the patients trained in the SR&RP reported on follow-up that their pain is "still there" but that their relationship to it has changed, i.e., there is less fear of pain, less self-pity, and less willingness to let pain or fear of pain restrict activity. However, an analysis of the components of the total PRI (sensory, affective, evaluative) on follow-up did not yield discrimination of this kind as might have been expected. It remains for a carefully controlled study to elucidate this observation.

(4) The high compliance with the meditation practice achieved during the SR&RP appears to have been maintained over time. Seventy percent of the respondents reported that they still meditate (in response to the question, "Do you meditate anymore?"). A likely explaination for such a high proportion of individuals who claim to still be meditating on follow-up is that the meditation practice has an informal dimension in addition to the more time-consuming formal discipline. Thus subjects can honestly report that they still meditate in the sense that, from time to time, they consciously bring attention to the moment-to-moment events and experiences of their daily lives. On the basis of precise questions about the frequency, duration, and type of practice, 41% could be classified as regular meditators (class A; see Results.).

(5) Among the most successful individuals (those with Summary Outcome Scores above 3.8), there appeared to be two equal classes of pain outcome: (a) those for whom the pain was greatly reduced or eliminated and (b) those who reported that the pain was unchanged but that they were coping with it differently and therefore it was not as problematic as before the meditation training. Patients with diagnoses of headache predominated in the former class, but some individuals with chronic gastrointestinal, chest, and facial pain also reported sustained disappearance of pain. Low back-pain patients predominated in the latter class, but headache and other classes of pain were also present.

(6) There were considerable differences in the composition of the two cohorts of Pain Clinic patients compared here, and the potential

influence of these differences on the results observed is unknown. For this reason, the comparison suffers obvious shortcomings and needs to be repeated in a randomized prospective study.

(7) It is important to emphasize that the intervention makes use of meditation practice within a context of stress reduction and health promotion. Because of the short period of the training and its clinical orientation, it cannot be compared facilely with the years of intensive meditation training common in the more traditional contexts in which such consciousness disciplines are pursued. Nevertheless, the fact that even at an introductory level, such training appears to be enthusiastically received and useful and practical for patients with long-term pain problems attests to the potential power and depth of such approaches (see Burns, 1973).

For mindfulness meditation to be considered a practical tool in clinical behavioral medicine, it must be investigated and conceptualized within the theoretical and experimental perspective developing from the study of the psychological interventions currently in widespread use for chronic pain relief. At present, the most widely used and accepted of these are progressive relaxation, biofeedback, operant conditioning, hypnosis, and cognitive-behavioral therapies (Turner and Chapman, 1982a,b). One element which the above methods have in common and which may be of central and underestimated therapeutic importance is attention regulation. Each of these methods necessitates a conscious primary utilization of attention: either to muscle tension and relaxation (progressive relaxation and biofeedback), to a feedback stimulus (biofeedback), to exclusive expression of nonpain behaviors (operant conditioning), to suggestions of altered proprioception (hypnosis), or to events, emotions, and thought patterns in relationship to symptom onset (cognitive-behavioral procedures). Attention is directed to quite different objects in these different therapies. Yet it may be the regulation and the intensity of one's attention, and one's belief in a method based on past experience, rather than the particular object or process attended to, which are of greatest therapeutic value. Indeed, it is well known that any strategy for the self-regulation of attention, including purposeful distraction, can be used with some effectiveness in coping with pain both in the laboratory and in the clinic.

In this regard, recent laboratory studies using the cold pressor stimulus have shown that a strategy of attention to proprioception during the trial results in significantly less distress and higher tolerance than strategies utilizing distraction or expression of emotions (Ahles *et al.*, 1983) and that attention to sensation becomes a relatively better coping strategy the longer the trial (McCaul and Haugtvedt, 1982). In these laboratory studies, the word "pain" was studiously avoided because it had been observed (Levinthal *et al.*, 1979) that mention of the word pain negated any positive effects of attending to sensations. This lability of the attentional strategy to the mention of the word

pain suggests that training in detached observation of sensations through mindfulness meditation techniques could greatly enhance the positive effects of the attentional strategy used in these experiments since subjects were untrained and merely instructed to describe aloud the sensations that they were experiencing (Ahles *et al.*, 1983). This possibility could be tested by comparing experienced meditators with naive subjects using the cold pressor test and carefully documenting the precise strategies subjects *actually* used during the trials.

In terms of chronic pain, the results of our study suggest that the systematic cultivation of a flexible attentional capacity for detached observation of proprioception can enhance whatever the patient's previously (and often inadequate) coping strategies have been and reduce the level of distress. Holroyd and Andrasik (1980) have observed, in carefully controlled studies with tension-headache patients, that pain relief following EMG-biofeedback training was the result not of self-control of muscle tension but of learning to recognize the onset of headache symptoms. There is now increasing evidence that the use of biofeedback for pain control offers no therapeutic benefit in most situations beyond that attributable to the relaxation that is taught in conjunction with it (Zitman, 1983; Turner and Chapman, 1982a) and/or the cognitive and behavioral changes that often arise spontaneously within the therapeutic context (Turk *et al.*, 1979). Indeed, each patient's own private strategies need to be inquired into and cultivated when appropriate, rather than imposing the therapist's choice of method. When Holroyd and Andrasik's patients were taught to recognize the onset of symptoms, they spontaneously changed the ways in which they were coping even when no coping skills were taught. These authors concluded that "it may be less crucial to provide clients with specific coping responses than to insure that 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 circumstances where...inappropriate, should not be relaxation."

These observations imply that moment-to-moment mindfulness may, in this and other interventions, itself be the principal, if implicit, coping mechanism. While there may be a variety of cognitive and behavioral strategies to enhance this capacity, the clinical results of our study suggest that the systematic formal practice of mindfulness meditation, which in this context emphasizes attending from moment to moment to proprioception and to stress reactions, may provide a therapeutic dimension which includes both physiological relaxation *and* cognitive-behavioral changes and which goes deeper than the methods currently in use. We suggest that the evidence is strong enough to merit a comparative study of mindfulness meditation and other psychological interventions under rigorously controlled conditions in both the laboratory and the clinic.

## COMMENT

To be effective, it is likely that any clinical approach in behavioral medicine seeking to relieve suffering and improve the quality of life for patients with chronic medical problems must require an *active participation* by the patient to develop and utilize his or her full range of internal resources, including deep relaxation, physical fitness, self-confidence, and even wisdom.

Mindfulness meditation has a number of unique features which recommend it as a clinical method for teaching self-regulation and as a psychological intervention in chronic pain. (1) It is much less expensive to introduce than elaborate inpatient behavior modification programs, and training is readily accomplished in groups of up to 30 individuals. The high compliance we observed during and after training suggests that meditation can be both enjoyable and beneficial to large numbers of patients. (2) Its emphasis on self-observation and on self-responsibility can enhance realizations of self-worth and help people to perceive conditioned patterns of (illness) behavior more clearly. (3) Since this form of meditation is a systematic development of the basic human capacity to attend intentionally to events, percepts, and cognitions in the field of consciousness, it has a generalized applicability within a wide range of perceptual, cognitive, and behavioral contexts, which includes but is not limited to pain relief. (4) As with other meditative practices, mindfulness meditation can facilitate deep physiological relaxation (Benson, 1975). In contrast to relaxation techniques, however, it has the further property of enhancing what the Buddhists call "insight" (Nyanaponika, 1962). Walsh (1980) and Wilber (1980) suggest, as do the classical Buddhist meditation texts (see Nyanaponika, 1962), that mindfulness meditation accesses the deep structure or "core" of one's being and can potentiate the experience of what has become known in contemporary psychological circles (see Walsh and Vaughan, 1980) as "transpersonal" levels of consciousness. Potential benefit may thus be derived from training in this form of meditation on a multiplicity of levels, ranging from relaxation and anxiety reduction to profound personal transformation (Wilber, 1979). Mindfulness meditation has recently become a subject of exploration by psychiatrists (Burns, 1973; Burns and Ohayv, 1980; Walsh, 1977, 1978, 1983; Deikman, 1982; Kutz *et al.*, 1985a) and clinical psychologists (Brown and Engler, 1980; Deatherage, 1975; Shapiro, 1980). Attempts to integrate meditation practice into psychotherapy in appropriate instances are currently in progress (Deatherage, 1975; Kutz, *et al.*, 1985a,b; Shapiro and Giber, 1978). (5) An increasing number of Westerners are being trained in mindfulness meditation without cultural, religious, or ideological overtones at meditation centers in the West. It is certainly no longer merely an esoteric "Eastern" phenomenon. As yet, it is unclear whether the other major class of meditative practices, known generically as concentration meditation, would achieve similar clinical results. Mindfulness

is a generic term, encompassing a range of techniques and traditions, all utilizing attention in a well-defined way which differs substantially from the concentration practices but which, nevertheless, requires a foundation in concentration. It remains for further studies to clarify this point. (6) The physiology (see Davidson, 1976), psychophysiology (Woolfolk, 1975), and phenomenology (Maliszewski *et al.,* 1981) of intensive meditation practice are becoming fields of serious scientific research. While presently in its infancy, in the future this research may provide an important foundation for understanding the underlying psychobiological mechanisms of meditation and of the self-regulation of pain and point to new ways to maximize the subjective and latent dimensions of human consciousness for achieving wholeness and well-being, even in the midst of suffering.

## NOTE ADDED IN PROOF

A recent study has demonstrated the reproducibility of the results reported here and has extended the follow-up time to four years post SR&RP (Kabat-Zinn *et al.,* 1984).

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